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THE FIELD OF GEOGRAPHY.*

By Sir CLEMENTS R. MARKHAM, K.C.B., F.R.S., President R.G.S.

It was with great pleasure that I received an invitation to address a meeting in this town, on the occasion of the founding of a Southampton Geographical Society. Similar institutions have met with success and have proved useful in Edinburgh, in Newcastle, in Manchester, and in Liverpool, and I think that there are special reasons why equal success should attend the laudable and patriotic efforts to found such a society in Southampton.

I have thought that it would be agreeable to such an audience as I might expect to have the honour of addressing here, consisting of people of culture all more or less interested in geographical subjects, if I were to include in what I have to say, a general glance at the work connected with our science in its numerous branches, an explanation of the duties undertaken by a society devoted to furthering the aims and objects of geography, and a review of the uses of local societies, both to the people within the sphere of their action and to the general welfare and advancement of geographical science.

Geography is a description of the Earth as it is, in relation to man, and a knowledge of the changes which have taken place on its surface during historical times. One aim of this science is to ascertain by what agencies and by what processes the Earth has acquired its existing forms and characteristics. Sir Richard Strachey has poetically compared geographical knowledge to a setting in which are gloriously held together the bright gems of science, to form an intellectual diadem for man. Geography is the mother of the sciences, whence all others have

* Opening Address to the Southampton Geographical Society, November 17, 1897.

proceeded; and it is dependent on its offspring because it uses some of their facts, but looks at them from its own point of view. It deals with biology, but only from the point of view of geographical distribution and its causes. It deals with geology, but only so far as the past conditions explain and interpret the causes which have produced the present aspects of nature; while the geologist looks at the same facts from quite another standpoint—he studies the present that he may interpret the past. It deals with mathematics, but only so far as it is of practical use for accurate measurement, and for fixing the actual and relative positions of places on the Earth's surface. It is closely connected with meteorology and magnetism, because they deal with phenomena affecting the conditions of the Earth as an abode for man. Thus geography has been well defined by Dr. Mill, as the focus at which all the physical and historical sciences converge to throw light on the Earth as an organic whole. Mr. Mackinder has aptly summed up the work of geography with reference to the questions it answers. It first answers the question, "Where is it?" secondly, it answers the question, "Why is it there?" and, thirdly, it explains in what way its presence bears on the condition of man by affecting his environment.

It will thus be seen that geography is not a mere collection of names and of dry facts, but a body of knowledge of the deepest interest to every class in the community; while the adventures, the perils, and the heroism of the collectors of that knowledge form the brightest pages in our annals.

The first work of geographers is to answer the question, "Where is it?" To measure all parts of the earth and the sea, to ascertain the relative positions of all the places on the Earth's surface, and to delineate the varied features of that surface. This great work has been proceeding from the first dawn of civilization, and it will probably be centuries before it is completed. Explorers and geographers, surveyors and geodesists of each generation, work their allotted time, gradually increasing the stock of human knowledge by enabling other sciences and other branches of inquiry to make parallel advances; for they are all dependent on the accurate measurement and mapping of the Earth. Locality is one of the bases upon which all human knowledge must rest. Arts, sciences, administration, commerce, warlike operations, all depend upon correct geographical data. As those data become more extensive and more exact, so will every other human pursuit gain increasing light and truthfulness.

We are still very far indeed from an accurate geographical knowledge of even the most civilized countries, while by far the largest portion of the Earth's surface is inadequately surveyed, and a smaller part, though far from an inconsiderable part, is unsurveyed or entirely unknown. In the division of labour, the explorer forces his way into the unknown parts of the Earth; the surveyor follows, and furnishes us with topographical maps; and, finally, the geodesist produces, after rigorously exact surveys, those large-scale maps which meet the necessities of a highly developed civilization.

The first process, the actual discovery of unknown regions, usually attracts the greatest attention, because the heroic devotion and gallantry of travellers and navigators is an unending source of interest to old and young, and it has been so in all ages. All admirers of geographical achievement should ever bear in mind the story of the first known explorers. When they pass in review the deeds of the long roll of illustrious discoverers, down through the centuries, their starting-point should always be the tale told by Herodotus of the lads who, though young in years, are really the fathers of geographical discovery for its own sake.

On the shores of the Greater Syrtis, a deep gulf of the Mediterranean between Carthage and Cyrene, there dwelt, in remote ages, a Libyan tribe called Nasamonians. Five young men of their nation, enterprising youths of the highest rank, resolved to explore the vast deserts to the south of Libya. It would be a perilous enterprise even now; but in those days it was an undertaking involving not only obvious difficulties, but also appalling unknown dangers. Much forethought was necessary in making preparations for the journey. The lads must have been prudent and thoughtful as well as courageous, for these qualities were necessary for success, and they succeeded. After crossing a region frequented by wild beasts, they entered upon the actual desert, and travelled across it for many days. At length they came to a grove of trees, where they were seized and led away prisoners by a number of black men of small stature. They were taken through extensive marshes, and at length came to a city whose inhabitants were black. A large river flowed by this city, and in it crocodiles were seen. The Nasamonians had crossed the Sahara, discovered the Hausaland of Sir George Goldie and the Niger Company, and had reached the river Niger. The point of the story is that the lads returned safely, and imparted the new geographical information to their people. Traders of the nation told it to Etearchus, king of the oasis of Ammon, who repeated it to some Greeks of Cyrene. These Greeks retailed it to Herodotus, and the Father of History has handed it down to us. It is our great landmark, this expedition of the young Nasamonians. For theirs is the first exploring enterprise in history made avowedly to penetrate beyond where any one had been before. And, moreover, they became the geographical instructors of their people. They performed the functions of a geographical society, as well as of an exploring expedition. They have had a long line of successors during the subsequent two thousand years. There have been Nasamonians—it is an appropriate name for them—in all parts of the world, by land and by sea. Their names and their deeds are known to us all, from Bruce and Mungo Park to Burton and Speke, and still more recent worthies. Nor is the race likely to become extinct. There are Nasamonians at work in every continent. Young Mr. Cavendish, a youth who reached the age of twenty-one last May, has just returned from an important exploring journey in Africa. Sven Hedin, who will be with us in a few days, has climbed the unascended mountain of Mustagata to 20,000 feet, and has, for the first time, traversed the desert of moving sand between Yarkand and Khotan, at the peril of his life. Persuade him to come down to Southampton and lecture to the members of your young society; you will then see the true type of a Nasamonian. It should be one of your objects to find out the boys in the schools of your neighbourhood who have the true Nasamonian instinct, and see that they are given a fair chance.

Stories of heroic devotion, true deeds of knight errantry, long and tried services, are recorded of our geodesists and rigorously accurate surveyors, as well as of our explorers and discoverers. It is a high honour, as well as a great advantage, to Southampton that the establishment of the Ordnance Survey has been in your midst for upwards of half a century. The names of Roy and Colby, of James and Clark, must be, they certainly ought to be, as household words amongst you. Their measured bases, their 350 trigonometrical points from the Shetlands to the Scilly islands, and from Valentia to Lowestoft, are miracles of accuracy. Think, too, of the amount of cultured skill, of patient industry, and of devotion to duty that they represent. The two principal base-lines on Salisbury plain and on the shores of Lough Foyle are 360 miles apart. To test the accuracy of the work, their lengths were computed through the series of triangles extending over the 360 miles, and compared with results by actual measurements. What do you suppose was the difference? Five inches! This is what I call a miracle of accuracy. Here are the compensation bars for measuring the bases, and hither, to this town of Southampton, have been brought the standards of all the civilized nations of the earth for comparison. England may well be proud of her geodesists. And not less honour is due to the British officers who have worked at the trigonometrical survey of India throughout this century. Their labours, too, have been conducted in a deadly climate, in the jungles and deserts of the low country, in pestiferous deltas, and on the snow-clad summits of Himalayan peaks. In the whole range of exploring narrative there is nothing more calculated to excite admiration, nothing more touching, than the devotion of Colonel Lambton, the first superintendent of the Great Trigonometrical Survey of India. The old man had been absorbed in his great work for half a lifetime. He was fast wasting away from exposure and hardship. But to the very last he brightened up to renewed animation and vigour when the great theodolite was brought before him. He died at his post in a wild part of Central India. This was nearly eighty years ago. But in our own time the equally heroic death of Colonel Basevi has been recorded. At a height of 17,000 feet above the sea, on a Himalayan peak, where the temperature was below zero, and protected only by a light tent, this martyr to science was engaged in the delicate operation of swinging the seconds pendulum. One morning, while gallantly striving to rise from a bed of suffering and continue his work, he fell back and died. These geodesists and their labours ought to be present in our minds when we use their maps. They must combine the knowledge of a Cambridge wrangler with the energy, resource, and presence of mind of an explorer or a backwoods-man; and they must add to all this the gallantry and devotion which inspire the leader of a forlorn hope. The danger of surveying service in the jungles and swamps of India, with the attendant anxiety and incessant work, is greater than the chances against one man on a battlefield; the percentage of deaths is larger, while the sort of courage that is called forth is of quite as high an order. When the stories of the Ordnance Survey in Great Britain, and of the Great Trigonometrical Survey of India are fitly told, they will form some of the very proudest pages in the history of our nation.

We owe even more to our navigators and marine surveyors, for they have discovered, surveyed, and mapped the coast-lines of the world, thereby creating the commerce and the material prosperity of Great Britain. It is often forgotten with what an expenditure of valuable lives this mighty result has been obtained, and with what devoted perseverance and resolution our sailors have worked during the last four centuries, actuated and inspired by the love of their fatherland.

We read with enthusiasm the narratives of the voyages of Drake and Cavendish, of Davis and Hudson, of Dampier and Cook, of Parry and Franklin. They stand out before us as beacons to light the way. But we must recollect that they are only the greatest achievements, and that hundreds of services, some almost and some quite as admirable, are forgotten or not so conspicuously recorded. In the survey of the coasts of Africa, the deadly climate has demanded a precious life for every 50 miles that has been laid down, while the first explorers of the Niger and the Congo have been mown down wholesale. In the arctic regions we meet with equally devoted zeal. Nothing has ever surpassed the heroism of Sir John Franklin and his companions. They struggled on, in the performance of duty, and their voyage has no equal. They discovered the North-West Passage, forging the last link of the chain with their lives. Nor are the deeds of the leading men who conducted the searches for Franklin less worthy of our admiration. Think of the labours of M'Clintock, who, without the aid of dogs, was away in a tent for one hundred and five days, and travelled over 1328 miles. Think of Mecham, who in seventy days, also without dogs, went over 1336 miles, at the rate of 20 miles a day. Think of Sherard Osborn, whose writings are as charming as his labours on the ice were admirable; of Vesey Hamilton, whom we still have among us; and of many others.

More recent arctic work has proved that British explorers have not degenerated. The thrilling narratives of their exploits teem with deeds of devotion unequalled in all the deeds of knight-errantry. To select one out of many, I will mention what was done by my own young friends, Rawson and Egerton, in March, 1876. Their duty required them to set out over the ice, with a dog-sledge, and accompanied by the Danish dog-driver Petersen, when the thermometer was $-35°$, that is, 67 degrees of frost, falling afterwards to $-50°$, or 82 degrees of frost. Petersen was taken ill with cramp, and after that nothing would keep him warm. He was rapidly freezing, and if he had been alone, or with less devoted companions, he would soon have been dead. The two young officers burrowed a hole in the snow, covered it, and put Petersen in, raising the temperature to $+7°$, or only 25 degrees of frost. They then deprived themselves of all their own warm clothing, kept themselves alive by violent exercise, and took it in turn to warm Petersen at the expense of the heat of their own bodies. They succeeded, after long persistence and great suffering to themselves, in restoring the circulation to Petersen's extremities. They thus brought the poor fellow on board alive. I have always, in my own mind, placed the conduct of Rawson and Egerton, on this occasion, among the finest things in the annals of arctic heroism. Wyatt Rawson, as is well known, fell mortally wounded when guiding the Highland Brigade to the attack on the lines of Tel-el-Kebir. Egerton, now captain of the *St. George*, is one of the most distinguished officers in our navy.

Of this splendid courage, which knows no turning back from duty, no fear, no thought of self, our best discoverers and explorers are made. It is with such stuff that the greatness of our country has been built up; as well as by that moral courage which prompts men, in positions of responsibility, to decide upon the right course, which is usually the boldest course. In this connection I will allude to Captain Philip Carteret, of the *Swallow*, because he was a resident in this town of Southampton. Carteret sailed with Captain Wallis in 1766 on a voyage round the world, his vessel being very small and merely a tender to the *Dolphin*, commanded by Wallis. After a harassing struggle through the long narrow Strait of Magellan, in the face of gales of wind and other dangers, they passed out into the Pacific. The two vessels were then separated during thick weather, and Captain Wallis had given no rendezvous. The *Swallow* was not fitted up for the long voyage without a consort. She had no forge, and all the articles of trade were on board the *Dolphin*. Carteret might, under these circumstances, when he found himself alone, have abandoned the voyage. But he was made of different stuff. He was not to be daunted. He conceived that his duty pointed to the westward, and he boldly went forward. In spite of sufferings from scurvy, scanty supplies, and a leaky ship, he circumnavigated the globe single-handed, and made an important discovery on the way.

The reason I have selected Captain Carteret, among so many others, as a bright example of moral courage, is that he afterwards lived and died in this town of Southampton. He is one of your local geographical worthies.

My object in referring to these examples of heroic devotion among our travellers, geodesists, and navigators has been twofold. We ought to keep fresh in our minds the expenditure of energy, ability, and endurance, and the great loss of life that have been required to furnish us with reliable maps for our use and our instruction, to rejoice us with thrilling narratives of adventure which in themselves form an education, and to accumulate knowledge which has been of inestimable value, not only to this country, but to the whole civilized world. That expenditure, terrible though it has been and must continue to be, is fully justified, and more than justified, by the value of the results. Still it is very great. And when a devoted explorer falls, like Cook, or Franklin, or Livingstone, in the midst of his discoveries, his dying consolation is that his services will be appreciated and remembered by his country. It is for us, therefore, to keep the memory of such achievements ever green and fresh.

On the other hand, the stories of exploring labours, of gallant exploits in distant lands are the flowers which thickly strew the path of the geographical student, offering vivid pictures to his imagination, and giving an abiding and a living interest to all his studies.

The maps we have the privilege of using are the product of these gigantic labours. Their value to us cannot be over-estimated. They make us acquainted with all the world, they expound and explain the narratives which absorb us, in a way that no mere words can ever do. It is necessary to become familiar with them, but when that close acquaintance is obtained, they are documents which may be read, and which convey ideas and information like a book. The maps of the Ordnance Survey are now within the reach of all the people, and with them we can study the history of our country. We have the topographical (1 mile to an inch) maps, the county maps on a scale of a mile to 6 inches, and the parish plans on the much larger scale of a mile to 25 inches. Such maps—and there are similar publications in most of the countries of Europe—serve a thousand useful purposes. They are the basis of all inquiries conducted on scientific principles. Without them a geological survey is impossible; nor can botany, zoology, or ethnology be viewed in their broader aspects, unless considerations of locality, altitude, and latitude are kept in view. Not only as the basis of scientific inquiry, but also for the comprehension of history and of operations of war, for administrative purposes, and for the illustration of statistics, the uses of accurate maps are almost infinite. M. Quetelet, in one of his well-known letters, declared that such graphic illustrations often afforded immediate conviction of a point which the most subtle mind would find it difficult to perceive without such aid. Maps both generalize and allow of abstraction. They enable inquirers at once to detect and offer to rectify errors which, if undetected, would affect results, and throw calculations into confusion. As an example of the use of maps for administrative purposes, the series constructed by Mr. Prinsep in India is worthy of notice. They showed the agricultural tribes of a special district arranged according to occupancy of land, fiscal divisions, physical features and zones of fertility, productive power as influenced by rain or irrigation, different kinds of soils, acres under different kind of produce, and lines of traffic. Another series displays irrigative canals, depth of wells, rainfall and zones of drought, and other features. Similar information is shown on the 'Cartes agricoles de France.' In no other way can economic and industrial facts be so lucidly and clearly, as well as so rapidly impressed on an inquirer's mind. Maps can also be made to illustrate history, and other fields of research in a thousand ways.

Narratives and maps are the chief ways in which we receive the results of labours in the field, and in due time they conduce to still mightier results by the opening of new regions for enterprise, and the dissemination of knowledge leading to discoveries of practical utility. It will at once occur to any one who contemplates the gradual accumulation of this mass of knowledge, that there would soon be need for some active agency to undertake its organization and distribution. In point of fact, this need has always existed, and we now come to the main part of our subject, the foundation of Geographical Societies.

The need has, of necessity, always existed even from the days of the illustrious travellers and explorers of the time of Queen Elizabeth, and we may take a hasty glance at the way in which this need has been more and more effectually supplied as the years rolled on. The duty was first done by the collection and publication of voyages and travels. We must go back to the reign of Queen Mary, and to this old town of Southampton on the day that Philip of Spain landed here, and rode on to Winchester in pelting rain, to be married to his elderly cousin. We follow Philip and Mary to their subsequent public entry into London. It was a gorgeous display, and among the admiring crowd there was a young undergraduate from Cambridge, named Richard Eden. He described himself as nearly lifted out of self-command by the excitement of the scene, and he resolved on the spot to set about some work which might fitly commemorate the event. He published his 'History of Travayle' in 1555, and strove in other ways to do the work now undertaken by a Geographical Society. His mantle fell on the shoulders of Hakluyt, who zealously continued the same work throughout the reign of Queen Elizabeth, publishing his great book, 'The Principal Navigations, Voyages, and Discoveries of Englishmen made by Sea and Land,' in 1598 to 1600.

When the Royal Society was founded in 1665, for a century and a half it had to attend to all branches of science. Geography received some attention from it, but much less than any other science, and much less than its importance deserved. But this was more than made up for by the powerful influence of such personalities as Sir Joseph Banks and Major Rennell.

Sir Joseph Banks, the companion of Captain Cook in his first voyage, was a warm and active friend to geography during his long and useful life. In fact, he was the Geographical Society, to all intents and purposes, from 1778 until his death in 1820. He was an active member of the old African Association, formed for the exploration of that continent. He it was who obtained the order for forming the first settlement in Australia. He it was who, in conjunction with Sir John Barrow, raised the question of arctic research in 1818. We can read the narratives of very few explorers in those days who do not mention that they were helped either by representations to the Government, or by introductions, or by grants of money, or by advice from Sir Joseph Banks; while his most hospitable mansion in Soho Square was always open to geographers and explorers.

When Sir Joseph died in 1820, Major Rennell, the greatest among English geographers, took his place. He had been the Surveyor-General of India. He had constructed the map of Hindostan, which was the best for many years. He had prepared the map for Mungo Park's work, and had published the best maps of Africa. Travellers and explorers came to him with their rough work; projects were submitted to him for his opinion; reports were sent to him from all parts of the world. He presided over the labours of geographers, and formed a central rendezvous for help and advice. His forenoon receptions at No. 23, Suffolk Street, were frequented by all the geographers and explorers of the day. After the death of Sir Joseph Banks, the Geographical Society was Major Rennell. Hence it was that when Rennell died, at a good old age, on March 29, 1830, the foundation of a Geographical Society became a necessity.

The Royal Geographical Society of London was founded in the year of Major Rennell's death. Its first meeting took place on May 24, 1830, and it has now been in full work for sixty-eight years. The African and Palestine Associations were merged in the new Society; and a very active branch society was formed in 1832 at Bombay, which came to an end in 1873, after the ill-advised abolition of the Indian Navy.

The work of the parent Geographical Society has been, *first*, to collect and disseminate geographical information by the publication of transactions, occasional volumes, and maps; by holding evening meetings where papers are read and discussed; by collecting a library, and making catalogues to facilitate the work of students in consulting it; by forming a large collection of atlases, maps, and photographs; and by throwing the map-room open to the public.

Secondly, to promote and encourage expeditions for discovery and for exploring little-known regions. This has been done by making representations to the Government—which have frequently been successful—by drawing up instructions and giving advice, by lending instruments, by making grants of money towards the equipment and subsequent expenses of expeditions, by training travellers, by publishing the volume called 'Hints to Travellers,' and by granting to successful explorers the Royal awards and other recognitions. The Society has also sent out expeditions at its own expense and under its direct control.

Thirdly, to further geographical education, first among travellers, but also in the educational establishments of the country. The first object was secured by a system of instruction at small cost to the pupils, by which intending travellers are taught to make celestial and other observations, to calculate their observations, to use and adjust instruments, to make outer surveys, and to construct maps. They are also taught photography, and can receive such lessons in geology and botany as will be useful to an explorer. The Society has also succeeded in getting a geographical readership permanently established in the University of Oxford, has assisted the cause of geographical education by large grants during more than a quarter of a century, and has now under consideration a considerable scheme proposed by Mr. Mackinder. The Royal Geographical Society strongly feels the want of properly trained teachers of geography in the secondary schools throughout the country. We wish to see the standard of teaching raised where it exists at all; we wish to see geography included in the curricula where it does not now find a place. We believe that then, and not till then, Government examination papers will be prepared in a very different way from what is now the case, with a view to testing knowledge instead of inflicting useless torture on the memory. We are seeking for the best means of raising up a body of trained teachers who will be able to make their influence felt for good; but it is a very difficult question, and progress will, I fear, be slow. At present Great Britain is far behind most of the continental nations as regards the teaching of geography.

In spite of the unfortunate position of geography as a subject in educational curricula, there is no doubt that the interest in geographical work has immensely increased among the general public during the last twenty years, and it has been found that there is ample room for local geographical societies to flourish and to do good work at several important centres. Manchester, I believe, set the example in 1884. I have myself had the pleasure of visiting the Manchester Society four years ago, and have witnessed its crowded meetings and its excellent methods of work. The example of Manchester was followed by Edinburgh in December, 1884, and the Scottish Society has had the great advantage of influential support from Mr. Bartholomew, the eminent cartographer of Edinburgh. The Geographical Society of Newcastle-on-Tyne was founded in 1887, that of Liverpool in 1892, and both have received sufficient support, and have flourished. Evidently they are all filling obvious needs in their respective communities.

The aims and objects of local Geographical Societies would, I presume, speaking broadly, be much the same as those of the parent Society. They would endeavour to co-operate with existing local institutions, such as Chambers of Commerce, in the collection and diffusion of geographical information, probably paying a large share of attention to commercial geography. But there would, perhaps, be differences in this respect, with reference to the requirements of particular localities. They should all, however, devote attention to local topography and physical geography. I think it likely that the largest sphere of usefulness for local Geographical Societies will be found to be in the department of education, and here their influence ought really to be of national importance.

A society at Southampton, if well supported—and I sincerely trust that it will be so supported—appears to me to have a grand field of usefulness before it. The very position of Southampton seems to suggest the existence of such a society. The town must be full of cultured men with stores of reminiscences relating to voyages and travels. The great lines of steamers cannot have had their headquarters here for half a century without impressing the place with some marks of the two Indies. But the country itself is full of those features which are calculated to arouse interest in geographical evolution. You are at the head of a noble estuary penetrating far up into the eocene bed of Hampshire. The question, "Where is it?" is answered by the Ordnance Survey. But the further question, "Why is it there?" will be one of the problems which the Southampton Geographical Society will explain to its members. The eocene bed, on which your town rests, is surrounded and overlaid by chalk. What effect has this disposition of the land had upon the history of your neighbourhood? The Romans well understood the special value of particular sites, with reference to local advantages and to communications. Their reasons for placing their town of Clausentum on that peninsula formed by the river Itchen may well throw light on the geography of Southampton. When Cerdic and his Saxon army of colonizers landed here, they too, doubtless, had a reason for selecting this rather than any other port. This question will doubtless lead your members to consider the physical features of the Itchen valley, of the *Gwent* or *Venta* where Winchester now stands, and of the impenetrable fastnesses of Andredsweald. How did it happen that it was Jutes and not Saxons who found their way up the Hamble.

and settled as the Meonwara at the foot of the chalk? In short, your members will desire to know the history of everything in their neighbourhood which has any bearing on its physical aspects. Your Hampshire cliffs of clay and sand will also claim your attention. You know that the Saxon cathedral of Selsea is gone, and that its site is now far out at sea. You will doubtless make investigations respecting the rate at which your cliffs are being washed away by the action of the waves, and whither the sediment is taken. I think that the researches of your society into the geographical evolution of your own county and into its history as explained by its geography, will be the most fascinating part of your labours.

But, of course, you will also have to go further afield. Southampton seems to be well suited for establishing relations with explorers and with foreign countries. Its proximity to London will render it more easy to secure capable geographers to give courses of lectures, and to induce eminent travellers to visit you. I think it may also be expected that the presence here of numerous officials connected with the great lines of steamers, and of consuls representing foreign countries, will be a great advantage to the Society. It is not ten years ago since Mr. H. Guillaume, the Consul-General of Peru at Southampton, published his work on the Amazonian Provinces as a field for European emigration. It is likely that there are other foreign representatives here who take a similar interest in geographical subjects, and who will support your movement. Referring to your long connection with the Royal Mail Company, it looks to me most probable that your interest in distant regions will often be turned in the direction of the Western Indies. In that case you will open to yourselves a very interesting field for research. Certainly, apart from the polar regions, the most extensive remaining unknown and undiscovered areas are in South America, a continent which yields to none in interest and in the value of its products, nor has it any rival in the charm, beauty, and variety of its scenery.

I cannot resist the impression, however, that the most solid and fruitful department of your work will be connected with education. Southampton has the great privilege of giving a home to the Ordnance Survey, which is in itself a notable source of instruction. It supplies lessons in exact surveying and in cartography, while furnishing you with those maps with which all young geographers ought to begin their studies—the maps of their own homes. There should be a popular history of the Ordnance Survey in the hands of all young geographers of Southampton. One was written some years ago by Captain Palmer, which only requires to be brought up to date.

The Society will also, I can scarcely doubt, be in close alliance with the Hartley College, and I sincerely trust that the college will establish a Professorship of Geography, with classes for commercial geography, and for nautical astronomy and navigation. It is now some years ago since the Royal Geographical Society resolved to offer a prize if classes were formed with a syllabus approved by the Society's Council, including—

> Knowledge of the construction, adjustments, and use of instruments.
> Determination of geographical positions from astronomical observations.
> Rough surveying, bearings and distances, and determination of heights.
> Construction of a rough map of a region, to scale.
> Meteorological observations, reduction to averages, and drawing conclusions.

But, at that time, the Society's offer met with no response.

The professor might also train young geographers who, in their spare time, would become propagandists. The Manchester Geographical Society has long had a body of such youthful enthusiasts affiliated to it, who are called "Victorians." Well trained in the geographical subjects they undertake to propagate, they go forth to the towns and villages of Lancashire with lanterns and slides, and impart their own enthusiasm far and near. Through their means schoolmasters are indoctrinated with correct principles, and boys imbued with the geographical instinct, even in the most distant villages and the humblest positions, become known, and may have chances opened to them. The system of thus sending forth these geographical knights-errant has succeeded beyond expectation.

This is, I think, an example to follow. The young men of Southampton may equally be imbued with geographical enthusiasm, when they have been supplied with knowledge and trained as lecturers by the Hartley Professor. You need not give them the same name. Call them Nasamonians, after the geographical enthusiasts whose story has been handed down to us by Herodotus. A Nasamonian Club of such youths might be affiliated to your society. Mounting their bicycles, with lanterns and slides strapped on their backs, they would rush up the valleys of the Itchen, the Test, the Avon, and the Hamble, and penetrate to the remotest villages of the Meonwara. South Hampshire would become a geographically enlightened region, with your society as its centre. Ordnance Survey Maps of the parishes would be hung in all the village school-rooms, and masters would co-operate with the Society, and would teach from them on correct principles. Boys with geographical instincts and the desire to take trouble and to do well, would thus find opportunities, instead of having their hopes and aspirations crushed out of them. As members of the Nasamonian Club, they will be able to obtain encouragement, guidance, and information. Think by what mere chances our most illustrious geographers have been saved to us. Doubtless as many have been lost to us from never having had a chance.

Take the example of James Rennell, a friendless boy in the village of Chudleigh, in Devonshire. In 1756 the clergyman of the parish got him an appointment in a man-of-war. That was his chance. He devoted himself to geography, to making surveys and drawing charts. The rest of his story is like a fairy tale. In those days there was no promotion in peace time but through interest. Young Rennell had none. So at the end of the seven years' war he got his discharge at Madras. He received command of a small vessel belonging to the East India Company. She was lost in a hurricane. A merchant kindly made him master of a schooner going to Calcutta. When he arrived, the Governor of Bengal was looking out for some one to make a survey of the Company's dominions. His Excellency's private secretary had been an old messmate of Rennell's. He told the Governor that the master of a schooner in the Hugli was an admirable surveyor. The discharged midshipman, at the age of 22, was made Surveyor-General of India at a very large salary, received a commission in the Bengal Engineers, and in course of time became England's greatest geographer. The moral of which is—give your boys a chance.

Remember, too, the case of James Cook, the son of a poor farm labourer with a large family, and apprenticed on board a collier brig. He had the true geographical instinct. But he also had perseverance and the determination to do well—"Talant de bien faire," as it is expressed in the motto of Prince Henry the Navigator. Cook must have worked very hard in the nine years during which we know nothing of him. His chance came when he volunteered for a man-of-war as an able seaman to avoid the press-gang, and when Sir Hugh Palliser noticed his intelligence and zeal, he was made an officer. After ten years the value of his surveying services in North America had become so conspicuous that the Secretary of the Admiralty recommended him to command an expedition of discovery. The poor friendless boy, apprentice in a collier brig, became the most illustrious navigator that this nation has ever produced.

There are Rennells and Cooks in Hampshire villages now, waiting for the Southampton Geographical Society to found a Nasamonian Club. Not many years ago a ragged little boy came to a night school not a hundred miles from the Hartley Hall, and asked to be admitted. He was told that he could come in if he paid a shilling. He was going away with tears in his eyes, when the teacher, who was a kind-hearted man, was touched by his sorrowful face. He said he would let the boy come in without paying if he proved worthy. In a short time the boy was miles ahead of everybody else. He is now an officer of high rank in an important and responsible position. This shows that a teacher will do well to think twice, even three times, before he turns away a penniless little boy who wants to learn.

I have had no thought beyond throwing out hints for what they may be worth, in thus dwelling upon the work which might be undertaken by your society. But geography is many-sided, and equally good and useful work may be done on other lines. Whatever the plan may be, I sincerely trust that the Society will flourish and become a centre of humanizing influences, collecting information, spreading geographical knowledge, promoting education, and guiding and encouraging youthful talent.

In conclusion, I may mention that the Royal Geographical Society will have pleasure in welcoming the members of the Southampton Society when they visit London. They will have the use of the Society's rooms, the privilege of consulting the library and map-room; they will be given tickets on application to any of the Society's meetings; and they will be allowed to purchase the Society's publications at the Fellows' prices, which is less than those paid by the general public. It only remains for me to express my warmest wishes for the success of the Southampton Geographical Society.

TWO RECENT JOURNEYS IN NORTHERN SOMALILAND.*

I. BY F. B. PARKINSON, ASSOC. R.S.M., AND LIEUT. BRANDER-DUNBAR, 2ND CAMERON HIGHLANDERS.

IT was in October, 1894, returning from Australia with my friend Mr. Brander-Dunbar, that, on entering the Gulf of Aden, our conversation naturally turned to Somaliland. We had both of us read scraps about it sufficient to whet our appetites. We had heard of the high and healthy plateau of the interior, of luxuriant mimosa forests, of lions, of elephants, of semi-wild natives mounted on semi-wild horses, and of such-like things, that made us vow that if ever opportunity occurred we also would visit Somaliland, and see if there was anything left for us to discover.

Such opportunity came in the autumn of last year, 1896; but before commencing the record of what we saw and did, I take the opportunity of thanking the Society for the material assistance given us in the form of a loan of instruments, which enabled an accurate survey of the route, and also of the adjacent country, to be made. My best thanks are also due to several gentlemen for valuable advice and information, namely, Dr. Scott Keltie, Secretary of the Society; Mr. Coles, the Society's Instructor; Mr. Ravenstein; Prof. Howes, of the Royal College of Science; Dr. Woodward and Dr. Gregory, of the British Museum; and the Hon. Major Talbot, of the Department of Military Intelligence at the War Office. Also our trip would not have been so easy of

* Maps, p. 112.

accomplishment, had it not been for the kind and courteous assistance of Colonel Ferris at Aden, and Captain Mereweather, the Political Resident at Berbera.

On glancing at the general map of Somaliland, it is evident that, eastwards from Berbera, very little has been mapped beyond the forty-sixth meridian, except along the ninth parallel of latitude by Captain Swayne's trip to the Dolbahanta in 1891. At the same time Colonel Padget was working to the south-west of the Bur Dab range, and had a brush with the natives near Kirrit. It was, then, our main object to visit as much of this north-eastern portion of the country as we could, and how far we were able to carry this out will be seen at once from the annexed sketch-map of our route. For good reasons, which will be shown as we proceed with the narrative, we were unable to get as far east as we had hoped, and were obliged to turn southwards and content ourselves with exploring a bit of the Haud, or waterless plain of the interior. But there is nothing to regret in this, as we were more than repaid for any disappointment we might have felt by the observations we were able to make of the geological structure of the country, many important points of which we must have missed had we continued our easterly course.

Passing over the heat and dust of packing at Berbera, we found ourselves ready to start from that town on October 29, 1896, with twenty-two camels and twenty-six men. The hiring of these is not, after all, such a very arduous task, especially if one has read the concise hints on the subject in the Appendix to Swayne's 'Seventeen Trips through Somaliland,' a most valuable book, and our constant companion throughout the journey. The feeling of triumphant delight on setting out baffles all description, and brought forcibly to my mind those words of Dr. Livingstone's on beginning his last journey up the Rovuma—"Now that I am on the point of starting on another trip into Africa, I feel quite exhilarated." If an old hand like the doctor employs such an expression to describe his excitement, it may in a measure be imagined what the feelings are of those who start for the first time. It is impossible to ride for long; one is constantly jumping off one's pony's back to examine more closely some tree, insect, bird, or beast. This part of the maritime plains is known as the Guban. It is bounded by the Gulf of Aden on the north, and the wall of the great plateau on the south. We crossed it in a south-easterly direction, and it consists here of a limestone and shale country, more or less covered by low scrub, and traversed by numerous watercourses, which come down from the great wall. Several of these streams were running at this season. Large areas of this country are thickly covered with detritus, subangular fragments chiefly, and pebbles along the watercourses, which make very rough travelling. All along this route the escarpment of the plateau resembles a range of mountains running east and west. Viewed from Karingabile, it reminds one of the

Alps as seen from Turin; though on a smaller scale, it is just as imposing, because there is nothing visible by which the actual size may be compared.

Determining to ascend the plateau through the Miriya pass, we reached Huguf on November 5, a place immediately at the commencement of the rise, and already 2000 feet above sea. The next morning we began the ascent, and a magnificent gorge it is. We were much troubled by the midges, which, although they do not bite, yet fill one's eyes, ears, nose, and mouth, buzzing and crawling, so that without a bunch of twigs with which to whisk one's face, it would have been really impossible to proceed. It requires a bit of silk gauze, as trans-

CAMP AT DONGORREH, LOOKING WEST, SHOWING BAND OF CAVE-FORMING LIMESTONE IN THE HILLS.

parent as possible, to put over the hat and under the coat collar; this would entirely prevent the annoyance in these gorges. By 9 a.m. they had all dispersed. I believe it is only for a few weeks in the year that these midges occur, and on our return journey down the Sheikh pass, in January, we saw nothing of them.

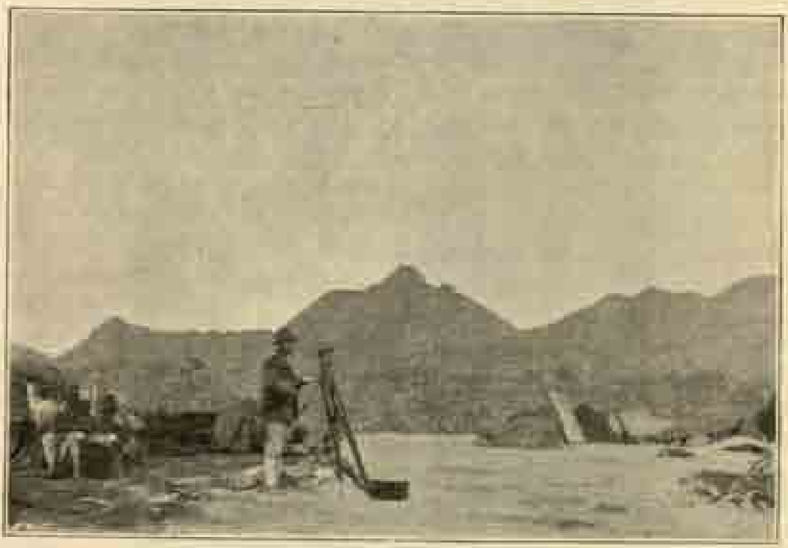
The geological section exposed in the Miriya pass is typical of the whole country which we visited, and all the principal horizons are here represented. On a bed of gneiss rest some 1800 feet of limestone, with less important layers of shale and sandstone. The band of hard limestone, some 250 feet in thickness, appears very generally over the country, and is everywhere eaten into caves at its outcrop. These caves are of all sizes, and afford a secure retreat to leopards, hyenas, and baboons. The photograph shows this formation above our camp at Dongorreh, where we remained for a few days to rest the camels and take observations, as I intended to make this the starting-point of the survey. The air is splendidly cool and bracing up here, and it is really hard to realize that one is in the tropics. The thermometer sinks to 65° in the early morning, making a good fur coat most welcome.

We ascended the hills to the west of camp, passing up one of the numerous ravines cut by the streams. The section was identical with the Miriya pass, though the cut was not deep enough to reach to the gneiss; and as this valley is at right angles to the pass, it proves the uniformity of the strata in this part. At one spot, where the torrent bed had been cut through the very compact hard limestone at an angle of about 30°, it was evident that at times the force of the water must have been tremendous. There were abundant proofs that a freshet filling this gully to a depth of at least 20 feet had passed down, but not recently, as there were trees growing from cracks in the rock at the bottom of the gully which measured 9 inches in diameter. They must have been at least forty or fifty years old, and had such a freshet come down within that time, they must certainly have been swept away. As the area drained by this gully is very small, it must have been a great and sudden downpour of rain to cause such a rush. On the top of the hill we found evidences of kudu and wild ass, and took a round of angles at a point 1600 feet above camp. This is a spur of the Negegr plateau, which lies to the north and forms the west wall of the Miriya pass. The well at Geba Geba is important, as it is the highest permanent water near the Miriya pass, and much used by the Habr Toljaala people when bringing their folds to pasture on the upper plateau.

Our next camp was at Gallol Dobleh, which we made on the 12th, near to a large guda tree in the plain, where a number of Toljaala shepherds were encamped with flocks of sheep and camels. We found no permanent water here, the nearest being Geba Geba. The bold outline of mountains to the north and east made good marks for the survey, so at night I took observations for latitude and azimuth, using Habrje peak as the referring-mark. The latter is a rugged mountain lying 17 miles to the north-east. It was at Gallol Dobleh that I obtained my first specimen of Clarke's gazelle. While encamped at this same place, I one day observed a vulture sitting on her nest in a low flat-topped mimosa. A colony of yellow weaver birds had built in the same tree, and some of their nests were actually attached to that of the vulture. I dare say they found this a great protection to them, as the smaller birds of prey would hesitate to approach such a formidable fortress. All the waters of this plain find their way southwards to the Tug Der; indeed, none of the streams flowing into the Gulf of Aden drain more than a few miles of the northern edge of the general plateau.

A march of 15 miles brought us to our camp near the base of the

Habrje peak: the central rock has a total height of 5079 feet. We pitched our tents at the foot of the peak, 500 feet above Gallol Dobleh. The first part of this march up to the low limestone ridge of Artalla lies over grass plain, pleasingly relieved with belts of small trees. But the moment the Artalla ridge is passed, quite a dense forest is seen to stretch up to the base of the mountain, and as far beyond it as the eye can reach, both east and west. This change in the vegetation is due to a change in the soil, which on inspection is seen to consist of the decomposed detritus of the intrusive rocks which form the axis of Habrje. I believe this is the only instance of a mass of granitic rocks, large enough to form a respectable mountain, known to exist in the explored parts of



HABRJE PEAK SEEN FROM CAMP, LOOKING EAST.

Northern Somaliland. I surveyed a closed polygon round the base, and found it 12 miles in circumference; the central peak rises 1500 feet above this. Our Malvern hills are a good example of a similar formation. The view from the top is magnificent. Eastwards, in the direction of Cape Guardafui, the wall of the rift extends as far as the eye can reach, and the most distant peaks must certainly be on or beyond the forty-seventh meridian; nearer are Gulhigluh and Morisman, apparently the exact counterparts of the Miriya pass. To the west can be seen all the country we passed through from Dongorreh. To the south the Bur Dab range is plainly visible, blue and shimmering in the heat; often the mirage makes this range appear as though it were the opposite coast of a large lake. To the north the prospect is limited by the range of gneiss hills that here bound the plateau. For 7 or 8 miles in all directions, except north, stretches a sea of rich green forest, which shows well how far the fertilizing influence of the detritus extends. Felspar and apatite, two very conspicuous minerals in this mountain, are no doubt responsible as the fertilizers. My friend Dunbar, who had been somewhat ailing since we left the coast, now developed an attack of jaundice, which necessitated our making permanent camp here until he should be able to march. This misfortune, though tantalizing in many respects, yet enabled me to make a more thorough investigation

HEADMAN OF OUR CARAVAN, ABDI ATTAYEH OF THE HABR GERHAJIS TRIBE.

of the immediate neighbourhood, and it also probably saved us from running into a "hornet's nest" unawares that might have crippled the caravan.

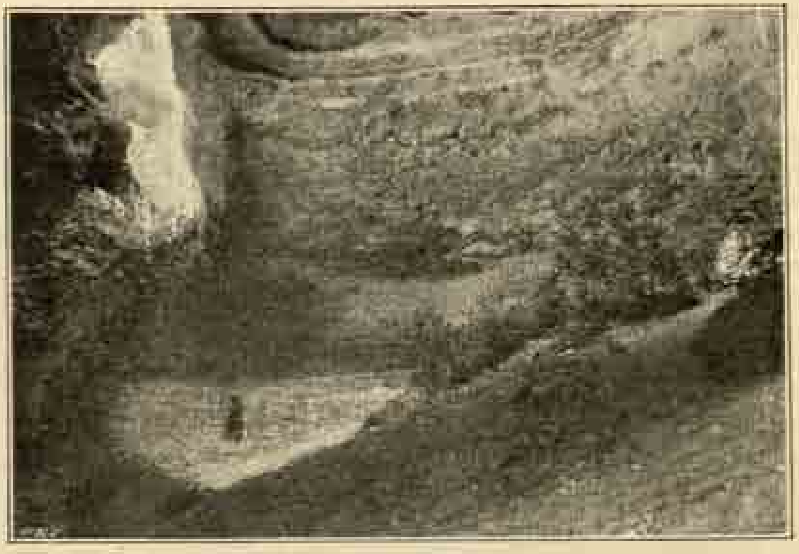
After reading Swayne's most accurate description of the Somali people and their ways, it would be mere repetition to attempt anything general here, especially as my experience was only of a few months' duration, whereas Swayne has worked amongst them for several years. However, we had rather a unique experience at this camp, which serves well to show the behaviour of the Somali when on the war-path. I had gone out in the early morning to shoot meat; Dunbar was in camp, ill. We had been following the fresh tracks of an oryx through the forest for a couple of hours, when shots were heard in the direction of camp. Wondering what this might mean, and finding that our quarry had been scared, we rounded for our zeriba, and had not gone far when we saw a mob of camels coming at a brisk trot down a glade towards us, and heard the clatter of horses' hoofs behind. Doda, my gunbearer, touched my arm and whispered, "Thief steal your camels, sir; shoot! shoot!" I at once exchanged the single rifle I was carrying for the heavy double, and bobbed down out of sight in the bushes. We had not many seconds to wait before the camels came straight up to us. We stopped them, and at the same time the heads of a score or two of horsemen appeared behind. Without further introduction, Doda dropped on one knee and deliberately fired amongst them, whereupon they dispersed in all directions, making the jungle crash splendidly. I ran 50 yards to my right to get clear of the bushes and opened fire; then, quickly reloading, gave them a parting salute. Doda had been blazing away all the time, but I don't know whether any of his shots took effect; he did his best, and behaved very coolly.

We now ran back to the camels, and were just congratulating ourselves upon their rescue, when the headman arrived with ten of our people. Adan, my butler, had had the foresight to bring me a fresh supply of cartridges; and the cook also appeared in warlike attitude, with a large enamelled iron basin for a shield, and brandishing a butcher's cleaver. A hurried conversation with the headman then ensued, from which it appeared that the raiders had driven off thirteen of our camels He was delighted that we had rescued them; but, as the raiders had also taken one of our ponies, I allowed the headman and six armed men to go on in pursuit to try and recover it, while we returned in triumph to camp with our camels. The raiders, when attacking, galloped past our camp to where the camels were feeding, 800 or 900 yards distant, and, in spite of the shots from the two men who were grazing the beasts, succeeded in rounding off the thirteen camels and a pony. By this time they were under a pretty hot fire from the party who made a sortie from the camp, but before they could get within reasonable range camels and raiders had disappeared into the forest, where our men, who were of course on foot, had but little chance of overtaking. However, our people ran well, and most fortunately drove the enemy into our ambuscade, and being met here at close quarters, they at once disgorged their booty. Had they known how small a force we were, I have no doubt they would have endeavoured to run the gauntlet, as they are brave fellows, and don't at all fear a fight, even against odds in the open. Later on, when we were at Eil Dab, we were able to send a messenger to these people, and found they bore us no ill will at all for having baulked them, and I have no doubt they will ultimately return our pony. Their whole sentiment seems to be that they are delighted to see us in their country, to go where we like; but if we are not strong enough in numbers, we must not mind the young men making a dash now and then to lift a camel or two. On sending out scouts to the east, we found that the Dolbahanta were in great force there, grazing ponies, so that, although we should not have been in any personal danger, yet probably, with our small force, we should have got a lot of our kit smashed, and lost camels. Dunbar also was sufficiently recovered to march to Berbera, and the necessary escort sent with him further reduced our force, so that I determined to remain where I was till they returned.

The Habrje well, from which we obtained our water at this camp,

HABR TOLJAALA NATIVES COMING TO "DIBALTIG."

lies 7 miles to the north, on the edge of the rift. It is a pool in a torrent bed, and with a little excavation might be much improved, or by building a dam across the gully quite a lake might be formed, which would enable a large number of people to stay here during the dry season and cultivate the rich soil. The true Somali would be offended if set to cultivate; so that, unless settlers from other parts could be induced to come, it would be waste of time and money to start public works for the improvement of the water-supply in such an isolated district. I am sure, as time goes on, additional wells will be made along the caravan routes; but it must be remembered that this offers an inducement to raiding-parties to harbour near such wells. For this reason many watering-places, which are opened by the herdsmen when they take their flocks up into the Haud, are carefully closed again when they retire. If it could be managed to close such wells with a cast-iron collar and locked door like the manhole of a sewer, it would certainly be a benefit to the people, and have a great tendency to check raiding, as the keys would only be in the possession of the elders whose people had a right to use the water. The eastern slope of the Habrje system is drained by quite a considerable river; it only has a definite channel for the first 9 miles of its course, but abreast of the peak it is 150 yards broad, and by the flood marks it must be chest-deep in the rainy season, and strong enough to transport large trunks of trees. A few miles to the south it splits up into many channels, the waters spreading over



CAVE AT SHIMBER BERRIS, LOOKING TOWARDS INTERIOR.

the plains, and finally joining the Tug Der. None of our people knew any name for it.

These volatile, song-loving Somalis form a great contrast to the stolid, practical Chinese with their iron memories, among whom I have lived so long. It has been observed by several people that the Somalis, when beckoning to any one at a distance, hold the arm extended, slightly raised and the palm down, and then bring the hand and arm with a sweep towards the ground. I am inclined to think that this is a more general form of beckoning than our English method with the forefinger slightly bent, holding the palm of the hand towards the face. I know both the Italians and the Chinese use the arm extended like the Somalis, and Dr. Livingstone mentions the same of the people in Central Africa. It was interesting to observe that my men, when drinking from a vessel, looked straight into the faces of their comrades, and showed no tendency to turn aside, as the British workman almost invariably does when treated to a pot of beer. One would have expected that this act to protect the throat would have been more strongly inherited by a semi-wild people. The Somalis are very keen in the chase, and brave to rashness.

One afternoon we hunted two lionesses. I had shot the first, and severely wounded the other as she galloped between two thickets, and so excited were the men that I could not stop them from at once following the lioness into the cover. She sprang on my gunbearer with such impetus that she turned a complete somersault with his leg in her mouth. The other two men, who were close by, did not yield an inch, but deliberately fired their rifles into the beast, and by good luck did not hit the man who was lying beneath her. Fortunately her next move was to charge at me, and enabled me to finish the encounter with a ball delivered into her chest at close quarters. My gunbearer was severely bitten in the leg and arm, but subsequently recovered. He seemed to think the matter rather a fine joke, and never deigned to show any symptoms of pain when his wounds were being dressed, not even when I had to enlarge one of the fang-marks to extract a piece of bone that had been splintered off the tibia. I found that carbolic acid, one in sixty, would not combat the deeper wounds; but a solution of mercuric chloride, one per thousand, applied with a syringe twice daily, at once checked the suppuration. In ten days granulation had set in nicely; but, owing to the large internal surface of the wounds, sufficient mercury had been absorbed to produce very slight symptoms of salivation, so I resorted again to the carbolic acid, which now proved effectual in completing the cure. For all wounds in tropical climates mercuric chloride is by far the safest and surest antiseptic, and even when it is not actually used upon the wound itself, a piece of lint soaked in it should be placed over all, to keep out the larvæ of flies, which are not killed by carbolic acid. Another great advantage is its portability, and perhaps the best way is to have it compressed into tabloids with a little ammonic chloride, which increases its solubility. The shepherds sent us a present of milk as a thankoffering for slaying the lionesses. A message also came indirectly from the raiders, apologizing for their rude disturbance.

On December 14, Dunbar joined me again in high spirits; he had quite recovered, and bagged a fine lion on his way from the coast. He came over the Sheikh pass, and down to Ber on the Tug Der. We decided that it was now best to go south, and crossed the plains to the foot of the Bur-Dab range at Shimber Berris. On this route there is rich vegetation the whole way, grass alternating with thick belts of trees and open park-like country. Dunbar reports that on his way to Habrje from Ber there are two marches of rather sterile country, with no trees and poor tussocky grass, due no doubt to over-stocking near the wells. Shimber Berris is 1000 feet below our camp at Habrje, though to the eye these plains seem as level as the sea. Game is plentiful here, but wild. Fine rocky gorges in the range show the same section as the Miriya pass, but the cuts are not deep enough to expose the gneiss.

The photographs show the interior of one of the large caves which we found in this part of the country. In it were the remains of many fires and camels' bones strewed about, showing it to be one of the resorts of robbers. It is a stiff climb to reach these caves, and no camel could ever get there unless cut up and carried on men's backs. About halfway

CAVE AT SHIMBER BERRIS, LOOKING TOWARDS THE MOUTH.

up the gorge is a deep cleft among huge boulders, with water at the bottom, forming a natural well. It is known as the Shimber Berris well, and has evidently been used for a long time, as the hard rock is worn in furrows 6 inches deep by the ropes that have been used for drawing water. This well, like the many cairns on the hilltops and remains of ancient buildings, is universally ascribed by the natives as being of Galla origin. Needless to say, the Bur Dab range is composed of limestone, and there is no evidence of volcanic origin.* We found here an old man living entirely alone, subsisting on gum and snared

* Swayne, 'Seventeen Trips,' p. 97.

game. He was very clever at catching gerinouk, or Waller's gazelle, by means of a cord made of the fibre of the "hig" aloe. At one end of the cord a running noose, 6 inches in diameter, was laid round the rim of a cup-shaped hole scooped in the ground, and supported by a series of small pegs. Near the noose was attached a fine but strong thread, the other end of which was fastened to a springy branch of a tree, bent down for the purpose. The noose was prevented from being dragged out of the hole by two pieces of wood laid crosswise. The loose end of the cord was either tied to an adjacent tree or pegged firmly

BUR DAB RANGE, LOOKING SOUTH-EAST.

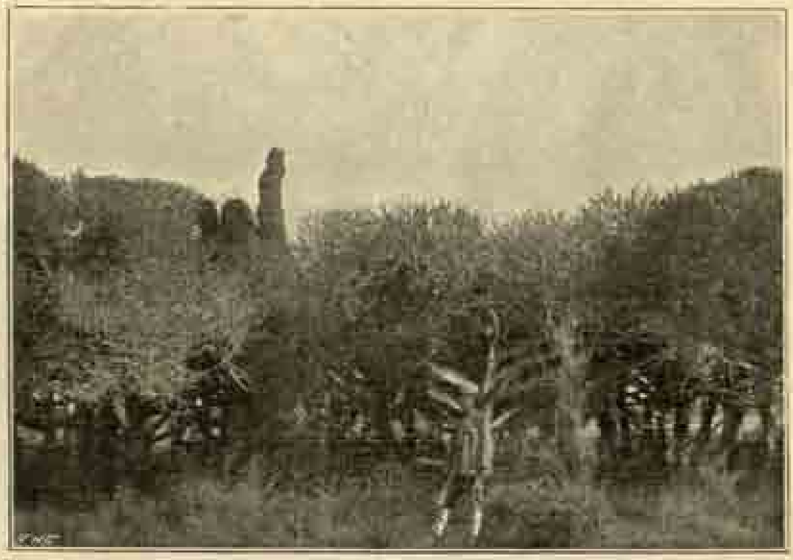
to the ground, and all traces of the trap neatly covered with leaves and sand. The gazelle is, of course, caught by the leg, and once the noose is drawn tightly round above the hoof there is no escape; but it must need large experience of the haunts of the game to know where to set these gins. The old man had thirty or forty constantly set, and said he got a gazelle once every four or five days. Opinions in camp were divided concerning this old man; some looked upon him as a knave, and others as a fool. I incline to the latter view, as he was mentally deficient in many ways, but there did not appear to be anything vicious about him.*

The Tug Der river has no permanent channel anywhere along here, but the water extends in a belt several miles wide, and nowhere more

* An old man of this description was found near this place by Swayne in 1891. I have no doubt it was the same.

than a foot or 18 inches deep, as seen from the high-water marks on the tree-trunks. At this season the surface of the ground is perfectly dry, but a view from the top of the range shows at a glance the extent of these flood waters, as the trees are stunted and the grass luxuriant.

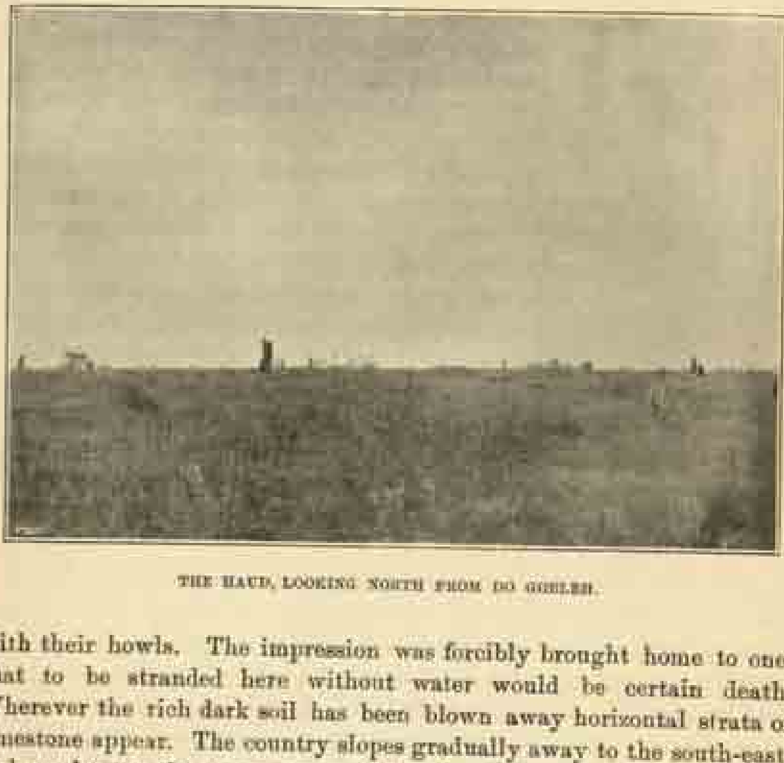
One morning I had wounded an oryx and followed the track for 6 or 7 miles, finally losing it on some hard ground; on returning we found the spoor of a large lion, which had been stalking us. It was evident that he had followed till we came to an open place, and, having sighted us, turned aside. Shortly after we met Dunbar, who had also discovered the track. We followed till nearly sundown, but he fairly beat us in some



GIANT ANT-HILL AND EUPHORBIAS AT ARRI BOB.

heavy jungle, and we returned to camp rather fagged by a hard day's work in the hot sun. A long march brought us to the top of the pass in the Bur Dab range called Bah Lardis, or, as Swayne has it, Laba Gardai. About halfway up on the northern slope were the fresh tracks of a rhinoceros across the path, but the rocky nature of the ground and horrible thorn thickets made it impossible to follow. It confirms the fact of these animals existing in the Bur Dab range, and the Dolbahanta people at Eil Dab told us there were three, two old ones and a younger female, that had been in this district for many years. At Eil Dab we found a considerable karia or collection of flocks and herds at the wells, and the young fellows who came to "debaltig" before us were the finest men and had the best horses we had yet seen in the country.

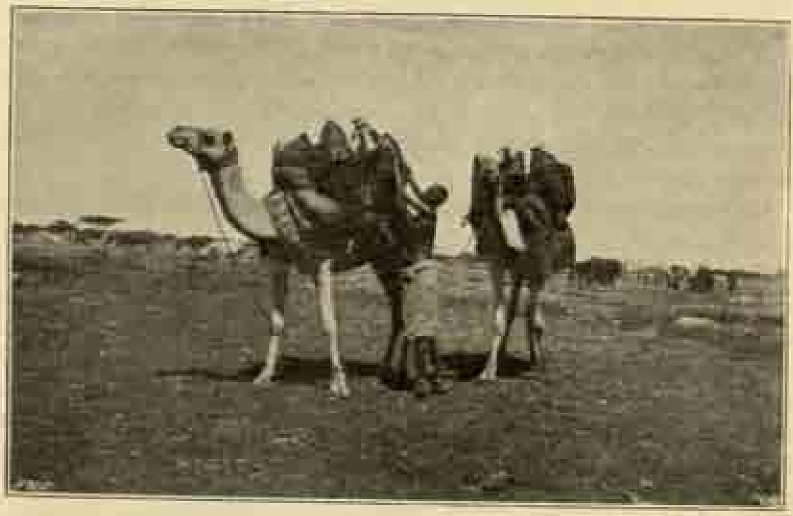
Filling all our water-barrels at Eil Dab, we set out on January 2 for Bohotle, 45 miles to the south. Passing through an undulating country of conglomerate with patches of sandstone, we camped the first night at Arri Bob by a grove of giant euphorbias and anthills. A leopard jumped over the zeriba in the night, and took a sheep's head out of the pot only a few yards from the tent. The Haud proper begins here, and stretches away to the south as far as the eye can reach, like a bush-covered sea studded with enormous anthills of dark chocolate-coloured earth, reminding one of the crumbling monuments in a deserted cemetery. No game here at this season, except the little "dik dik;" all is silent and desolate; even the hyænas did not follow us to make night hideous



THE HAUD, LOOKING NORTH FROM DO GOBLEH.

with their howls. The impression was forcibly brought home to one, that to be stranded here without water would be certain death. Wherever the rich dark soil has been blown away horizontal strata of limestone appear. The country slopes gradually away to the south-east, and one by one the upper strata of the Bur Dab range crop up, till at God-la-Yareh the appearance of the cherts show the top bed has been reached; that is, the top bed which now remains on the Bur Dab and Golis ranges, there being beds overlying this at Kirrit and other places, consisting of shales and marlstone containing gypsum, hæmatite, and flint, and whose decomposition forms the ferruginous soil of the Haud.

On the morning of the third day from Eil Dab a belt of forest appeared above the horizon to the south, making us hasten our steps as we entered the welcome shade, and in half an hour we emerged into a fine open spot covered with green grass, in which scores of wells have been dug, and good water is everywhere within 6 or 8 feet of the surface. It is a shallow basin in the Haud, which in the rainy season floods to a depth of 8 or 12 inches, forming a lake about 2 miles in diameter and almost circular. This, in drying up, passes through the various stages of a swamp, until (as when we saw it) the surface is quite dry and hard and covered with rich herbage. The surrounding belt of forest marks the limit of the flood, the big trees only thriving where the water does not stay too long upon the surface. These wells of Bohotle form a most important outpost in the Haud, affording



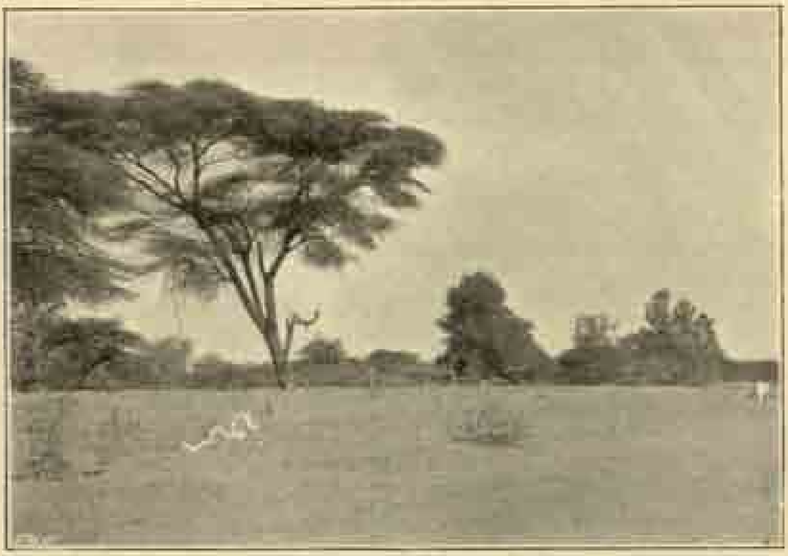
LOADING WATER-BOTTLES AT BOHOTLE.

a permanent water-supply to thousands of horses and cattle. Also caravans coming from the Merehan country in the south can water here before proceeding to the coast, either *viâ* Kirrit or Eil Dab. Countless doves roost in the belt of forest surrounding the wells, coming down every evening to drink. Wherever one of these birds is seen in Somaliland, it is a sure sign of water within 7 or 8 miles, and its direction can be found by watching their evening flight. Guinea-fowl and plovers are also plentiful here.

Bohotle was our farthest point south, namely, lat. 8° 15′ 45″ N., and on January 7 we took a north-westerly course for Kirrit. A well-worn caravan route leads all the way across the Haud, and there are, no doubt, many places where water could be obtained by digging wells, notably at Do Gobleh, two marches from Bohotle, where a similar "pan" exists, though on a smaller scale. It is evident that water remains on the surface here long after the rains have ceased. Somewhere to the west of this part of the Haud, Colonel Padget offered to dig a well and present it to the people; but they begged him not to do so, as it would offer an inducement for raiders to establish themselves in the Haud during the dry season. Footprints of lions were visible in the mud, which was now baked hard, showing that there is game here in rain-time. Of all the antelope, the dik dik (*Madoqua phillipsi*) appears to exist with the least amount of moisture. They were here in the open Haud, not in great numbers, it is true, but everywhere some half-dozen would be sighted in the day's march, even where the herbage was so dry that it crumbled to dust when rubbed between the fingers, and such distances from water that it was quite out of the question for these little animals to reach it. Moreover, when at the wells, it was certain they never came to drink there. At the time of our visit a scanty dew was only apparent on one or two mornings, yet, although all the other quadrupeds had retired, these little antelope not only subsisted, but were in good condition.

Nothing of importance occurred during the remainder of the journey across the Haud, and it was with a feeling of relief that we sighted the hills near Gorroreh, where there is a well of horrible water, smelling strongly of sulphuretted hydrogen, and possessing marked tonic and aperient properties. However, it did not appear to be unwholesome either to man or beast, and in this respect differs from the well at Kirrit (one short march to the north), which made Colonel Padget's people so ill. The Kirrit well is a natural cave in a gypsum bed, which runs through the base of a conical hill. The bottom of this cave is filled with the most fetid water, and they told us that only the day before we arrived two men, who were handing up the water to their friends at the mouth of the cave, fell insensible from the gases emanating from the water. Fortunately, we had loaded up the camels with Gorroreh water, which was the lesser evil of the two. We had to make this last to Burao, as at Idoweino there were only three bucketsful to be got after digging out the sand at the bottom of the well, and we found the wells closed at Eil-ka-dalanleh. This was annoying, as we had promised the camels a day's rest and ourselves a lion hunt at Idoweino.

It was with a feeling of regret that we entered the well-known country again at Burao. The Tug Der has a regular and broad channel all the way from the Golis range through Ogo, and for several miles below Ber, and a belt of fine park-like country borders both sides of the river. Through Ogo we found a rise of 300 feet in 20 miles as we journeyed northwards, which is an average of 15 feet per mile. Each day's march brings larger bushes and a fresher morning, but it is not until Dubbur is reached that the rugged edge of the rift appears, and the everlasting plains are left behind. It was here, on January 15, that I registered the lowest morning temperature, namely, 47° Fahr. at 6 a.m. The air was excessively clear, and fifteen minutes after the sun had risen I was able to light my pipe with a lens only 1¼ inch diameter. Later in the day Dunbar shot a fine kudu; the horns measured 53½ inches along the curve; the head was broad and symmetrical. An examination of this part of the Golis range showed the geological structure to be identical with the Miriya pass and Bur Dab. We enjoyed the march down the Sheikh pass tremendously; the scenery much resembled that of the Apennines when crossed from Chiavari



ON THE TUG DER.

on the Genoa side into the plains of Lombardy. Our time being expired, we made a rapid march across the Guban to Berbera, meeting Mr. Lort Phillips and party at Bihendula, who were on their way to the interior by the Sheikh pass.

Let us glance briefly at the tract of country we have passed through. All that part east and south-east of the Habrje peak is inhabited by the Mahmoud Gerad, a tribe of the Dolbahanta. Possessing many ponies, they are inclined to be rather independent and lawless, the more so as they do not wholly depend on Berbera for their supplies of cloth, rice, and dates, but go to the east coast, and also to Mait, 150 miles east of Berbera, in the Gulf of Aden. They have improved much of late years, and the increased value of ponies since the Italo-Abyssinian war is a great inducement for them to keep a check on their raiding instincts, and come in to trade at Berbera.

The Allegheri, who live to the south of the Bur Dab around Bohotle, are already entering into treaty with the British Government, and the Resident at Berbera had gone down to them a week before our visit. The same may be said of the Arasama, who until lately were the terror of all caravans; they are sandwiched, as it were, between the Mahmoud Gerad and the Allegheri. The Bur Dab range, owing to its large extent, rocky gorges, permanent water, and innumerable caves, will long remain the resort of robbers, unless the wells could be closed when the legitimate inhabitants move their flocks to other pastures. It is upon the protection of the pastoral interests that the prosperity of this part of Somaliland depends; it is within easy

ON THE TUG DER.

reach of Berbera, where there is always a good market. The quality of the mutton is excellent, and the ponies are useful little beasts, capable of enduring long marches under a blazing sun. The camels also are of a small but hardy breed, well adapted for the transport of merchandise. The resources of the country stand thus: sheep and cattle, camels and ponies, and next in importance hides, gum, "hig" fibre, and a few ostrich feathers.

The wants of the people are confined to cloth, rice, and dates, together with salt, brown blankets, and a few beads. They are capable of smelting iron themselves, but foreign metal is coming much into favour among the smiths, as it saves them the heavy labour of reducing the ore, and can be obtained very cheaply in a convenient form, to make their spears, axes, and smaller articles, such as bits and stirrups. A very small quantity of iron suffices for the Somali, as he requires neither agricultural implements nor vehicles. As matters stand at present, the country not only pays for its government, but there is always a small surplus, and although great commercial developments are hardly to be expected, yet it ought to be jealously guarded by us, as it is one of the few remaining places where, in a healthy and bracing climate, our young men may learn to face their lion and obtain that coolness of judgment only to be acquired in the chase of big game, and which will be of the greatest value to them in many spheres of life.

The preservation of the game by the proper regulation of the hunting-parties who go into the country should form one of the leading objects of the government, so that the stock may be kept up indefinitely, and all may find something worthy of their steel.

With regard to the map, the principal positions were found by observations of stars for latitude and azimuth, and the detail by traversing with prismatic compass. These methods are particularly adapted to the kind of country surveyed, which consists of large stretches of plain with bold peaks and ridges that form unmistakable referring-marks.

The only place I am not quite sure of is Daba Kallareri, there being two positions pointed out to me by our men as having that name, one at the north end of the Kerimo range, and the other some miles to the south-west. I have therefore marked them A and B.

The heights were calculated from observations of an aneroid and thermometer by Stanley, both of which instruments have been examined at Kew.

The following is a list of the principal positions :—

Positions found by Astronomical Observations.

	Lat. N.	Long. E.
	° ′ ″	° ′ ″
Arregir	9 10 16	46 10 35
Shimber Berris	9 12 21	46 4 5
Gallol Dobleh	9 42 20	46 0 33
Habrje camp	9 50 13	46 11 20
Station on Habrje	9 50 10	46 12 35
Bohotle	8 15 45	46 27 55
Himiri	9 11 34	45 45 20
Gorra Alm	8 49 0	46 26 40
Dongorreh	9 47 50	45 54 10
Bah Lardis pass	9 6 40	46 20 15
Eil Dab	8 56 40	46 29 40
Laseal well	9 54 0	45 51 10

Positions found by Triangulation with Theodolite, and traversing with Prismatic Compass.

	Latitude.	Longitude.
	° ′ ″	° ′ ″
Habrje peak	9 50 50	46 12 50
Ardi peak	9 58 20	46 3 30
Habrje well	9 36 50	46 14 10
Hill near Habrje well...	9 56 5	46 14 0
Daba Kallareri (A)	9 40 0	46 24 20
Daba Kallareri (B)	9 39 15	46 17 50
Artalla	9 43 5	46 8 0
Chan Der	9 36 0	46 6 0
Orhor	9 31 35	46 5 25
Cordohn Medn	9 25 10	46 4 30
Arri Bob	8 43 30	46 24 25
Ber Ras	8 36 5	46 25 10
God la Yarch	8 29 20	46 26 10
Shololah	8 22 20	46 25 15
Dohn	8 26 0	46 23 30
Morerdleh	8 28 30	46 20 25
Elemo	8 20 30	46 20 20
Do Gobleh	8 24 30	46 15 40
Yeh Bachti	8 31 45	46 13 15
Serman Ghadu	8 37 0	46 11 30
Adaleh	8 44 30	46 10 50
Gorroreh	8 52 45	46 9 50
Gol Addeh	9 1 55	46 4 15
Idoweino well	9 9 0	45 52 20

Positions taken from Swayne's Reconnaissance of 1891.

	Latitude.	Longitude.
	° ′ ″	° ′ ″
Yirrowa	9 24 44	45 43 5
Shellelo	9 2 52	46 0 25
Kirrit	8 58 33	46 9 28
Kabr Ogaden	8 56 24	46 28 4
Arreged	9 8 26	46 12 20
Lasaul (top of mountain)	9 52 39	45 51 46

II. By G. Percy V. Aylmer.

Starting from England for Aden by the P. and O. *India*, towards the end of 1896, we quickly exchanged the dreary skies and sullen winter weather for warmer and brighter latitudes. The "we" consisted of Mrs. E. Lort-Phillips and Miss Gillett, Messrs. E. Lort-Phillips, Bland, Fremantle, Gillett, and myself, all bound for Somaliland. Although so large a party, most of us had previous experience of the country, and each a special object in revisiting it. Mrs. Lort-Phillips and Miss Gillett, to add to the valuable collection, botanical, entomological, and geological, obtained in 1895 by the former and Miss E. Cole; Lort-Phillips to complete, if possible, his unique collection of birds, the result of many toilsome expeditions already; Fremantle and Bland on shooting bent. These comprised the main camp, whilst Gillett and myself formed a detached party for lion-hunting, in which I may mention at once we were singularly unsuccessful; and I also wished to fill in some blanks in a previous map, take a series of altitudes and observations, and visit certain parts of the Haud which were unknown to either of us, and consequently attractive. Aden, with its troublesome preliminaries, relieved by kind hospitalities, left behind us, and the miserable passage across to Berbera consigned to oblivion, we spent a busy week getting

DOBAR, FROM BERBERA.
(*From a photograph by F. Gillett, Esq.*)

together men, camels, ponies, and the thousand other requisites, and, having moved out to the Dobar mountains, camped near the stream which, issuing from its interior, provides Berbera with its water-supply. The Dobar mountains form one of several isolated limestone hills which shut in the maritime plain from the Hinterland. Although the ascent from the coast is to the eye almost imperceptible, yet its base springs from an elevation of 360 feet, whilst its summit, which Lort-Phillips, Fremantle, and I reached after a pretty rough scramble, is 1534 feet above sea-level. Here, perched upon a precipitous pinnacle of rock, we found a native praying-place, indicated by the circular arrangement of stones and boulders, probably of considerable antiquity, and seldom, if ever, visited, except by the troops of cynocephalous apes, which scream and swear at being disturbed. A glorious view rewards the climb. Across the glaring plain to the north the white mosques and buildings of Berbera show up against the deep blue background of sea, fringed with a golden eyelid of sand. East and west lies the maritime plain, with its rugged mountain sentinels, whilst to the south, the distant Goolis range, in tender blues and darker purples, half veiled by the crimson haze of the westering sun, stands cool and inviting above the fierce heat of the lowlands. From Dobar, the main route to the Sheikh pass in the Golis crosses another narrow plain, a few miles in width, and plunges into a rocky and precipitous defile, winding through the Kaffir hills. These are a broken and rugged line of limestone hills running east and west, about 6 to 7 miles in width. Singularly desolate in appearance, barren, and almost devoid of animal life, they are riven and weathered in every direction by the intense heat. About midway through this one comes upon the hard and imperishable Plutonic rock, here exposed by the cutting of the stream, which in this pass is almost always running above ground, in pleasant contrast to the usual dry and sandy tugs (or river-beds) along which one has so frequently to travel. The end of a long day's march from Dobar brings us to the pleasant camping-ground of Bihendula, and here, many hands making light labour, our querulous camels are relieved of their loads, which, skilfully superintended, spring up as a canvas village clustered around the grateful shade of a wide-spreading fig-tree. From Bihen extends another gradually ascending plateau, dotted like the lower maritime plain with solitary hills, here composed of Archæan rocks, and generally steep and difficult cones. The most imposing of these, Daimoli, I had long wished to ascend, so early one morning in 1895 I rode out from this same camp of Bihen, with two or three natives, a supply of water, and a good length of sound camel-rope. Seven or eight miles, gradually ascending all the way, over rough and stony ground of broken limestone, cherts, and granite (amongst the former of which are many ammonites, belemnites, and other fossil shells), brought me within easy reach of the north slope of the hill, which from this point certainly appears anything but tempting; in the form of a double cone, the higher is scarped all round its summit with a rather formidable-looking perpendicular cliff. Below this to the south and to the west its sides are impregnable; to the east, from this point of view, it looks perhaps practicable for a goat; whilst towards me its northern face sloped steeply down from its summit scarp for 600 or 700 feet in a bare face of smooth-worn stone. The base of this terminates in a tangle of stunted trees and huge boulders, and looked easily attainable, so leaving pony and camel, and taking with me a couple of natives, water, rope, and instruments, we laboriously worked our way up to the end of this fringe and to the base of the granite slope. This proved by no means so bad as it looked from the distance, so taking off boots and sandals, and using the rope in the bad places, we carefully crept up. As we ascended, however, the angle grew ever steeper and the stone smoother, until at last we arrived at a spot where progress seemed completely barred. My Somalis, although thoroughly plucky, had neither of them good heads for heights, and certainly clinging to the smooth rock face, which immediately below our feet sloped sharply away into apparent nothingness, was rather dizzy work. The plan so far had been, in the more difficult places, to advance with the rope until I found secure foothold, leaving the men standing firm below, to stop me if I should slide down, and then to lower the rope, by aid of which we all safely gained the same vantage. Here, however, the footing was so insecure, and the angle so steep, that evidently if I once began to slide (as was almost inevitable), I should carry the whole party ingloriously and disastrously down. To return as we had come was not desirable, even if practicable, and to go up here was clearly impossible, so was any movement to the east, but to the west it looked just possible to move sideways across the face. Anyway, it was clear we must move somehow, if we were not to stay up there for ever, and as the longer we looked at it the less I liked it, I made the move. Slowly and carefully, with boots and sandals dangling round our necks, we progressed crab-fashion across the slope to the westward, until at last, after an anxious passage, we arrived at a spot on the granite which I had previously noted, above which the angle seemed less steep, from which we were again able to resume our ascent. From this point all real difficulty ended; even the steep cliff at the extreme summit let us off easily, and we eventually found ourselves, hot and breathless, upon the hitherto untrodden top. A rough climb, but well worth the trouble. The summit, formed of huge weathered masses of bare gneiss, curiously studded with small protruding points of dark hæmatite, is split into fissures 10 or 12 feet deep, in which grasses, stunted shrubs, and flowering plants find a scanty soil. Of these I made a hasty collection for the benefit of our botanists in camp, and was richly rewarded by one of them subsequently proving to be new.*

After a welcome rest, utilized for taking bearings, boiling thermometer, etc., a close inspection from the top showed that a route down the eastern side to the col between the two cones was quite practicable, and proved to be perfectly easy; by it accordingly we descended, and by it this year (1897) Gillett and I went up without the slightest difficulty, and were again fortunate enough to secure two new botanical specimens. Bihen, from a geological point, is full of interest. From the specimens brought back in '95, Dr. Gregory (to whose notes on the subject † I am indebted for much information) decides that the limestone there is lower Oolitic and Bathonian, and a large and valuable collection of its fossils has been made by Mrs. Lort-Phillips. From Bihen, two short marches bring one to the foot of the Sheikh pass. Although this

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* *Kew Bulletin*, No. 105, September, 1895, pp. 211-230.

† 'Notes on the Geology of Somaliland,' by Dr. Gregory, F.G.S., F.R.G.S., etc.

is now an excellent road, our camels being heavily loaded, it occupied nearly the whole day to get them up. As, however, in 1884 it took us three days' hard preparatory work at the pass before we were able to even attempt the ascent, one may well be content with the present. At the summit of the pass is one of the comparatively few permanent villages in the country. These are solely occupied by the Widadin (priests), and correspond to a certain extent with our universities as seats of learning. They are also regarded as centres of godliness, which may, perhaps, rather destroy the parallel. Their sheikh succeeds to his position by virtue of age and holiness; cleanliness is evidently not taken as a connection of the latter, as I have seldom seen any apparently dirtier old man than the present holder of the title. Here, also, overshadowed by huge hassadans (euphorbias), lie the crumbling remnants of one of the old Galla villages, sole visible proofs of the occupation of a vanished race. That their inhabitants were in no way inferior in civilization to their successors, seems evident from even the scanty traces they have left behind them. Solidly made stone houses point to permanent occupation, and few years of disuse would naturally obliterate any trace that might be expected of regular cultivation. Well built of rough blocks of the country rock, laid in fairly regular courses, mud mortar alone was apparently used, as I could discover no sign of lime, and this and time probably account for their present ruinous condition. Rectangular in form, generally they are of narrower frontage than depth, and usually face north and south. The interiors in most cases consisted of a single room; several holes sunk in the sandy soil and *débris* within the walls brought us down to a hard limestone surface, which presumably did duty as flooring. No trace of woodwork in any form was left, anything of this nature having probably long since been used up for firewood; nor could I form any opinion as to the construction of the roof, unless the negative evidence of absence of remains in the interior points to thatch. In all probability, the method employed was that in use by their descendants in the Galla countries at the present day. That the entire population occupied permanent settlements seems, from the scarcity of these ruins, impossible; where they do exist, the sites are well chosen, but not even at Eyk, which is the most considerable of any of these ruined towns I have visited, do the number of houses appear sufficient to account for more than a few hundreds of inhabitants.

From this place our respective routes for a time diverged. Our main camp moved leisurely along the eastern extension of the ledge as far as the priests' village of Sok Soddah, within reach of the lofty mountain of Waggar, busily occupied with the acquisition of every object, animate and inanimate, that seemed worthy of a niche in the ever-growing collection; whilst I, with ten or a dozen Somalis, made a rapid march down to the neighbourhood of Bur Dap, in the south-east, from which direction reports of lions had been brought in. News, however, in

Somaliland, though it flies fast and far, generally grows in importance in inverse ratio to its accuracy, and, this case proving no exception, I rejoined the main camp at Sok Soddah a fortnight later, after a fruitless march of over 200 miles of roasting desert, having come upon only one old lion track during the journey, men, horses, and camels rather played out. The mountain of Bur Dap enjoys an evil reputation: situated on the boundary of the Habi Toljarlla and Dolbahanta tribes, and also within easy reach of the Habr Yunis, its position makes it extremely convenient for anybody who may be "wanted," no extradition

CAMP ON THE BIRSA.
(*From a photograph by F. Gillett, Esq.*)

treaties being there in force. The first meaning of its name signifies Fire mountain. As there is nothing volcanic in its composition, perhaps signal fires may be alluded to; on the other hand, I have heard the name explained by the assertion that Dap is the native equivalent for the rock of which it is composed.

I was glad, on this march, to renew my acquaintance with Burao (the point from which, in 1884, with the late F. L. James's expedition, we commenced a march to the Webbi by fourteen days over almost entirely waterless desert, across the Haud to Gerloguby, during which our camels never drank), and with one Mattar, then a boy, now sultan of this district, and the second in descent from that Awad who then held the reins. Awad was slain in one of their constant raids, and Mattar exhibited with much pride a sword we had presented to his ancestors, and gratified me by the intelligence that our Namoos, or good name, had acquired a permanent fragrance with his people, to preserve which I made him a small present, and prescribed three Cockle's pills for one of his wives, who suffered from a disorganized liver. Though I believe Somaliland to be in the main most healthy, and the hill country for Europeans particularly so, even more than usual care is needed at these elevations to guard against the great variation in temperature between the midday heats and the rapid fall in the thermometer which occurs immediately after sunset; whilst to the Somali, who has usually managed to pick up fever in some of his many wanderings to the Webbi or elsewhere, this cold mist and wet almost inevitably recalls his enemy. For these expeditions we always lay in a good stock of rough warm blankets to serve out to the men on guard at night or invalids, and they have really proved worth their weight in gold; but even with their aid the fever fiend cannot be entirely exorcised.

Shortly after returning to Sok Soddah, the weather improving and marching becoming again practicable, we moved the camp to the actual slopes of Waggar, where, at an elevation of about 180 feet above the Sok Soddah plateau, we found a much improved climate. The mists and rain seemed to blow over the shoulder of the mountain, and collect and hang upon the plateau, leaving the higher ground windswept and free, though even here reminiscences of just a soft day in the Scottish highlands were unpleasantly frequent. Excepting for this one drawback, Waggar seems to be a paradise for the 'ologist. Day by day saw large and increasing numbers of every species, known and unknown, creeping, crawling, flying, harmless, and (to give piquancy to their pursuit) deadly poisonous, added to the cases and bottles of our insatiable collectors. Gillett and I were on the eve of starting on a hard and long march into the Haud, for which we should require to take away about sixteen strong camels, and although we had left Berbera with close on to seventy, yet a certain number of these were always on the road keeping up communications with that place, and a certain number were weak or ailing, so that even Lort-Phillips himself, most ardent of collectors, who was meditating another move for the main camp still higher into the mountain fastnesses, groaned when he thought of the cruel track before him, at the rate at which the loads were increasing. However, as it turned out, our own camels bred on the plains proved quite unfit for the chamois track up which the main camp subsequently went, and hardy Eesa Moosa camels had to be hired for the purpose. For many years I had cherished the hope of paying a visit to a reputed

Galla city in the centre of the Haud named Eyk. Rumour had it that here the ruins were of vast extent, that every kind of antiquarian treasure was to be had for the picking up, and even as far back as 1884 whispers of heavy discs of gold finding their way mysteriously down to the coast had reached my ears, added to which that rather fraudulent monarch of the forest, the lion, was reported to be there in inexterminable numbers. Therefore, as time waits for no man, and summer must see us back in England, it was clear we must break up our pleasant, cheery party, and, leaving the cedars, running streams, ferns, and orchids of this land of comparative milk and honey, set our faces steadily to the south, and march into the heat and glare of the waterless Haud. So on February 18 we broke camp and started south. Four long days' marching through the monotonous stretches of the

WHITE-ANT HILLS.
(From a photograph by F. Gillett, Esq.)

desert, a constant reiteration of parched sandy plains, bare save for the endless succession of the giant white-ant hills, which give such a melancholy, churchyard-monumental look to the land there. Then long miles of the khansa (wait-a-bit thorn) jungle, through which the track, where there is one, winds a devious course, making each mile into two, and the task of working the prismatic compass almost hopeless. Then again through pleasanter stretches of large trees and patches of the tall and graceful durr grass, where oryx, debbertag, gerenouk, and owal relieve the march and help the larder; and by midday of the fifth day, emerging from one of the thick belts, Abdulla, our taciturn Midgan guide and tracker, points across a long dull-red depression, evidently in better times of rain a water-pan, to a distant cluster of brown irregular mounds dotting a wide open plain, on which a yellow sea of grass is waving, and laconically says, "Eyk." Pleased as we were to have attained it, depression fell upon us at its apparent insignificance, and, riding forward, we halted the caravan and pitched the camp amongst its broken walls. These a closer view showed to be of greater extent than at first appeared, and presently all hands, spurred on by prizes offered for the best finds, were hard at work hunting for relics. Of these we soon had a large store. Broken glass of a variety of sizes and patterns; broken bracelets very similar in pattern to those in use at the present day; pottery and china of several kinds, including Oriental china and Celadon; some few pieces of worked iron, silver, and bronze rings; a crucible for melting down silver coin to work up into ornaments, just as they use now; and also some interesting fragments of a grinding-stone composed of a hard black species of stone, which I believe was

RUINS OF EYK.
(*From a photograph by F. Gillett, Esq.*)

much sought after for this particular purpose in many parts of the world. These all formed a rather imposing array, but still were perhaps disappointing—nothing was whole, everything broken; and where were those golden discs under whose fancied weight our camels had groaned? Two days were spent in a close examination, which disclosed little further of interest. The houses, although in some cases larger than those at Sheikh, were built in the same manner and position, although of different stone, the material being a kind of conglomerate of limestone rubble naturally cemented together, brought from some slightly elevated ground at a few miles distant. Vast middens, overgrown with grass and thorns, pointed to a prolonged occupation, and yielded our principal finds. We came across several pits 15 to 20 feet deep, either wells dried and filled up with washed-in silt, or more probably, perhaps, simple catchment basins by original design, as they now are in effect, the surrounding mounds of thrown-out soil having been cut through on the southern and higher sides to allow the surface rain-water to drain in.

The Somalis have a legend that somewhere near there is concealed a deep and never-failing well, but so artfully hidden by the last departing of its original owners as never afterwards to have been discovered. Certainly there is abundance of water here in the rains, and by a little engineering applied to the depression to the north enough might be stored to last for a considerable period; but the Somali is content to drive away his herds and camels when the hard times come, and seek fresh pastures. The position of Eyk I found to be within a few miles of that assigned to it in 1884 by Mr. W. D. James and myself from native reports. This evening four camel-loads of water arrived, somewhat to our relief, as the precious fluid was running low. The want of water is the greatest possible hindrance to shooting in this region, where the lion-tracks may lead one to, no man can forecast, and, being almost always several days' journey from the nearest wells, it is anxious work making arrangements to meet camels with fresh supplies at some unknown point in the desert, whilst any hitch might cause a serious disaster. Providence was especially kind to us in this respect on several occasions. For long we drew our supplies from Berato, where an enterprising Somali has dug some wells; unpleasant and unwholesome, its only merit was the fact of its being liquid. At Berato there is a priests' village, permanent stockaded huts and jowari cultivation; whilst about 9 miles west is the large and important town of Hahi, the position of which I wished to fix, but was unfortunately prevented from visiting. At Berbera, however, I met Captain Swayne (brother of the author of a well-known book of Somaliland); he had just returned from this town, and gave me its position, but, having unfortunately mislaid the notes on this point, I have been compelled in this map to leave it in its present position, which is, however, approximately correct. The men with these water-camels reported that our road into Eyk had been crossed by a party of four lions, so we broke up the camp, and next morning at daybreak picked up their tracks. These we followed in an easterly direction towards Bur Dap, gaining little upon them, the tracking being slow, and towards evening of the second day, losing them entirely, and water running short, were compelled to leave them. The anthills in this particular district are certainly the largest that I have ever seen. Built up around a tree, which is rapidly absorbed within a tomb of red mould, very roughly following its outline, they assume most fantastic shapes, growing perhaps along some leaning fork until the centre of gravity falls so nearly outside the base that they are easily blown over by one of the frequent tornadoes of wind-blown sand, which the Arabs so aptly name spirits of the desert. They are built with great rapidity, according to the Somalis, attaining ten or a dozen feet of height in the course of a single year. On this day I picked up a good *Amadorcas Clarkii* freshly killed by a leopard, skin and scalp almost perfect. For weeks after this our journey was an unbroken record of constant marching and counter-marching across the Haud, at rare intervals finding lion-tracks, following them, never reaching them. Almost always their tracks showed them to be in large mobs, and always travelling. Our luck was out, and in spite of incessant hard labour we were never able to strike them. Pressing necessity at last for communication with the others, mails, and provisions drove us as far north as Dawelli, near the Djerato pass, which may almost be considered the western extension of the Mirsa ledge, as, although its continuity is broken between Bun Yero and Gan Libah, yet west of the latter the altitude and general geological features are again almost identical with those at Sheikh.

These objects achieved, we again started south for a rapid march to the Toyo plain for haartebeest, with the intention of returning from

TRACKING THROUGH ANTHILL COUNTRY.
(*From a photograph by F. Gillett, Esq.*)

there *viâ* Hahi to Sheikh; but a dangerous case of fever in camp made it necessary to give up the long march, and we accordingly returned to Sheikh by easy marches along the southern crest of the Golis, at an elevation of nearly 5000 feet, daily marching through dense fogs and rain. At Sheikh, Gillett, with his usual energy, started off on a flying march to endeavour to intercept the main camp—rumours of its being unexpectedly seen in Berbera having reached us—whilst I turned west again along the Mirsa, and ascended a steep pass impracticable to camels, in order to revisit the interesting cave of Shonach. Situated on the lofty neck' which joins the bluff of Foadwein with Foadiare, the mouth of this curious place is near the eastern extremity of a rocky gorge, on entering which one suddenly passes from the bright daylight into Cimerian gloom. Overgrown with heavy-leaved figs, hassadans, and junipers, a narrow path leads into this eerie place, until one's steps are arrested by the unusual sound of running water, which issues from a dark and creeper-hidden orifice. Needless to say, the place is haunted. Have not sheep and goats been seen to enter and never to return? and does not, from far down in the bowels of the earth, a deep booming sound come echoing along the narrow passage? Clearly a malevolent and carnivorous Afreet. Is not also the water itself, gushing from the dry rocks at the top of the hill, decidedly uncanny? Certainly the place does look interestingly mysterious, but also carried an unpleasant suggestion of snakes with it, which was not dispelled by the answer to my question on this head—"Allah yaaraf, labat" ("God knows, maybe"). Knowing the supply of air to be limited, I left my men behind and entered. For a short distance the height is sufficient to stand upright, and the breadth to walk dryshod on each side of the stream; but very soon height and width contract, and one has to take to crawling along the bed of the stream. Lighting a lantern, I became presently aware of the voice of the spirit: from far up the narrow tunnel came a deep booming, rushing sound, now advancing, now dying away. On advancing, the walls still contracted, until, being reduced to dragging myself along prostrate, a refreshing stream of water entered my collar and pleasantly trickled along into my boots. Again the mysterious noise approached, and the lantern, pushed in advance—which was just tall enough to keep the flame from the water—was, with my face and shoulders, violently assailed by a swarm of hundreds of bats, which came sweeping down the passage. Finding it completely blocked by the unexpected obstacle, they turned, and with them the noise again died away into the distance, until, their passage in that direction also presumably being arrested, the performance began again *da capo*. Twice I came to places where the roof was higher, and was able to relieve the strain of the awkward position, but the atmosphere grew more and more oppressive. Close above my face two huge and abominably repulsive greenish-coloured spiders kept pace. The light burned lower and lower, and finally went out. With some trouble I extracted from a dragging pocket a matchbox (fortunately water-tight) and relighted. Again and again it declined to burn, and finally, recognizing that the board-school allowance of air must be in dangerous deficiency, I commenced a feet-forward retreat until able to turn round and meet the welcome daylight. Before leaving I captured a couple of bats to add to the collection, but have not yet heard whether they belong to any new species. Sheep or goats, finding their way in, must perish miserably, as, following the water up, they must soon find themselves unable to turn, and would lack the sense to retreat backwards. The water on its exit from the cave falls almost immediately into a circular basin, from which it drains away by a subterranean outlet, and no doubt forms the headwaters of the Alla Ulli tug. I had attacked this cave in 1895 with no better success, and this year had conceived the idea of diverting the water from the basin and allowing it to form a surface-running stream down the valley, to the great advantage of those who frequented it. Now, however, the volume of water running had diminished by half, and as this would be almost immediately sucked out of sight in the thirsty soil, that scheme had to be abandoned. Where the source of this water may be, I am quite at a loss to know. That it could be an artesian supply, under pressure from the Abyssinian highlands to the west, forcing its way here to the surface through some natural shaft, seems difficult to believe, as it would have had to make its passage upwards through the subjacent granites as well as the limestone formation above. That water has in the past found its way into this gorge through similar channels seems evident, as I found several other smaller caves giving into it, apparently formed by water; but if considered as surface water, it is an equal puzzle how sufficient storage to maintain a constantly running stream can be found so near the summit. Moreover, this year much heavier rains had fallen in the immediate vicinity than on my previous visit, yet the stream had shrunk to half its volume.

The question also of what becomes of the rainfall over a great part of the Haud seems rather obscure. A considerable number of boiling-point altitudes show that the general trend of the country slopes to the south-east. The heavy rainfall from the crests of the Golis, and, with few exceptions, from the level of the Mirsa also, flows south and south-east, until, merging into the Tug Der ("Long tug"), it finds its way down the Wady Nogal and into the Indian ocean. This river, however, does not appear to drain any of the country south of about 9° 30′ N. lat., whilst the actual surface of the Haud below this, although of course in the main undulating, is, taken in detail, so remarkably flat that it is almost devoid of watercourses, and in the rare cases where any water-cuttings are met with, they extend no distance, but spread out on to the level surface like the fingers of a hand. This occurs even at Beràto, where one branch of the considerable tug which takes its rise under Dodoaba, loses itself in the plain after furnishing the wells at Oadwein with their water. I gather from native reports that the other branch in the rainy season carries water to Hahi, which in the dry season has to use the Oadwein wells. In some of the shallow pans which exist in limited numbers, the water remains for several months, and in a few throughout the year. In the former, even when dry on the surface, a species of mud that is just liquid to drink can sometimes be obtained by digging a few feet down, but care must be taken not to break through the thin stratum of clay which holds it from the sand below. The depth of this desert sand must be considerable, 70 or 80 feet of it being sunk through to reach the water at Burao on the northern side, and apparently diminishing to the southwards until the rock at Gerloguby on the southern edge is reached. As the Tug Der is ascended from Burao and the Golis approached, the water is found nearer the surface; but instead of finding, as might be expected, the converse to obtain in descending the river, we find the water at Ber, 10 miles below Burao, at only about 15 feet. Here the river-banks have almost disappeared, the flood water finding its way through several shallow channels, which converge again lower down. No doubt evaporation carries off a great deal of the rainfall, but does not seem sufficient to account for all. Natives of the desert certainly possess a kind of inherited instinct for the likely places in which to look for water, but it would be interesting to ascertain whether it might not also be found, to the great advantage of the country, in many places where it has not been sought for, but where to all appearance the indications seem equally favourable. Sun wedded to water in this soil and climate would grow anything and everything, and could the supply of the latter be made permanent, this arid desert would quickly blossom into a garden of Eden.

The benefits of an English occupation of the Somali coast are obvious to the Somalis. Natives near the coast are now met, more often than not, carrying no more formidable weapon than a stick. In 1884 this would have been with justice considered as merely foolhardy. Might was right, and though arbitration was frequently called upon to decide disputes, more often than not the question would end by being put to the crucial test of steel. Now when robbery and bloodshed occur, the disputants bring their case to the court at Berbera, where they are settled with justice and despatch before the Assistant Resident. Should one side consider that an appearance in person might involve danger to his life or liberty on account of the weakness of his case, pressure can be generally brought to bear upon the representatives at Berbera of his tribe, which will either ensure his eventual appearance, or necessitate his leaving his tribe for some such happy hunting-ground as Bur Dap, where he is, however, in the uncomfortable position of an exile and an outlaw. Trade with the interior existed under the old *régime*, but restricted almost to vanishing-point by the oppressive tolls levied upon the caravans, both on their journey and at Berbera. Fifty per cent. of their profits were commonly allowed to go in this manner. Now it is true we levy export duties, but these in no way compare with the former exactions of the Berbera brokers, whose profits, although not extinguished, are kept in reasonable check by legislation. Armed escorts are furnished to caravans passing through disturbed regions, to protect them from blackmail on the journey, whilst the mountain passes have been made passable, and life and property within our sphere are reasonably secure. These are but a few of the happy contrasts existing between now and then. Alas that in another respect *laudator temporis acti* should have a stronger case! The big-game shooting of the country year by year grows less, and I greatly fear that its fate is sealed. This is, however, a question which I have no justification for discussing here.

ROCKALL.

THE Royal Irish Academy has recently published an important series of papers on the remote islet of Rockall,* which summarizes all existing knowledge of that interesting rock. The recent revival of interest in Rockall is largely due to Mr. Miller Christy, who has called attention to the importance of its position as the site of a meteorological station, and endeavoured to induce the owners of sea-going yachts to attempt a landing. As Rockall is a small and steep rock rising on a bank of no great extent from the abysmal waters of the North Atlantic in lat. 57° 36', long. 13° 14' W., it is extremely difficult of access. It lies 185 miles from St. Kilda, in the Outer Hebrides, itself only accessible on a few occasions each year, and 260 miles from the north coast of Ireland. Prof. Rupert Jones, F.R.S., contributes a historical notice of previous references to the islet, from which, and from notes in the reports of other contributors, it appears that while frequently sighted and often mistaken for a ship, it has rarely been landed upon, and only a few attempts to land have been recorded. Fishermen from Grimsby and the Færoes frequent the Rockall bank, and they may have landed occasionally without leaving any authentic record. The recorded landings are given as follows:—

July 8, 1810: A party from H.M.S. *Endymion*, under Captain Basil Hall, made a landing with much difficulty, and brought away some fragments of the rock, which are still preserved.

August 15, 1862: A boat from H.M.S. *Porcupine* attempted to land; one man only succeeded in doing so, but at a point from which it was impossible to climb the rock. He broke off specimens with the sounding-lead which was thrown to him, and Captain G. H. Inskip presented fragments of the rock so obtained to several museums.

In or before 1888 the captain of a Grimsby fishing-smack is reported to have landed, and, climbing to the top, estimated its height as 78 feet.

In July, 1887, and in 1888, two fishermen from the Færoes landed and climbed the rock.

These appear to be all the authentic instances of a landing having been made. The rock is only about 70 feet in height, and not more than 100 yards in circumference, with some small submerged rocks lying off it. The extent of the bank, less than 100 fathoms deep, is about 100 miles from north to south, and 50 miles from east to west. The rock

* *Transactions of the Royal Irish Academy*, vol. xxxi. part 3, August, 1897.

has always been known as a resort of sea-birds, and the bank has a high reputation as a fishing-ground.

The expedition which forms the subject of the present notice is described by the Rev. W. Spotswood Green, who undertook it, together with Mr. Barrington, Mr. J. A. Harvie Brown, and other gentlemen. The Royal Irish Academy gave a grant in aid of the expedition, and the steamer *Granuaile* belonging to the Congested Districts Board was chartered for the occasion.

An outfit was put on board consisting of trawls, dredges, wire-rope, a sounding-machine, a harpoon gun throwing a small grapnel to facilitate landing, a rope ladder, and means for securing and preserving specimens. On June 3, 1896, the party left the harbour of Killybegs; the bank was found by soundings on the 5th, but on account of bad weather the rock was not sighted till daylight on the 6th, when a heavy sea was running, and the spray broke over it, rendering landing impossible. A fringe of tangle hanging in the foam, and a green band of alga above formed all the plant-life visible, and it seemed impossible that any land-plants could exist. By the evening of the 7th, all hope of the weather improving was abandoned, and on the 8th the steamer returned to Killybegs.

On the night of June 13, the party sailed again, sighted Rockall on the morning of the 15th, and made an attempt to land on the 16th, but the swell was too high, and the boat could not approach within 20 yards of the rock. Next day the steamer went on to St. Kilda, and returned thence to Ireland. While the trip was a failure as regards landing, a number of specimens had been secured by dredging on the bank, though at the expense of much loss of gear, and a series of photographs had been taken from all points of view, which, together with a coloured sketch, are reproduced in the memoir. From most points of view the rock appears as an inclined cone, the diameter in every case being less than the height; on one side the rock is perpendicular. The summit is whitened with the droppings of sea-birds, and there seems no possibility of ever establishing a station upon it. It was hoped that the rock might prove to be a breeding-place of the great shearwater, but, although a specimen of that bird was secured, it did not appear to breed there.

Most interest attaches to the dredgings, which revealed an abundance of Pecten and other shallow-water shells evidently long since dead, and lying in water of a depth in which they could not have lived. Mr. Green considers the possibility of these shells having been drifted there by icebergs in the remote past, or brought as bait by fishing-smacks more recently, but he concluded that neither hypothesis is tenable. He is consequently driven to conclude that the area is subsiding, and that the shells had lived on the spot when the sea was much shallower, and the land in the centre an island of some size. He is inclined to view the evidence as confirming the existence of the "Sunken land of Buss," as had previously been suggested; and he considers that it might repay the trouble if a similar exploration of the Porcupine bank were made to seek for traces of the equally mythical "Land of Hy Brasil."

Following the narrative is a report by Prof. Judd, F.R.S., on the rock-specimens taken by Captains Basil Hall and Inskip, in which he finds that Rockall is composed of an igneous mass capping a bed of possibly sedimentary rock. The igneous rock is of a special character, and Prof. Judd proposes to name it Rockallite; it is more nearly allied to a granite-porphyry than to gneiss, the chief minerals being quartz, felspar, and augite. Prof. Granville Cole reports on the rock specimens dredged on the bank, from which he gathers that the remains of a basalt plateau may be found there underlying the rockallite. Mr. R. H. Scott, F.R.S., gives a note on the currents and winds of the region round Rockall; Mr. H. N. Dickson contributes an analysis of the water samples collected by the expedition; Messrs. Harvie Brown and Barrington discuss the birds; and several specialists deal in detail with the animals obtained by dredging. Thus, although unsuccessful in one important particular, the enterprise of the investigators has been productive of excellent scientific results.

THE FUNAFUTI CORAL BORING EXPEDITION.

REFERENCE has frequently been made in the *Journal* to the progress of the deep boring which was undertaken last year in the coral island Funafuti, one of the Ellice group. An attempt had previously been made under the charge of Prof. Sollas, F.R.S., but on account of the cavernous nature of the rock and the prevalence of quicksands, it had to be abandoned when a depth of about 100 feet had been reached.

The geographical and geological interest of a deep boring in coral rock lies in the fact that, if a solid core of rock can be obtained, the examination of its nature should decide the question at issue between the theories of Darwin and Murray as to the origin and mode of growth of coral formations. Darwin's theory accounted for the series of coral forms—fringing-reef, barrier-reef, atoll—on the assumption that the foundation was undergoing subsidence, and a consequence of this theory, if true, would be that barrier-reefs and atolls were composed of masses of coral rock of very great thickness. Murray's theory, on the other hand, accounts for the form of coral islands by considerations of growth and wave-action alone, not requiring a region of subsidence for its development, but demanding that the cake of coral rock should be not more than from 100 to 200 feet thick, this representing the bathymetrical limit of the life conditions for reef-building corals. The sheet of coral rock must, on this theory, be based upon other marine sediments of different character or on volcanic rock.

Deep borings have previously been made in coral islands, even to depths exceeding 1000 feet, but they were not available for the crucial test of the two theories, because the drills employed pulverized the material and made it impossible to determine its precise nature. The diamond drills used at Funafuti cut out and bring to the surface a core of unbroken rock. They were lent by the Mining Department of the New South Wales Government, and put in charge of a staff of workmen under an experienced foreman.

The Australian papers give a full account of the second and successful expedition, a brief note on which appeared in our December number. The Geographical Society of Australasia, Sydney branch, deserves much credit in promoting the expedition, the funds of which were also added to by the late Hon. Ralph Abercromby and Miss Edith Walker. Prof. David, who occupies the chair of Geology and Physical Geography in the University of Sydney, accepted the leadership of the expedition, and was accompanied by Mrs. David, Mr. George Sweet of Melbourne, Mr. Poole, and Mr. Woolnough of Sydney, and six men in charge of the diamond drill. They left Sydney on June 4, 1897, and got to work immediately on arriving at Funafuti. The spot selected was on the atoll rather nearer the oceanic than the lagoon side, at a place where the ribbon of land is only about a foot above high-tide level, and not more than 265 yards across. By July 19 the bore was down 102 feet, but the work was extremely slow on account of the necessity of lining the bore with iron pipes as it proceeded. Had the rock been hard enough to render lining unnecessary, or soft enough to allow the successive lengths of tubes to be rammed down by a pile-driver, the distance drilled in a given time would have been twice as great. As it was, the tubes had to be "under-rimed," *i.e.* the hole bored out to a greater diameter than the recovered core, thus just doubling the labour. The tubes used are 5 inches in diameter down to 118 feet, and then 4 inches. In spite of difficulties, due to the breaking of machinery and the illness of some of the workmen, who suffered severely from boils, the work went on steadily until September 7, when a depth of 557 feet had been reached. At that date Prof. David had to leave the island to resume his duties at Sydney. He sailed with the core of rock on the London Missionary Society's steamer *John Williams*, Captain E. C. Hore, and reached Sydney on October 14. The boring operations continued under the charge of Mr. Sweet. By September 16 the bore was 643 feet deep, and it had reached 690 feet before the work stopped.

The preliminary examination of the core tends to confirm Darwin's theory of the origin of atolls. It is too soon, however, to speak with absolute certainty on this point. Portions of true reef are found at various positions throughout the whole depth, although separated by deposits of coral sand and the remains of other organisms. It is certain that for over 600 feet the reef has been built up in the immediate neighbourhood of growing coral; but apparently the possibility of the boring being situated on a very steep slope of volcanic rock, covered by a talus of coral *débris* from a reef on the summit, is not excluded. The atoll was completely surveyed, and biological collections made both from the land and from the surrounding sea.

GEOGRAPHICAL RESEARCH IN THE UNITED STATES.*

By MARCUS BAKER, U.S. Geological Survey.

It was in April of the present year that the National Geographical Society received from the President of this Section an intimation that a series of brief papers on the present status of geographical knowledge as to and of activity in the United States, touching geographical matters, would prove an acceptable contribution to your programme. When I recall the pleasure experienced at your meeting in Montreal thirteen years ago, and the eagerness with which every man and woman I met from over the sea were seeking and devouring information about America; when I recall the questions asked, the interest, nay, consuming interest, shown in everything relating to this country, then first visited by many of your members, I can well understand that it would have been ungracious not to accept this flattering intimation, and to offer a contribution which it is hoped may prove to be neither disappointing nor unprofitable.

In arranging our programme, a series of the most interesting and important topics was selected, and leading students of those topics invited to prepare papers thereon. The task of tying all these topics together, of showing their interdependence and relations, and sketching the great general outlines of the whole field of geographical work in the United States, devolved most naturally and fittingly upon the President of the Society, Hon. Gardiner G. Hubbard. To this task he addressed himself, and had gathered some material when, about five weeks ago, he found, to my regret and to yours also I fear, that his duties at the Nashville Exposition would prevent both the preparation of this introduction and his attendance here. As one of the Vice-Presidents of the Society, I was summoned to fill this gap. I felt this call to be one of duty; as such I accepted it, but with misgivings, feeling sure that the place, which he so worthily fills, is one that I can only occupy. I therefore crave your sympathetic indulgence for a brief interval, while I sketch in broadest outline the present state of our knowledge of the extent and geographical character of the United States, and the agencies by which such information has been and is being acquired.

The United States, now little more than a century old, comprise an area of 3,600,000 square miles—an area a little greater than that of Canada, and a little less than that of Europe. From easternmost Maine to westernmost Alaska it stretches through 120° of longitude, or about one-third of the Earth's circumference. Thus in midsummer the sun has risen in Eastern Maine twenty minutes before it has set in westernmost Alaska. From southernmost Florida, reaching to the verge

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* Paper read before Section E (Geography) at the Toronto meeting of the British Association, August, 1897.

of the torrid zone, it stretches northward to northernmost Alaska, more than 300 miles within the arctic circle; while in altitude it ranges from 200 or more feet below sea-level in the deserts of Southern California to heights of more than 18,000 feet in Alaska.

Beginning with the close of the war for independence 114 years ago, as thirteen distinct and independent states stretching along the Atlantic seaboard from New Hampshire to Georgia, we have first a loose confederation of states which, speedily breaking down, was replaced by the present constitutional union of the people, bound together in forty-five sovereign states and five territories. In 1790 the thirteen states had an area of about 350,000 square miles, and a population of a little less than 4,000,000. A century later its area was nearly eleven times as great, and its population about seventeen times as great, or between 65,000,000 and 70,000,000.

The discovery of what is now the United States began just four centuries ago this very year, when the Bristol merchant, Cabot, the first white man (after the Norsemen) to set foot on the American continent, antedating Columbus by fourteen months, landed on the bleak coast of Labrador, and then cruised southward as far as Virginia. This, like all discoveries, was only a beginning, which pointed the way to and stimulated other discoveries. These are still unfinished, and within the limits of the United States some tracts exist which have never been seen by the white man. Of other tracts, though seen and long vaguely known, our knowledge is still dim and shadowy. For a century after Cabot small advance was made in our knowledge of the continent, formally taken possession of by him in the name of his sovereign lord, King Henry VII. The outline of the Atlantic and Gulf coasts were crudely delineated, but of the Pacific coast north of California our maps, until about 1750, were either blank or filled with fabled lands or monsters. Bering's voyage of 1741 yielded the first definite knowledge of North-Western America; but it was not until nearly forty years later, in 1778, that Cook, the great English navigator, gave to the world the general outlines of Alaska as we now know them. The general features of the coast of western North America obtained by Cook were, some sixteen years later, vastly improved, from Southern California to Kadiak, by another English navigator, the equal if not the superior of Cook, whom every American student delights to honour—Captain George Vancouver.

The period of the war for independence in the last quarter of the last century was one of great geographical activity, and stimulated the production of maps of the revolted colonies. The numerous and excellent, for their time, maps by the English geographer, Thomas Jefferys, may be taken as the best exponent of American geography a hundred years ago. They show fairly well the Atlantic coast-line from the maritime provinces of Canada to Georgia, and so much of the interior as was the scene of hostilities; but west of the Appalachian mountain chain the delineation was conjectural. The existence of the Great Lakes, of the mighty Mississippi, and of the fertile valley drained by it, were barely known. Such was the world's geographical knowledge of what is now the United States when those states united in 1789. The knowledge subsequently acquired is the work of the United States.

The General Land Office.—One of the earliest agencies by which geographical knowledge was increased was the General Land Office. The general government found itself, in 1783, possessed of a region called the North-West Territory, lying beyond the mountains. Into this region settlers came about the beginning of the century. That they might acquire title to lands for their homes, the government early devised a system of land partition. Surveyors were sent into the wilderness to subdivide the land for purposes of record and sale or gift. The land was divided into square tracts 6 miles on each side, called towns or townships, and their corners marked, sometimes by axe-marks on trees, called *blazes*, and sometimes by artificial marks. A row of such towns running north and south is called a range, and numbered east and west from some arbitrary meridian. Similarly, a row of towns running east and west is called a town, and is numbered north and south from an arbitrary base-line. Each town was further subdivided into thirty-six squares, each containing 1 square mile, or 640 acres, called a section. The sections are similarly numbered from 1 to 36 in every town. Each corner of each section was marked by the surveyors, who were thus required actually to chain over every mile, to keep a record of their measures, to note all streams and lakes, and the character of soil and timber; to note the magnetic declination, and to submit to the General Land Office a skeleton map of each town subdivided, together with their field notes. These maps, called town plats, now constitute a vast body of original records in the General Land Office at Washington, and are the sole dependence of map-makers for hundreds of thousands of square miles of our territory. Every state and territory in the Union, except the original thirteen—Maine, Vermont, Kentucky, Tennessee, Texas, and Alaska—has been thus, in whole or in part, surveyed and subdivided. This work, now far advanced toward completion, has always been under the control of the General Land Office, now a part of the Department of the Interior. For geographical purposes, the results are shown in a series of state maps and a general map of the United States. The work was, for about a century, done by contract, but within the past two or three years a part has been done by the United States Geological Survey in connection with its topographical surveys.

Thus indirectly the General Land Office has, for a century, been, and still continues to be, one of the important geographical agencies of the United States.

Coast and Geodetic Survey.—Another old and important geographical agency is the Coast and Geodetic Survey, under the Treasury Department. The primary purpose of this bureau is to accurately chart the coast for purposes of commerce and defence. Its field of work is tidewater, with a fringe of topography landwards, and a somewhat extensive border of sea-bottom seawards. Created in 1807, it made little progress till 1832. In that year it was revived, and has continued uninterruptedly until the present day. Of the details of the accurate results secured by this organization, it is not my province to speak. From the beginning its ideals were high. Great accuracy has ever been and is its motto. It has been a leader, and not a follower. It has developed its own methods and instruments, and to its officers—civil, military, and naval—we are indebted, among other things, for the zenith telescope for the most accurate determination of latitudes; for the application of the telegraph to longitude determinations; for the invention, construction, and use of a machine for predicting tides, and for great improvements in apparatus for measuring the force of gravity. The polyconic projection, now so extensively used, was developed and applied by officers of this bureau, as also were appliances for deep-sea sounding and the study of the ocean deeps. Its field of work was extended in 1871 to include geodetic work in the interior, and in 1878 it received the name of Coast and Geodetic Survey, by which it is officially designated, though often referred to as the Coast Survey. It is one of the active geographical agencies of the United States, and is not only making charts, coast pilots, and tide tables, but is contributing to our knowledge of ocean physics, terrestrial magnetism, and of the size, shape, and structure of our planet.

Engineer Corps, U.S.A.—The United States Engineers, though not now actively prosecuting geographical research, have in the past made notable contributions to geography. Prior to, and even since, the war of the rebellion, 1861–1865, numerous expeditions in the far west were made by army officers, and each of these added something to our geographical knowledge. Aside from these various military reconnaissances, two noteworthy surveys have been carried on in the past by the United States Engineers. One was a survey of the northern and north-western lakes, which, after an existence of forty years, was concluded in 1881. It made a series of detailed and accurate charts of all the Great Lakes, and a valuable collection of data. Its series of lake-levels has very recently been put to use in determining certain secular changes in the crust of the Earth, forming the great basin in which those lakes lie. If the slow tilting of this basin southward, which these levels show when compared with recent ones, continues for a period of about 6000 years, then it is calculated that Niagara will have vanished, and all the lakes except Ontario will drain to the Mississippi by way of the Chicago outlet. These highly interesting and somewhat startling conclusions have just been presented at the Detroit meeting of the American A.A.S., by Mr. G. K. Gilbert, of the United States Geological Survey.

Another noteworthy geographical work by the United States Engineers was a general map-making survey in the far west, under the direction of Captain M. Wheeler, U.S.E., and usually referred to as the Wheeler Survey. A considerable tract of the country was mapped by it on a scale of 8 miles to 1 inch. This survey, with two others, the so-called Hayden and Powell Surveys, were merged in the present Geological Survey in 1879.

The work of improving rivers and harbours in the interest of commerce is now carried on by the United States Engineers, and their geographical work consists in special surveys for these improvements, and of a new survey of the Great Lakes.

Geological Survey.—The chief agency for increasing geographical knowledge of the United States at the present time is the United States Geological Survey, now eighteen years old. Nearly or quite one-half of its energies and funds are expended in the production of topographical maps, and thus it is in fact, though not in name, the United States Topographical and Geological Survey. The conditions confronting this survey at its creation differed in one important particular from those similarly confronting European geological surveys. Those surveys had, in almost if not quite every case, been preceded by topographical surveys, and the geologists found maps, adequate to their needs, ready made. But in the United States topographical maps were not available, as there had been no topographical survey. Thus progress in geological mapping was impeded at the outset by the lack of suitable maps. Accordingly, in 1882 authority was given to make topographical maps, and since then about one-half of the energies of the survey have been given to their production. Since 1882 the survey has surveyed and mapped, on scales of 1, 2, and 4 miles to the inch, an area of 760,000 square miles, about equal to the combined area of Great Britain, France, Germany, Spain, and Portugal. The results are contained in 980 atlas sheets, 460 on the 1-mile scale, 460 on the 2-mile scale, and 60 on the 4-mile scale. These surveys have been made in nearly every state and territory. Following these came the geological surveys. But before much progress was possible, a large amount of preliminary investigation was needful to determine the great features whose details were to be wrought out and mapped. A system of rock classification uniformly applicable to so great and complex an area as the United States, required much careful preliminary work. That has been accomplished, and systematic geological mapping has been in progress for some years.

The aspect of the country and its utility for man's use is largely dependent on the annual rainfall. This ranges from a very few inches in the dryest part of the arid or desert regions of the south-west, to nearly or quite 8 feet per year on the coast of Southern Alaska. As the humid regions were settled up, population gradually pushed into the semi-arid and desert regions of the far west, where agriculture without artificial irrigation is impossible, but *with* irrigation marvellously successful. Thus came a demand for knowledge as to water-supply, and to this work one division of the Geological Survey is wholly devoted.

Intimately associated with water-supply is the forestry problem. The proper administration of the forests—their preservation from destruction by carelessness or greed—is a question now attracting serious attention. A number of large forest tracts in the west have been recently set apart as reservations, and these, with the Yellowstone National Park, the Yosemite, and others previously reserved, comprise a total area estimated at 38,880,000 acres, or more than 60,000 square miles. In the budget for this year the Congress has included an item of $150,000 (£30,000) for the survey of these forest reserves. This work is under the direction of the United States Geological Survey.

The output of the mines and quarries of the United States has grown in value from $369,000,000 (£74,000,000) in 1880 to $622,000,000 (£124,000,000) in 1896. That authentic information on this subject might be promptly available, a Division of Mineral Statistics has existed in the Geological Survey from the beginning, charged with the duty of gathering and publishing statistics. This it does in an annual volume, and the state of the mining industry from year to year finds permanent record in these volumes.

Navy Department.—The Hydrographic Office of the Bureau of Navigation has for a primary aim the securing and publication of information useful to those who go down to the sea in ships. This includes surveys and chart-making of all coasts (except those of the United States), ocean meteorology, terrestrial magnetism, and ocean physics. The charting of the coasts of the United States is done exclusively by the Coast Survey, which has nearly completed the Atlantic and Gulf coasts, and about three-fifths of the Pacific coast, except Alaska, of which only a small part is as yet surveyed. Of foreign coasts, the Hydrographic Office has recently surveyed and charted the western coast of the peninsula of Lower California, one of the Mexican states, about 1000 miles in extent. It has extended our knowledge of the sea abysses by various lines of soundings in the interest of projected cable lines; it lessens the perils of ocean travel by the monthly issue of pilot charts of the North Pacific and North Atlantic oceans, containing information as to derelicts, ice-fields, storm-tracts, and other information useful to the mariner. The systematic and constant collection of data for these pilot charts results in a constant increase in our knowledge of the geography of the sea.

Weather Bureau.—To investigate the history, structure, and contents of the Earth is the peculiar province of the Geological Survey; to study the currents, movements, and characteristics of the Earth's salt water envelope is the province of the Coast Survey and Hydrographic Office; to investigate the character, amount, habits, and migrations of its contained life is the province of the Fish Commission. The study of the all-enveloping gaseous ocean in which we live and move, that invisible sea of air with its ever-varying moods of restful calm and fierce storm, now delightfully transparent, and now sombre or menacing with storm-cloud, sometimes scorching and sometimes freezing; the study of this gaseous envelope, of the laws which govern its behaviour, and the daily deductions from these laws foretelling to the sailor, the farmer, the traveller, what he may expect, is the peculiar province of the Weather Bureau. May we not properly call this field of study the geography of the air? And has it not ever formed a large chapter in our physical geographies?

The weather service in the United States is twenty-seven years old, dating from

1870. At first it was a military organization called the Signal Service, and its purpose was to give "notice on the northern lakes and on the sea-coast, by magnetic telegraph and marine signals, of the approach and force of storms." Its primary object was, therefore, not the study of climate, but the prediction of storms. It seeks to tell the weather of to-morrow rather than that of the last year or the last century. But as we are forced to judge the future by the past, the study of meteorological records is not neglected, and within the bureau there has ever been a corps of scientific experts at work upon such lines as gave promise of producing something new or useful for the forecaster.

The bureau is now a civilian one, having been transferred from the War Department to the Department of Agriculture. Its present field of activity is far wider than I have indicated—so wide, indeed, that time will not permit even a mention of details.

I ought to at least mention a few more of the agencies still at work and actively contributing to a fuller and better knowledge of our geography.

The total railroad mileage of the United States, not counting second or third tracks or sidings, is, in round numbers, 180,000 miles, or about forty-five per cent. of the world's mileage. To locate and construct these thousands of miles of road, much of it running through districts little or quite unknown when preliminary surveys began, has involved vast expenditures of money, by which geographical knowledge has been increased. It has been estimated, perhaps I ought to say guessed, that the sums expended on these railroad surveys is enough to have produced a topographical map of the entire country. The chief geographical contribution from these surveys is a knowledge of altitudes. Over all these railroads lines of level have been run, and by collecting and platting those levels and adding to them those obtained from other sources, it has been possible for the Geological Survey to produce a fairly approximate contour-map of the United States.

The Mississippi river, with its tributaries in the great central valley of the United States, drains an area of about 1,200,000 square miles, or about one-third of the United States. From the sources of the Missouri to the passes at the mouth of the Mississippi, in the Gulf of Mexico, is 4200 miles. These two great rivers, with their affluents, afford thousands of miles of navigable water through the great central valley. So important is this artery of commerce that two distinct commissions, one for the Mississippi and one for the Missouri, have existed for some years, for the purpose of surveying, mapping, studying, and improving them. Detailed maps of the rivers and a fringe of topography on either side have been made over a considerable portion of the navigable parts of these rivers, and the results are shown on 240 atlas sheets. Much precise levelling has also been carried on in connection with these surveys.

Independent of the Federal Government, various states to the number of twenty or more, particularly those known to possess mineral wealth, have conducted geological surveys, or perhaps I should say geological reconnaissances. Two have conducted topographical surveys, and four have co-operated with the general government in making topographical surveys. These four, Massachusetts, Rhode Island, Connecticut, and New Jersey, as also the district of Columbia, are now completely mapped on a scale of one mile to the inch, and in contours with a vertical interval of 20 feet.

The Post-office Department, for its own purposes in administering the seventy thousand post-offices under its control, compiles state maps, showing post routes and political divisions. The boundary-lines shown on these maps are compiled from the laws and by correspondence, and constitute an authentic source of information as to minor boundaries.

I have alluded to the work of the Fish Commission in studying the character, habits, and migrations of marine life, and by its side should be mentioned the similar work on land carried on by the Biological Survey in the Department of Agriculture.

Of the great advances in geographical knowledge resulting from the exploration of Lewis and Clarke, near the beginning of the century, from the work of Fremont, the pathfinder, from the Pacific railroad surveys of fifty years ago, and from numerous military expeditions, time fails me for more than a bare mention.

Thus I have passed in rapid review the greater geographical agencies of the United States. Some of these will be presented to you more at large by the gentlemen actually conducting the works outlined. As to the future, it will easily appear that the amount already achieved is but a small part of what remains to be done. Geographical research and progress in the United States has never been more active or swifter than it is to-day, and knowledge of environment and resources is gathered in large instalments each year. To discover and develop its resources, the United States is now employing about five thousand persons, and expending nearly $8,000,000 annually. Just as the Royal Geographical Society of London sixty-seven years ago began its work of fostering and promoting geographical research, so the National Geographical Society of Washington nine years ago entered upon similar work. Great and lasting good has resulted from each undertaking. May their efforts continue until dark continents and unexplored regions shall have vanished from our maps!

THE INDIAN SURVEY REPORT FOR 1895-96.

The Indian Survey Report, which usually arrives in England in April or May, has been considerably delayed this year, and has only recently come to hand. This appears to be due to the fact that the operations reviewed therein extend up to September 30, 1896, instead of March 31, 1896, as would have been the case had the old practice been adhered to of assimilating the survey year to the financial year. We are not told the reason of the change, but it may be assumed that it fits in more conveniently with the plan of operations and rotation of work in the field, which naturally opens with the commencement of the cold season, and which thus forms a better starting-point for an annual review of work. Colonel C. Strahan, R.E., was surveyor-general during the year, assisted by Colonels W. H. Wilkins and J. E. Sandeman, in charge of the Revenue and Bengal Survey branches, and Lieut.-Colonel St. G. C. Gore, R.E., in superintendence of the Trigonometrical Surveys. Principal triangulation was executed during the year, both in Upper Burmah and in Baluchistan. In the former, the series which will connect the Mandalay Meridional series with the Assam triangulation was carried across the flat forest-clad valley of Chindwin, but, owing to the haze and the difficult nature of the country, it was found impracticable to complete the connection. In Baluchistan a beginning was made with the principal longitudinal series, which, starting from the Great Indus series of the main triangulation of India, is to be pushed westwards through Baluchistan and Makran, and will thus form an accurate basis for the mass of secondary triangles and detailed reconnaissances which have from time to time been carried out in the regions immediately west of India. This fabric of triangulation will undoubtedly be extended in process of time, so as to link up the trigonometrical systems of Europe and Asia. During 1895-96 three figures, extending over 1114 square miles, were projected westward into the territory of Las Bela, the chief of which died in January, 1896.

With regard to topography, six survey parties were engaged in the Southern Maratha country, in Sind, Baluchistan, in the Himalayas, and in Upper Burma (2) respectively. The first-named of these surveys has now been brought to a completion, after nine seasons' work, and the party have consequently been transferred to Burma. The Baluch party was divided up into five detachments, one of which, under Mr. Tate, was engaged on the Baluch-Afghan Boundary Commission, and the record of this piece of work forms the most interesting chapter in the present Report.

The scope of the Commission included the delimitation of the frontier between British territory and Afghanistan from the southern limit of Waziristan up to the eastern confines of the Persian Empire. Of the large extent of country lying between these widely distant extremes, the common boundary had been settled only as far south as the British frontier outpost of Chaman, where the operations were brought to a close in June, 1895. The winter of 1895-96 was devoted to the demarcation of the boundary between this point and the Persian frontier, where the Koh-i-Malik Siah had years ago been recognized as the tri-junction point common to the frontiers of Persia, Afghanistan, and Baluchistan. Its position, however, had never been determined with exactitude, and to settle this was a principal part of the programme of the Commission.

The formal meeting of the two commissioners, Sardar Muhammad Umar Khan on the part of the Amir, and Captain McMahon for the Government of India, took place on February 3, 1896, at the Wachdara, after which the work of delimitation was commenced. For the first 60 miles of its course the boundary followed the crest of the western scarp of the Peshin plateau in a generally southern direction. From the highest point of the plateau it struck westward, leaving the Chagai fort which had been seized by the Afghans about ten or twelve years ago, within Baluch territory. The formal surrender of the fort itself was made on the return journey, while the mission was encamped in its vicinity. So far the country traversed was covered by the Kharan triangulation of Mr. Tate in 1886-87, and that carried out in 1884-85 by the Afghan Boundary Commission. The fresh work began after the 64th meridian of longitude was passed. Between that and the meridian of 62° 30′ the country consists of lofty hills, rising sheer out of the plain, and composed for the most part of granite and igneous rocks. With two exceptions, their summits were inaccessible. The most conspicuous and impressive is the Malik Dokand hill, near which alabaster is found in abundance. All around lies a sea of sandhills, while further to the west, between Malik Naro and Koh-i-Sultan, is a small hollow tract where good water is obtainable near the surface, and the great natural spring of Manzil is found. The natives have a tradition that this was once a Hamun, which has since become filled with drift-sand. Mr. Tate thinks it may possibly have been a portion of the great hollow or depression of Zirreh, or Zarang, by which name the country was known to the Arabs, and which had existed even in Arrian's time, as the name of Drangianæ appears to indicate.

The Koh-i-Sultan is a group of hills some of whose peaks rise to a considerable height, the loftiest being 7656 feet. These hills are rich in minerals, sulphur being especially abundant, while the assafœtida plant grows very plentifully on the otherwise bare and arid slopes around. The assafœtida is sought after, not only by the inhabitants of the surrounding country, but by the Afghans of Zhob and far distant Ghazni. The latter form large caravans and visit the Koh-i-Sultan every year, usually staying some months to gather the plant.

Between 64° and 62° 30′ the existing maps were found to be very unreliable, and a careful re-survey was made, the detailed work being carried across the boundary-line to Afghan territory, up to the southern edge of the desert skirting the Helmand river. Further west, between 62° 30′ and 61°, very little trustworthy topography had been laid down by previous travellers, but, unfortunately, the country here was so inhospitable, that it had to be traversed as quickly as possible.

From the summit of the Koh-i-Malik Siah, angles were taken to all the prominent peaks that were visible, observations being obtained to the southern and apparently the higher of the twin peaks of the Koh-i-Taftan, the topmost point in the mountains of Eastern Persia. It rises to an elevation of 12,000 feet, and quite at the end of April there was still a great quantity of snow apparent on both its summits. On the top of the Koh-i-Malik Shah, a mark-stone and a cairn 10 feet in height were raised, and in the Report under review we are presented with a remarkably clear and life-like photograph of the English officers, viz. Captain McMahon, Surgeon-Captain Maynard, and Mr. Tate, together with the Afghan Commissioner and the Governor of Chaharburjak in the Helmand. At Koh-i-Malik Siah the mission broke up, the British Commissioner and party returning by the same road as they had come.

Altogether 12,000 square miles of triangulation and 19,200 square miles of topography were completed by the detachment, the latter being for the most part a revision of old reconnaissances.

Sub-Surveyor Jamaludden mapped about 14,000 square miles on the ¼-inch scale near the Persian border, but unfortunately the report gives no idea where this work was actually accomplished, although we are told that it was in connection with a request for the sub-surveyor's services made by Captain Sykes, British Consul at Kirman.

In Upper Burma the topographical work consisted of the commencement of the 1-inch topographical survey of the Northern Shan States, geographical survey on the ¼-inch scale in the Myitkwa district, and the continuation of the demarcation of the Burma-Siam boundary. It is satisfactory to learn, after all one has heard of the expense of surveys in Burma, that transport animals are becoming yearly less expensive to hire, and railway communications are gradually becoming more available, so that the cost-rates bid fair to decrease. The Burmans, too, are showing themselves yearly more sensible and amenable to discipline, and before long, no doubt, will take service as surveyors in local topographical parties; the work being peculiarly suited to them, as they are very intelligent, quick to learn, and deft with their fingers, while the higher pay which they require is compensated for by their knowledge of the language and country, and in various other ways.

The out-turn of forest surveys during the year amounted to 4914 square miles, and of cadastral surveys, 8609 square miles. Three parties were employed on traverse surveys, the object being to furnish a skeleton basis for settlement surveys by local agency.

The operations for the telegraphic determination of the difference in longitude between Karachi and Greenwich have been already briefly touched upon in the *Geographical Journal*. Captains Burrard and Lenox-Conyngham continued the work that they had begun, and the arcs Potsdam—Teheran and Teheran—Bushire were measured. In spite of the immense length of the line to be worked and the unpropitious nature of the weather experienced, the work was completed most satisfactorily, and the subsequent reductions have been finished. The final value of the longitude of Madras is $5^h\ 10^m\ 59{\cdot}113^s$, a value which is $0{\cdot}308^s$ less than that which has been hitherto regarded as the most accurate available. It is equivalent to $4{\cdot}62''$ of arc, or about 150 yards in linear measurement.

Observations with the self-registering tide-gauges have been made at thirteen stations in India, Burma, the Persian gulf, Ceylon, the Andaman islands, and Minicoy. A new tidal observatory was erected at Suez, and will be fitted up and started during the ensuing year.

In Upper Burma an area of 5079 square miles of new country was geographically surveyed by the surveyors of 21 Party, and the aggregate areas thus surveyed on the eastern and western frontiers amounted to 30,279 square miles. This class of survey is one of special interest to geographers, as the regions covered are those which are practically unknown, and which it is the special aim of the Society to make better known to modern research. It is much to be hoped, therefore, that, in accordance with the arrangement entered into between the Government of India and the Society, reports of these operations, excluding all political passages to which exception might possibly be taken, will be furnished at an early date for the information of readers of the *Journal*.

C. E. D. B.

AREAS OF AFRICAN AND ASIATIC RIVER-BASINS.

Dr. Alois Bludau contributes to the August and October numbers of *Petermanns Mitteilungen* the second and third instalments of his recalculation of the areas of river-basins outside of Europe by the method explained in our note on the first instalment ("Areas of South American River-basins") in vol. ix. p. 666. Dr. Bludau prefixes various notes setting forth the principles on which he has dealt with various African rivers, but the only point that need be noted here is that, in accordance with the view expressed by Wagner in the last edition of his *Lehrbuch der Geographie*, he has considered as belonging to the basins of the Orange river, Nile, and Niger, not merely the areas actually drained by those rivers, but also those areas in which the slope even of dry river-beds is in the direction of the main stream. As in our former note, Dr. Bludau's figures, which are to the nearest multiple of 1000 square kilometres, are here given to the nearest multiple of 500 square miles.

AFRICAN RIVER-BASINS.

A. General Synopsis.

	Sq. miles.
1. Atlantic domain	4,070,000
2. Mediterranean	1,680,000
3. Domain of Indian Ocean	2,086,000
3. Regions of inland drainage	3,452,000
	11,288,000

B. Atlantic Domain.

		Sq. miles.
1. Cape Agulhas to Orange...		48,000
2. Orange river—		
(a) Area of surface drainage ...	172,500	370,500
(b) Remainder of basin ...	198,000	
3. Orange to Kunene ...		98,000
4. Kunene		53,000
5. Kunene to Kwanza ...		63,500
6. Kwanza		57,500
7. Kwanza to Congo ...		35,500
8. Congo		1,425,000
9. Congo to Ogowe		56,000
10. Ogowe		67,500

B. Atlantic Domain—*continued*.

		Sq. miles.
11. Ogowe to Niger		151,500
12. Niger—		
(a) Area of surface drainage ...	584,000	808,000
(b) Remainder of basin ...	224,000	
13. Niger to Cape Palmas ...		338,000
14. Cape Palmas to Senegal		290,000
15. Sahara rivers		131,000
16. Atlas region		68,000
		4,070,000

C. Mediterranean Domain.

		Sq. miles.
1. Nile—		
(a) Area of surface drainage	1,027,000	1,082,000
(b) Remainder of basin ...	55,000	
2. Sahara rivers		502,000
3. Atlas region		96,000
		1,680,000

D. Domain of Indian Ocean.

		Sq. miles.
1.	Cape Agulhas to Limpopo	154,500
2.	Limpopo	154,500
3.	Limpopo to Zambezi ...	96,500
4.	Zambezi	513,500
5.	Zambezi to Rovuma ...	104,000
6.	Rovuma	56,000
7.	Rovuma to Rufiji ...	28,000
8.	Rufiji	68,500
9.	Rufu and Tana	195,000
10.	Tana to Jub	129,500
11.	Jub	75,500
12.	Somali peninsula to Gulf of Tajurra	305,000

D. Domain of Indian Ocean—*continued.*

		Sq. miles.
13.	Tajurra to Massaua ...	87,500
14.	Massaua to Suez	118,000
		2,086,000

E. Regions of Inland Drainage.

1.	Etosha—Ngami—Zuga ...	340,000
2.	Lake Leopold	25,000
3.	Lake Rudolf	90,500
4.	Lake Chad	394,000
5.	Sahara	2,602,500
		3,452,000

ASIATIC RIVER-BASINS.

A. General Synopsis.

1.	Domain of Arctic Ocean ...	4,367,000
2.	Domain of Pacific Ocean	3,641,000
3.	Domain of Indian Ocean	2,873,000
4.	Domain of Mediterranean Sea	268,500
5.	Regions of inland drainage	4,900,000
	Total (round numbers) ...	16,050,000

B. Arctic Domain.

1.	Kara	6,000
2.	Ob	1,125,500
3.	Samoyede peninsula ...	56,000
4.	Nadym and Tas rivers ...	148,500
5.	Yenisei	969,000
6.	Yenisei to Lena	484,500
7.	Lena	896,000
8.	Lena to East Cape ...	681,500
		4,367,000

C. Pacific Domain.

1.	East Cape to Amur ...	463,500
2.	Amur	776,000
3.	Amur to Vladivostok ...	35,000
4.	Vladivostok to south point Korea	49,500
5.	South point Korea to Shanhaikwan	184,000
6.	Shanhaikwan to Hwang-ho	128,000
7.	Hwang-ho	378,500
8.	Hwang-ho to Yangtse-kiang	68,000
9.	Yangtse-kiang	685,000
10.	Yangtse-kiang to Si-kiang	106,000
11.	Si-kiang	154,500
12.	Si-kiang to Mekong ...	159,000
13.	Mekong	313,000
14.	Mekong to Menam ...	21,000
15.	Menam	58,000
16.	Menam to Cape Buru ...	62,000
		3,641,000

D. Domain of Indian Ocean.

1.	Cape Buru to Salwin ...	53,000
2.	Salwin	125,500
3.	Salwin to Iráwadi	14,500
4.	Iráwadi	165,000
5.	Iráwadi to Brahmaputra ...	33,500
6.	Brahmaputra	258,500
7.	Ganges	409,500
8.	Mahánadi and neighbouring basins	108,000
9.	Godávari	119,500
10.	Krishna	104,500
11.	Krishna to Cape Comorin	101,500
12.	Cape Comorin to Tapti ...	43,000
13.	Tapti	25,000
14.	Narbadá	38,500
15.	Narbadá to Indus, including Rann of Cutch	175,500
16.	Indus	370,500
17.	Indus to Shat-el-Arab ...	150,500
18.	Tigris	145,000
19.	Euphrates	129,000
20.	Shat-el-Arab to Cape Mesandum	48,500
21.	Cape Mesandum to Bab-el-Mandeb	122,000
22.	Bab-el-Mandeb to Akaba	124,500
23.	Akaba to Suez	9,000
		2,873,000

E. Mediterranean Domain.

1.	Port Said to Iskenderun ...	34,000
2.	Iskenderun to Gulf of Kos	37,000
3.	Gulf of Kos to Skutari ...	38,000
4.	Skutari to Kobulety ...	99,000
5.	Kobulety to the Kuban ...	14,500
6.	Kuban	22,000
7.	Kuban to Manych ...	24,000
		268,500

F. REGIONS OF INLAND DRAINAGE.

	Sq. miles.
A. Central Asia.	
1. Tibet	239,500
2. Tsaidam and Kuku-nor ...	116,000
3. Tarim basin to Suchau ...	467,000
4. Middle Gobi (Alashan) ...	201,000
5. Northern and Eastern Gobi	411,000
6. Dzungaria	125,500
	1,560,000
B. Aralo-Caspian Region.	
7. Lake Balkhash	187,500
8. Syr-Daria	108,000
9. Syr-Daria to Amu-Daria ...	102,500
10. Amu-Daria	173,500
11. Murghab to Heri-Rud ...	89,000
12. Atrek and South Caspian shore to the Kura ...	64,000
13. Kura with the Aras ...	75,500
14. Terek and Kuma	61,500
15. Ural	105,000
16. Emba (Ural to Mugojar mountains)	85,000
17. Mugojar mountains to Lake Balkhash	324,500
18. Trans-Caspian region south of 55° N.	187,500
19. Sea of Aral	26,000
20. Caspian Sea	169,500
	1,759,000
C. Iranian Region.	
21. Inner Iran	602,500
22. Lake Urmia	21,000
23. Lake Van	7,500
	631,000
D. Syrian-Arabian Region.	
24. Syrian-Arabian desert ...	899,500
25. Dead Sea	19,500
	919,000
E. Asia Minor.	
26. Inner region with Lake Eyerdir	31,000
Total (F)	4,900,000

RUSSIAN EXPLORATIONS IN MANCHURIA.*

THESE explorations were made in 1896, in connection with the Trans-Siberian railway, by the mining engineers, E. E. Anert and I. I. Revyakin, the railway engineer, P. S. Svinghin, and V. L. Komaroff, botanist. Broadly speaking, the journey was made from the Suifun river (near Vladivostok) to Ninguta, during which a series of parallel ranges were crossed along two different routes by two members of the expedition. From Ninguta they went to the small town Omoso, or Homoso, whence part of the expedition returned to the Usuri, taking a more northern route; while M. Anert went to Kirin, the capital of Manchuria, and thence proceeded in a boat down the Sungari till its junction with the Amur, and returned to Khabarovsk.

The Sungari, up to Kirin, was already explored in 1864, when Colonel Chernyaeff and the Urga consul, M. Shishmareff, accompanied by Th. Usoltseff, astronomer, two experienced topographers—M. Vasilieff and his aid—and myself, went on board the small steamer *Usuri* up the then quite unknown great river of Manchuria. Our steamer, though she only had 3 feet draught, had great difficulty in making her way across the countless banks of the lower course of the Sungari; but finally we reached Kirin, and a map of the river was made on a scale of two-thirds of a mile to the inch. The map was so good that with its aid we easily navigated down the river on our back journey, only once running over a bank in the upper course, from which we soon cleared with the aid of some two hundred Chinamen—the Chinese authorities being only too anxious not to have

* Abridged from a paper by E. E. Anert, in the *Izvestia* of the Russian Geographical Society, 1897, ii., and the *Yearly Report* for 1896.

our steamer wintering on the Sungari. Unhappily, the original maps, as well as the accounts which Usoltseff and myself wrote of this journey and published in the Memoirs of the Siberian branch of the Geographical Society, were destroyed during the great conflagration at Irkutsk.* As to the researches of the Russian engineers in South-East Manchuria, they are entirely new, and so complete as to give a full idea of this formerly unexplored region.

Leaving the Suifun river at Poltavskaya, the expedition crossed the Hai-hing-lin mountains, which run south-west to north-east and are pierced by the Siao-Suifun twice. M. Anert went through the passes Hai-pin-lin, Kun-yu-shiu, Khu-li-mi-lin, and Cho-li-tai; while Rovyakin, with the party of topographers of Colonel Kozlovsky, crossed the same ridge further south. Both reached the Muren river, called by the Chinese Molin-ho. The range, which is accompanied by several parallel subranges, consists of granite covered with gneisses and mica-shists, pierced by veins of porphyries and other younger rocks. Already in the Kun-yu-shiu Anert saw the flat elevated plains covered with basalts, and could notice a number of small conic-shaped hills consisting of porphyritic diabases.

Crossing another range, which has the same direction and the same composition, M. Anert reached the Mudan-tsan river and the town of Ninguta, where he stayed for a week. From Ninguta the expedition went to the small trading town of Omoso, or Homoso. They crossed again a range which runs towards the north 40° E., and consists of sandstones and quartzites, which are covered in places with lava-streams. The lake Belten, towards which an excursion was made, is due to such a lava-stream acting as a dam across which a river runs, making a waterfall 105 feet high. The last range, which was crossed before reaching Omoso, consists of granite and gneisses, intersected with dykes of diabase, diorite, and so on. The flat-topped, table-like mountains which are characteristic of the neighbourhoods of Ninguta, do not appear further west.

From Omoso Anert went to Kirin. He crossed, first, the Tiang-guan-tsai-lin mountains, which consist of several parallel ridges running south-west to north-east (N. 25–30° E.), and visited the coal-mines of Tio-ho, or Chau-ho, where a layer of coal about 8 feet thick is worked; the whole surface of the coal-bearing formation, limited by granite hills, being probably small. He then crossed the Loe-lin mountains, which attain a great height, and are composed of a series of five or six parallel ranges, the height of which increases southwards. This system is also composed of granites and various crytalline slates. The Sungari was reached at Kirin, where it has a width of about 400 yards, and flows amidst clayey river-terraces, raised about 35 feet above the average level of the river. The Siao Pei-shan mountains rise in the south-west of Kirin; granites, quartzites, porphyrites, and marble veins enter into their composition. On August 20, Anert left Kirin in a boat to go down the Sungari. At a distance of about 60 miles from the Manchurian capital, the river issues from the mountains and enters a wide plain, where only a few low cliffs approach the river; they consist of Oolite sandstones and clays, while immense sand-dunes cover most of the plain. Many sand-bars are formed in the bed of the river. An immense desert,

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* The excellent map of M. Vasilieff was lithographed on six sheets in a few copies only at Irkutsk. These copies were destroyed during the fire. A small reduction of it was published in the said Memoirs, but this reduction was based upon five astronomical determinations of Usoltseff, the accuracy of which was not very great. Even this edition was destroyed by the fire, and the very few copies left are now a great bibliographical rarity.

covered with sand-dunes and very poorly clothed with vegetation, then begins; only occasionally the same red clays or conglomerates appearing in low cliffs. Then the Sungari pierces the granitic Hei-shan ridge (a continuation of the Little Khingan), and enters below Sian-sin the wet lowlands of its lower course.

In his general conclusions, after having mentioned the structure of the mountains between the Suifun and the Muren, and of the flat-topped mountains in the basin of the Mudan-tsan near Ninguta (conglomerates and sandstones, covered with a layer of volcanic tuff and basalt, with occasional layers of more recent lava-streams), Mr. Anert says, "We must thus conclude that the Little Khingan and the mountains of Middle Manchuria represent one whole, and are a mountain region consisting of a whole series of parallel ranges running from the south-south-west to north-north-east. None of them is a continuous chain, the central line of the system being thus shifted east and west. Between the Tiang-guan-tsai-lin and the Loe-lin, to the south of the Ta and the Siao Laba-lins, as well as in many other spots of the basin of the upper Sungari, there are remains of the coal-bearing Mesozoic deposits, with beds of coal and breccias, which are retained in the shape of islands amidst the granites and the older crystalline rocks.

"When the traveller enters the plain of the Middle Sungari, he is struck with the difference of landscape. Instead of the variety of mountains and valleys, one sees a monotonous flat surface, into which the rivers have cut deep (100 to 200 feet) and sometimes broad valleys. Oolitic sandstones and clay slates, lying quite horizontally, and covered with red and yellow clays, also arranged in horizontal beds, are occasionally seen in some low cliffs. In the middle parts of that plain begin the sands which spread as far as Tsitsikar, according to the report of Prince Andronikoff. Dunes appear at the same time in the river-valley, and the surface of the sands is covered with *barkans*. These plains, which do not depend upon the work of the Sungari, deserve the name of the Mongol-Manchurian Great Plain."

The region of the lower Sungari has a quite different character; It belongs to the lowlands of the Amur and Sungari. At high water all these lowlands are inundated with water, and then represent quite an interior sea; there are no old shores, no terraces—the two rivers and their tributaries flowing between low banks, and dividing into a great number of separate branches.

The vegetation of the Sungari region is the same as in the Little Khingan; and the influence of the monsoons, which bring with them immense quantities of rain, is felt in the valley of the Sungari as it is felt in the valleys of the Amur and the Usuri.

P. Kropotkin.

THE MONTHLY RECORD.

THE SOCIETY.

Royal Geographical Society's Year-Book.—The Council have decided to publish a "Year-Book and Record," on somewhat similar lines to those issued by the Royal Society, only the two will be combined in one volume. As a matter of fact, the List of Fellows annually issued contains a good deal of information in addition to the list—such as List of Referees, of recipients of Royal Medals and other honours, of institutions, etc., to which the publications of the Society are presented or with which exchanges are effected. In addition to these lists, the new Year-Book will contain the charter and bye-laws, a brief sketch of the foundation of the Society, with sections on the House (including a catalogue of portraits, pictures, relics, etc.), publications, the library, the map-room, scientific instruction, education, expeditions and the sums expended on them from the beginning, meetings, and other matters. The object is to place at the disposal of Fellows, and others interested in the Society, an adequate account of its character and objects, and of the varied work which it annually accomplishes. The Year-Book will contain a view of the House, and of one or two of the principal rooms, a plan of each floor, illustrations of the Society's medals, etc. Of the first issue, which it is hoped will appear in January, a copy will be sent to each Fellow; and Fellows may obtain copies for distribution among any of their friends who may be interested in the Society.

Lieutenant R. E. Peary.—This distinguished American arctic explorer received an enthusiastic welcome at the meeting of the Society on December 6, and indeed wherever he and Mrs. Peary appeared, in England or Scotland, in public or in private. It is pleasant to record that Mr. Alfred Harmsworth, who has already done so much to promote exploration, has presented Lieut. Peary with the *Windward*, which is to be supplied by Mr. Harmsworth with new boilers and engines, and in every respect fitted for the important work which, it is hoped, she will accomplish.

ASIA.

The Hissar Expedition.*—The aim of the expedition, which consisted of V. I. Lipsky and L. S. Barschevsky, was to explore the mountain region where the three chief tributaries of the Amu, Surkhan, Kafirnagan, and Vaksh, as also the left tributaries of the Zerafshan and those of the Kashka-daria take their origin. The expedition started from Samarkand. Unhappily there were very heavy snowfalls during the winter, and they were followed by heavy rains in the spring. Great inundations, followed by a fearful development of malaria, even more mortal in the Merv oasis than the cholera of 1892, were the consequences; and, when the expedition reached the Hissar ridge from the north, it was found that most trails were in a quite unpracticable condition. Finding it impossible to cross the Hissar range at Shut, the expedition went westwards, round the range, reaching its foot from the south. There they explored the tributaries of the Kafirnagan, the Khanaka pass, which leads to Iskander-kul (where they found immense morainic deposits 10 miles long, although there was no glacier now in that valley), and the valley of the Zigdi river, from which they crossed the Akba-kul pass leading to the Yagnob. The Yagnob is a great river which receives about forty tributaries; its upper course was shown totally wrong on our maps. Thence the expedition went to the basin of the Surkhab and to Garm, in order to explore the tributaries of the Surkhab—the whole of that region being almost entirely unknown. The expedition returned, bringing back extremely interesting surveys, a great number of altitude-measurements, about two hundred photographs of mountain and glacier scenery, a botanical collection of six thousand specimens, several thousand zoological specimens, and a geological collection. "The Hissar range,"

* *Annual Report* of the Russian Geographical Society for 1896; *Izvestia* of the Russian Geographical Society, 1897, II.

V. I. Lipsky writes, "runs from the west to the east; it ends in the west by the Hazret-sultan group, which has a complicated structure, and in the east it joins the Zerafshan range, which is continued further on by the Alai mountains. It has a length of about 200 miles, and attains a great height, reaching 13,000 and 14,000 feet in its passes Akba-kul and Sary-kobdy respectively. With the exception of the group of peaks (Great and Little Barzenga, and Rostovtseff's peak) at the head of the Yagnob, there are no peaks of exceptional height in that range. Even the highest peaks are not covered entirely with snow—the air in this region being as a rule exceedingly dry. There is more snow, however, on the northern slope. The main chain gives origin to many side offshoots, and is accompanied by a parallel chain, the Zigdinsk ridge. Deep gorges are sunk between the side branches of the main ridge. The Hissar mountains consist almost entirely of granites, gneisses, and all sorts of crystalline slates—their southern slopes being skirted by Loess hills, which are inhabited and cultivated. There is a remarkable absence of forests in the Hissar mountains. Woods are only seen along the courses of the rivers in the gorges, and chiefly consist of *Juglans regina* and *Platanus orientalis*. Separate individuals of *Juniperus* cover the slopes of the mountains. There is also a remarkable absence of Alpine meadows. Rains are very scarce in that region: during the hundred days that the expedition spent in the mountains there were only eight days when some rain fell. Clouds are very rare, and, when the sun stands above the horizon, its rays are simply burning, while at night it freezes." On August 13 it began to snow in the mountains, and next day the explorers experienced, on the surface of one of the glaciers, a snow-storm. Several dozen glaciers were noticed, nearly all of them formerly unknown. They were all covered thickly with snow. The chief glaciers (about twelve) are at the headwaters of the Yagnob; the largest of them received the name of Rostovtseff's glacier. They all lie at very high altitudes, none of them descending below the 10,000 feet level. All seem to be in a period of decrease.

Early Geography in China.—Prof. Friedrich Hirth, of Munich, who was for many years engaged in the Chinese Imperial Customs, and is the author of many standard works on the history and archæology of China, communicated a paper to the recent Oriental Congress in Paris, on the native sources to the history of pictorial art in China. The *geographical* interest attaching to what at first sight looks like a very remote department of knowledge, consists in the prospect which the author sees of obtaining from the study of pictorial art in China the best information regarding the development of cartography in the East. The Chinese look upon cartography as a branch of their pictorial art. On p. 10 of the reprint of the paper referred to, mention is made of a work entitled, *Ti-hing-fang-tchang-t'u*, i.e. "The Shape of the Earth depicted on a Square," in which P'eï Siu, the great cartographer of the third century, places on record his view of the subject. Prof. Hirth informs us that P'eï Siu, whose biography is contained in the Chinese annals, lived from A.D. 223 to 271. His fame as a geographer is mainly due to a large map, in eighteen sheets, of the topography of the Yü-kung, *i.e.* the Tribute of Yü, showing the configuration of China under the Emperor Yü (2205 B.C.), one of the oldest attempts at historical cartography. A map of the world, as then known to the Chinese, had, under the title *Ti-hing-t'u*, i.e. "Map of the Earth's Shape," been drawn by the painter Tchang Hêng, who, according to the *Han Annals*, lived from A.D. 74 to 136. Students of historical geography will be struck by the strange coincidence of work so similar in purpose being taken up in the same period by Ptolemy in the West, and the Chinese painter in the East. The close political relations between China and the Bactrian border states which had, in the second century B.C., commenced to open China to the influx of Græco-Asiatic influences, were certainly not unfavourable to the introduction of Western ideas. Prof. Hirth hopes to return to this subject, and to devote a special chapter to the cartographical branch of pictorial art in China—a work which he is well fitted to undertake, and which will be looked forward to with great interest by geographers.

Ascent of Mount Morrison, Formosa.—Towards the end of 1896, Mount Morrison, the highest summit of Formosa, was for the first time ascended by a party under the leadership of Dr. Seiroku Honda, Professor of Forestry at Tokio, commissioned by the Japanese government to report fully on the forestry of the central mountainous region of the island. The party also included a geologist and topographer, so that results of considerable value from a scientific point of view have been obtained. A short summary of these, together with a narrative of the ascent of Mount Morrison, is given by Prof. Honda in the sixtieth part (July, 1897) of the *Mittheilungen der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens*. Landing at Kelung, the explorers proceeded southwards on foot along the western slopes of the central mountain chain. After a march of ten days the last Chinese settlement, Ling-ki-ho, was reached, eastward of which only the aboriginal inhabitants were met with. Roads being unknown, it was necessary to engage porters for transport service, and this was a matter of difficulty, owing to the fear inspired by the natives, who are given to head-hunting. As the ascent began the cultivated land, grass, bamboos, and bananas gave place to luxuriant evergreen forest, composed chiefly of fig and camphor trees mixed with palms, creepers, and tree-ferns. Some of the camphor trees were of enormous size, but great havoc had been played among them by the camphor-collectors. Two days were taken up in the passage through this forest, the night being spent in a solitary hut used by the collectors. A village of aborigines was reached on the third day, and friendly relations were established after the armed Japanese guard had been dismissed. The system of communal batchelors' quarters was found to be in force, and among the customs noted were the extraction of the eye-teeth at the age of five years, and the use of girdles of *calamus* fibre, said to have for its object the prevention of over-eating! At 6000 feet woods of conifers began (*Chamaecyparis* and *Cryptomerias*), and at 7000 feet fir-woods were reached. The way led up the narrow gorge of a stream. At 9500 feet a grass plain, forming the water-parting, was reached, and the actual peak of Mount Morrison was in view. The ascent of this led partly through woods of *Tsuga* and pines, partly over grass-flats, and finally over ridges of rock. From the top the sea was clearly visible to the east, and less distinctly so to the west. Countless mountain summits lay in the former direction, while towards the north extended a chaos of wooded ridges. Several of the party suffered severely from fever at this high altitude. The chief scientific results of the journey may be summarized thus. The mountain is not volcanic, but consists of clay-slate and quartzite. The height was found by barometer to be 14,350 feet, in place of the 12,830 feet given by trigonometrical measurement from the coast. Snow was nowhere seen, even in holes among the rocks, and the belief that it covered the mountain must have been due to the appearance of the quartzite. The mountain slopes towards the south are often covered with extensive areas of grass, and the extent of forest did not exceed 40 per cent. in the parts within view. The tropical vegetation of the lowlands extends upwards to a height of 1700 feet, and as already mentioned the subtropical forest gives place to woods of conifers at 6000 feet. The aborigines are agriculturists, not hunters.

AFRICA.

Journey to Lake Rukwa.—A journey was made early in 1897 by Captain Langheld, chief of the German station at Tabora, through the districts of

Unyamwezi, Ukonongo, and South-Eastern Ufipa (*Deutsches Kolonialblatt*, 1897, p. 511). A remarkable fact disclosed by this journey is that Lake Rukwa had, at the time, almost entirely dried up, its place being taken by a grassy plain abounding in game. At the western end a large swamp, 40 square miles in extent, was the only water visible, even with a field glass, though larger swamps were said to exist towards the south-east. This is the more remarkable, as Lake Nyasa has lately stood at an unusually high level. According to the native accounts, the water had retreated about six years before, but had so completely dried up only within the last year. In the greater rains the whole steppe was said to be covered with water, and to be impassable. Captain Langheld visited Dr. Kaiser's grave, near the western end of the lake. Although, since that explorer, no European had passed through much of the country traversed, the natives showed little shyness, although manifesting some curiosity. They all showed a general resemblance to each other in most respects, except that in Ufipa round huts took the place of the "tembes" of the north. The surface of the country was extremely uniform, belonging almost entirely to the granite plateau of Unyamwezi.

The Passage of the Congo through the West African Highlands.—In the eighth sheet of his map of the Congo State, which appears in the *Mouvement Géographique* for November 21 (No. 47), M. Wauters endeavours to bring out the general features of the line of highlands (the so-called Serra do Cristal) which bounds the Central Congo depression to the west, whilst in an accompanying article he describes in detail the passage of the Congo through these mountains. M. Wauters lays stress on the great width of this line of high ground, which, instead of being limited to the region between Matadi and Stanley pool, really extends from the east end of Mateba island, just below Boma, almost as far as Bolobo on the Upper river. He divides the system into two main chains, separated by a median region of less elevation. The eastern chain extends from Chumbiri to Manyanga, its western limit coinciding with the line of partition between the streams of the central and maritime zones. The western chain occupies the interval between Isangila and Boma. In its passage through each of these chains the Congo consists of a navigable and unnavigable section, whilst in crossing the median region it is navigable. The basis of the map is supplied by the astronomical observations of Captains Delporte and Rouvier, the work of other explorers being adapted to the fixed positions thus determined.

Transport Experiment in German East Africa.—An attempt to improve the existing means of transport in German East Africa by the use of wheeled vehicles has lately been made, apparently with some success. Under the superintendence of Major v. Natzmer, the caravan road from Dar-es-Salaam to Kilossa was widened, and the distance was successfully traversed by a cart drawn by mules. The return journey to the coast was accomplished, without porters, with the aid of four mules, one of which served as a pack-animal. The distance of 190 miles, to traverse which caravans of porters take twelve to fourteen days, was in this way accomplished in eight. An order has been issued that in future a part of the loads of each military caravan proceeding into the interior shall be carried by pack-mules or in carts.

Hausa Immigration into the Congo Basin.—In the last number of the *Journal* (vol. x. p. 638) mention was made of Hausa settlers who have of late years made their way south into the interior of the Cameroons. This enterprising race appears to be pushing southward still further, in the north-western parts of the Congo basin. According to a note in the *Mouvement Géographique* (1897, No. 47), a regular trade is now carried on by them with the Europeans and natives of the

Upper Sanga. They are well received by the latter, and the French authorities endeavour to induce them to settle in the country, in hopes that a great impetus to trade will be given by their means. Colonies have already been established at Carnot, Bania, and Nola.

M. Foa's Journey across Africa.—The news of Mr. Foa's arrival at Libreville, in the Gabun, is published in the *Mouvement Géographique* for December 12. When last heard of (*Journal*, vol. x. p. 539), M. Foa was at Abercorn, at the south end of Lake Tanganyika, and was then planning to complete the journey across the continent by a new route. This he has therefore successfully accomplished, though the exact route followed is not stated.

Meteorological Observations in Tropical Africa.—We have received the *Report* of the British Association Committee on the Climate of Tropical Africa for the past year, the sixth of the committee's existence. The Report includes abstracts of the observations made at stations under the direct control of the committee—in particular those of Mr. John W. Moir at Lauderdale, and of the Scottish Mission station at Kibwezi. A series of observations on the level of the Victoria Nyanza is also of much value. The principal achievement of the committee during the year, however, is the provision, at the instance of the Foreign Office, of several sets of instruments for use in Nyasaland. These will form the nucleus of what it is to be hoped may one day grow to a fully equipped meteorological service for the Protectorate.

St. Helena.—From the Annual Report for 1896 on St. Helena (Colonial Reports Annual, No. 213) we extract the following particulars relating to the recent condition of the colony. In 1896 the total revenue amounted to £9160, as compared with £9762 in the previous year. The value of the imports was £30,950, and of the exports £4739. Two new meteorological stations, "North" and "South," have been established on the island. The largest amount of rainfall during 1896 was registered at the southern station, the next wettest locality being the central station. The greatest daily record, 1·41 inch, was recorded at the central station on March 26. The absolute maximum and minimum temperature at the same station was 77·6° and 50·2° on March 2 and September 10 respectively. The health of the island was satisfactory, with the exception of the infant mortality, which was high. The population was estimated at the end of 1896 to be 3890.

Affinities of the Flora of the Aldabra Islands.—*Globus* (No. 20, vol. 72) gives a short *résumé* of a paper published by Hans Schinz on the flora of the Aldabra islands, in the Indian ocean (*Abhandl. der Senckenb. Naturf. Ges.*, vol. 21). The coral rock, of which the three small islands composing the group consist, is covered sparingly with grass or with thick bush. The total number of species of plants hitherto found on the islands amounts to seventy-one, of which sixty-five have been accurately determined. Ten of these are endemic, while forty-three show affinities with Madagascar or the African continent, four being confined to the latter and the neighbouring islands. Thirteen of the species are also met with in Sokotra; but, with one exception, these are all tropical cosmopolitan species. Those common to Aldabra and tropical India are either cosmopolitan, or at least such as are widely diffused through the eastern hemisphere, with the exception of one species—*Moringa pterygosperma*—and the presence of this may be explained by its frequent cultivation in the tropics.

AMERICA.

Exploration of the Sushitna River, Alaska.—In the *Journal* for June last (vol. ix. p. 668), allusion was made to explorations by prospectors in the region north of Cook's inlet, on the southern coast of Alaska. A short account of the results of these explorations, with sketch-map, has now been given in the November number of the *National Geographic Magazine* by Mr. W. A. Dickey. The Sushitna river, which empties itself into the northern end of Cook's inlet, is, according to Mr. Dickey, one of the largest rivers in Alaska, carrying more water than the Copper river, though its course is not quite so long. Its name, which means "Great muddy river," well describes its character. Extensive mud flats border its delta, which is traversed by many channels. The tides, though rising over 30 feet, are unnoticeable a few miles up the stream. Beyond the point reached by them the Sushitna is for the first time confined to a single channel, cutting through a rocky dyke which crosses the valley diagonally. Here the stream is 1200 yards in width, very deep and swift, soundings showing a depth of over 100 feet. It is formed by the junction of many branches, which extend over a wide area. One from the west, which joins the northern main branch not far from its mouth, appears to rise near the source of the Kuskokwim, the water-parting being not formed, apparently, by any very high ground. The northern branch is characterized by many islands and channels, masses of driftwood and many snags, while the caving banks and swift current make the ascent dangerous. Its various head streams descend from a region of lofty mountains, of which Mount Bulshaia (great mountain) or McKinley towers aloft above the rest, and is said to be higher than any summit in the St. Elias range. Four other high peaks (unnamed) cluster around it. The branch followed by Mr. Dickey and his companions led to a narrow valley between low hills, which increased in height until they confined the stream within a cañon, with walls nearly 1000 feet high, in some places perpendicular. From the accounts of the natives, it seems that the main source of the Copper river is near the headwaters of this branch of the Sushitna, and not far from the Tanana. Indians from the latter river came down the Sushitna last winter to trade. They are said to be cannibals. Except birds, little animal life was seen, bear being more frequently seen than any other large game. The signs of gold diminished upstream.

Coronado's Expedition to Cibola, or the "Seven Cities."*—Although originally published as a part of the Annual Report of the United States Bureau of Ethnology, Mr. Winship's recent work on the Coronado expedition forms in itself a quarto volume of over three hundred pages. The study of which it is the outcome was first undertaken by him when an undergraduate at Harvard University; but its scope has since been extended until the material collected has assumed its present considerable proportions. The first part of the book, occupying a space of about seventy pages, consists of a historical sketch of the events which led to the despatch of Coronado's expedition, and of the course of that expedition itself, which, after those of Cortez and De Soto, was perhaps the most important ever undertaken by the Spanish in North America. Set on foot by the Viceroy Mendoza in consequence of the reports brought back by Cabeza de Vaca from his long wanderings as a survivor of Narvaez's ill-fated expedition, it resulted in the identification of the mysterious "Seven Cities" with the communal villages of the Zuni Indians, and in the exploration of the greater part of the modern New Mexico and Arizona as far as the Grand Cañon of the Colorado, then brought to light for the first time. The larger and perhaps most important part of the book is that in which the narrative of Pedro de Castañeda, himself a member of the expedition—not to be confounded with the Portuguese historian Castanheda—is for the first time printed in the original Spanish, from an early copy of the original manuscript in existence in the Lenox Library in New York. A French

* 'The Coronado Expedition, 1540-42.' By George Parker Winship. Extract from the Fourteenth Annual Report of the Bureau of Ethnology. Washington, 1896.

translation of this was printed by Ternaux-Compans in the ninth volume of his collection of voyages; but, as Mr. Winship points out, this is in many respects faulty, so that the publication of the Spanish text is a valuable contribution to the literature of historical geography. Mr. Winship gives an English version of the narrative, which will be useful to those unable to read Spanish, although it may be doubted whether his rendering of the many obscure passages of the original is in all cases entirely satisfactory. As, however, he is careful, in cases of doubt, to refer the reader to the Spanish text, the risk of error arising from mistranslation is lessened. Besides the description of the Colorado cañon, the account of the vast herds of bison met with may be specially mentioned as being one of the earliest which exists. Among other documents included in the volume is a copy of a letter written apparently by one of the friars who accompanied Coronado. Copious footnotes are given, in which reference is made to the work of other writers on the subject, and especially to the modern investigations—by Mr. Bandelier and others—into the history and antiquities of the country first explored by Coronado. The work contains many copies of old maps (although these are but briefly referred to in a footnote), as well as illustrations of the physical type and mode of life of the modern Indians of New Mexico.

Explorations in the Basin of the Upper Amazon.—A journey from the headwaters of the Amazon to the mouth of the great river has lately been made by an American traveller, Major Orton Kerbey, principally with a view to the discovery of fresh fields for the prosecution of the rubber industry. Major Kerbey started from Cuzco, and proceeded down the Urubamba and Ucayali rivers to the junction of the latter with the Marañon. He claims to be the first white man to have traversed the whole of this distance, following the course of the rivers, and this without the aid of Indians. At the rapids known as Pongo de Mainique he lost both his canoes and baggage, and his difficulties were thereby much increased. He insists that the true upper branch of the Amazon is the Ucayali, not the Marañon. This is, however, no new idea, as even in the last century De la Condamine noticed the greater size of the Ucayali at the confluence, and knew that its source was probably the more remote, whilst in later times Squier and others have held the same view. In any case Major Kerbey can hardly be correct in estimating the length to the source of the Urubamba as nearly 1000 miles greater than that to the source of the Marañon. As a practical result of the journey, he claims to have discovered a splendid region for the cultivation of rubber and other tropical products.

Mr. Hatcher's Explorations in Patagonia.—Further details respecting the expedition to Patagonia, supported by Princeton University, to which allusion was made in our last number, are published in the November issue of the *National Geographic Magazine*, together with a general sketch by Mr. Hatcher, the leader of the expedition, of the geography of the regions traversed. Although Mr. Hatcher's natural history work was also concerned with the region of the straits of Magellan and Tierra del Fuego, his journeys in the interior of Southern Patagonia are naturally the most interesting from a geographical point of view. Accompanied only by his assistant, Mr. O. A. Peterson, Mr. Hatcher proceeded from Gallegos, the seat of government of the province of Santa Cruz, in a north-westerly direction to the Rio Santa Cruz. This being unfordable, the travellers followed its course to Lake Argentino, near the foot of the Cordilleras, where they found a boat which had been abandoned some years before by English explorers. This enabled them to cross the river, and the journey was continued northwards near the base of the mountains. A new river was discovered, fully equal to the Santa Cruz in volume, which rises to the east of the Andes, and breaks through the chain by a profound cañon to the Pacific ocean, thus supplying a notable example of the deviation of the water-parting from the principal chain of the Andes. It is fed by some noble glaciers, and was found to be so swift and tumultuous that it was impossible to trace its course more than a part of the way through the mountains. The plains of Patagonia, traversed by the expedition, consist of a series of benches, or steps, rising from the Atlantic coast towards the Cordilleras. A prominent feature in these plains is the occurrence of numerous groups of volcanic cones, separated from the Cordilleras by plains entirely devoid of volcanic phenomena. Mr. Hatcher inclines to the opinion that they may be regarded as lateral cones deriving their molten matter from the same reservoir as the greater volcanoes of the Cordilleras, although they may possibly form an independent system. East of the crater region, the plains are marked by the existence of shallow salt lagoons at the bottom of great depressions, or excavations. Near the base of the Cordilleras the surface is broken by heterogeneous masses of stones, etc., evidently the terminal moraines of former glaciers, by which the fresh-water lakes, which lie along the foot of the mountains, are confined. Extreme ruggedness is the most characteristic feature of the Andes of Patagonia, where everything points to the comparatively recent age, both of mountains and plains. The former, as is pointed out in an editorial note, probably existed as an archipelago of islands before the plains emerged from the ocean, the cañon of the newly discovered river (named the Mayer) possibly marking the position of an ancient strait. Botanically, Patagonia may be divided into three regions, according to the quantity and quality of the vegetation. The first, or eastern coast region, is occupied by sheep-farmers; the second, or central zone, consists of high barren pampas, entirely uninhabited; the third is the region of the Cordilleras, which is far richer in vegetation than the other two. The photographic illustrations which accompany Mr. Hatcher's paper give an excellent idea of some of the typical features of the country.

Santa Catalina Island.—The first number of the third series (Division Geology) of the *Proceedings* of the California Academy of Sciences has recently been issued. It may here be well to note that the Academy intends for the future to issue its *Proceedings* in several wholly independent divisions or parts, each division to be devoted to a single branch of science or to a group of closely related sciences. The present number consists of an account of the geology of Santa Catalina island, by Mr. W. S. Smith, and contains much matter that will interest the geographer. Santa Catalina island is one of the group known as the Channel islands, and lies off the coast of Southern California. The general trend of the island is north-west by west. Its length is approximately 21 miles, with an average width of 3 miles, varying from half a mile at the isthmus to about 8 miles in the widest part. Owing to its ruggedness and the scarcity of water, the island is habitable in only a few places. The principal settlements are at Avalon, and a small community at the isthmus. The island presents two types of topography. Its prevailing topographical features are a succession of sharp, steep ridges and V-shaped cañons. The main ridge, which traverses the island from end to end, has an average elevation of about 1400 feet. The two greatest elevations are Orizaba, or "Brush mountain," marked 2109 feet on the map, and Black Jack, about a hundred feet lower. There is one small lake on the island, described as a drainage lake, without outlet, situated about a mile to the north-east of Black Jack, at an altitude of about 1300 feet. Except for the openings formed by the cañon mouths, cliffs surround the island on all sides, ranging from 100 or 200 feet to 1400 feet or more in height. The cliffs are rapidly receding. The coast-line, particularly on the landward side, is indented with numerous bays. With but two exceptions, Santa Catalina is devoid of any evident terracing from one end to the other, and in this respect contrasts greatly to the adjacent land areas.

POLAR REGIONS.

Dr. Nathorst's Expedition to Spitsbergen.—We have received a letter from Dr. Nathorst, giving some details respecting the expedition which he is to lead to the polar regions next summer. The programme is essentially the same as that sketched out a year ago (*Journal*, vol. ix. p. 95), consisting, broadly speaking, of the examination of the area between the mainland of Spitsbergen and Franz Josef Land. Pending the opening of this region to navigation, investigations will be made during the early summer on Western Spitsbergen, North-east Land, etc. The *Antarctic*, which made the voyage towards the south pole in 1894, has been purchased, and will be under the command of Emil Nilsson, of the Swedish mercantile navy, who has made voyages to the Yenesei, and also commanded the *Sophia* during Baron Nordenskjöld's expedition to Greenland in 1883. The scientific staff is to be particularly large and efficient, including men who have had wide experience of the polar regions. Dr. Nathorst himself will devote his attention more particularly to geology. The two zoologists will be Mr. G. Kolthoff, also a member of the 1883 expedition, and Dr. Axel Ohlin, who to his previous experience of the arctic regions has added that acquired as member of the Swedish expedition to Patagonia. The botanist will be Dr. Gunner Andersson, of the University of Stockholm, while Dr. Axel Hamberg will probably undertake the hydrographic work, and Lieut. O. Kjellström the cartography, the former giving especial attention to the study of glaciers, which he has already prosecuted in Spitsbergen and Lapland. The two last-named both accompanied Nordenskjöld in 1883. Mr. J. G. Andersson, assistant-geologist, will also study the "plankton" of the waters visited; and the surgeon, Dr. E. T. Levin, will investigate the occurrence of *bacteria* in the polar region.

Geodetic Expedition to Spitsbergen.—The idea of carrying out the measurement of a degree of latitude in Spitsbergen, first put forward early in the century by the late Sir Edward Sabine, has often during recent years occupied the attention of the Swedish Academy of Sciences. The Spitsbergen expeditions of 1861 and 1864, under Torell and Nordenskjöld respectively, were largely concerned with investigations as to the practicability of the idea, and in 1891 a committee was appointed to consider the question, a result of its deliberations being that a preliminary scheme was drawn up by Prof. Rosen, and published as a pamphlet in 1893, with map showing the proposed system of triangles. The idea seems now to be taking more definite shape, and, according to the Swedish *Dagens Nyheter*, a proposal has been made by Prof. Jäderin that a preliminary expedition should be sent to Spitsbergen next summer, to make preparations for the carrying out of the scheme in 1899 and 1900. It is suggested that the Russian Government should be asked to co-operate with the Swedish in the final measurement.

MATHEMATICAL AND PHYSICAL.

Ocean Currents.—A letter has been received from Mr. Charles Wilde, manager of the West Caicos Fibre Company, stating that on the morning of July 16, 1897, one of the negroes in his employment brought him a corked bottle, picked up on a sandy beach at the north end of West Caicos Island, near the south end of the Bahamas. It contained a sheet torn from a log-book with the following written on it: "15th January, 1894. Ship *Queen Elizabeth*, bound for Hambourg from Saltal, 81 days out, lat. 25° north, long. 40° west. All well. Wind very light. (Signed) C. E. Fulton, Commander. 15th day of January, 1894." The position given is near the northern limits of the north-east trade-winds, near the southern margin of the Sargasso sea. The length of time which has elapsed since the bottle was launched, of course deprives it of any value as a means of determining the velocity of the current which carried it, as in the time it might possibly have made the complete tour of the North Atlantic, or it might have gone ashore at the time of its first coming within the influence of the north-flowing current off the West Indies.

The "Plankton" of the Red Sea.—The extensive collections made with the tow-net on board the s.s. *Pola* during her expeditions in the northern part of the Red sea (1895–96), have now been worked through by Dr. Adolf Steven, and the preliminary results as to distribution fall into line in a very striking manner with the current system described by Dr. J. Luksch. Certain well-defined regions are found to be extremely rich in plankton, while others are correspondingly poor, and it appears that the latter occur in districts surrounded by currents of relatively low temperature, while the richer parts are where the movements of the water are blocked through irregularities in the coast-line or other cause.

GENERAL.

Royal Medal awarded to Sir Richard Strachey.—At the anniversary meeting of the Royal Society a royal medal was awarded to General Sir Richard Strachey, a former president of the Royal Geographical Society, and a strenuous advocate for the proper recognition of scientific geography by the Universities. The grounds of the award were his "investigations in physical and botanical geography, geology, and meteorology," and special reference was made by Lord Lister, when presenting the medal on November 30, to Sir Richard Strachey being the first to treat scientifically of the physical geography of the Western Himalaya and Tibet. The royal medals may be awarded for distinction in any department of science, and it is doubly gratifying that it should be conferred for geography, and upon a geographer so experienced and hard-working as Sir Richard Strachey.

Yearly Report of the Russian Geographical Society.—The yearly *Report* of the Russian Geographical Society for the year 1896 is, as usual, full of interest. It contains this year a novel feature, which will be most welcome to geographers, namely, the yearly reports of the Siberian (Irkutsk) branch, and the young Amur (Khabarovsk) branch of the society, for the years 1894 and 1895, as well as the yearly report of the Society for the Exploration of the Amur Region. Every geographer will surely concur in the desire of seeing these reports continued, and of having them completed by a yearly report of the West Siberian (Tomsk) branch of the society.

A New Geographical Society.—A new branch of the Russian Geographical Society has been opened at Tashkend for the exploration of Turkestan. It received from the State the usual allowance of 200*l*. a year.

Old French Standard of Length.—It has generally been taken for granted that the *toise* employed by the celebrated mathematician and astronomer, Jean Picard, for the first exact measurement of the degree in the latitude of Paris, has been lost beyond the hope of recovery. Thus it has been hitherto impossible to compare the results of this measurement with later measurements of degrees, such as those carried out in Lapland and Peru. M. C. Wolf, of the French Institute, has, however, been so fortunate as to light on a passage in the *Journal des observations* of J. D. Cassini, which enables the toise of Picard to be restored. A short account of this discovery is given by him in the *Revue Scientifique* for August 14 last. In his book, 'De la Mesure de la Terre' (1671), Picard announces that steps would be taken to keep a record of the length of the Paris *toise*, and of the pendulum beating seconds, at the Paris Observatory; but although it has been known that in 1682 the Academy of Sciences discussed the question of lowering the gnomon of the observatory so that its height should exactly equal ten times the length of such pendulum, it has hitherto remained doubtful whether this idea was carried out. The passage from J. D. Cassini's journal relates that on March 12, 1682, the writer, together with MM. Picard and de la Hire, measured exactly the height of the southern window of the large hall of the observatory, which had been altered so as to exactly equal ten times the length of the pendulum beating seconds. The height—1405 lines on the basis of the *toise* used by Picard—was fixed as the height of the base of the gnomon. Now, as the same height was given by Jacques Cassini (son of the above) at 4400 lines, the means are at hand for comparing the lengths of the *toise* of Picard and the *toise* of Cassini (the younger). The latter *savant* caused 31 rules, each measuring one-tenth the height of the gnomon, to be let into the marble along the length of the meridian, where they remain to this day, thus supplying a tangible test of the length of the pendulum as given by Picard. M. Wolf explains the divergence in length between the *toise* of Picard and that of his successors, by supposing that subsequently to his time friction had enlarged the space between the perpendicular pegs of the standard fixed at the *Grand Châtelet* in 1668, from which all others were derived.

Turkish Sea-Book of the Indian Ocean.—As a contribution to the celebration of the discovery of the sea-route to India, the Vienna Geographical Society has published a German translation of the topographical chapters of the 'Mohit,' or 'Mirror of the Indian Seas,' compiled by the Turkish admiral, Seidi Ali, in the year 1554. The translation, made for the first time into the German language,* is by Dr. M. Bittner, whilst an introduction giving a clear account of the work and its author, together with a series of maps in which an attempt is made to reconstruct the maps of the period from the data supplied by Seidi Ali, is contributed by Dr. W. Tomaschek. The author was personally acquainted with the Eastern seas from his command of the Turkish fleet in those waters during the conflicts of the Turks with the Portuguese, and in the 'Mohit,' which is a veritable mine of topographical information, he has both collected together a mass of material derived from Arabic sailing directions, mostly of a date anterior to the arrival of the Portuguese, and also added much from his own knowledge. The work is of special value as facilitating a comparison of the nautical science of the Arabs with that of the Portuguese which soon took its place. Whereas a general agreement in the nomenclature is to be noticed, the 'Mohit' records many ancient names which had no place on the later Portuguese charts. An instance of this is the localization by Seidi Ali, of Fansur, the famous port for the export of camphor on the west coast of Sumatra, mentioned by Marco Polo, whilst its site was quite unknown to the Portuguese. The work is divided into ten chapters, many of which deal with questions of astronomy, the division of time, and so forth. The topographical chapters now published are the fourth, which contains minute descriptions of the Indian coasts and of the islands of the Eastern seas; and the sixth, which gives the latitudes of a large number of places visited by mariners, by means of altitudes of the pole star and other northern stars. Dr. Tomaschek gives a chapter on the reconstruction of the maps from the data furnished by the 'Mohit.' The points of the compass were roughly indicated among the Arab navigators by the rising and

* The topographical chapters of the 'Mohit' were published in 1894 by Dr. Bonelli in the *Rendiconti della Reale Academia dei Lincei*, whilst some extracts were given in the *Journal of the Asiatic Society of Bengal* (vols. 3, 5, 6, 7), but a complete reproduction of the work, of which only two manuscripts are known to exist, is still a desideratum.

setting points of certain stars (compass-stars), of which there were fifteen, supplying, in conjunction with the north and south poles, a means of defining thirty-two different bearings. These are employed by the 'Mohit' for the description of the various coasts, and the data when transferred to the map prove surprisingly exact. The latitudes, as already mentioned, are defined by the altitudes of certain northern stars, and are reckoned in *isba* (fingers or thumbs), a term which originated in the primitive measurement of altitudes by holding the arm at full length and reckoning the number of thumb-breadths subtended by any given angle. The statements of Seidi Ali allow the *isba* to be estimated with precision at 1° 42′ 50″, so that his latitudes can at once be reckoned in degrees. His tables give lists of places for every quarter *isba* from eleven *isba* of the pole-star to one *isba* of the body of the Great Bear, embracing roughly the space between the tropics. In the more frequented regions the maximum error is as low as 25′ 42·48″. Longitudes are, of course, not given, but some lists of distances in an east and west direction supply their place. For purposes of comparison Dr. Tomaschek gives maps based on Portuguese authorities, side by side with those reconstructed from the data of the 'Mohit.'

OBITUARY.

Justin Winsor.

By the President.

Among the Honorary Members of this Society who have been recently elected, few have been so distinguished in literature, none have been so helpful to me in my duties connected with the Society's work, as the late Mr. Justin Winsor, Librarian of Harvard College, whose sudden death we now deplore. Mr. Winsor belonged to an old colonial family, and was descended from one of the first settlers in Massachusetts. He devoted much of his time, from an early age, to a study of the history of New England, and latterly to the history of America generally; but his most prominent and useful public services were connected with the organization of libraries, and with utilizing them for the public to the utmost possible extent. He was superintendent of the Boston Library from 1868 to 1877; and the lead he had taken in the development of public libraries for popular use, led to his election as president when the American Library Association was founded in 1876, an office which he held for ten years in succession. During the last twenty years of his life Mr. Winsor was Librarian of Harvard College, and his position enabled him to be of great service to old and young, in directing their researches and giving them advice and assistance. His ever-ready sympathy, his kindness and good nature, were highly appreciated by a wide circle of friends and acquaintances. His plan of editing such works as the 'Memorial History of Boston' and the 'Narrative and Critical History of America,' was very happily conceived. While the whole scheme was matured and arranged by himself, he secured the services of several writers who had special acquaintance with the various sections, and who prepared them under his editorship, and with his ever-ready advice and help. In knowledge respecting several sections of the 'History of America,' Mr. Winsor was himself without a rival; and it was appropriate, and even necessary, that he should undertake the account of works relating to America in libraries and bibliographies, the early description of the New World, and the pre-Columbian exploration, as well as the chapters on early cartography. But his inexhaustible stores of information are met with throughout the critical essays which form such a special feature of this great and important work.

Mr. Winsor's 'Christopher Columbus' was published in 1891, his 'Cartier to Frontenac' in 1894, and his 'Mississippi Basin' in 1895. His shorter publications, in reviews and magazines, are exceedingly numerous, and always throw fresh light on some disputed question in geographical history or cartography.

Mr. Winsor had the great merit of seeing very clearly the absolute necessity for studying geography in order to appreciate the course of history. He did me the honour of dedicating to me his last work on the 'Mississippi Basin,' and in his dedication he expresses his view on that point with the terse vigour which characterizes his style. He remarks, "You know how the physiography of a continent influences its history, how it opens avenues of discovery, directs lines of settlement, and gives to the natural rulers of the earth their coign of vantage. I would not say that there are not other compelling influences, but no other control is so steady. If we appreciate such a dominating power in subjecting the earth to man's uses, we cannot be far from discerning the pith of history, particularly of those periods which show the work of pioneers." It is his clear perception of the necessity for treating history from this point of view, which gives special value to Mr. Winsor's more recent works. As a geographical historian, combining profound knowledge with a clear perception of the correct treatment of his subject, Mr. Winsor had few equals. He strove with all his might, and with single-minded zeal, to make the great libraries of Boston and Cambridge widely useful, and the inquiries of students always received from him the most prompt and courteous attention. While his loss will be severely felt by scholars and students, it will be mourned by a wide circle of friends, both in the United States and throughout Europe.

Ernest Giles.

Ernest Giles, whose death at Coolgardie in Western Australia was announced by telegraph at the end of November last, was one of the most persevering and successful of the band of explorers who, after the completion of the Australian trans-continental telegraph-line from Adelaide to Port Darwin, were the first to shed light on the vast unknown interior of the western half of the continent, lying between that line and the Swan river settlements on the west coast.

Born at Bristol about the year 1847, Ernest Giles was educated at Christ's Hospital, and on leaving school joined his parents in South Australia, whither they had already emigrated. On the migration of his family to Victoria, he for a time held posts in the post office and county court at Melbourne. The untrammelled life in the Australian bush early possessed for him a powerful attraction, and his eager perusal of narratives of voyages and discoveries, including those of the pioneers of Australian exploration, aroused in him an ardent desire to emulate their exploits by traversing the vast extent of territory still remaining a blank on the maps of Australia. Want of means, however, for a long time stood in the way of the realization of his dreams. For some years he gave his attention to stock-raising in the colonies of New South Wales and Queensland, and it was not until 1872, after he had had the good fortune to meet the late Baron von Mueller, and to receive his warm encouragement for the projects he had at heart, that he was able to take the field as an explorer. The funds collected by that well-known patron of Australian discovery, together with supplies contributed by his brother-in-law, Mr. G. D. Gill of Melbourne, supplemented from his own resources, enabled him in that year to equip an expedition, which was to start from Chambers' Pillar, near the

Finke river, for the unknown country to the west of the telegraph-line. In this enterprise he was joined by Mr. S. Carmichael, whom he had met in Melbourne.

At this time neither Warburton, Forrest, nor Gosse had made their important journeys in the interior of Western Australia, so that to Mr. Giles belongs the credit of initiating the exploration of the western interior, although on this first journey he was unable to penetrate more than about 300 miles from his starting-point. The country became very unpromising, but a geographical discovery of some importance was that of the extensive swamp named by its discoverer Lake Amadeus, although this subsequently proved smaller than was originally supposed. The remarkable natural features Ayers' Rock and Mount Olga, colossal remnants of an ancient geological formation, were also sighted during this journey, and some new ranges of mountains, well grassed and permanently watered, were discovered west of the head-waters of the Finke.

On his return from this journey, Giles found that two other expeditions had been set on foot by Sir Thomas Elder and the South Australian Government, respectively under the command of Colonel Warburton and Mr. Gosse. This news spurred him to fresh efforts, and with the help of Baron von Mueller, and of a small grant from the Government of South Australia, he was soon again in the field, this time accompanied by Mr. W. H. Tietkens and two other "whites." A start was made on August 4, 1873, from Ross's water-hole on the Alberga in about 27° S. lat., and the direction taken led generally a little north of west. This expedition involved excessive toil and hardships owing to the inhospitable nature of the country traversed, and proved fatal to one of Giles' companions, Gibson, who missed the track and was never afterwards heard of. The leader himself narrowly escaped a similar fate, having to make his way back to camp alone and on foot from the furthest point reached in the spinifex desert, several days being passed entirely without food, and with the scantiest supply of water. The turning-point was in about 126° E., or far to the west of the West Australian boundary.

On both these expeditions Giles had used horses—Warburton's and Gosse's expeditions having been supplied with camels—and the result proved the unsuitability of horses alone for the exploration of the western deserts of Australia. He therefore obtained, through Baron von Mueller, an introduction to Sir Thomas Elder, then the only camel-owner in Australia, who soon agreed to supply the necessary camels for a new expedition. The journeys of Warburton and Forrest had by this time drawn two narrow threads across the unknown interior of Western Australia, in its northern and central portions, and the work entrusted to Giles was to do the same for the more southern region by striking across from east to west on about the 29th parallel. After a preliminary visit to the country at the head of the great Australian bight, Giles proceeded across the barren region west of Lake Torrens to Beltana, Sir Thomas Elder's cattle station, where he organized his fourth and most important expedition, on which the whole width of the interior desert was twice traversed in its fullest extent. The westward section of this expedition, which may almost be considered as two separate journeys, is described in the Society's *Journal* for 1876.

Accompanied by Messrs. Tietkens and Young, with two other white men, an Afghan camel-driver, and twenty-two camels, Giles set out from Port Augusta on May 23, 1875, and passing round the north end of Lake Gairdner, soon plunged into the region of scrub, sandhills, and spinifex, which continued, with few intermissions, until the settled regions of Western Australia were reached. The country was, as a whole, of the most wretched description, and not a trace of land possessing any agricultural value was met with. Water-holes were fortunately found at long intervals, but between Boundary dam, near the frontier of Western Australia, and Queen Victoria spring, in about 123½ E. lat., a distance of 325 miles, which it took sixteen days to traverse, not a drop of water was found.

Having safely reached Perth, after one of the most brilliant desert-journeys on record, Giles set about preparing for the return march, on which he hoped to connect the known portions of West Australia with the terminus of his unfortunate expedition of 1873–74. Messrs. Tietkens and Young both elected to return home by sea. Proceeding to Champion bay, the expedition struck north-east for the head-waters of the Ashburton, discovering *en route* some good pastoral country. The eastern limits of the basin of this river were for the first time determined, and beyond this the party again plunged into the open rolling desert of sandhills and spinifex, which proved hardly less inhospitable than that previously traversed to the southward. At one part a space of ten days elapsed without a drop of water being seen. The Alfred and Marie range, sighted in 1874, was crossed, and the route continued by the Rawlinson and Petermann ranges, south of the Amadeus swamp, to the telegraph-line in the neighbourhood of the Alberga.

A minor expedition in 1882, in the region west of the Peake telegraph station, completed Giles' work as an Australian explorer—work which gained him the gold medal of the Royal Geographical Society in 1880, and a decoration and diploma of knighthood from the King of Italy. For the extent of unknown country traversed, his explorations can hardly be matched by those of any other Australian pioneer, and though, unfortunately, they did not open up any large tracts of country of value to the settler, the inhospitable nature of the scene of his labours in itself brings into clear relief the qualities of endurance and daring which enabled him to disclose its secrets. In addition to various official reports, a connected account of his travels, written in a bright and interesting style, was published in 1889. Giles was a life member of the Society, which he joined in 1877.

CORRESPONDENCE.

The Discovery of Australia.

In Major's introduction to the Hakluyt Society's volume 'Early Voyages to Australia,' on p. 64, he sums up the results he has arrived at by saying, "Our surmises, therefore, lead us to regard it as highly probable that Australia was discovered by the Portuguese between the years 1511 and 1529, and almost to a demonstrable certainty that it was discovered before 1542." The reasons for this are briefly—there exist French maps, and only French maps as early as 1542, which give the outline of a country that is certainly Australia; on this outline map are certain Portuguese names (p. 59), which show that the discoverers were Portuguese.

I venture to think that the Portuguese did not discover Australia; their official histories, which are very full on all new voyages, never mention such a fact, and there was no reason for special silence in regard to it. The passage quoted later from Couto, who wrote about 1596, shows that at that late date their information regarding Australia was of the vaguest and most fragmentary character.

The problem therefore is, how did the French obtain the information that enabled them, and them alone, to map the Australian coast? and if they did not obtain it from Portuguese sources, how are the Portuguese names on the map to be explained? With diffidence, I would suggest that the explanation should be sought in the French expedition with Portuguese captains and pilots that visited the East about 1527. The dates agree, and the presence of the Portuguese officers would account for the names.

It will be better to bring together what is known of this French expedition from Portuguese sources. Gaspar Correa has the most detailed account, and I will abridge what he says. I will then give corroborative notices. Correa went to the East in 1513, and lived there continually till after 1566; the date of his death is uncertain. He was at Diu in the commencement of 1531. His history was, however, not printed until 1858, and has not been borrowed from by either earlier or later historians.

Correa, vol. iii. p. 238, referring to the year 1528:

"In the year 1527 there left France three vessels armed as corsairs, and they journeyed towards India. At sea one of them—of which Stephen Dias Brigas, a pilot and Portuguese, was the captain—separated from the others and reached Diu with forty-eight men; the ship had much artillery, and 60 of the crew had died. When he got there the captain Brigas went on shore, and feigned that he was but a messenger sent by another who remained on board, and told those in the boat that if they were questioned they should say the captain was on the ship, and that he was his servant. He went to the captain of Diu, who was then called Camalmaluqo (Kamalu-l-mulk ?), and told him the captain of the vessel wanted his safe conduct to sell the merchandise he had on board and buy that of the town, and that he was ready to pay customs as a strange merchant; that he had never visited these parts before, and that he was the vassal of a great king with whom he should make friendship. The captain of Diu asked him whether he was an ally of the Portuguese, and he replied that he knew them, but had not yet met them. The Moor told him he was pleased to see him, and that he could trade in the city with full security, and as a safe conduct gave him an arrow from his quiver, which is the customary form of royal security. On this Brigas returned to his ship, and told the crew they might buy and sell. With the Moor captain were some renegade Portuguese, who were asked of what nationality were those of the ship, and they said French, who came from a country called France, without any licence, to rob whoever they found on the sea; that they were thieves, and that if the Portuguese caught them they would kill them as if they were Turks. The Moor held his tongue, and, seeing the French were ragged and dirty vagabonds—who ranged the streets and frequented taverns to drink country liquor, who had no merchandise, and only sold hatchets and knives and swords and matchlocks, all articles of iron, but no merchantable goods, and bought stamped cloths to clothe themselves, and their only trade eating and drinking—he wrote all to his lord, the King of Cambay * (Guzerat). When the king heard this, he sent foists to the ship and brought away Brigas and all the crew, leaving the vessel empty, and put them in a house well guarded. He took out of the ship all that was in it, chiefly artillery, large and small and white arms, and lay it aground in the channel; it was about 250 tons, and very rotten. When this ship was crossing the Gulf (Arabian sea) to Diu, one of our ships coming from Malindi met it and tried to get near it, but it sailed away, as it was a good sailer, and the French did not speak with us. Perhaps Brigas had no quarrel with us, and preferred robbing the Moors. The king sent for Brigas and the French, and told them to turn Moor and serve him, and that he would pay and patronize them, and that he had no work for them in his country if they were not Moors, and those who would not turn he would order to be killed. To this the captain Brigas answered, 'Lord, we are in your hands and under your feet, but you cannot act thus with justice, for we have your royal security. On me you can work your will, for I will not turn Moor. These others can do as they please.' When the others heard the king's words they

* At this time Sultan Bahadar.

were afraid that he would kill them, and said to Brigas that they should obey the order, and God would find the remedy, who, since He had brought them here, would not cause their deaths. Then they all conformed to save their lives and turned Moor, and all died Moors. The king gave a robe to Brigas, and gave him pay, and always had him with him. The others, as they were low men, were debauched, and the king sent them to Champaner to work on the fortifications, since they were not men to let roam freely. Brigas was a good servant before the king, who was gracious to him, and afterwards ordered him to marry a Spanish woman called the Marqueza, who was captured in one of our galleys that was taken by a Mecca (Red sea) ship that was going to Diu in the time of the Governor Dom Duarte, as I have related before in its proper place, and they were long married, and Brigas died a good Christian, and the woman was afterwards freed from her captivity when Nuno da Cunha had a fortress in Diu, as I will tell when the time comes.

"Another of the ships separated near the Cape of Good Hope towards the south, going it knew not where, and touched land on the Sumatra coast, whence it went to the Island of Gold where all the sand of the shore, large and small, was of gold, and the land very fertile, and great woods and rivers of fresh water, and the people naked and bestial, with coverings made of leaves, who did not prevent anything being taken away. They loaded what gold they pleased, and started for they knew not where, and the winds carried them to the Sumatra coast, very broken, with the greater part of the crew sick or dead, and the ship leaking so that she was foundering, they ran her towards the shore to beach her, when she struck on a shoal and was wrecked. Those who could work got out the boat and reached the shore with a lot of gold they put in her; on the land they were killed by the fishermen, who took their gold. The merchants from Sumatra told this tale in Malacca, and the whole country-side spoke of this boat the fishermen found filled with gold, and with a crew that spoke like Bombardiers,* of whom they took one to the king of that country, who impaled him, as he said he could not find his way back to the Island of Gold. Thus was discovered that Island of Gold, and by this it was known † that this ship was of the fleet in which Brigas sailed.

"The third ship reached the island of St. Lawrence (Madagascar), and, struck by a storm, found shelter in a bay with kindly people on shore, who dealt well by them; they refitted their ship, and traded with hatchets and iron goods and cloths, and bought pepper—old and weak, which seemed to have been wild pepper, and smelling woods that are a bad imitation of sandal wood, and with cinnamon, all of little value, and they thought they had got to India. When they started they returned by the way they came, and watered at St. Helena, where they picked up three of our men who had deserted from cargo-ships in which they were prisoners banished to the Brazils, and, starting again, reached France at the port of Neypa,‡ whence they started. When it was found their goods were false and bad, they did not try again this labour, for they were corsairs who sought what they could rob. The Portuguese who came back with them were pardoned of the banishment to which Lopo Vaz had condemned them for going with mutineers in India, and they told the king all about this ship."

There are, then, two points: first, the statement that there was a French expedition that left France in 1527, and that one of the ships composing it was lost on Sumatra after discovering the Island of Gold. Assuming this to be correct, the second point is, where is this Island of Gold, and what is its present name?

* That is, unlike Portuguese. Bombardiers were usually Flemings.

† Query by speech of crew?

‡ Dieppe.

As to the first point, Correa's narrative is very detailed, and, with the exception of a minor matter to be noticed later, bears on the face of it an appearance of truth. In the case of the first ship, we know that Correa was at Diu within two and a half years of its reaching there. We also know that many of the crew were living from whom he could have learned the facts. He tells us, in a later part of his history, that the surviving members of the crew were with Sultan Bahadar's (king of Guzerat) army at Mandishwar, when in 1534 he was defeated by the Emperor Humayun of Dehli. Now Castanheda, who came out to India in 1528, though he does not give a detailed account of this Diu ship, corroborates Correa in a curious way. In Book viii. chap. 94, p. 226, speaking of the camp at Mandishwar, he says that in Sultan Bahadar's army were "30 Frenchmen who came to Diu in Brigas' ships." Now, the forty-eight Frenchmen of Correa in 1528 would certainly have dwindled to at most thirty in 1534. Barros mentions this Diu ship, Decade IV. Book iii. chap. 2, when he says that Brigas' ship reached Diu in 1527;* and also in Decade IV. Book iii. chap. 4, he mentions that Bartholomew Freire had met a French ship with a Portuguese master Brigas. Now, Freire's ship had reached the African coast in November, 1528, and this date confirms the account of Correa. As to the third ship, the one that touched at Madagascar, I have only found a mention in Correa, vol. iii. p. 385, where it is said that in 1530 a Frenchman who had been left in Madagascar by a French ship was found and taken off; and a note to Barros, Decade IV. Book v. chap. 6, confirms this, and says that the Frenchman was rescued by Diogo da Fonseca (see, however, Barros, Decade IV. Book iii. chap. 2, where it is said that the Frenchman had only been left on Madagascar in 1529). As to the third ship (which is the second of Correa's narrative), the note to Barros above quoted, after mentioning the Diu and Madagascar ships, goes on, "Of the third the captain and pilot was a Portuguese, of Villa de Conde, who called himself the Rosado, which ship was lost in a bay on the west side of the island of Sumatra, near Panaajú, a city of the king of the Batos, who got from it some artillery, which he used against the king of Achin in the year 1539."

This French expedition is also mentioned in another work, which is certainly not sober history, but which, published in 1614, and referring to 1539, brings together in a romance many traditions of that time—I refer to the 'Peregrinaçoes' of Fernaõ Mendez Pinto. The author of this work, in chapter 15, says that he saw among the artillery of the king of the Batos,† in Sumatra, two camels and one half espera in bronze, with the arms of France on them, which in the year 1526, when Lopo Vaz de Sampayo was governing India, were obtained from a French ship, whose captain and pilot was a Portuguese of Villa de Conde, who was called The Rosado. Again, in chapter 20 the same author says, speaking of the geographical inquiries he had made in Sumatra, "And also I discovered the bay in which was lost the Rosado, captain of a French ship, and companion of Brigas, captain of another ship, which put in to Diu in 1529, while Sultan Bahadar, king of Cambay, was living. All the French in that one became Moors, who were 82 in number, whom the king took in 1533 as gunners in the war he had with the king of the Mogols, where all died and none remained alive."

The dates 1526 and 1529 are traditional and incorrect. Considering all there accounts, we may take it that Correa was right when he says that a French expedition of some kind, consisting of three ships, did go to the East in 1527, and that of the three ships one was lost on the coast of Sumatra. Correa having been shown to be correct thus far, we may go a step further, and say that probably he

* This is incorrect, as the next quotation from Barros shows

† For the people called Battas, see Yule's 'Glossary S.V.'

was correct when he says that this Sumatra ship had made some discoveries beyond the island of Sumatra itself. He calls the land discovered the Island of Gold. What light, then, do the Portuguese historians throw on this name *Island of Gold?* This brings us to the second point. In his description of this island Correa has departed from the appearance of truth which obtained in the rest of his story, and, in fact, merely describes a traditional El Dorado. The Island of Gold looms large in the story of Portuguese explorations in the farther East. Major, in his life of Prince Henry the Navigator, p. 445, identifies the Island of Gold as a Portuguese name for Australia. Without recapitulating his arguments, I will examine certain passages in the early Portuguese writers where this name occurs, and leave it to be judged how far he was correct. Speaking of 1518, Barros (Decade III. Book iii. chap. 3) says that the governor, Diogo Lopez, having heard much talk of the Island of Gold, sent Diogo Pacheco to explore Sumatra, as rumour in India said that the Island of Gold lay south of Sumatra, and the people there always maintained that the gold they sold was not the produce of Sumatra, but brought from the outside. Diogo Pacheco discovered two or three persons who said they had made the voyage to the Island of Gold; they said it lay south-east from Sumatra, over 100 leagues away; that the island lay in the centre of shoals and banks, and that they had to pass through narrow channels that shifted every year. Even when it was perfectly calm the sea broke on the edge of the channels violently. Because of these shoals and banks they could only go in small vessels, and the favourable winds only lasted for three months, and not a quarter of the ships that started ever returned, so that very few ever ventured on a second voyage, even though the trade was very profitable. The island in the centre of these shoals was described as having a fringe of palm trees, with many black people who would not allow traders to land, so that the Sumatrans knew nothing of the country. These black people traded their gold for cloths. Pacheco circumnavigated Sumatra for the first time on the occasion on which he made these inquiries, and was wrecked and killed in a second voyage in which he intended to try to make this Island of Gold. This description of the Island of Gold points in a curious way to Australia. Still the difficulties of accepting the identification are great. It must be remembered that the account is not of what Pacheco saw himself, but of what he heard from natives of Sumatra, with whose language he was imperfectly acquainted, who were themselves uneducated, and who may possibly not have been speaking from their own personal knowledge. The direction, south-east from the south of Sumatra, points unmistakably to Australia—there is no intervening land. The distance 100 leagues is out of the question; from Sumatra to Australia is nearer 1400 miles than 300. This distance points rather to the Cocos islands, but they lie south-west, and the informants would be more likely to err in the distance than in the direction; in fact, any measure of distance would be almost certainly unknown to them. The description of the land would apply to any coral island with a barrier reef. The description of the people certainly could not be applied to any Australian aborigines with which we have since become acquainted. Couto, who continued the history of Barros and wrote at the end of the sixteenth century, carried the matter a little further. In Decade IV. Book vii. chap. 8 of his history, when he is speaking of New Guinea he mentions the neighbouring islands, and says, "South of Amboina are the Banda islands, and to the east of them, nearly 300 leagues away, is, as some affirm, an island of much gold, whose inhabitants are only 4 palms high, and if this is correct, then they are the true pigmies." Omitting all consideration of the description of the people, the direction and distance point undoubtedly to Australia, the northern point of which lies some 900 miles from the Banda group—if not due east, very slightly the south of east. Due east lies New Guinea, to which Couto has previously referred. That the Island of Gold is the old Portuguese name for Australia is a theory which has, as I have said, the great authority of Major to support it.

To resume, then, we find that a French expedition was in Eastern waters between 1527–1529, and that one of the ships was wrecked on the Sumatran coast after penetrating to a land still further east, which the Portuguese then knew as the Island of Gold; we find, further, that this term "Island of Gold" is used to denote a country of whose existence the Portuguese of the sixteenth century had no precise knowledge, but which they located in the seas where we now know Australia lies. This French expedition was commanded by Portuguese officers. We also know that the earliest maps which show the existence of the Australian continent, and show it with considerable accuracy, are French, that they are dated 1542, and that they have Portuguese names on them. We may also accept Major's surmise, from other facts than are here brought out, that the discoveries represented on the map were probably made before 1529. The two sets of facts seem almost certainly connected. There are two weak links, however, in the chain: (1) How, after the wreck of the Rosado's ship, did the papers reach Europe? (2) Why is nothing known of the expedition from French sources? for Parmentier's expedition is said not to have left Dieppe before 1529. As to the first point, the words of Correa are not explicit, but that they cannot mean that all the ship's crew were killed in the wreck and massacre is clear, as is shown by the survival of the man afterwards impaled for his obstinacy; some, therefore, must have escaped. My suggestion is that some did escape, and that the papers did, possibly after some years' wanderings, reach Europe, and that to them we owe the anomalous and puzzling maps that exist. As to the second point, the reply would lead us too far; it must be sought in those causes which have left in obscurity the history of all early French voyages. This semi-piratical cruise, commanded by foreign officers, would have less chance of being remembered even than the more truly national ones.

Since writing thus far, I have come across a passage that bears on the ignorance of the Portuguese of the sixteenth century as to Australia, a point touched on but not elaborated above. Gabriel Rebello, a man of exceptionally acute and inquiring mind, was in the Moluccas, the nearest Portuguese station to Australia, for thirteen years in the middle of the sixteenth century, and about 1560 or a little later he wrote a book called 'Informação das cousas de Maluco.' For a eulogy of him, see Couto, Decade VIII. chap. xvi. In chapter xi. of part i., he describes, among other islands, the "Arcepelago dos Papuas," and says that little is known of them, as the voyage is very dangerous by reason of the islands, banks, and shoals, but that it is said they are bounded on the south by land, which appears to run from east to west to the Straits of Magellan. This shows a very hazy acquaintance with the Australian continent twenty years after the far more accurate French maps had been published. As to this great southern continent, see also Couto, Decade IV. Book vii. chap. viii., for a somewhat similar statement made fifty years after the date of the maps.

R. S. Whiteway.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY. SESSION 1897–98.

First Ordinary Meeting, Monday, November 8, 1897 (in the Queen's Hall).—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"The Jackson-Harmsworth Arctic Expedition." By Frederick G. Jackson.

Second Ordinary Meeting, November 22, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Thomas John Allen; William Gaskell Aspland; Henry Vere Barclay; T. Hudson Beare; Captain Maurice D. Bell, R.A.; Otto Leopold Beringer; Captain Hon. Cecil Bingham (1st Life Guards); John Brickwood; David Bruce; William Alexander Buchanan; G. Murray Campbell; H. S. H. Cavendish; Walter Cheesman; Frederick Henry Cheesewright, M.I.C.E.; Major Joseph Cooke Cox; Harry Maule Crookshank, Pacha (British Controller, Daira Sanieh Administration); Walter S. Curtis; Lieut. Tristan Dannreuther, R.N.; William Warburton Davidson; Cairns Dess, C.E.; W. F. S. Dugdale; Jerome E. Dyer; A. H. Festing; George K. French; Frederick Cesar Bangeley Frost; George W. Gore-Harvey; Major S. C. N. Grant, R.E.; Professor Alfred C. Haddon; Colonel Mortimer Hancock (Commandant 2nd V. Batt. King's Royal Rifles); Richard McDonnell Hawker; Rudolph Harriot Henning; Geo. H. St. Hill; David Edward Hume; Captain E. T. James (1st Batt. S. Lancashire Regiment); Ernest A. Hastings Jay; Lieut.-Colonel Duncan Alexander Johnston, R.E.; Henry Kemp-Welch; Eugene Koop; August Krauss; Harry Lister; Lieut. F. Lyon, R.A.; George Macartney; Peter McCallum; Robert B. McClure; W. Page May, M.D.; Max John C. Meiklejohn, B.A.; Henry Mellish; John Milne, F.R.S.; Walter Mole; Thomas Warren Moore; John Pakeman, J.P.; Major Stanley Paterson (Argyle and Sutherland Highlanders); J. R. Pease; John Thomas Read; Alexander Leslie Renton; Robert Roach; Ross Robinson; John W. Shelley; Haakon Skattum; Lieut. George Edward Smith, R.E.; Charles James Thomas; Arthur Noël Thorpe; De Sales Turland; Robert Edwin Villiers; Lieut.-Colonel Frowd Walker, C.M.G.; Rev. Reginald Arthur Richard White.*

The Paper read was:—

"Four Years' Exploration in Central Asia." By Dr. Sven Hedin.

Third Ordinary Meeting, December 6, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Captain W. A. Crawford Cockburn; John Robert Cosmr; William Edwards; Edwin Essery, J.P.; Alexander Donald Gairns; Sir Edward Grogan, Bart.; Leonard Clements Henry; Frank R. Labouchere; Rev. Walter Metcalfe Holmes Milner; Charles de Pass; Rev. James Smith, M.A., B.D.; Arthur H. Vine; William Birkbeck Wakefield; Colonel Mildmay Wilson, C.B.; Major George J. Younghusband.*

The Paper read was—

"Explorations in the North of Greenland." By Lieut. R. E. Peary.

Fourth Ordinary Meeting, December 13, 1897.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Hari Charan Banerji; Captain H. E. J. Brake, R.A.; Major H. E. Buchanan-Riddell (King's Royal Rifles); Thomas Rodolphus Croger, F.Z.S.; John Buckman Essuman-Gwira, C.E.; Sydney Harvey; Charles Adolph Heimann; Francis Barkley Henderson; Sidney Robert, M.A., M.B., B.S. Camb.; John Robertson; Alexander H. Turnbull; Hendrik Vroom, C.E.; Falconer Wallace; Francis Welch; Charles Herbert Wilkinson.*

The Papers read were:—

"Visits to Barents and Kara Seas, with Rambles in Novaya Zemlya, in 1895 and 1897." By Colonel H. W. Feilden.

"A Cruise on the East of Spitsbergen." By Arnold Pike.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Caverns. *Spelunca* 3 (1897): 43–52. **Boegan.**
Les Grottes de Corniale, d'Obrou et de Padrič. Par M. E. Boegan. *With Plans.*

Austria—Poland.
Akademia Umiejętności w Krakowie. Sprawozdanie Komisyi Fizyograficznej. Tom. xxxi. w Krakowie, 1896. Size 9½ × 6, pp. iv., xl., 256, and 258. *Plates. Presented by the Academy of Sciences of Cracow.*

Baltic Lands. *Nineteenth Century* 42 (1897): 744–754. **Reid.**
Some First Impressions. By Sir Wemyss Reid.
On a tourist trip to the "Northern capitals."

France—Brittany. *La Géographie* 10 (1897): 448, 461, 471, 490, 499, 508. **Bassilan.**
Au pays des Homards. Excursions en Bretagne. Par M. Mallat de Bassilan.

France—Jura. *Spelunca* 3 (1897): 101–112. **Bidot and Chevrot.**
Exploration du trou des Gangônes, etc. (Jura 1896–97). Par MM. Bidot et Chevrot. *With Plans and Illustrations.*

France—Lozère. *C. Rd.* 125 (1897): 622–625. **Martel and Viré.**
Sur l'aven Armand (Lozère) (profondeur 207^m). Note de MM. E. A. Martel et A. Viré. *With Plans.*

France—Mont Blanc. *Rev. Scientifique* **8** (1897): 616-623. **Capus.**
Une ascension d'hiver au Mont-Blanc. Par M. G. Capus.

France and Italy. **Hachez.**
B.S.R. Belge G. **20** (1896): 285, 389; **21** (1897): 23, 133, 232, 359.
Voyage de François Vinchant en France et en Italie du 10 Septembre 1609 au 18 février 1610. Par Félix Hachez.

Germany. *Aus allen Welttheilen* **28** (1897): 601-606, 639-650, 671-684. **Detmer.**
Landschaftsformen des nordwestlichen Deutschlands. Von Prof. Dr. W. Detmer.

Germany—Prussia. *Globus* **72** (1897): 249-254. **Tetzner.**
Haus und Hof der Litauer. Von Dr. F. Tetzner. *With Illustrations.*
On the typical Lithuanian houses and farmyards in Prussia.

Holland—Friesland. **Cappelle.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **5** (1888): 141; **7** (1890): 780; **9** (1892): 469, 965; **12** (1895): 183-202.
Bijdrage tot de Kennis van Frieslands bodem. Door Dr. H. van Cappelle. *With Map and Plates.*

Italy. *Petermanns M.* **43** (1897): 193-197, 218-221. **Fischer.**
Untersuchungen zur Entwickelungsgeschichte der Appenninen-Halbinsel. Von Prof. Dr. Theobald Fischer.
The results are summarized in the *Journal* for December, 1897, p. 633.

Italy—Sette. *B. American G.S.* **29** (1897): 168-174. **McCracken.**
The Sette comuni: a Teutonic Survival on Italian Soil. By W. D. McCracken.

Mediterranean—Cyprus. **Deschamps.**
Tour du Monde **3** (1897): 157, 169, 181, 469, 481, 493.
Quinze Mois à l'Ile de Chypre. Par M. Emile Deschamps. *With Map and Illustrations.*

Mediterranean—Cyprus. *B.S.G. Paris* **18** (1897): 179-201. **Enlart.**
L'île de Chypre. Par Camille Enlart.
Account of a journey in Cyprus in 1896, made with the object of studying the monuments of the French occupation of the twelfth to fourteenth centuries.

Russia. *B.A. Imp. Sci. St.-Pétersbourg* **5** (1896): 347-356. **Galitzine.**
Le prince B. Galitzine. Note sur les élements magnétiques, observés à Worobiewo dans l'arrondissement de Podolsk du gouvernement de Moscou. [In Russian.]

Russia. *B.A. Imp. Sci. St.-Pétersbourg* **6** (1897): 343-362. **Ostrooumoff.**
A. Ostrooumoff. Recherches hydro-biologiques dans les embouchures des fleuves de la Russie méridionale. (Communication préliminaire.) [In Russian.]

Russia—Astrakhan. *Meteorolog. Z.* **14** (1897): 254-262. **Woeikof.**
Das Klima Astrachans nach F. Schperk. Von A. Woeikof.

Russia—Novaya Zemlya. *B.A. Imp. Sci. St.-Pétersbourg* **5** (1896): 251-261. **Galitzine.**
Pr. B. Galitzine. Compte rendu sommaire du voyage à Nowaia Zemlia entrepris pendant l'été de l'année 1896. [In Russian.]

Russia—Novaya Zemlya. *B.A. Imp. Sci. St.-Pétersbourg* **6** (1897): 325-334. **Galitzine.**
Le pr. B. Galitzine. Observations météorologiques, faites par les officiers du navire "Samoyède," pendant l'éclipse totale du soleil le 9 Août 1896 dans le Kostin Shar à Novaïa Zemlia. [In Russian.]

Russia—Sea of Azov. *Ann. Hydrographie* **25** (1897): 398-406. ——
Beschreibung russischer Handelshäfen am Asowschen Meer. Nach amtlichen Berichten.

Spain. **Gadow.**
In Northern Spain. By Hans Gadow, M.A., PH.D., etc. London: A. & C. Black, 1897. Size 9 × 6, pp. xvi. and 422. *Map and Illustrations. Presented by the Publishers.*

Spain—Historical. **Fabricius.**
Aarb. Nordisk Oldkyndig. Hist. Kjøbenhavn **12** (1897): 75-160.
Normannertogene til den spanske Halvø. Af A. Fabricius. *With Map.*
On the Viking expeditions to Spain.

Sweden. *Bihang K. Svenska Vetens.-A. Handlingar* **23** (1897): 1-55. **Engholm.**
Om fagellifvet i sjön Takern. Af W. A. Engholm. *With Map.*
On the bird-life of Lake Takern, a small lake east of Lake Vetter.

Switzerland. *Scottish G. Mag.* **13** (1897): 466-475. **Geikie.**
The Prehistoric Rock-Shelter at Schweizersbild, near Schaffhausen. By Professor James Geikie, D.C.L., etc.

Switzerland—Geodesy. **Messerschmitt.**
Internationale Erdmessung. Das Schweizerische Dreiecknetz herausgegeben von der Schweizerischen geodätischen Kommission. Siebenter Band. Relative Schwerebestimmungen. I. Teil. Im Auftrage ausgeführt und bearbeitet von Dr. J. B. Messerschmitt. Zürich: Fäsi & Beer, 1897. Size 12 × 9, pp. 216. *Plates. Presented by Dr. J. B. Messerschmitt.*

Turkey—Albania. *Petermanns M.* **43** (1897): 163-170, 179-183. **Baldacci.**
Die pflanzengeographische Karte von Mittel-Albanien und Epirus. Von Dr. Antonio Baldacci. *With Map.*

Turkey—Albania. *Petermanns M.* **43** (1897): 163-170. **Baldacci.**
Die pflanzengeographische Karte von Mittel-Albanien und Epirus. Von Dr. Antonio Baldacci. *With Map.*

United Kingdom—England. *J. R. Agricultural S.* **8** (1897): 490-515. **Bear.**
The Food Supply of Manchester. II. Animal Produce. By William E. Bear. *With Illustrations.*

United Kingdom—England. *Nineteenth Century* **42** (1897): 1009-1018. **Denison.**
The Present Situation of England: a Canadian Impression. By Lieut.-Colonel George T. Denison.

United Kingdom—England. *Knowledge* **20** (1897): 263-264. **Lydekker.**
English Plains and Escarpments. By R. Lydekker, F.R.S.

United Kingdom—England. **Tomlinson.**
Life in Northumberland during the Sixteenth Century. By William Weaver Tomlinson. London: W. Scott [1897]. Size $7\frac{1}{2} \times 5\frac{1}{4}$, pp. iv. and 276. *Price 4s. Presented by the Publisher.*

Interesting notes on the condition of Northumberland in the sixteenth century, touching on the former physical condition of the county, as well as detailing the character of the people and the conditions of social life.

United Kingdom—England. **Baddeley.**
Thorough Guide Series. Yorkshire (Part I.)—The East Coast, York, and the country between the North-East Main Line and the Sea; also the Cathedral and Castle of Durham. By M. J. M. Baddeley, B.A. Third Edition. Revised. Twelve Maps and Plans by Bartholomew. London: Dulau & Co., 1897. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. xvi. and 138. *Price 2s. 6d. Presented by the Publishers.*

United Kingdom—England—Mersey. **Nares.**
Report on the Present State of the Navigation of the River Mersey (1896), to the Right Honourable the Commissioners for the Conservancy of the Mersey. By Vice-Admiral Sir G. S. Nares, K.C.B., F.R.S. With Appendix. London: Metchim & Son, 1897. Size $9\frac{1}{2} \times 6$, pp. 16.

In addition to particulars as to dredging and the Manchester ship canal, a table is given of the eight severe gales which occurred in 1896; six of them were from the west, and the other two from W.N.W. and W.S.W. respectively.

United Kingdom—Meteorology. ——
Meteorological Observations at Stations of the Second Order for the Year 1892. Ditto for the Year 1893. London: Eyre and Spottiswoode, 1896-97. Size $12\frac{1}{2} \times 10$, pp (each vol.) 184. *Maps. Price (each vol.) 27s. Presented by the Meteorological Office.*

These are tables of observations published without discussion.

United Kingdom—Scotland. *P. Philosoph. S. Glasgow* **28** (1896-97): 1-17. **Duncan.**
The Scottish Races: their Ethnology, Growth, and Distribution. By Dr. Eben. Duncan.

United Kingdom—Scottish Geological Survey. ——
Science and Art Department. Edinburgh Museum of Science and Art. Guide to the Collections illustrative of Scottish Geology and Mineralogy. Part i.

Collection of the Geological Survey. Edinburgh. Third Edition, 1897. Size $8\frac{3}{4} \times 5\frac{1}{2}$, pp. 32. *Plan. Presented by J. G. Goodchild, Esq.*

United Kingdom—Seaports. *Nineteenth Century* **42** (1897): 411–425. **Ackland**
The Growth of our Seaports. By Joseph Ackland.

ASIA.

Asia Minor. **Kannenberg.**
Kleinasiens Naturschätze: seine wichtigsten Tiere, Kulturpflanzen und Mineralschätze vom wirtschaftlichen und kulturgeschichtlichen Standpunkt. Von Karl Kannenberg. Mit Beiträgen von Prem.-Lieut. Schäffer. Berlin: Verlag von Gebrüder Borntraeger, 1897. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xii. and 278. *Illustrations. Price 14 marks. Presented by the Publishers.*

The preface opens with the simile, "The Turks are the Germans of the East, as the Greeks are the French of the East," and the object of the book is to show the importance of Asia Minor as a centre of German trade and colonization. The contents are excellently arranged, and the references to literature on the various subjects are copious and satisfactory. An account is given of the domestic and wild animals, the most important cultivated plants, the most abundant minerals; and an appendix deals briefly with the configuration and hydrographic system. The subjects are dealt with as much from the point of view of the scholar as of the practical man, a special feature being the collection of Turkish proverbs bearing on each subject, and a very full glossary of Turkish names.

Central Asia—Positions. *B.S.G. Paris* **18** (1897): 207–216. **Oltramare.**
Mission Dutreuil de Rhins et Grenard dans l'Asie Centrale (années 1891 à 1894). Observations astronomiques, longitudes, latitudes et azimuts magnétiques. Rapport par M. F. Oltramare.

The instruments are described, the methods and degree of accuracy discussed, and a full list of the determined positions is given.

China—Trade. ———
China. Imperial Maritime Customs. I.—Statistical Series: Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1896. Part II.—Reports and Statistics for each Port. With Report on Foreign Trade of China. Shanghai, 1897. Size 11×9, pp. xiv. and 612. *Map and Diagrams.*

India. *Nineteenth Century* **42** (1897): 845–868. **Colvin.**
The Problem beyond the Indian Frontier. By Sir Auckland Colvin, K.C.S.I., etc.

India—Botanical Survey. ———
Report of the Director of the Botanical Survey of India for the year 1896–97. 1897. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 28.

India—Burma. **Thorell.**
Descriptive Catalogue of the Spiders of Burma, based upon the collection made by Eugene W. Oates, and preserved in the British Museum. By S. Thorell. London: Longmans & Co., 1895. Size 9×6, pp. xxxvi. and 406. *Presented by the British Museum.*

India—Forestry. *Scottish G. Mag.* **13** (1897): 572–590. **Bailey.**
Forestry in India. By Lieut.-Colonel F. Bailey.

A paper read at Section E of the British Association at Toronto.

India—Historical. ———
List of Factory Records of the late East India Company, preserved in the Record Department of the India Office, London. 1897. Size $13 \times 8\frac{1}{2}$, pp. xxviii. and 92.

Indian Ocean. **Kettle.**
A Supplement to the Fourth Edition of Findlay's Sailing Directory for the Indian Ocean, Red Sea, Persian Gulf, and Bay of Bengal. By W. R. Kettle. London: R. H. Laurie, 1897. Size $10 \times 6\frac{1}{2}$, pp. 170. *Price 4s. Presented by the Publisher.*

Japan. **Ribaud.**
Miss. Catholiques **29** (1897): 8, 19, 29, 43, 53, 68, 81, 91, 104, 116, 128, 138, 151, 163, 175, 184, 198, 211, 224, 345, 357, 370, 382, 393, 406, 414.

Un été au Japon Boréal. Japonais et Aïnos dans le Yéso (Hokkaïdo). Par M. Michel Ribaud. *With Map and Illustrations.*

Korea. *Globus* 72 (1897): 149-151. **Grünau.**
Ein Ritt quer durch Korea. Von Leutnant v. Grünau. *With Map.*

Baron von Grünau rode last summer from Fusan, across Korea, to Seoul, and gives a short account of the journey. When he wrote from Pekin in June, 1897, he was preparing to cross Mongolia and Siberia on horseback.

Malay Archipelago—British North Borneo. **West.**
Imp. and Asiatic Quarterly Rev. (3) 4 (1897): 330-345.
British North Borneo. By Leonard H. West, LL.D.

Malay Archipelago—Ceram. *Deutsche Rundschau G.* 20 (1897): 82-83. ——
Die Insel Ceram. *With Map.*

The map of Ceram is on the scale of 1 : 1,060,000.

Malay Archipelago—Macassar Strait. *Ann. Hydrographie* 25 (1897): 352-363. ——
Makassar-Strasse. Borneo-Bank und Lima- oder Siri-Inseln. *With Chart.*

This gives the results of recent surveys by the Dutch Surveying-vessel *Banda.*

Persia. **Stahl.**
Zur Geologie von Persien. Geognostische Beschreibung des nördlichen und Zentral-Persien. Von A. F. Stahl.—*Petermanns Mitteilungen.* Ergänzungsheft Nr. 122. Gotha: Justus Perthes, 1897. Size 11 × 7½, pp. 72. *Maps and Profiles.*

This is the most important contribution to the geology of Persia yet made, and the accompanying geological map, on the scale of 1 : 840,000, is likely to be the standard for many years to come.

Persian Gulf. **Genthe.**
Der Persische Meerbusen, Geschichte und Morphologie. Inauguraldissertation zur Erlangung der Doktorwürde . . . zu Marburg vorgelegt von Siegfried Genthe aus Hamburg. Marburg, 1896. Size 9½ × 6½, pp. 98. *Maps and Sections. Presented by the Author.*

This monograph will be separately noticed.

Philippine Islands. **Gummá y Marti and Romanet du Cailland.**
B.S.G. Madrid 39 (1897): 21-46.
El archipiélago Dondiin, et nombre de Luzón y los origenes del Cristianismo en Filipinas. Polémica entre D. Alfredo Gummá y Martí, y M. Romanet du Cailland.

Russia—Caucasus. *Ann. G.* 6 (1897): 328-346. **Fournier.**
Les éléments de la géographie physique de la chaîne du Caucase et leurs relations avec la structure géologique. Par M. E. Fournier. *With Map.*

Russia—Caucasus. *Petermanns M.* 43 (1897): 49-59, 80-86, 119-127. **Schuchardt.**
Zur Geographie und Statistik der Kharthwelischen (südkaukasischen) Sprachen. Von Prof. Dr. H. Schuchardt. *With Map.*

Russia—Kirghiz Steppe. **Muschketow.**
Mém. Comité Géolog. (St. Petersburg) 14 (1896): 1-28.
Allgemeine geologische Karte von Russland. Blatt 114. Geologische Untersuchungen in der Kirgisen Steppe im Jahre 1894. Von J. Muschketow. [In Russian.] *With Map.*

Russia—Siberia. **Talko-Hryncewicz.**
Le climat de Troitzkossavsk-Kiakhta en Rapport à l'Hygiene. Par J. de Talko-Hryncewicz. [In Russian.] Irkutsk, 1897. Size 10½ × 6½, pp. iv. and 100. *Diagrams.*

Russian Turkistan. **Rocca.**
Il Turkestan russo (Osservazioni fatte durante un viaggio nell' Asia Centrale). Comunicazione del cav. Felice de Rocca.—Atti del II° Congresso Geografico Italiano, Roma 1895. Roma, 1896, pp. 357-374.

Siam. *Imperial and Asiatic Quarterly Rev.* 4 (1897): 112-119. **Parker.**
Siam. By E. H. Parker.

A historical sketch, in the course of which the writer shows the grounds that exist for considering the Shans and Siamese as forming one race.

Siberia. *B.S.G. Lyon* 14 (1897): 309-318. **Levat.**
De Moscou à Vladivostok. Par M. David Levat. *With Maps.*

Siberia. *Petermanns M.* 43 (1897): 101-106. **Krahmer.**
Russische topographische und kartographische Aufnahmen in Sibirien im Jahre 1895. Von General-major z. D. Krahmer.

Siberia. *Petermanns M.* **43** (1897): 118–122. **Wilkizki.**

Ueber die Arbeiten der Hydrographischen Expedition im Jahre 1895, nach den Flüssen Jenissei, Ob und dem Eismeer. Bericht von A. A. Wilkizki.

Siberia. *J. Tōkyō G.S.* **18** (1896): 445–450. **Suzuki.**

Our Future Trade in Siberia. By O. Suzuki. [In Japanese.]

Siberia. *B.S.R. Belge G.* **21** (1897): 339–358. **Schokalsky.**

Les travaux géographiques russes en 1895 et 1896. Par Jules de Schokalsky.

The greater part of this paper is occupied with an account of the Russian voyages to the Kara sea in 1895 and 1896, in continuation of the author's paper read to the International Geographical Congress in London in 1895.

Siberia—Lake Baikal. *Globus* **72** (1897): 144–145. **Pech.**

Drishenkos Erforschung des Baikalsees. Von Traugott Pech.

Siberia—Nertchinsk. *Blackwood's Mag.* **162** (1897): 271–285. **Simpson.**

The Prisons of Siberia. III. The Silver Mines of Nertchinsk. By J. Y. Simpson.

Syria—Palestine. **Lees.**

Village Life in Palestine. A Description of the Religion, Home Life, Manners, Customs, Social Characteristics, and Superstitions of the Peasants of the Holy Land, with reference to the Bible. By the Rev. G. Robinson Lees, B.A. London: Elliot Stock, 1897. Size 7½ × 5, pp. 138. *Illustrations. Presented by the Author.*

Lectures on modern life in Palestine recast in book form. They deal with six years' experience of the author.

Syria—Palestine. **Smith.**

A Pilgrimage to Palestine. An Account of a Visit to Lower Palestine (1893–1894). By Rev. James Smith, B.D. Aberdeen, 1895. Size 9 × 6, pp. viii. and 302. *Maps and Illustrations. Presented by the Author.*

A pleasantly written record of a trip to Palestine, printed by the author for private circulation, but more worthy of publication than most books of its class.

Tigris-Mesopotamian Railway. **Rassam.**

Imperial and Asiatic Quarterly Rev. (3) **4** (1897): 11–26.

The Tigris-Mesopotamian Railway and India. By Hormuzd Rassam.

Sets forth the advantages, for the construction of a railway, of the route from Alexandretta and Aleppo to the Persian gulf *viâ* the Tigris valley.

Turkey—Babylonia. **Peters.**

Nippur, or Explorations and Adventures on the Euphrates. The Narrative of the University of Pennsylvania Expedition to Babylonia in the years 1888–1890. By John Punnett Peters, PH.D., etc., Director of the Expedition. 2 vols. New York and London: P. G. Putnam's Sons, 1897. Size 9 × 6, pp. (vol. i.) xvi. and 376; (vol. ii.) x. and 420. *Maps and Illustrations. Price 25s. Presented by the Publishers.*

The two expeditions recorded in these volumes were made at the cost of some citizens of Philadelphia and under the direction of the University of Pennsylvania. They deal with the Euphrates valley, and in particular with the ruins of Nippur, the sacred city of ancient Babylonia and Nineveh. Immense stores of archæological records were discovered and brought to Philadelphia, and many years must elapse before these can be fully examined and described. Meanwhile Dr. Peters has given a narrative of the two expeditions which he conducted, and a preliminary discussion of the results attained. Written records were found for which he claims an antiquity of six thousand years, and there was evidence of history extending back for two thousand years beyond that period. Dr. Peters does not hesitate to describe Nippur as the site of the oldest temple in the world. The two campaigns took place between 1888 and 1891, and have since been followed by other American expeditions.

AFRICA.

Africa—Liquor Traffic. *Nineteenth Century* **42** (1897): 766–784. **Lugard.**

Liquor Traffic in Africa. By Major F. W. Lugard.

Algeria and Tunis. **Piesse.**

Collection des Guides-Joanne. Algérie et Tunisie. Par Louis Piesse. 8 cartes et 22 plans. Paris: Hachette et Cie., 1896. Size 6¾ × 4½, pp. 52, lxvi., and 412.

Angola. *Deutsche Rundschau G.* **20** (1897): 69–74. **Friedrich.**

Die portugiesische Colonie Angola. Von Paul Friedrich. *With Illustrations.*

Angola—Plants. **Hiern.**

Catalogue of the African Plants collected by Dr. Friedrich Welwitsch in 1853-61. Dicotyledons. Part I. By William Philip Hiern. London: Longmans & Co., 1896. Size 9 × 6, pp. xxvi. and 336. *Portrait. Presented by the British Museum.*

This catalogue is prefaced by a short biography of the author, a statement of the somewhat unusual manner in which the collection was acquired by the Museum, and a portrait of Dr. Welwitsch. The collections of plants, now for the first time described systematically, were made in Angola.

British West Africa—Sierra Leone. **Pierson.**

Seven Years in Sierra Leone. The Story of the Work of William A. B. Johnson, Missionary of the Church Missionary Society from 1816 to 1823 in Regent's Town, Sierra Leone, Africa. By the Rev. Arthur T. Pierson, D.D. London: J. Nisbet & Co., [1897.] Size 7½ × 5, pp. 252. *Price 3s. 6d. Presented by the Publishers.*

The record of a residence in Sierra Leone seventy-five years ago, retold and somewhat modified—the simile of a simple reed-lute robbed of its sweetness by being varnished and gilt, is the author's, and given in the first sentence of the preface.

Congo State. *Petermanns M.* **43** (1897): 187-189. ——

Missionsreisen in Marungu und Itawa. 1. Reise des Provikars V. Roelens, 1895. 2. Pater G. de Beersts Reise, 1896. *With Map.*

A journey between Lake Tanganyika and Lake Bangweolo.

Congo State. *Globus* **72** (1897): 278-285. **Glave.**

Glaves Reise vom Tanganjikasee zum Kongo. Die Herrschaft des Kongostaates westlich vom Tanganjika. *With Illustrations.*

Congo State. **Jullien.**

Au Congo. Première causerie. Du Dr. A. Jullien. Bruxelles: Société Belge de Librairie, 1897. Size 9½ × 6, pp. 30.

A light sketch of life on the Congo.

Egypt. **Smith.**

A Pilgrimage to Egypt. An Account of a Visit to Lower Egypt. By the Rev. James Smith, B.D. With Introductory Preface by the Rev. A. H. Sayce, D.D., etc. Aberdeen, 1897. Size 9 × 6, pp. x. and 342. *Maps and Illustrations. Presented by the Author.*

This privately printed book is much more than the record of a flying visit to Egypt. It is certified by Prof. Sayce to be singularly free from mistakes, although filled with a great collection of facts gathered from many quarters.

French Congo. *B.S.G. Paris* **18** (1897): 252-256. **Danzanvilliers.**

Les reconnaissances géologiques de M. R. Thollon dans les vallées du Djoué et du Niari. Par M. Paul Danzanvilliers.

The late M. Thollon discovered good limestone for lime-making and marble for building purposes in the neighbourhood of Brazzaville, and the late M. Danzanvilliers described the circumstances, with a diagrammatic section.

French West Africa. ——

Renseignements Colon. Comité l'Afrique Française **4** (1897): 81-111.

Les écoles au Soudan français.

La religion musulmane au Soudan français. *With Map.*

German West Africa—Togo. ——

Das deutsch-französische Abkommen über die Abgrenzung von Togo. *With Map.*—Beilage zum "Deutschen Kolonialblatt," viii. Jahrgang. Berlin, den 25 Oktober 1897. Pp. 4. Size 10¼ × 7½.

Hausa Grammar. **Robinson.**

Hausa Grammar, with Exercises, Readings, and Vocabulary. By the Rev. Charles H. Robinson, M.A. London: Paul & Co., 1897. Size 7½ × 5¼, pp. x. and 124. *Frontispiece. Price 5s. Presented by the Publishers.*

Natal and Zululand. **Ingram.**

Natalia; a condensed History of the Exploration and Colonisation of Natal and Zululand. From the Earliest Times to the Present Day. By J. Forsyth Ingram. London: H. Marshall & Son [1897]. Size 8½ × 10½, pp. 26. *Map and Illustrations. Presented by Messrs. Harvey & Greenacre.*

This beautiful album of photographic views, with accompanying text, is published in Natal by Messrs. Harvey and Greenacre, and in Cape Colony by Messrs. Dunbar

Bros. It is produced in celebration of the four hundredth anniversary of the discovery of Natal by Vasco da Gama. The letterpress includes a sketch of the history of the colony, and the illustrations are carefully selected and finely reproduced. A special feature is made of photographs from the same point at long intervals of time, thus presenting a vivid picture of the progress of the colony.

Niger Coast—Benin. **Bacon.**

Benin, the City of Blood. By Commander R. H. Bacon, R.N. London: E. Arnold, 1897. Size 9 × 6, pp. 152. *Map and Illustrations. Price 7s. 6d. Presented by the Publisher.*

A straightforward account of the naval expedition to Benin, forming an appropriate sequel to Captain Boisragon's account of the massacre which led to it. An interesting picture is given of natives constructing a plan of Benin city with corks and matches on the ground. It would have been very interesting if an exact copy of the plan had been preserved for comparison with the real state of things. The exigencies of bush fighting are excellently described, and a brief account—which we could wish to be longer—is given of Benin city itself. It is enough, however, to amply justify the sub-title of the book.

Obock. *Rev. G.* 41 (1897): 194-203. **Rouire.**

La côte française des Somalis et le Somaliland britannique. Par le Dr. Rouire.

Somali Dictionary. **Larajasse.**

Somali-English and English-Somali Dictionary. By the Rev. Fr. Evangeliste de Larajasse. London: Paul & Co., 1897. Size 7½ × 5½, pp. xviii. and 332. *Price 12s. Presented by the Publishers.*

Somali Grammar. **Larajasse and Sampont.**

Practical Grammar of the Somali Language, with a Manual of Sentences. By Rev. Fr. Evangeliste de Larajasse and Ven. Fr. Cyprien de Sampont. London: Paul & Co., 1897. Size 7½ × 5½, pp. xii. and 266. *Price 12s. Presented by the Publishers.*

South Africa. **Bryce.**

Impressions of South Africa. By James Bryce. With Three Maps. London: Macmillan & Co., 1897. Size 9 × 6, pp. xxvi. and 604. *Price 14s.*

This will be separately noted.

South Africa—Mashonaland. *M.k.k.G. Ges. Wien* 40 (1897): 187-211. **Lenz.**

Ueber altarabische Ruinenstätten im Maschona-Land und deren Beziehungen zum biblischen Ophir. Von Oskar Lenz.

A useful summary of the results of recent discoveries.

South African Races. *Imp. and Asiatic Quarterly Rev.* 4 (1897): 43-59. **Colenso.**

The Problem of the Races in Africa. By Miss Harriette E. Colenso.

The writer discusses the present relations between the white and black races in South Africa, and insists on the need of caution in dealing with the latter.

Sudan. **Edwards.**

Reconquering the Sudan. By Frederick A. Edwards. From the *Gentleman's Magazine*, October, 1897, pp. 360-371. Size 9 × 6. *Presented by the Author.*

A record of recent political and military movements in the Sudan.

Tripoli. **Cowper.**

The Hill of the Graces: a Record of Investigation among the Trilithons and Megalithic Sites of Tripoli. By H. S. Cowper. London: Methuen & Co., 1897. Size 9 × 6, pp. xxii. and 328. *Map, Plan, and Illustrations. Price 10s. 6d. Presented by the Publishers.*

Mr. Cowper prefaces his interesting record of explorations in Tripoli by an anecdote showing the dense ignorance of the average well-informed person as to the facts of geography, three fellow-passengers on a Mediterranean steamer never having even heard of Tripoli. The general results of Mr. Cowper's journeys have already been published in the *Journal*, but, in view of the controversy sure to arise where there is so much that is new and interesting, the extended and complete description is very welcome. The first section deals with the town of Tripoli, the second with journeys in the hill range, the third with the modern and ancient geography of the hill range, the others with the Senams and their story, the Khoms and Lebda, a description of the sites visited, and some remarks on the future of Tripoli.

Tunis. *B.S.G. Paris* **18** (1897): 217–229. **Blanc.**
Note sur la position de l'ancienne ville de Thigès. Par M. Édouard Blanc. *With Map and Illustrations.*

This paper, read at the Paris Geographical Society in 1894, gives reasons for placing the town of Thiges, in the ancient Roman province of Africa, about midway between Gafsa and Tozeur, instead of in the immediate neighbourhood of Tozeur as formerly believed.

Tunis. *A travers le Monde (Tour du Monde)* **3** (1897): 217–220. **Hess.**
Les Ports et les Voies de Communication en Tunisie. Par Jean Hess. *With Map and Plans.*

Tunis. *Rev. Scientifique* **7** (1897): 705–712, 745–751. **Levasseur.**
Ce qu'on peut faire en Tunisie. Par M. Levasseur.

On the agricultural prospects of Tunis.

Tunis—Carthage. *Miss. Catholiques* **29** (1897): 485–489, 500–502, 514–516. **Delattre.**
Carthage. Quelques tombeaux de la Nécropole punique de Douimès (1892–1894). Par le R. P. Delattre. *With Illustrations.*

Tunis—Carthage. **Drapeyron.**
Calcul géographique et chronologique des périodes de l'histoire de l'Afrique ancienne dont Carthage fut la capitale (872 av. et 698 ap. J.-C.). Par M. Ludovic Drapeyron.—Association Française pour l'Avancement des Sciences. Congrès de Carthage, 1896. Pp. 668–676. Paris: Au Secrétariat de l'Association. Size $9\frac{1}{2} \times 6$. *Presented by the Author.*

Tunis—Kairwan. *B. S. Khédiv. G.* **4** S. (1897): 767–776. **Beyram Bey.**
Kairouan. Par Beyram Bey.

West Africa. *Rev. Scientifique* (4) **8** (1897): 289–300. **Hourst.**
Du Sénégal au Dahomey. Par M. Hourst.

West Africa—Mosi. **Voulet.**
A travers le Monde (Tour du Monde) **3** (1897): 257–260.
Le Mossi. La Mission du lieutenant Voulet. *With Illustrations.*

West Africa—Niger. **Hacquard.**
Miss. Catholiques **29** (1897): 247, 259, 270, 282, 296, 307, 320, 333, 343, 352.
De Tombouctou aux Bouches du Niger avec la Mission Hourst. Récit du R. P. Hacquard. *With Illustrations.*

West Africa—Niger. *B.S.G. Com. Paris* **19** (1897): 433–458. **Hourst.**
Sur le Niger, de Tombouctou à l'embouchure du fleuve. Par M. le lieutenant Hourst. *With Map.*

West Africa—Niger. *B.S.G. Com. Havre* **14** (1897): 67–77. **Hourst.**
Réception-Conférence de M. Hourst, lieutenant de vaisseau, chef de la mission hydrographique du Niger.

West Africa—Niger. **Trotter.**
An Expedition to the Source of the Niger. By Colonel J. K. Trotter, R.A. (From the *Geographical Journal* for September and October, 1897.) Size $10 \times 6\frac{1}{2}$, pp. 40. *Map and Illustrations.*

West Africa—Niger. *B. Comité l'Afrique Française* **7** (1897): 253–266. ——
Dans la boucle du Niger: I. La mission Voulet-Chanoine au Mossi.—II. La mission Chanoine au Gourounsi.—III. Les missions Destenave et Vallet-Candretier.—IV. La situation de Samory.—V. Les missions du Haut-Dahomey. *With Map and Portraits.*

West Africa—Niger Basin. *Blackwood's Mag.* **162** (1897): 557–573. ——
French and English in the Basin of the Niger.

West Africa—Sudan. **Meyer.**
Erforschungsgeschichte und Staatenbildungen des Westsudan mit Berücksichtigung seiner historischen, ethnologischen und wirtschaftlichen Verhältnisse. Von Dr. Paul Constantin Meyer.—Petermanns Mitteilungen. Ergänzungsheft Nr. 121. Gotha: Justus Perthes, 1897. Size $11 \times 7\frac{1}{2}$, pp. 108. *Maps.*

This will be separately noticed.

Western Sahara. *A travers le Monde, Tour du Monde* **3** (1897): 353–356. ——
Le Sahara Occidental. *With Illustrations.*

Western Sahara. **Bindloss.**

A Visit to the Western Sahara. By Harold Bindloss. From the *Gentleman's Magazine*, October, 1897, pp. 400-411. Size 9 × 6.

A graphic account of a visit to the coast of the Sahara between Marocco and Senegambia, with the hope of establishing trade with the Arabs. The landing was made close to Cape Bojador.

Zululand—Minerals. **Garrard.**

Report on the Mining Industry of Zululand for the year 1896. By J. Jervis Garrard. Pietermaritzburg, 1897. Size 9½ × 6, pp. iv. and 72. *Sections. Presented by the Government of Zululand.*

The report gives a detailed account of the gold and coal fields of Zululand, the value of which is said to be considerable, but the working of neither gold nor coal is as yet fully undertaken, on account of the want of competent prospectors and means of transport.

NORTH AMERICA.

Canada. *Nature* **57** (1897): 62-66. ——

Geologists in Canada. *With Illustrations.*

Notes on the transcontinental excursion after the British Association meeting in Toronto.

Canada, N.W.T. **Hayne and Tayler.**

The Pioneers of the Klondyke: being an account of Two Years' Police Service on the Yukon. Narrated by M. H. E. Hayne and recorded by H. West Tayler. London: Low & Co., 1897. Size 7½ × 5, pp. xii. and 184. *Map and Illustrations. Price 3s. 6d. Presented by the Publishers.*

This was referred to in the December number, vol. x. (1897), p. 631.

Canada—Ontario. ——

Dominion of Canada. Gold Mining in Ontario. Its Present Position and Future Prospects. London: Straker Bros. & Co. [1897]. Size 11 × 8½, pp. 8. *Map.*

Canada—Selkirk Colony. **MacBeth.**

The Historical and Scientific Society of Manitoba. Transaction No. 50. Farm Life in the Selkirk Colony. By Rev. R. G. MacBeth, M.A. Winnipeg, 1897. Size 8½ × 6, pp. 4. *Presented by the Society.*

Canada and Newfoundland. **Dawson.**

Stanford's Compendium of Geography and Travel (New Issue). North America. Vol. i. Canada and Newfoundland. By Samuel Edward Dawson. London: E. Stanford, 1897. Size 8 × 5½, pp. xxiv. and 720. *Maps and Illustrations. Price 15s. Presented by the Publisher.*

This important book will be specially noticed.

Great Lakes. *National G. Mag.* **8** (1897): 233-247. **Gilbert.**

Modification of the Great Lakes by Earth Movement. By G. K. Gilbert. *With Maps.*

Mexico—Antiquities. *P.R.S.* **62** (1897): 67-80. **Maudslay.**

A Maya Calendar Inscription, interpreted by Goodman's Tables. By Alfred P. Maudslay. *With Illustrations.*

Newfoundland. *Globus* **72** (1897): 261-263. **Bach.**

Reise durch Neufundland von Ost nach West. Von Rudolf Bach.

Newfoundland. **Harvey.**

Newfoundland in 1897, being Queen Victoria's Diamond Jubilee Year and the Four Hundredth Anniversary of the Discovery of the Island by John Cabot. By the Rev. M. Harvey, LL.D. London: Low & Co., 1897. Size 7½ × 5, pp. xiv. and 294. *Maps and Illustrations. Price 5s.*

Dr. Harvey gives a concise and popular account of Newfoundland, illustrated by some interesting photographs.

Newfoundland. *J. Franklin I.* **144** (1897): 161-170. **Outerbridge.**

The Undeveloped Mineral Wealth of Newfoundland. By A. E. Outerbridge, Junr.

Photographs of some of the principal mines in Newfoundland accompany the paper.

Newfoundland Bank. *Ann. Hydrographie* **25** (1897): 390-393. **Schott.**
Die Nebel der Neufundland-Bänke. Von Dr. Gerhard Schott. *With Maps.*

On the fog on the Newfoundland Bank.

North America—Physical Geography. *Nineteenth Century* **42** (1897): 799-820. **Kropotkin.**
Recent Science. By Prince Kropotkin.

The article deals largely with the physical features of North America and their origin.

Southern California—Santa Catalina Island. **Smith.**
The Geology of Santa Catalina Island. By William Sidney Tangier Smith. Proc. California Academy of Sciences. Third Series. Geology. Vol. i. No. 1. San Francisco, 1897. Size 10 × 7½, pp. 72. *Map and Plates.*

United States. **Fewkes.**
Preliminary Account of an Expedition to the Cliff villages of the Red Rock Country, and the Tusayan Ruins of Sikyatki and Awatobi, Arizona, in 1895. By J. Walter Fewkes.—Annual Report of the Board of Regents of the Smithsonian Institution, . . . July, 1895. Washington, 1896. Size 9½ × 6, pp. 557-588. *Plates.*

United States. *National G. Mag.* **8** (1897): 285-293. **Hubbard and Baker.**
Geographical Research in the United States. By Gardiner G. Hubbard, LL.D., and Marcus Baker.

A paper read to Section E of the British Association at Toronto.

United States. *National G. Mag.* **8** (1897): 299-303. **Moore.**
United States Daily Atmospheric Survey. By Prof. Willis L. Moore.

A paper read to Section E of the British Association at Toronto.

United States—Agriculture. ——
Yearbook of the United States Department of Agriculture, 1896. Washington, 1897. Size 9½ × 6, pp. 686. *Portraits and Illustrations.*

This Yearbook is distributed gratuitously by the United States Government to the farmers of the United States; the issue consists of 500,000 copies. It contains a large number of popular articles, dealing with many scientific questions closely bearing on agriculture and on agricultural processes, as well as statistical appendices, the whole being profusely illustrated.

United States—Appalachians. *American J. Sci.* **4** (1897): 357-371. **Branner.**
The Former Extension of the Appalachians across Mississippi, Louisiana, and Texas. By John C. Branner. *With Maps.*

United States—Arizona. **Mindeleff.**
The Repair of Casa Grande Ruin, Arizona, in 1891. By Cosmos Mindeleff. Fifteenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1893-94. By J. W. Powell. Washington, 1897. Size 12 × 8, pp. 321-349. *Plans and Illustrations.*

United States—Arizona. *Appalachia* **8** (1897): 225-232. **Toumey.**
La Ventana. By J. W. Toumey. *With Illustrations.*

United States—Arizona. *National G. Mag.* **8** (1897): 203-226. **Fernow.**
The Forests and Deserts of Arizona. By Bernhard E. Fernow, PH.D., etc. *With Illustrations.*

United States—Bureau of Ethnology. **Powell.**
Fourteenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1892-93. By J. W. Powell, director. Two Parts.—Fifteenth Annual Report . . . 1893-94. By the same. Washington, 1896-97. Size 12 × 8, pp. (14th Report) lxii. and 1136; (15th Report) cxxii. and 366. *Maps and Illustrations. Presented by the Director, U.S. Bureau of Ethnology.*

United States—California. *J. Geology* **5** (1897): 563-578. **Drake.**
The Topography of California. By Noah Fields Drake.

United States—Caves. *Spelunca* **3** (1897): 22-31. **Owen.**
Marble Cave (Missouri) et Wind Cave (Dakota). Par Miss Luella A. Owen. *With Illustrations.*

United States—Coast and Geodetic Survey. **Mendenhall and Tittmann.**
National G. Mag. **8** (1897): 294–299.

A brief Account of the Geographic Work of the U.S. Coast and Geodetic Survey. By T. C. Mendenhall, LL.D., etc., and Otto H. Tittmann.

A paper read to Section E of the British Association at Toronto.

United States—Forest Reserves. *National G. Mag.* **8** (1897): 177–187. **Newell.**
The National Forest Reserves. By Frederick H. Newell. *With Diagrams.*

United States—Forests. *B. American G.S.* **29** (1897): 181–192. **Gannett.**
The Administration of the Forests of the Public Domain. By Henry Gannett. *With Map.*

United States—Indians. **Mooney.**
The Ghost-Dance Religion and the Sioux Outbreak of 1890. By James Mooney. Fourteenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1892–93. By J. W. Powell. Part 2. Washington, 1896. Size 12 × 8, pp. 641–1136. *Map and Illustrations.*

A discussion of the Indian ghost-dance, comparing it with the outbreaks of dancing mania in Europe, and an account of the reprisals of United States troops on the rebellious Indians, the reported barbarities of which it would be impossible to believe were this not an official document.

United States—Meteorology. ——
U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau, 1895–96. Washington, 1896. Size 12 × 9, pp. xl. and 266. *Maps and Diagrams.*

Amongst other papers there is a list of tornadoes in the eight years 1889–96, with a map for each year.

United States—Michigan. *American J. Sci.* **4** (1897): 383–386. **Mudge.**
Some Features of Pre-Glacial Drainage in Michigan. By E. H. Mudge.

United States—New Mexico. *National G. Mag.* **8** (1897): 273–284. **Hodge.**
The Enchanted Mesa. By F. W. Hodge. *With Map and Illustrations.*

United States—Inland Navigation. **Leach.**
Minutes of P.I. Civil Engineers **129** (1897): 247–279.
Inland Navigation in the United States. By Major Smith S. Leach. *With Plate.*
On the canals, river-improvements and lake harbours of the United States.

United States—Kentucky, Mammoth Cave. *Spelunca* **3** (1897): 12–22. **Call.**
La Cartographie de Mammoth Cave (Kentucky). Par M. Ellsworth Call. *With Maps.*

United States—Lower Mississippi. *Scottish G. Mag.* **13** (1897): 419–421. **Gannett.**
The Flood of April, 1897, in the Lower Mississippi. By Henry Gannett. *With Map.*

United States—Menomini Indians. **Hoffman.**
The Menomini Indians. By Walter James Hoffman, M.D.—Fourteenth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1892–93. By J. W. Powell. Part i. Washington, 1896. Size 12 × 8, pp. 3–328. *Map and Illustrations.*

United States—New York. *American Naturalist* **31** (1897): 690–699, 792–800. **Rowlee.**
The Swamps of Oswego, N.Y., and their Flora. By W. W. Rowlee.

United States—New York. *Globus* **71** (1897): 384–388. **Steffens.**
Chinatown in New York. Von Dr. C. Steffens. *Illustrations.*

This little article is cleverly illustrated with original drawings of Chinese life in New York.

United States—Niagara. ——
Thirteenth Annual Report of the Commissioners of the State Reservation at Niagara. Albany and New York, 1897. Size 9¼ × 6, pp. 69. *Illustrations. Presented by Andrew H. Green, Esq.*

Describes the working of the State Reservation, which, combined with the Victoria Park on the Canadian side, has cleared the environs of the falls of Niagara from all that is unsightly and unsafe.

United States—Pacific Coast. **Lamb.**
The Sand Dunes of the Pacific Coast. By Frank Haines Lamb. (From the *Forester*, 3 (1897), pp. 94–97.)

United States—Pennsylvania. *B. American G.S.* **29** (1897): 175–180. **Chittenden.**
Mountain Structures of Pennsylvania. By A. P. Chittenden.

The result of the author's investigation is summarized in the statement that the synclinal mountain is not (as has been held) the predominant type in the Pennsylvanian Appalachians, but that the predominant structures in the district are in the proportion—Monoclinal, 1333; anticlinal, 334; synclinal, 245.

United States—Survey. *B. Philosoph. S. Washington* **13** (1897): 204–222. **Preston.**
The Transcontinental Arc. By Erasmus Darwin Preston. *With Map.*

United States—Upper Mississippi Valley. **Keyes.**
Trans. A. Sci. St. Louis **7** (1897): 357–370.
Relations of the Devonian and Carboniferous in the Upper Mississippi Valley. By Charles R. Keyes.

United States—Washington. *National G. Mag.* **8** (1897): 226–230. **Elliott.**
Mount St. Helens. By Lieut. Charles P. Elliott. *With Map.*

CENTRAL AND SOUTH AMERICA.

Argentine Languages. **Quevedo.**
B.A. Nac. Ci. Cordoba **15** (1896–97): 5–200, 253–420.
Lenguas argentinas. Idioma Abipon. Ensayo fundado sobre el "De Abiponibus" de Dobrizhoffer y los manuscritos del Padre J. Brignial, S.J., con Introduccion, Mapa, Notas y Apéndice. Por Samuel A. Lafone Quevedo, M.A.

Argentine—Patagonia. *American J. Sci.* **4** (1897): 327–354. **Hatcher.**
On the Geology of Southern Patagonia. By J. B. Hatcher. *With Map and Illustrations.*

Argentine—Patagonia. **Mercerat.**
An. Museo Nacional Buenos Aires **5** (1896–97): 105–130; 309–319.
Essai de classification des terrains sédimentaires du versant oriental de la Patagonie Australe. Par Alcide Mercerat.
Coupes géologiques de la Patagonie Australe. By the same. *With Plates.*

Argentine—Patagonia. *Petermanns M.* **43** (1897): 212–216. **Nordenskjöld.**
Ueber die Natur der Magellansländer. Vorläufige Mitteilung über die Schwedische wissenschaftliche Expedition, 1895–97. Von Dr. Otto Nordenskjöld. *With Map.*

Argentine—Patagonia. **Nordenskjöld.**
A Journey in South-Western Patagonia. By Otto Nordenskjöld. From the *Geographical Journal* for October, 1897. Size 10 × 6½, pp. 10. *Map and Illustrations.*

Argentine Republic. *B.A. Nac. Ci. Cordoba* **15** (1897): 201–252. **Bodenbender.**
Devono y Gondwana en la República Argentina. Las formaciones sedimentarias de la parte Noroeste. Par Guillermo Bodenbender. *With Map and Profiles.*

Argentine Republic ———
Anuario de la Direccion General de Estadistica Correspondiente al Año, 1896. Tomo I. Buenos Aires, 1897. Size 11 × 7½, pp. xiv. and 410.

Argentine—Chile Frontier. *Petermanns M.* **43** (1897): 177–179. **Steffen.**
Bemerkungen zur Karte der chilenisch-argentinischen Grenze im Feuerland. Von Dr. Hans Steffen. *With Map.*

Central America. **Sapper.**
The Old Indian Settlements and Architectural Structures in Northern Central America. By Dr. Carl Sapper. Annual Report of the Board of Regents of the Smithsonian Institution, . . . July, 1895. Washington, 1896. Size 9½ × 6, pp. 537–555. *Plans.*

Central America—Costa Rica. **Church.**
Costa Rica. By Colonel George Earl Church. From the *Geographical Journal* for July, 1897. Size 10 × 6½, pp. 30. *Map.*

Central America—Nicaragua Canal. *B.S.G. Madrid* **39** (1897): 7–20. **Sobral.**
El canal de Nicaragua. Por D. José Gutiérrez Sobral.

Chile—Census. ——

Noticia preliminar del Censo Jeneral de la República de Chile levantado el 28 de Noviembre de 1895. Santiago de Chile, 1896. Size 10½ × 7, pp. xii. and 254.

The population of Chili in 1895 is given as 2,712,145, showing the smallest ten-yearly increase since 1843.

Chile—Statistics. ——

Sinópsis Estadística i Jeográfica de la República de Chile en 1896. Valparaiso, 1897. Size 10 × 7, pp. 204.

Chili. ——

Anuario hidrográfico de la Marina de Chile. Año 19; Año 20. Santiago de Chile, 1896. Size 11 × 7½, pp. (19), 32, and 520; (29), 26, and 496. *Diagrams, etc.*

Chili—Tierra del Fuego. *Scottish G. Mag.* 13 (1897): 393–399. **Nordenskjöld.**

Notes on Tierra del Fuego. An Account of the Swedish Expedition of 1895–97. By Dr. Otto Nordenskjöld.

Cuba. *B.S.G. Lyon* 14 (1897): 454–512. **Crescent.**

L'Ile de Cuba. Étude Physique, Économique, Historique et Politique. Par M. A. Crescent.

A compilation.

Mexico and British Honduras—Boundary. ——

Treaty Series, No. 6. 1897. Treaty and Additional Article between Great Britain and Mexico respecting the Boundary between Mexico and British Honduras. [With a Map.] Signed at Mexico, July 8, 1893, and April 7, 1897. [Ratifications exchanged at Mexico, July 21, 1897.] London: Eyre & Spottiswoode, 1897. Size 10 × 6½, pp. 6. *Price* 6½*d.*

Peru. **Delgado.**

B.S.G. Lima 5 (1896): 445–457; 6 (1896–7): 96–105, 230–240, 393–396.

Etnografía y Lingüistica: Vocabulario del idioma de las tribus Campas. Por D. Eulogio Delgado.

Peru. *B.S.G. Lima* 6 (1897): 361–390; 7 (1897): 1–20. **Raimondi.**

Itinerario de los viajes de Raimondi en el Perú. Provincias de Cañete, Yauyos y Huarochiri. Tarma, Chanchamayo, Vitoc, Monomamba, Uchubamba y Jauja (1855).

Peru—Bibliography. ——

Biblioteca Peruana. Apuntes para un Catálogo de Impresos. II. Entrega 1 (pp. 1–288); Entrega 2 (pp. 289–618). Santiago de Chile. Biblioteca del Instituto Nacional, 1896. Size 10½ × 7. *Presented by the Biblioteca del Instituto Nacional.*

Bibliography, with notes of books published in Peru.

Peru—Carabaya. *B.S.G. Lima* 7 (1897): 105–119. **Balta.**

Observaciones hechas en un viaje á Carabaya. Por José Balta.

Peru—Huánuco. *B.S.G. Lima* 7 (1897): 61–105. ——

Monografía de la provincia de Huánuco. Por X. X.

Peru—Palominos. *B.S.G. Lima* 6 (1897): 417–440. **Villareal.**

Posición Geográfica del Faro de Palominos. Por el Dr. Federico Villareal.

An elaborate discussion of the observations by which the position of the island of Palominos, off the coast of Peru, was determined as 12° 8′ 5·5″ S., 77° 14′ 44·5″ W.

Peru—Piura. *B.S.G. Lima* 7 (1897): 21–25. **Eguigúren.**

Estudios demográficos de la ciudad de Piura. Por el Dr. Victor Eguigúren.

Peru—Tambo. *B.S.G. Lima* 6 (1897): 440–443. **Zúñiga.**

La Mar.—Itinerario del camino de Ayacucho al puerto fluvial de Simariva en el Apurimac. Por D. Braulio Zúñiga.

South America—Palæontology. *Natural Science* 11 (1897): 256–264. **Ameghino.**

South America as the Source of the Tertiary Mammalia. By Florentino Ameghino.

Straits of Magellan. *Anuario hidrog. Marina de Chile* 20 (1896): 3–41. **Wilson.**

Memoria de la Comision hidrografica al Estrecho de Magallanes, a cargo del capitan de fragata don Arturo E. Wilson, en los meses de octubre a diciembre de 1894. *With Chart.*

Venezuela and British Guiana—Boundary. ———

United States Commission on Boundary between Venezuela and British Guiana. [Washington, 1896-97.] Report and Accompanying Papers of the Commission appointed by the President of the United States "to Investigate and Report upon the true Divisional Line between the Republic of Venezuela and British Guiana." 9 vols. Vol. 1, Historical; vol. 2, Extracts from Archives; vol. 3, Geographical; vol. 4, Atlas; vol. 5 and 6, British Blue Books; vol. 7, Official History, etc., of Venezuela; vol. 8, Venezuelan Documents; vol. 9, Venezuelan Briefs. Size: vols. 1, 2, 3, 7, 8, 9, 9½ × 6; vols. 5 and 6, 13½ × 8½; vol. 4, 17½ × 15. *Maps. Presented by the Commission.*

Venezuela—Orinoco. *Deutsche Rundschau G.* **20** (1897): 14–20, 55–65. **Hübner.**

Reise in das Quellgebiet des Orinoco. Von Georg Hübner. *With Illustrations.*

Venezuela—Statistics. ———

Annual Statistics of the United States of Venezuela, 1894. Caracas, 1896. Size 9 × 6½, pp. 284.

West Indies. **Lighthourn.**

Lighthourn's West India Annual and Commercial Directory. St. Thomas: J. N. Lighthourn, 1897. Size 7½ × 5, pp. 208. *Presented by the Compiler.*

West Indies—Grenada. **Harrison.**

The Rocks and Soils of Grenada and Carriacou, and the Agricultural Chemistry of Cacao. By J. B. Harrison, Government Analyst of British Guiana. London: Waterlow & Sons, 1896. Size 10 × 6½, pp. 60. *Presented by the Colonial Secretary, Grenada.*

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West Indies—Trinidad. *Timehri* **10** (1896): 357-394; **11** (1897): 11-27. **Davis.**

Early English Colonies in Trinidad. By Hon. N. Darnell Davis, C.M.G.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia—Tertiary Mollusca. **Harris.**

Catalogue of Tertiary Mollusca in the Department of Geology, British Museum (Natural History). Part I. The Australasian Tertiary Mollusca. By George F. Harris. London: Longmans & Co., 1897. Size 9 × 6, pp. xvi. and 408. *Plates. Presented by the British Museum.*

Ellice Group—Funafuti. *Petermanns M.* **43** (1897): 190–192. **Langenbeck.**

Das Atoll Funafuti in der Ellice-Gruppe. Von Prof. Dr. R. Langenbeck.

New South Wales. ———

Annual Report of the Department of Mines and Agriculture, New South Wales, for the year 1896. Sydney, 1897. Size 13 × 8½, pp. 164. *Plans and Sections.*

New South Wales. **Coghlan.**

New South Wales. Statistical Register for 1895 and previous years. Compiled . . . by T. A. Coghlan. Sydney, 1897. Size 10 × 6½, pp. xxviii. and 912. *Presented by the Agent-General for New South Wales.*

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The Wealth and Progress of New South Wales, 1895-96. By T. A. Coghlan. Vol. i. Ninth Issue. Sydney, 1897. Size 9 × 6, pp. 492. *Presented by the Agent-General for New South Wales.*

This important and well-known work contains what is really the detailed commercial geography of New South Wales.

New South Wales. **Etheridge, David, and Grimshaw.**

J. and P.R.S. New South Wales **30**, 1896 (1897): 158–185.

On the Occurrence of a Submerged Forest, with Remains of the Dugong, at Shea's Creek, near Sydney. By R. Etheridge, Junr., Prof. T. W. Edgeworth David, and J. W. Grimshaw. *With Plates.*

The observations recorded in this paper form "the best direct evidence hitherto obtained to show that the existence of man in Eastern Australia can probably claim something approaching to a geological antiquity, as is implied by the fact that the Pacific ocean and the Australian land have changed their respective levels by as much as 15 feet since the existence of Neolithic man at Botany bay."

New South Wales. **McKinney.**
J. and P.R.S. New South Wales **30**, 1896 (1897): lxxiv.-lxxxix.
Water Conservation Surveys of N.S. Wales. By H. G. McKinney.

New South Wales—Blue Mountains. **David.**
J. and P.R.S. New South Wales **30**, 1896 (1897): 33-69.
Summary of our Present Knowledge of the Structure and Origin of the Blue Mountains of New South Wales. [Part. III. of Anniversary Address, by T. W. Edgeworth David.] *With Maps and Plates.*

New Zealand—Pit Dwellings. *J. Polynesian S.* **6** (1897): 77-84. **Rutland.**
On the Ancient Pit Dwellings of the Pelorus District, South Island, N.Z. By Joshua Rutland. *With Illustration and Plan.*

Queensland. **Weedon.**
Queensland, Past and Present. An epitome of its Resources and Development, 1896. By Thornhill Weedon. Brisbane, 1896. Size 9 × 6, pp. 240.
An official, historical, and statistical account of Queensland.

Queensland—Water Supply. **Henderson.**
Queensland. Water Supply. (Report of the Hydraulic Engineer on.) Brisbane, 1896. Size 13½ × 8½, pp. 24. *Maps and Diagrams.*

West Australia. *Deutsche G. Blätter* **20** (1897): 215-221. **Greffrath.**
Geographisch-statistische Uebersicht über die australischen Kolonien. I. Die Kolonie Westaustralien. Von H. Greffrath.

POLAR REGIONS.

Antarctic—Belgian Expedition. *B.S.R. Belge G.* **21** (1897): 395-400. ——
Régions antarctiques.—Départ de l'expédition antarctique belge.

Arctic—Andrée's Balloon Expedition. **Baschin.**
Die Abfahrt der Andrée 'schen Ballon-Expedition zum Nordpol und ihre Aussichten. Von Otto Baschin. (Sonder-Abdruck aus d. Verhandlungen d. Gesellsch. f. Erdk. z. Berlin, 1897, No. 7.) Size 9 × 6, pp. 10.

Arctic—Franz Josef Land. *Petermanns M.* **43** (1897): 217-218. **Supan.**
Copelands Neue Karte von Franz Josef-Land. Von Prof. Dr. A. Supan.

Danish Arctic Expeditions. **Gosch.**
Danish Arctic Expeditions, 1605 to 1620. In Two Books. Book I. The Danish Expeditions to Greenland in 1605, 1606, 1607; to which is added Captain James Hall's Voyage to Greenland in 1612. Book II. The Expedition of Captain Jens Munk to Hudson's Bay in Search of a North-West Passage in 1619-20. Edited, with Notes and Introductions, by C. C. A. Gosch. 2 vols. (Nos. xcvi. and xcvii. of the Hakluyt Society's Publications.) London: Printed for the Hakluyt Society, 1897. Size 9 × 6, pp. (vol. i.) xvi., cxviii., and 206; (vol. ii.) cxvii. and 188. *Charts and Plates. Presented by the Hakluyt Society.*

Greenland—Umanak Fjord. **Barton.**
The Scientific Work of the Boston Party on the Sixth Peary Expedition to Greenland. Report B. Glacial Observations in the Umanak District, Greenland. By George H. Barton, S.B. Reprinted from *Technology Quarterly*, vol. x. No. 2, June, 1897. Size 10½ × 7, pp. 213-244. *Map and Illustrations. Presented by the Author.*

A fine description of a summer's work on the Umanak fjord and the edge of the adjacent ice-sheet. The illustrations from photographs are of exceptional interest.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Hann.**
Bibliothek Geographischer Handbücher, Herausgegeben von Prof. Dr. Friedrich Ratzel. Handbuch der Klimatologie. Von Julius Hann. Zweite . . . Auflage. 3 vols. Stuttgart: J. Engelhorn, 1897. Size 8½ × 5½, pp. (vol. i.) xii. and 404; (vol. ii.) viii. and 384; (vol. iii.) viii. and 576. *Price 26 mark. Presented by the Publisher.*
This will be specially noticed.

Climatology. **Madsen.**

C. L. Madsen. Thermo-Geographical Studies. General exposition of the analytical method applied to Researches on Temperature and Climate. Awarded by the Smithsonian Institution, Washington, with the Hodgkins Medal, 1895. With numerous tables and plans, and a Codification of the principal Thermo-geographical Formulæ, Tables, and Definitions. Copenhagen: G. E. C. Gad, 1897. Size 14 × 10½, pp. xxii. and 142. *Price* 30*s*.

This will be specially noticed.

Climatology. *Meteorolog. Z.* **14** (1897): 359-361. **Woeikof.**

Die ganze Temperaturschwankung im arktischen und äquatorialen Seeklima. Von A. Woeikof.

Gravitation and Magnetism. **Eötvös.**

Math. u. Naturwiss. Berichte Ungarn **13** (1897): 193-243.

Untersuchungen über Gravitation und Erdmagnetismus. (Vorläufige Mittheilung.) Von Dr. Roland Baron Eötvös.

Ice Age. *J. of Trans. Victoria I.* **29** (1897): 201-238. **Upham.**

Causes of the Ice Age. By Warren Upham.

Meteorology. *P. American A. Arts and Sciences* **32** (1897): 245-251. **Rotch.**

On obtaining Meteorological Records in the Upper Air by means of Kites and Balloons. By A. Lawrence Rotch.

Oceanography. *Petermanns M.* **43** (1897): 201-212. **Schott.**

Die Gewässer der Bank von Neufundland und ihrer weitern Umgebung. Eine oceanographische Studie von Dr. Gerhard Schott. *With Maps.*

Oceanography—Plankton. **Cleve.**

Bihang K. Svenska Vetens.-A. Handlingar **22** (1896): 1-33.

Redogörelse för de svenska hydrografiska undersökningarne Februari 1896 under ledning af G. Ekman, O. Pettersson och A. Wijkander. V. Planktonundersökningar: Vegetabiliskt plankton. Af P. T. Cleve. *With Plate.*

Oceanography—The Tides. *Ann. Hydrographie* **25** (1897): 337-346. **Krümmel.**

Ueber Gezeitenwellen. Von Prof. Dr. Otto Krümmel.

An account of the tidal theory from the time of Newton down to the most recent observations, given in popular language and almost without the use of mathematics.

Pacific Ocean—Fisheries. *Globus* **72** (1897): 121-124. **Schott.**

Die Fischereibänke des Nördlichen Stillen Ozeans. Von Dr. Gerhard Schott. *With Map.*

The map shows the recognized fishing-banks along the east and north shores of the Northern Pacific, and the accompanying letterpress summarizes the nature of each bank and the fish frequenting it.

Physical Geography. **Klein.**

Jahrbuch der Astronomie und Geophysik . . . Unter Mitwirkung von Fachmännern herausgegeben von Dr. Hermann J. Klein. VII. Jahrgang 1896. Leipzig: E. H. Mayer, 1897. Size 9 × 6, pp. x. and 400. *Map and Plates.*

The plan of this annual is to give summaries of a selection of the papers published each year in each of the chief departments of astronomy and physical geography.

Physical Geography. **Arçtowski.**

Physico-Chemische Notizen, 1894-96. Size 9 × 6½. *Illustrations. Presented by the Author.*

This bound set of memoirs, by Dr. Arçtowski, contains one on the plateau of the Ardennes, and one on the antarctic regions.

Physical Geography. **Lapparent.**

A. de Lapparent. Notions générales sur l'Écorce terrestre. Paris: Masson et Cie. [1897]. Size 7½ × 5, pp. 156. *Illustrations. Price* 1 *fr.* 20 *c. Presented by the Publishers.*

An admirable epitome of physical geography in the form of a course of lectures to young ladies in a school in Paris. Prof. de Lapparent treats of the general relief of the Earth's crust, the action of the atmosphere, formation of sediments, movements in the crust, the characters of the Paris basin, and a glance at geological periods.

Plant-Geography. *Deutsche G. Blätter* 20 (1897): 179–214. **Oppel.**
Die Kokospalme. Von Dr. A. Oppel.

On the distribution of the coco-nut palm.

Plant-Geography. **Hooker and Jackson.**
Index Kewensis: an enumeration of the Genera and Species of Flowering Plants, from the time of Linnaeus to the year 1885 inclusive, together with their authors' names, the works in which they were first published, their native countries, and their synonyms. Compiled at the expense of the late Charles Robert Darwin, under the direction of Joseph D. Hooker, by B. Daydon Jackson. 2 vols. Oxford: The Clarendon Press, 1895. Size 13 × 11, pp. (vol. i.) xiv. and 1268; (vol. ii.) viii. and 1300. *Presented by Major L. Darwin.*

This splendid work, suggested by the late Mr. Darwin and carried out at his expense, was undertaken on account of the difficulty which the great biologist had experienced in tracing the habitat of different plants from the books available at the time. The importance of the catalogue to the student of plant distribution cannot be over-estimated.

Sand. *Tijds. K. Ned. Aard. Genoots. Amsterdam* (2) 14 (1897): 321–364. **Lorie.**
De Zand-Onderzoekingen der laatste jaren. Door Dr. J. Lorie. *With Plate.*

On recent investigations into the nature of sand, with reference to its occurrence on the beach or in dunes.

Seismology. *B.S.G. Italiana* 10 (1897): 265–270. **Baratta.**
Il grande terremoto indiano del 12 giugno 1897. Di M. Baratta. *With Diagram.*

The paper contains a seismographic record taken in Padua on the occasion of the great earthquake in the north of India in June, 1897.

Seismology. *Petermanns M.* 43 (1897): 112–115. **Supan.**
Vorschläge zur systematischen Erdbebenforschung in den einzelnen Ländern. Vortrag, gehalten auf dem XII. Deutschen Geographentag. Von Prof. Dr. A. Supan.

Springs and Wells. **Heim.**
Vierteljahrsb. Naturforschenden Ges. Zürich 42 (1897): 112–128.
Geologische Nachlese. Von Albert Heim. Nr. 7: Quellerträge in Schächten und deren Bestimmung.

A study of deep wells and the conditions which regulate their yield of water.

Terrestrial Magnetism. **Creak.**
The General Bearings of Magnetic Observations. By Ettrick W. Creak.—Annual Report of the Board of Regents of the Smithsonian Institution, . . . July, 1895. Washington, 1896. Size 9½ × 6, pp. 107–115.

Terrestrial Magnetism. *Sitzb. K.P.A. W. Berlin* (1897): 678–686. **Eschenhagen.**
Ueber schnelle, periodische Veränderungen des Erdmagnetismus von sehr kleiner Amplitude. Von Prof. Dr. M. Eschenhagen. *With Plate.*

Terrestrial Magnetism. *Z. Ges. Erdk. Berlin* 32 (1897): 112–136. **Hellmann.**
Die Anfänge der magnetischen Beobachtungen. Von G. Hellmann.

On the first observations of the variations of terrestrial magnetism.

Terrestrial Magnetism. *Ann. Hydrographie* 25 (1897): 299–308. ——
Bericht der Deutschen Seewarte über die Ergebnisse der magnetischen Beobachtungen in dem deutschen Küstengebiete und in den deutschen Schutzgebieten während des Jahres 1896.

Magnetic observations are recorded for several parts of the German coast, for German East Africa, and for German New Guinea. At Hamburg the disturbing effect of the new electric tramways was so great as to very seriously interfere with the testing of compasses at the Naval Observatory.

Terrestrial Magnetism. *Sitzb. K.P.A. W. Berlin* (1897): 414–449. **Bezold.**
Zur Theorie des Erdmagnetismus. Von Wilhelm von Bezold. *With Plates.*

Terrestrial Magnetism. *Terrestrial Magnetism* 2 (1897): 45–60. **Fleming.**
The Earth, a Great Magnet. By Dr. J. A. Fleming, M.A., F.R.S.

Terrestrial Magnetism. **Fritsche.**
Ueber die Bestimmung der Coefficienten der Gaussischen Allgemeinen Theorie des Erdmagnetismus für das Jahr 1885 und über den Zusammenhang der drei

erdmagnetischen Elemente untereinander von Dr. H. Fritsche. St. Petersburg, 1897. Size 9¼ × 6¼, pp. 86. *Presented by Dr. H. Fritsche.*

Apart from the scientific value of this elaborate treatise, it is of interest in being entirely photo-lithographed from the author's manuscripts, thus obviating the possibility of printers' errors in the tables.

The Earth. **Lobley.**

The Mean Radial Variation of the Globe. Being the Address to the City of London College Science Society at the Opening of the Session 1896-97. By the President, Prof. J. Logan Lobley, F.G.S., etc. Reprinted from the *Journal of the City of London College Science Society*, vol. iv. No. 4 (January, 1897). Lewes. Size 8½ × 5½, pp. 22. *Presented by the Author.*

Topographical Climatology. **Davis.**

A Speculation in Topographical Climatology. By Prof. W. M. Davis. [Reprinted from the *American Meteorological Journal* for April, 1896.] Size 10 × 6½, pp. 10.

Underground Water. **Auchincloss.**

Waters within the Earth and Laws of Rainflow. By W. S. Auchincloss, C.E. Philadelphia, 1897. Size 9½ × 6, pp. 44. *Diagrams. Presented by the Author.*

A study of the movement of percolating water beneath the surface of the land.

Water—Temperature. *Notizblatt V. Erdk. Darmstadt* (1896): 17–22. **Greim.**

Zum Temperaturgang im Jambach bei Galtür. Von Dr. G. Greim. *With Plate.*

On the hourly variations of temperature in a mountain stream and in the surrounding air on two consecutive days, showing the change produced by a flood in the stream.

Zoo-Geography. **Sclater.**

The Geography of Mammals. The Palæarctic region. By W. L. Sclater, M.A., F.Z.S., Director of the South African Museum. From the *Geographical Journal* for July, 1897. Size 10 × 6½, pp. 8. *Map.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Mason.**

Influence of Environment upon Human Industries or Arts. By Otis Tufton Mason.—Annual Report of the Board of Regents of the Smithsonian Institution, . . . July, 1895. Washington, 1896. Size 9¼ × 6, pp. 639–665.

Anthropogeography. **Powell.**

Relation of Primitive Peoples to Environment, illustrated by American examples. By J. W. Powell.—Annual Report of the Board of Regents of the Smithsonian Institution, . . . July, 1895. Washington, 1896. Size 9½ × 6, pp. 625–637.

Anthropology—Yellow Races. **Hamy.**

The Yellow Races. By Dr. E. T. Hamy.—Annual Report of the Board of Regents of the Smithsonian Institution, . . . July, 1895. Washington, 1896. Size 9¼ × 6, pp. 505–517.

Historical—Adam of Bremen. **Lönborg.**

Adam af Bremen och hans skildring af Nordeuropas länder och folk. Akademisk Afhandling af Sven Lönborg. Upsala: Harald Wretman, 1897. Size 9 × 6, pp. 182. *Presented by the University of Upsala.*

Historical—Columbus. *Rev. Trim. I. G. e Hist. Bahia* **4** (1897): 323–359. **Pragner.**

Estudos Historicos. O Descobridor do Novo Mundo foi Colombo. (Henrique Pragner.)

BIOGRAPHY.

Abercromby. *Nature* **57** (1897): 55. **Scott.**

Hon. Ralph Abercromby. By R. H. Scott, F.R.S.

Avennes. *La Géographie* **10** (1897): 473. **Obalski.**

L'Explorateur Prisse d'Avennes, 1807–1879. Par M. T. Obalski. *With Portrait.*

Memorandum on the life of an Egyptologist, whose name has recently been given to a new street by the Municipality of Paris.

Biographical Dictionary. **Lee.**

Dictionary of National Biography. Edited by Sidney Lee. Vol. li. Scoffin—Sheares; vol. lii. Shearman—Smirke. London: Smith, Elder & Co., 1897. Size 10 × 6½, pp. (vol. li.) vi. and 464; (vol. lii.) vi. and 414. *Price, each vol.*, 15s.

Vol. ii. includes notices of the following names of geographical interest: William Scoresby, and his son William Scoresby, by Prof. J. K. Laughton; Henry Seebohm, by B. B. Woodward; Berthold Carl Seemann, by G. T. Boulger; Robert Barkley Shaw, by S. E. Wheeler; and Thomas Shaw, by T. Seccombe. Vol. iii.: George Shelvocke, by Prof. J. K. Laughton; Sir George Simpson, by C. A. Harris; Thomas Simpson, by Prof. J. K. Laughton; and Sir Edward Bose Sladen, by Stephen Wheeler.

GENERAL.

Ballooning. *C. Rd.* **125** (1897): 587-589. **Cailletet.**

Appareil destiné à mesurer les hauteurs atteintes par les aérostats. Vérification des indications fournies par le baromètre. Note de M. L. Cailletet.

Bering Sea. *Fortnightly Rev.* (n.s.) **62** (1897): 679-691. **Wilson.**

The Bering Sea Dispute. By H. W. Wilson. *With Map.*

On the controversy as to seal-hunting in Bering sea.

Bibliography. **Baschin.**

Bibliotheca Geographica. Herausgegeben von der Gesellschaft für Erdkunde zu Berlin, bearbeitet von Otto Baschin. Band iii. Jahrgang 1894. Berlin: H. W. Kühl, 1897. Size 9 × 6, pp. xvi. and 402.

The new volume of this admirable Bibliography contains several marked improvements, and the fulness of its record of geographical literature in 1894 is almost alarming. So many papers are recorded from little-known publications that we hope steps will be taken to secure the preservation of at least one copy of each in some accessible geographical library.

Bibliography. ——

Catalogue d'une importante Bibliothèque composée d'ouvrages anciens, rares et précieux. Ancienne Bibliothèque de D. de Salvaing de Boissieu, 1600-1683. Grenoble: Librairie Dauphinoise H. Falque et Félix Perrin, 1897. Size 9½ × 6¼, pp. 232.

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University of the State of New York. State Library Bulletin, Additions No. 3. September, 1894. Albany, 1897. Size 10 × 7, pp. 511-1364. *Presented by the New York State Library.*

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University of the State of New York. State Library Bulletin. Additions No. 4. September, 1896. Additions to Medical Division 1895. Albany, 1896. Size 10 × 7, pp. 130. *Presented by the New York State Library.*

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University of the State of New York. New York State Library. Seventy-seventh Annual Report, 1894. Albany, 1897. Size 9 × 6, pp. 548, 205-1304, and 14. *Presented by the New York State Library.*

British Colonies—Trade. *Contemporary Rev.* **72** (1897): 697-708. **Mulhall.**

The Trade of the British Colonies. By M. G. Mulhall.

Channel Pilot. ——

The Channel Pilot, Part ii. Coast of France and the Channel Islands. Originally compiled by Staff-Commander John W. King, R.N. Sixth Edition. London: J. D. Potter, 1897. Size 9½ × 6½, pp. xviii. and 678. *Index Chart. Price 3s. 6d. Presented by the Hydrographer, Admiralty.*

Educational—Methods. *Petermanns M.* **43** (1897): 242-245. ——

Der geographische Unterricht an den deutschen Hochschulen im Wintersemester 1897-98.

Educational—Methods. **Mill.**

Hints to Teachers and Students on the Choice of Geographical Books for Reference and Reading, with Classified Lists. Prepared at the request of the Geographical Association. By Hugh Robert Mill, D.SC. London: Longmans & Co., 1897. Size 7½ × 5¼, pp. 142. *Price 3s. 6d. Presented by the Author.*

This was referred to in the *Journal* for December, 1897, vol. x. p. 641.

Geography. *National G. Mag.* **8** (1897): 251-266. **Keltie.**

The Great Unmapped Areas on the Earth's Surface awaiting the Explorer and Geographer. By J. Scott Keltie, LL.D.

The Presidential Address to Section E of the British Association at Toronto.

German Naval Observatory.

Neunzehnter Jahres-Bericht über die Thätigkeit der Deutschen Seewarte für das Jahr 1896. Erstattet von der Direktion. Beiheft ii. zu den "Annalen der Hydrographie und Maritimen Meteorologie," 1897. Hamburg, 1897. Size 11 × 7½, pp. iv. and 66. *Presented by the German Naval Observatory.*

International Bosphorus Commission. [Schjott.]

The Work of the International Commission: appointed to prevent Shipwreck at the Entrance to the Bosphorus from the Black Sea, and render assistance to the shipwrecked. By a Member of the Committee. Dover: G. W. Grigg & Son, 1897. Size 8½ × 5½, pp. 24. *Presented by the Author.*

International Geological Congress. *American Naturalist* **31** (1897): 951–969. **Palache.**

The Geological Congress in Russia. By Charles Palache.

On the meeting and excursions of the Geological Congress at St. Petersburg in the autumn of 1897.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

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England and Wales. **Ordnance Survey.**

Publications issued since November 8, 1897.

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25-inch—Parish Maps (revised):—

England and Wales:—**Cheshire,** XXVIII. 8, 15; XXIX. 5; XXXVI. 4, 11, 14, 16; XXXVII. 1, 9; XLIII. 4, 8. **Durham,** IV. 2; XXXVII. 12, 15, 16; XLII. 2, 9; XLIV. 16; XLV. 13; XLVII. 7; XLVIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16; XLIX. 1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16; LII. 3, 4; LIII. 4, 5, 7; LIV. 2, 3, 4, 7, 8; LV. 3, 4, 11. **Hertfordshire,** XXIII. 13. **Essex,** II. 4, 11, 14; III. 1, 2, 3, 7, 8, 16; IV. 9, 10, 11, 12; VIII. 1, 10, 14; XII. 7; XVIII. 5, 6, 7; XX. 11, 12, 13, 14, 15, 16; XXVII. 11; XXIX. 4, 7, 8, 15, 16; XXXVI. 4; XXXVII. 7, 10, 13, 14, 15, 16; XXXVIII. 4, 11, 12, 13; XXXIX. 9; XL. 7; XLVI. 8; XLVII. 1, 2, 3, 4, 12; XLVIII. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11; XLVIIIa. 1; XLIX. 14; LXXXIII. 9, 14. **Hampshire,** XXXVI. 12, XXXVII. 13, 14; XLV. 1, 5; LXX. 11; LXXVI. 13; LXXVIII. 3, 5, 7, 9, 11; LXXX. 9, 10, 11, 13, 14, 15, 16; LXXXI. 10, 11, 12, 13, 14; LXXXII. 1, 2, 5, 9, 13, 14; LXXXVIII. 1, 3, 4, 5, 8, 11, 13; LXXXIX. 1, 2, 8, 9, 10, 12; XC. 1, 8, 9, 10, 11; XCI. 6, 7, 11. **Kent,** III. 11; IV. 9, 11, 13; VII. 8, 12; VIII. 5; X. 1; XIII. 12, 16; XIV. 9, 10, 13, 14; XV. 3, 11; XVI. 5; XIX. 1, 5; XXI. 8, 13, 15, 16; XXII. 2, 5, 6, 7, 9, 10, 11, 16; XXXI. 4; XXXIII. 13, 15; XXXIV. 1, 5, 7, 14; XXXIX. 13; XLV. 1, 2, 5; XLIX. 13; LXIII. 8; LXIV. 13. **Northumberland,** XIX. 8, 11, 14, 15, 16; XX. 6, 8, 9, 10, 11, 12, 15, 16; XXI. 5, 6, 7, 8, 9, 12, 13; XXII. 5, 6, 7, 10, 11; XXIV. 3, 4, 8; XXV. 1, 2, 3, 5, 7, 8; XXVI. 5, 13, 16; XXVII. 9, 10, 11, 12, 13, 14, 15, 16; XXXI. 4, 11, 12, 15; XXXII. 1, 2, 3, 5, 10, 13; XXXVIII. 3; XXXIX. 1, 2, 4, 5. **Surrey,** VI. 14; VII. 5; XXX. 3, 4, 8, 14, 15, 16; XXXVI. 6; XXXVII. 3, 16; XXXVIII. 3; XLI. 10; XLVI. 7; XLVII. 4. **Sussex,** XXV. 3, 7; XXVI. 4, 5, 8, 9, 10, 13, 14, 15, 16; XXXIV. 1, 5, 9, 13;

XXXVII. 8, 12, 16; XLVIII. 1, 5, 9, 11, 13, 14, 15; XLIX. 14; L. 14; LI. 2, 3, 6, 7, 8, 9, 11, 14, 15; LXII. 2, 3, 4, 7, 8, 10, 11, 12; LXIII. 3. 3s. each. (*E. Stanford, Agent.*)

Historical Geography. **Poole.**

Historical Atlas of Modern Europe from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Pool, M.A., PH.D., Lecturer in Diplomatic in the University of Oxford. Part xiv. Oxford: The Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde; Edinburgh: W. & A. K. Johnston. 1897. *Price 3s. 6d. each part. Presented by the Clarendon Press.*

Part xiv. contains the following maps: No. 53, France in the thirteenth century, by W. E. Rhodes, M.A.; Nos. 71 and 72, the Eastern Roman Empire in the tenth century, by Prof. Bury, LITT.D. Each map is accompanied by letterpress.

Sweden. **Topographical Section, Swedish General Staff.**

Generalstabens Karta öfver Sverige. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheet 70, Arvika. 1896.

Norrbottens Län. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Sheets: 37, Lulea; 32, Tärna.

Höjdkarta öfver norra Sverige. Scale 1 : 500,000 or 8 stat. miles to an inch. 5 sheets. Topographical Section, Swedish General Staff, 1897. *Presented by the Topographical Section, Swedish General Staff.*

Sweden. **Byström.**

Karta öfver Vermlands Län utarbetad vid Generalstabens Litografiska Anstalt af A. H. Byström, 1897. Scale 1 : 200,000 or 3·1 stat. miles to an inch. 4 sheets. *Presented by the Kongl. Universitets-Bibliotek, Upsala.*

ASIA.

Indian Government Surveys. **Surveyor-General's Office, Calcutta.**

Indian Atlas, 4 miles to an inch. Sheets: 44, part of Malabar (Madras Presidency); 76, parts of districts Karnul, Guntur, Nellore, and Cuddapah (Madras Presidency). Quarter-Sheets: 20 N.E., part of Jodhpore (Native State, Rajputana Agency); 27A N.E., part of Baltistan or Little Tibet, and portion of Karakoram Himalayas; 31 N.E., parts of districts Ferozepore and Ludhiana, and of Patiala, Nabha, Faridkot, and Jind (Native States), Punjab; 32 S.W., part of Bickaneer (Rajputana Agency); 33 S.W., parts of Jodhpore and Ajmere (Rajputana); 33 S.E., parts of districts Ajmere and Native States of Jeypore, Jodhpore, and Kishengurh (Rajputana Agency); 44A S.W., part of Baltistan or Little Tibet; 72 N.E., parts of districts Nagpur, Seoni, Bhandara, Chhindwara, and Balaghat (Central Provinces); 72 S.E., parts of districts Nagpur, Bhandara, Raipur, Balaghat, and Chanda (Central Provinces); 72 N.W., parts of districts Chhindwara, Betul, Nagpur, and Seoni (Central Provinces), and of Berar (Hyderabad Assigned Districts); 87 S.W., parts of districts Lucknow, Bara Banki, Fyzabad, Unao, Rae Bareli, Sultanpur, and Gonda (N.W. Provinces and Oudh); 91 N.W., parts of districts Bilaspur, Balaghat, and Raipur, and Native States of Kawarda, Chhuikhadan, Nandgaon, and Khairagarh (Central Provinces); 124 S.W., parts of districts Kamrup, Darrang, Garo hills, Goalpara, and Khasi, and Jaintia hills (Assam).—Canal map of India, 1897, scale 32 miles to an inch, 6 sheets.—Bengal Survey, 1 inch to a mile. No. 139, district Puri, Season 1894-95; No. 294 (2nd edition), district Jalpaiguri, Seasons 1858-59 and 1888-92.—Bombay Survey, 1 inch to a mile. No. 301, parts of districts Belgaum and Bijapur, Kolhapur, and Satara Agencies, Season 1894-95.—Central Provinces Survey, 1 inch to a mile. No. 51, parts of districts Hoshangabad and Chhindwara (Central Provinces), Seasons 1868-69 and 1870.—Upper Burma Survey, 1 inch to a mile. No. 306 (preliminary edition), Northern Shan States (part of Hsipaw), Season 1895-96; No. 358 (preliminary edition), Southern Shan States, Season 1894-95.—Indus Riverain Survey, 1 inch to a mile. Nos. 18, 33, 34, 36, 49 (skeleton), 49, 50 (skeleton), 51, 52, 53 (skeleton), 53, districts Karachi and Hyderabad, 1894-95.—South-Eastern Frontier, 1 inch to 8 miles. No. 9, parts of districts Tavoy and Mergui (Lower Burma), and of Siam, Seasons 1865-67 and 1889-93.—District Jessore, Bengal, 1 inch to 8 miles, 1897.—District Dinajpur, Bengal, 8 miles to an inch, 1891.—District Sombalpur, Central Provinces, 1 inch to 16 miles, 1897.—District of Seoni, 8 miles to an inch, 1897.—District Kangra, Punjab, 1 inch to 12 miles, 1897.—District Naini Tal, N.W. Provinces and Oudh, 1 inch to 10 miles, 1897.—Map of the N.W. Provinces and Oudh, in April, 1894; accompaniment to the Annual Administration Report, N.W. Provinces and Oudh, P.W.D.B. and R. branch for the year 1893-94, 1 inch to 32 miles, additions to March, 1896.—Map of the Central Provinces, 1886, 1 inch to 32 miles, with additions to railways, March, 1896.—Patna division, 1 inch to 8 miles, additions to 1897, 2 sheets with pamphlet.—District Hoshungabad, Central Provinces Revenue Survey, 1 inch to 1 mile, additions to 1895, 13 sheets.—District Pabna, 4 miles to an inch, additions to 1897.—Chart of Triangulation, No. 18 Party (Himalayas), 1 inch to 2 miles; Nos. 311, 336, Punjab, 1897.—*Presented by H.M. Secretary of State for India, through the India Office.*

East Indian Archipelago. **Van der Stok.**

Wind and Weather, Currents, Tides, and Tidal Streams in the East Indian Archipelago. Published by order of the Government of Netherland's India, by J. P. van der Stok, PH.D., Director of the Meteorological and Magnetical Observatory, Batavia: Printed at the Government Printing Office, 1897. *Presented by the Board of Trade.*

This atlas is divided into three parts. The first treats exclusively of observations made on board ship, the second contains the results of observations of rainfall and winds made at places on the coast and also at some inland stations, whilst the third treats of tides and tidal streams.

Part i. includes the results of observations made on men-of-war from 1814 to 1890, on wind, weather, the condition of the sea, with monsoon-charts for different parts of the archipelago, and current observations as well as current-charts for two seasons. These observations form the principal bulk of the atlas, and a vast amount of information is given by means of wind roses, notes, and also in tabulated form. The information given in part ii. is all in tabulated form, and is most conveniently arranged for reference. In part iii. there are notes on the characteristics of the tides, and other useful information, and as a whole this atlas is a valuable contribution to the physical geography of the East Indian Archipelago.

AFRICA.

Egypt. **Audebeau, Souter, and Colani.**

Carte de la Basse-Égypte et de la province du Fayoum. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Dressée sur l'ordre de MM. Ed. Bouteron, J. Gibson, and S. E. M^{c} Chekib Pacha, Membres de la Commission des Domaines de l'Etat Egyptien, par MM. Audebeau, Souter, and Colani. Dressinée par Laurent Sémat, Caire, 1897. 4 sheets.

This map has been carefully compiled and brought up to date. It is on a sufficiently large scale to admit of considerable detail being given, and is very nicely drawn.

AMERICA.

Alaska. **Colton.**

New Map of Alaska, showing the Mining Districts. Scale 1 : 4,960,000 or 75 stat. miles to an inch. By G. W. & C. B. Colton & Co., New York, 1897.

Argentine Republic. **Church.**

A Railway Map of the Argentine Republic. Scale 1 : 5,100 000 or 81·6 stat. miles to an inch. By Colonel G. E. Church, F.R.G.S. E. Stanford, London, 1897. *Presented by the Author.*

All the railways in the Argentine Republic, in operation as well as those which it is proposed to construct, are laid down in this map. The gauge of each line is shown by the manner in which the line indicating its route is drawn.

Canada. **Topographical Surveys Branch, Department of the Interior, Ottawa.**

Sectional Maps: Scale 1 : 190,080 or 3 stat. miles to an inch. Sheets: 11, Manitoba House sheet; 12, Fairford; 19, Riding mountain; 29, Dutch mountain; 46, Prince Albert South; 47, Prince Albert North; 54, Carlton; 55, Shell river; 57, Cypress; 62, Battleford; 63, Fort Pitt; 71, Vermillion; 76, Rosebud; 77, Red Deer; 78, Peace hills; 79, Edmonton; 80, Victoria; 84, Morley; 87, St. Ann; 36, Yorkton sheet; 53, Saskatoon; 51, Rush lake; 41, Willow Bunch; 50, Swift current; 34, Moose mountain; 25, Antler; 28, Pelly; 39, Red Deer Forks; 44, Touchwood; 26, Moosomin; 27, Cut-Arm; 52, the Elbow; 17, Turtle mountain; 67, Rainy hills; 33, Souris; 3, Fort Alexander; 1, Emerson; 68, Sounding creek.—Topographical Survey of Canada. Scale 1 : 40,000 or 0·63 stat. mile to an inch. Sheets: Pilot mountain, Palliser, Sawback, Copper mountain, Banff, Simpson's pass, Cascade, Anthracite, Canmore, Forty-Mile creek, Kananaskis, End mountain, the Gap, Spray river, Castle mountain, the Devil's head, Saddle mountain, and Mount Aylmer. Map of part of Labrador, illustrating the proposed northern boundary of the Province of Quebec. To accompany the report of the Deputy

Minister of the Interior, dated January 29, 1896. 26 stat. miles to an inch. Topographical Surveys Branch, Department of the Interior, Ottawa. *Presented by Captain Deville, of the Topographical Survey, Ottawa.*

Nicaragua. **Church.**

Railway and Water Routes of Nicaragua, 1897. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. With Plan of proposed Silico Railway. By Colonel G. E. Church, F.R.G.S. London, 1897. *Presented by the Author.*

On this map all principal means of communication by railway and water in Nicaragua are shown, and the plan of the proposed Silico railway is given on an inset drawn on an enlarged scale.

GENERAL.

Educational. **Lehmann und Petzold.**

Atlas für Mittel- und Oberklassen höherer Lehranstalten, herausgegeben von Dr. R. Lehmann und Dr. W. Petzold. Bielefeld und Leipzig. Verlag von Velhagen & Klasing, 1897. *Price m.* 4.60.

This atlas contains sixty-nine principal maps and eighty-eight smaller ones. The first twenty-four sheets are devoted to mathematical and physical geography; these are followed by maps showing the density and distribution of peoples, religions of the world, and a general commercial map. On the remaining sheets general maps of the several countries are given. Many of the maps are orographically coloured, and it is altogether a very useful atlas for educational purposes.

Historical Atlas. **McClure.**

Historical Church Atlas. By Edmund McClure, M.A. Published by the Society for Promoting Christian Knowledge. London, 1897. *Price* 16*s. Presented by the Publishers.*

This atlas contains eighteen coloured maps and fifty sketch-maps in the text, illustrating the history of the Eastern and Western Christendom until the Reformation, and that of the Anglican Communion to the present day. The maps are accompanied by copious letterpress, in the compilation of which original authorities have been resorted to as far as possible, and the most recent sources of information have been used. The coloured maps are based upon those of Wiltsch and of Spruner-Menke.

Historical Atlas. **Schulz.**

Justus Perthes Geschichts-Atlas. Taschen Atlas zur Mittleren und Neueren Geschichte von Dr. Alfred Schulz. Gotha: Justus Perthes, 1898. 24 maps & letterpress. *Price m.* 2.60.

This is one of Justus Perthes' series of pocket atlases. It contains twenty-four historical maps, and chronological notes that will be found useful for reference.

The World. **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. *Price* 2 *fr.* each sheet.

The present issues of this atlas contain a political map of Africa, which is a reduction of the three-sheet map of that continent published by the same firm, and corrected by the most recent documents, and the south-west sheet of a six-sheet map of France, with an inset map of Paris. These, like all the other maps of this atlas, are beautiful specimens of cartography.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during September and October, 1897. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
2910 m	= 1·0	France, west coast:—Entrance to the Gironde river. 2*s.* 6*d.*
1589 m	= {0·9, 2·1}	Adriatic sea:—Valona bay, Port Palermo (republished). 1*s.* 6*d.*
2606 m	= 0·6	Mediterranean:—Candia to Alexandretta. 2*s.* 6*d.*
2834 m	= 0·5	Newfoundland, west coast:—Bear head to Cow head. 2*s.* 6*d.*
2064 m	= {2·0, 5·8}	Newfoundland, west coast:—Shallow bay to Gun point, including Cowhead harbour and St. Paul's bay and inlet, Portland Cove. 2*s.*
2993 m	= var.	Plans on the coast of Chile:—Manao bay, Port Huelhue and Linao bay, Port Huite, Port Quellon. Ancud bay, Port Quemchi. 1*s.* 6*d.*
1717 m	= 7·0	United States, west coast:—Port Angeles. 1*s.*
2981 m	= 0·65	Yezo island, west coast:—Furubira Wan to Ishikari Gawa. 1*s.* 6*d.*

2975 m = var. Anchorages on the west coast of Yezo island:—Oshidomari or Nakko bay, Iwanai anchorage, Yessabi anchorage. 1s. 6d.
1587 m = 3·0 Japan:—Yawatahama harbour, with the adjacent harbours and bays. 2s. 6d.
2984 m = 1·9 Australia, south coast:—Esperance bay and approaches. 2s. 6d.
1509 m = 7·8 Harbours and anchorages in South island of New Zealand:—Picton harbour. 1s. 6d.
463 Ports and anchorages in the Gulf of Corinth:—Plans added, Aspra Spitia bay, Zalitza bay.

(*J. D. Potter, agent.*)

Charts Cancelled.

No.		Cancelled by	No.
1587	Valona bay.	New Chart.	
1589	Port Palermo	Valona bay, Port Palermo	1589
712	Cowhead harbour.	New Chart. Shallow bay to Gun point	2064

Charts that have received Important Corrections.

No. 2296, Gulf of Bothnia:—South Quarken to Hornslandet. 2302, Gulf of Bothnia:—Tome point to Tauro. 2300, Gulf of Bothnia:—Stierno point to Fläderäg. 2643, France, west coast:—Raz de Sein to Gouiven. 2690, France, west coast:—Brest roadstead. 445, Black sea:—Pyrgos or Burghaz bay. 1569, Africa, north coast:—Approaches to Benzert. 1573, Central America:—Honduras gulf. 2522, South America, east coast:—Santa Catharina island to Rio de la Plata. 887, Magellan strait:—English, Crooked, Long, and Sea reaches. 477, Chile:—Trinidad channel. 465, Plans on the coast of Chile. 1936, Islands in the North Pacific ocean. 717, British Columbia:—Kyuquot sound. 1862, Africa, west coast:—Lekki to river Dodo. 1002, Madagascar:—Diego Suarez bay to Andranoaombi bay. 830, Bay of Bengal:—Bassien river to Pulo Penang. 70, Bay of Bengal. 829, Bay of Bengal:—Coconada to Bassein river. 823, Bay of Bengal, east coast:—Koronge island to White point, etc. 1789, Malacca strait:—Channel between Sumatra and Linga, etc. 2757, Banka strait to Singapore. 942a, Eastern archipelago, eastern portion. 935, Eastern archipelago:—Harbours and anchorages between Bali and Timor. 264, Cochin China:—Hué river entrance. 2412, Japan:—Amoy to Nagasaki. 518, Australia, west coast:—Shark bay. 1059, Australia, south coast:—Doubtful island bay to the head of the Great Australian bight. 2747a, Australia, south coast:—Port Philip entrance. 1171a, Australia, south coast:—Port Philip, southern sheet. 1475, Tasmania:—Port Arthur. 1079, Tasmania. 960, Tasmania:—Approaches to Hobart. 1423, New Zealand:—Port Nicholson. 1469, Solomon Islands:—Guadalcanar and Florida islands. 2226, New Hebrides:—Epi and adjacent islands.

(*J. D. Potter, agent.*)

PHOTOGRAPHS.

Costa Rica. **Pittier.**

Eight Photographs of the Guatuso Indians (Costa Rica), taken by Prof. Enrique Pittier. 1897. *Presented by Prof. Enrique Pittier.*

The following is a list of the photographs, which are chiefly interesting as showing a type of Indians about whom but little is known:—

(1) Guatuso-Indians, male, profile; (2) Male, profile; (3) Male, front view; (4) Female, front view; (5) Female, profile; (6) Male, front view; (7) Female, profile; (8) Female, front view.

Montenegro. **Kennedy.**

Seven Photographs of Montenegro, taken by the Hon. Mrs. Kennedy, 1897. *Presented by R. J. Kennedy, Esq., C.M.G.*

These photographs, of which the following is a list, are a welcome addition to the Society's collection:—

(1 and 2) Natives in the market-place of Cettinjé; (3) Native crowd before the Don at the old monastery at Cettinjé; (4) Dancing the "Hora;" (5) The monastery at Cettinjé, above the Skull Tower, where the heads of Turks killed in battle were exposed; (6) Prince Danilo, Crown Prince of Montenegro, at Cettinjé; (7) The British Legation, Cettinjé, on Jubilee Day, 1897.

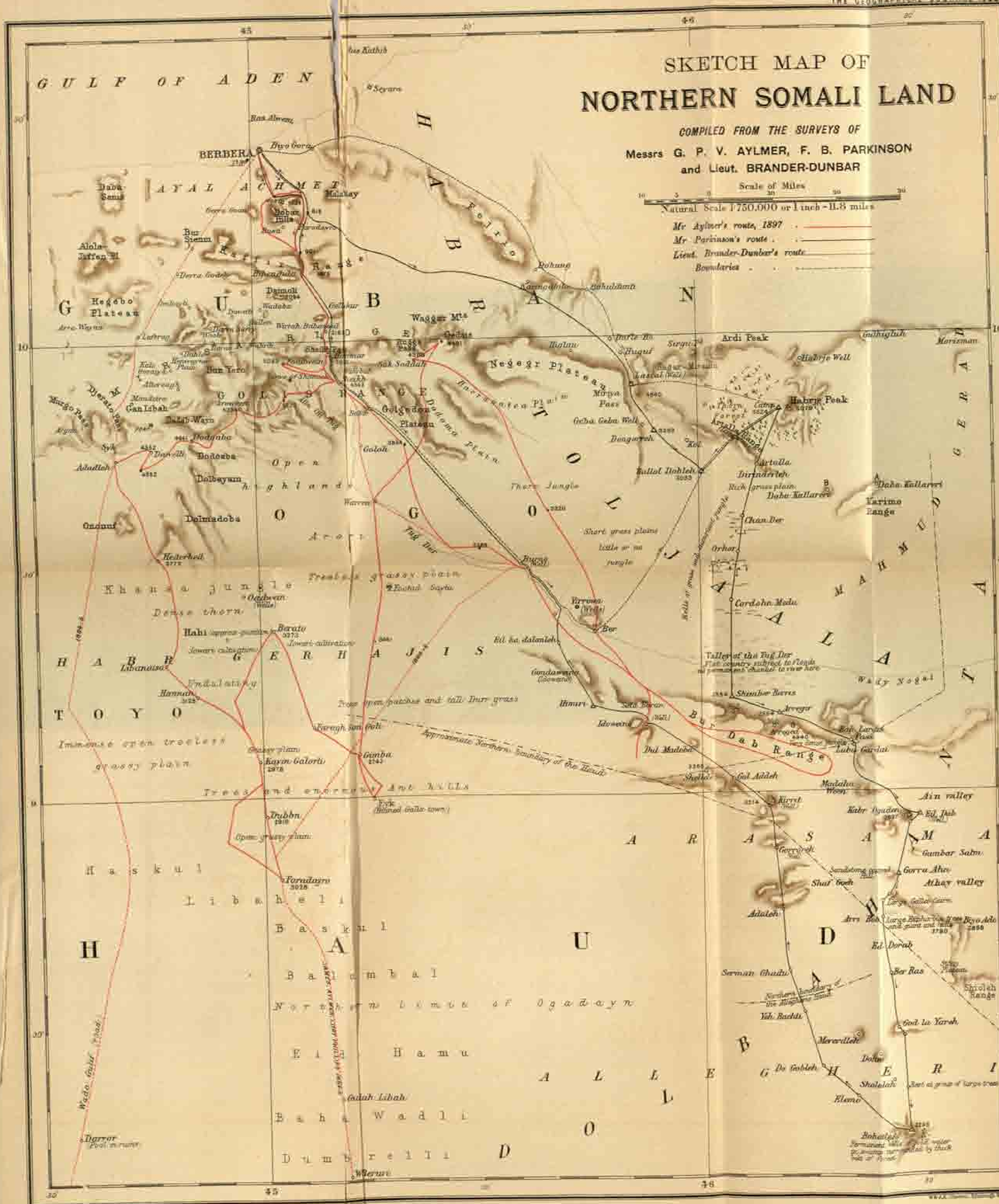
Morocco. **Macpherson.**

Sixty-eight Photographs of Morocco, taken by Surgeon-Major W. G. Macpherson, 1897. *Presented by Surgeon-Major W. G. Macpherson.*

As will be seen by the following list, these photographs include views of the principal points of interest, scenery, and ruins, in many parts of Morocco, and form a very valuable series:—

(1) Street leading to the Custom House, Tangier, from the Post Office; (2) The main street, Tangier; (3) Tents of Mecca pilgrims on the Soko, Tangier, awaiting embarkation; (4) Mogador, from the sea; (5) Mogador island, from the mainland; (6) Mogador, from the east side of the island; (7) Mogador, from the west side of the island; (8) A patio in the Mellah (Jews' quarter), Mogador; (9) Preparing mule-loads at Mogador previous to the departure of Sir A. Nicholson's Mission for Morocco city; (10) Sir A. Nicholson's camp at Sok-el-Arba, looking south over the Haha country; (11) Rain-water tank at Sok-el-Arba; (12) An Argan tree; (13) Sir A. Nicholson meeting the Shiadma tribe in the Argan forest; (14) A group of native musicians in the Miskála district; (15) Tribesmen getting ready for powder play at Sok-el-Jama-el-Kremát; (16) Group of tribesmen and Artin bushes at a surface pool on the road to Taftasht; (17) The Ain Omast, a spring close to the road on the fourth march from Mogador to Morocco; (18) Sir A. Nicholson crossing the Shasháwa river; (19) Kubba and camp of the Shereef of Tamshlott and Bubeker el Ganjáwi at Shasháwa, looking west; (19) Group in the Jews' quarter of a village on the east bank of the Shasháwa river; (20) Exterior of hovel in village on east bank of the Shasháwa river; (21) Kasbah or Kaid's house in a village on the Lemuri plain, looking towards the Great Atlas; (22) The Wad N'eefs, with thunderclouds gathering over the Atlas mountains; (23) Bridge and palm tree on the road approaching Morocco city from the south-west; (24) Panorama of the plain between Morocco city and the Atlas, with the tents of the Sultan's army outside the walls of the Maimunia garden; (25) Central pathway in the Maimunia, looking towards the pavilion in the centre of the garden (Morocco city); (26) View of Morocco city from the roof of the main building in the Maimunia; (27) Fountain and square outside the principal mosque (the mosque of the Kaid-el-Mouzzin), in the centre of the town, Morocco city; (28) Spanish falucho, Tangier bay; (29) Mazagan, from the sea; (30) The slave market, Morocco city—the alcoves are occupied by the slaves waiting to be sold by auction; (31) Central pathway in the Maimunia garden from the pavilion; (32) View of the Jibilat, on the way to Tamlelt; (33) Gateway and fountain at the western entrance to the Kasbah; (34) The Bab er Roub, principal gate in the southern wall of Morocco city; (35) The mosque of Mazzhen, in the Kasbah, near the Sultan's palace, Morocco city; (36) The approach to Morocco city from the south (from outside the west wall of the Agdal, or garden of the Sultan's palace); (37) The slave market, Morocco city—group of buyers; (38) Village and camp of Sir A. Nicholson's Mission at Burshid; (39) Unloading baggage of Sir A. Nicholson's Mission from lighter on north bank of the Meshra-el-Halluf, Oom-er-R'bia river; (40) Sir A. Nicholson's Mission approaching the Kasbah of the Kaid of Beni Mesquin; (41) Interior of the principal pavilion (Qobba), in the Kasbah of Beni Mesquin; (42) Patio of the principal pavilion in the Kasbah of Beni Mesquin, recently reduced to ruins by the tribe; (43) Sir A. Nicholson's Mission approaching Zeltat; (44) Sir A. Nicholson's camp at Taftasht, looking west; (45) The town of Kla, from the north, with the Jibilat range in the background; (46) Springs and watering-place in Zeltat; (47) Moorish tent (Qobba), in the Maimounia; (48) Watering-place, outside the south-west corner of Morocco city; (49) The mosque of the Kutubia (Morocco city), from the street approaching it on the south; (50) The Dukala mosque, from the west; (51) The Dukala mosque from the east; (52) The Bab-el-Khamis, northern entrance to Morocco city; (53) Old bridge and ravine outside the north-east corner of Morocco city; (54) The Dukala mosque as seen from a street leading to the centre of the town on the south of the mosque; (55) The Sultan riding outside the city of Morocco with his court; (56) The Sok-el-Jáma-el-Fená, near the Kutubia; (57) Mosque of Sidi M'salah, west façade, in the centre of Morocco city; (58) The saddle-cloth makers' bazaar, Morocco city; (59) The patio of the principal building in the Maimunia garden; (60) The Bab Hamár (red gate), eastern entrance to Morocco city through the Kasbah; (61) The Sok-el-Khamis, outside the northern gate, Morocco city; (62) Surface pool, mosque, and grassy hill at Tamlelt; (63) View of Jibilat on the north-west of the road to Kla; (64) Sir A. Nicholson's Mission inside the town of Kla; (65) Raft of skins crossing the Oom-er-R'bia at the Meshra-el-Hallouf; (66) Raft of skins on the south bank of Meshra-el-Hallouf, Oom-er-R'bia river.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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THREE YEARS' EXPLORATION IN FRANZ JOSEF LAND.*

By FREDERICK G. JACKSON.

It was in August, 1873, that the island group afterwards known as Franz Josef Land was first accidentally discovered by the Austro-Hungarian Expedition under the leadership of Weyprecht and Payer. In endeavouring to pass round the northern end of Novaya Zemlya to discover the North-east Passage, their ship, the *Tegetthoff*, became beset in the ice, and, after drifting for twelve months, they came in sight of an entirely new land, and the floe upon which the ship had been crushed up was frozen to the land-ice of Wilczek island. The following spring Payer made three plucky and adventurous journeys up and in the neighbourhood of what he then named Austria sound. After a hard and perilous journey, they were able to beat a retreat to Novaya Zemlya in boats, leaving the ship to its fate on the shores of Franz Josef Land, being quite of opinion that the country was unapproachable by ordinary methods. Payer had reached the latitude of 82° 5′ north, and was under the impression that he had seen land still further to the north in and beyond the 83rd degree, and land to the north-west reaching almost as far. It was upon these observations that arctic authorities advocated this route as the best for exploring to the northward, and upon which I based my plans in the latter end of 1892. Unfortunately, our expectations in this respect were fated to disappointment by the non-extension of land to the north, and we had not been long in Franz Josef Land before we discovered that, instead of this region being of continental dimensions, as many supposed it to be, it is only an archipelago of comparatively small islands; and this

* Paper read at the Royal Geographical Society, November 8, 1897. Map, p. 212.

unfortunately quite upset the basis upon which my plans for pushing north were founded, which were to follow the land, and form depôts of provisions as far as it extended.

Mr. Leigh Smith, in 1880 and 1881, visited Franz Josef Land, and continued Payer's discoveries westward; but all this is well known.

It was in the latter end of 1892 that I first published my plans, which, I am glad to say, met with the approval of most arctic authorities. These embraced not only an advance in a northerly direction, but mapping-in of the coast-lines of Franz Josef Land, a thorough examination of that country, taking scientific observations, and making collections generally. These plans we have been able to carry out; and scientific observations, which I think I may be excused for describing as valuable, have been carried on uninterruptedly for three years. We have also practically completed the map of Franz Josef Land, and settled the Gillis Land question.

For some time the sinews of war were conspicuous by their absence, and little encouragement given to my expedition. Consequently, in 1893 I determined to take a journey to Yugor straits, with the object of exploring Waigatz island, and the Bolshoya Zemelskja tundra country to the south of it, and at the same time thoroughly test the equipment which I intended to use in Franz Josef Land. This I accomplished, extending my journey round the White sea and through Lapland, to enable me to see something of the methods of the Lapps, in addition to those of the Samoyeds, with whom I had been travelling. It was on this journey that I became acquainted with reindeer as draught animals, and also fell in with the hardy Russian ponies which did us such sovereign service in the Franz Josef Land expedition, and I should consider the trouble of that former journey amply repaid if meeting with these horses had been its only result. Horses can be used to very great advantage in arctic exploration, and I am more than satisfied with the results of my experiments with them. At Archangel I received a telegram to return immediately, as Mr. Alfred Harmsworth generously offered to provide the necessary and long-sought funds for my proposed expedition. I considered, however, that I was serving the interests of the expedition best by returning by the rather longer way, *viâ* the White sea and through Lapland.

The next five months were spent in hurried preparations. After my return to London, the *Windward* was bought and alterations effected. A log-hut was ordered and erected at Archangel, and furs purchased there for us by the energy and kindness of Mr. Henry Cooke, H.M.'s vice-consul. Sledges, ski, etc., and more furs were obtained for us in Norway by Mr. Alexander Nansen, the brother of the explorer, and Mr. Joseph Jeaffreson. Tinned foods of all kinds were selected with the help of Mr. Harkness, of Somerset House, and examined by me; but I relied largely upon obtaining fresh meat in Franz Josef Land by shooting bears and walrus, as I consider fresh meat to be one of the greatest factors in procuring health. This expectation, I am glad to say, has been entirely fulfilled. With the help and advice of our medical man, Dr. Koettlitz, I am glad to be able to say that in three years not one of us had an hour's illness, and I never knew a single man knock off work on account of indisposition during that time. Through the help and advice of Dr. Koettlitz, all tinned meats used were carefully examined, either by him or myself, before being placed on the table, and anything in the least degree tainted was rejected, and placed on the roof to be out of the reach of the dogs. All water used for drink or in food was boiled, exercise was regularly taken daily, and, in addition to all this, we were always busy.

There is a popular impression that people in the arctic lead a life of hibernation, except when actually engaged in sledging; but such was certainly not the case with us, and I can safely say we were as busy, with scientific observations of all kinds, and work incidental to our life, as any men could be. It is to this I attribute our good health, and the happiness and cheerfulness of the party. I do not propose to dwell on our first two years in Franz Josef Land, as an account of the work done during these years has already been published in the *Geographical Journal* by Mr. Montefiore Brice.*

We left the Thames on July 12, 1894, in the steam-yacht *Windward*, calling at Archangel for our hut and furs, meeting with great kindness from everybody, from the governor downwards. Then we proceeded east, skirting the northern shores of Kolguev island to Khabarova, a Samoyed settlement on the Yugor straits, to take on board some fresh reindeer meat and our thirty dogs, which had been procured and brought there by a German named Ravin from the Obb river in Western Siberia. We then steamed north through the Barents sea, making for Bell island, Franz Josef Land. We found the ice lying exceedingly close to the eastward; but by keeping along the edge of the tight pack we followed a wide lane of water trending north in the direction of Cape Grant. On August 25 we sighted land in the neighbourhood of Cape Grant, being about 40 miles distant, but there our lead of water came to an end. Nothing but a tight pack, without a streak of water in it, lay between us and the land. For a fortnight we dodged about, endeavouring to get round to the back of the pack, but without success. Winter was rapidly coming on, bay ice was forming upon the sea, and we were being drifted to the westward. Things looked anything but promising, owing to the lateness of the season. However, fortunately a south-westerly gale sprang up, which opened up the ice, and on September 7 let us through into the land-water.

* *Geographical Journal*, vol. vi. p. 499; vol. viii. p. 543.

Meteorological, zoological, and other observations had been taken throughout the voyage. Eira harbour we found full of ice, so we steamed up Miers' channel, and looked for a suitable spot for putting up the hut and passing the winter. We here discovered a small island, a mile in length and half a mile in breadth, separated by half a mile of water from Bruce island, and consisting chiefly of weathered basaltic rocks. This I named Windward island—after our ship. Finding no suitable spot in this direction, we then steamed past the floe-edge to Cape Barents, which proved equally inhospitable. Here the rock consists mainly of columnar basalt. Collections of everything of scientific interest and observations of all kinds were made, and taken whenever possible; and our botanist, Mr. Harry Fisher, first found the curious vegetable life the alga, popularly called "red snow."

At this point I will endeavour to describe to you the general appearance of Franz Josef land. The mass of islands of which it is comprised consists of high glacier-land, rising to 2000 feet, covered with an ice-cap some hundreds of feet in thickness, and fronted along the shore by high perpendicular glacier faces, from 30 to 80 feet in height. At rare intervals high black basaltic rocks jut out of the ice near the shore, forming the only conspicuous landmarks. In front of these rocks the broken-down *débris* from the cliffs has formed a plateau or shore, upon which a certain amount of stunted arctic vegetation exists. Here may be found a few poppies, saxifrages, mosses, lichens, etc. Nothing grows higher than 6 inches from the ground. Everywhere else, with the exception of a few low islands, the ice-sheet dominates. Thick mists generally overhang this land; violent gales are frequent, combined with heavily falling and driving snow.

Finding no suitable site for our hut, we returned to Cape Flora, a high basaltic cape 1400 feet high, beneath which we pitched our camp, as being the most favourable spot we had yet seen, one of the strongest inducements being the presence of a large loomery in the high rocks, and the known presence of bears and walruses throughout the year. On September 8, after selecting as favourable a position as possible for the ship, we set to work to get our stores, etc., ashore, all hands working sixteen hours on and eight hours off, as I was anxious, if possible, to get the ship away again that autumn. The winter, however, came on with great rapidity, and three days afterwards the *Windward* was effectually frozen in for the winter. She was lying well out of reach of the driving pack, moving to the east with the flood-tide, and the west with the ebb. The current constantly moves in a westerly direction; the rise and fall off Cape Flora is about 17 inches, with a 3 to 4 knot flood-tide. She was also protected by two grounded bergs and an old floe to the eastward, together with a projecting rocky point. I did not, however, look upon her position as being too safe; but it was "Hobson's choice."

We at once set to work to shoot bears and walruses for the winter, to put up our log-hut—which I named "Elmwood"—and to make ourselves as comfortable as circumstances would allow. Our dogs, once landed, soon gave evidence that they had been on company behaviour when on board the ship. Carlo, a big retriever given me by Mrs. Harmsworth, opened the ball by killing one of the Ostiak dogs. He swaggered about among the pack, and exhibited all the supposed characteristics of the Britisher abroad. To check his homicidal, or rather canicidal, proclivities, I tied the dead dog round his neck. This, however, he evidently viewed as an excellent arrangement, especially devised for the arctic, where the food-supply is defective, and at once

WESTERN SIDE OF BRITISH CHANNEL. MARCH, 1897.

proceeded to make a cold lunch off his late adversary, looking up to me with grateful eyes, evidently thinking that it was very considerate of Jackson thus to provide him a larder right at hand. After this the dead dog was removed, and Carlo was always decorated with a muzzle. I afterwards made a good sledge-dog of him, but he could not stand the severe climate; and although the doctor made a blanket-coat for him, the poor old chap died sledging during the first fortnight in spite of it.

The rest of the pack were hardly less bellicose, but conducted their battles on lines hardly in accordance with civilized warfare. With the exception of two or three dogs, I always had the entire pack chained up, having taken out a large supply of English chains; but I found these quite inadequate to restrain these comparatively small dogs. One dog would break loose, and then commence a fight with another. The whole pack would become wildly excited, and one chain after another would snap, and all would then fall upon the losing combatant. The result would be another dead dog.

Our first anxiety, after putting up the house and getting the provisions ashore, was to obtain a sufficient quantity of fresh meat to keep ourselves and the crew of the *Windward* supplied throughout the winter. This we were fortunately able to do, and soon after the darkness closed in our larder was stocked with bears and walruses. Our hut was 20 feet long by 20 feet broad, 7 feet in height, double windows and roof, and consisted of pine logs a foot in diameter. Having some green baize with us, we used it for lining the walls, which gave the house an exceedingly snug appearance. We slept on the floor on skins, and made extra chairs out of old packing-cases, etc. It was quite comfortable, though hardly luxurious. During the winter meteorological observations were taken every two hours day and night, and for this reason we divided the time into watches. Mr. Armitage also took regular magnetic observations. In the autumn collections and examinations of the country were made, so far as time and opportunity admitted. Throughout the winter we were exceedingly busy making preparations for the following spring sledging, and with various jobs incidental to our life in the arctic, such as feeding and attending to the horses and dogs, and skinning bears and walruses, washing our clothes, and domestic duties generally. On the return of the sun, about the middle of February, we got ready to start, and on March 9 Mr. Armitage and I took a preliminary journey with the object of making a depôt of provisions to the north, and ascertaining the character of the travelling in that direction. Soon after our return, a severe gale of wind from the eastward broke up the ice in which the ship was frozen in, and for some time she was in considerable peril. This and other circumstances somewhat delayed our second departure. In the beginning of April, however, we started on our first march with three ponies and a number of sledges, being accompanied for the first week by Dr. Koettlitz and young Hayward, with one pony and sledges. But for details of this and subsequent journeys in 1895, I must again refer to the *Journal* of 1895, vol. vii. p. 499 *et seq*.

Returning from our summer journey, we reached Cape Flora on August 12, after being away thirty-three days, just in the nick of time, as on the following day the sea had become so full of ice that it would have been exceedingly difficult, if not impossible, to take the boat from Bell island. Observations for latitude and longitude were taken on all spots landed upon, and geological, botanical, and other collections and examinations were made. Meteorological observations were also taken throughout the journey, the heights of the various capes determined, and Cambridge bay and a little new country to the west were mapped in. As soon as we returned, we devoted our attention to getting ready for the winter. I shot nearly 1300 looms, which we hung up round the house, and which remained frozen for the next nine months. A quantity of scurvy-grass was collected, which was placed in a berg, and also frozen, thus providing us with fresh salad twice, and sometimes three times, a week throughout the winter. The winter was passed comfortably and happily. We were busy the whole time with meteorological and other observations, which were taken every two hours day and night, in working out our bearings, etc., mapping and plotting out the map, and making preparations for the spring sledging.

Early in the following March (1896), Armitage, Blonkvist, and I again got under way, taking a team of dogs and one pony, for the latter

CAPE WILLIAM BRUCE AND CAMP. MARCH, 1897.

of which we had made snow-boots, which I found exceedingly satisfactory, keeping her from sinking into the snow. We pushed north through what I decided to name the British channel, correcting and adding to our map of the previous year, and mapping in Koettlitz island. I must again refer, for the details of this year's work, to the *Geographical Journal*, vol. viii. p. 543 *et seq.* For the first week, I may say, we advanced at a good rate of speed, and we—that is, Blonkvist, Armitage, and I—were all jubilant at the prospect of reaching a high latitude. Our hopes, however, were short-lived, for on the morning of April 6, after moving half a mile from camp in dense mist and snow, we were suddenly confronted with a large open sea of water, with nothing but exceedingly thin bay ice upon it. To endeavour to get round this we edged away to the south-east, and when the sky cleared on the following morning we found ourselves encamped close to Cape Richthofen, in Alec Tweedie bay. This cape Mr. Armitage and I ascended. Again no Richthofen peak was visible in any direction, or anything approaching to the dignity of a mountain. Open sea lay before us, reaching from the high glacier-face below us to the western side of the British channel, where the water washed the ice precipices on that side. No ice could be seen except one solitary floating berg, the pack-ice having been driven off shore and clean out of sight by south-west winds. This endorsed my previous opinion that no land of any size lay to the north-west, and quite put out of my mind that King Oscar Land would be of any service as a means of getting north. A portion of this open sea near the land a few weeks later, owing to a fall of temperature, became frozen over, but at this period it was quite impassable. Boats at this time of the year are quite useless, as they would quickly become frozen in amongst ice that one can neither row through nor walk over.

Having completed our task, we returned to the hut on Cape Flora. Meteorological observations were taken throughout the journey. Mr. Armitage took observations for position whenever the sky was sufficiently clear. Botanical, geological, and other collections were made whenever possible, and a considerable amount more coast-line was added to the maps. Franz Josef Land being chiefly basaltic, local attraction of the magnet was often considerable. The country in the neighbourhood of Markham, Vesey Hamilton, and Allan Young sounds consists of high basaltic cliffs, with high country behind entirely covered with ice. Scott Keltie island is quite devoid of ice; so likewise is a portion of Koettlitz island. Here and there, where the land is low and out of the sweep of the glaciers, the country is bare of ice; but, with the exception of these isolated spots, the whole country is glaciated, and a more arctic-looking country it is impossible to imagine. The western side of the British channel is one large glacier, and from Cape Forbes, Nightingale sound, to Cape John Murray, not even an isolated rock can be seen.

On our return to Cape Flora, we set to work to sledge driftwood from Cape Gertrude, 4 miles distant, most of which was very old, and had probably lain there some thousands of years, to judge by its position above sea-level. Our coal was running short, we only had a little dust remaining; so the driftwood mixed with blubber did good service for the stove.

Throughout the following autumn and winter we were always busy with our scientific work, preparing for the spring journeys and other tasks incidental to our life in the arctic. Tents were made, a canvas canoe, pony snow-boots, and so on.

In March, 1897, Armitage and I started with a team of thirteen dogs, the remnants of our pack, and our surviving pony. Our draught-power had become reduced to a low ebb, and we greatly regretted we had not more dogs or ponies at our disposal. We pushed north up the British channel to go round the western land, to determine its limits, and, if possible, to settle the Gillis Land question. At an early stage in our journey our difficulties began. The pony broke loose the second night out, and, unfortunately, gorged herself with dried vegetables. These, together with dog-biscuits and a few pounds of oats saved from the previous sledging, were her usual fodder, owing to the lack of legitimate horse-food, which had quite run out more than twelve months before. As I expected, the surfeit of dried vegetables brought on a serious illness, to remedy which Armitage and I clubbed together the small supply of pills which we had with us. He produced, I think,

CAPE CECIL HARMSWORTH (AFTER LOSS OF PROVISIONS). MAY, 1897.

two varieties of pills, and I had a number of podophyllin; so we made up a dose of twenty-two in all, which I administered to our invalid pony, mixed up in some frozen fat from our frying-pan. This, I am glad to say, had the desired effect of, at all events, partly restoring her to health; and if I could have fed her upon oats or any legitimate horse-food, she would, I think, be alive now. The weather from the very outset was remarkably bad. Gales of wind, dense mist, and driving snow were almost constant. The floes were very heavy with deep snow, which, together with crushed-up, trappy ice, made travelling bad. Even at this early stage of the journey we had to go three times over the ground. Our pony, poor animal, owing to her illness, went very badly, and frequently lay down in the snow and refused to move. Armitage and

I would then take on separate loads with the dogs, and return for the others. During a very clear interval we found that Peterhead curves round further west than I had previously supposed. Nothing but glacier-face lined the coast, and the ice flowed down in curving lines as far as the eye could reach. Not even a bare stone was visible.

On the march we rounded Cape John Murray, which is about 300 feet in height, in a fresh gale. This I ascended, and found strewn with boulders, indicative of a raised beach. On that day we used sails on our sledges; it was the only day throughout the journey that we got a wind in our favour. On March 27 a new fjord appeared in view, with high basaltic rock, chiefly consisting of columnar basalt, jutting out of the glaciated land at its southern entrance. This I named St. Chad's Head. The cape appeared to consist of nothing but basalt. It is 400 feet high. I carefully searched, so far as the time of year would allow, for anything of botanical, geological, or other interest; but only found a few mosses and lichens, and a single saxifrage. Leaving Mr. Armitage to form a camp, I went off on my ski and took bearings from the summit and a number of photographs. At the western end of the bay the water appeared to run out, which observation was further strengthened by a view which we got some days later on the northern side, thus making an island of the land to the north, which I named after Albert Armitage, our astronomical observer. We then pushed on to a bold headland, which I named Cape William Bruce, after our zoologist. Capes Richthofen, Albert Markham, and Fisher were visible in the distance, and Cape McClintock dimly so. The position of Capes Richthofen and Fisher, being fixed astronomically by us previously, were of great help to me in mapping out this western coast-line, as they gave exceedingly good cross-bearings.

On March 28 we rounded Cape William Bruce, which also consists of basalt, some of which is columnar, and is 500 feet high. I ascended this cape while Mr. Armitage struck the camp, taking my camera, prismatic compass and stand, and other instruments with me. On the summit I took a round of angles and a number of photographs. I also made a cairn of stones, placing among the rocks a tin containing a record, a Union Jack, and a penny-piece, and on the top of the cairn another "Jack" on a bamboo staff. From the summit I could see plainly Mary Elizabeth island, Cape McClintock, and the surrounding coast. To the north I could make out two islands and a portion of a third, which appeared to be entirely ice-clad. To the west-south-west the land was very ill defined, which I found later was due to the exceeding lowness of the northern coast. It was, moreover, misty in that direction, and thus obliterated any definite view. To the north-west I could see the floes in a broken-up condition, with large pools of open water.

When detained by bad weather off Cape William Bruce, our second dog died, being simply frozen to death. I had examined them all an hour or two previously, and they appeared to be all right. A little later I found one dog frozen as hard as a rock, and another one frozen down, which I had to hack out of the ice to get free. The weather became, if possible, worse than ever. Gales of wind and driving snow gave us no rest, with dense mist and temperatures as low as minus 46°. I saw a few rotges and dovekies flying about these rocks; collected a few mosses and lichens and one saxifrage, and in the tide-crack a piece of laminaria. The isolated bare spots of this side of the British channel appear to be very barren, scantily supplied with vegetation, and bird and animal life deficient. Since leaving Elmwood we had only seen one track of a bear. After being detained three days by persistent gales, we marched towards the neck of low land connecting the two portions of Albert Armitage island, but, finding the travelling over this land less favourable than I had anticipated, we determined to retrace our steps a few miles, and go to the north of it by rounding Cape Battenberg. We continued our march along the north-western coast, which we soon found to be low, without the high basaltic rocks which are such a conspicuous feature on the southern coast. On April 7 we reached the head of what we soon discovered to be Cambridge bay. We had been travelling along low undulating ground, which bore evidences of being an old beach, and had driftwood upon it. At this point the severe weather had killed all our dogs but five, and these were in a weak condition. The following morning I went on ski on to the ice of Cambridge bay, and took bearings and photographs of conspicuous points. Cambridge bay, I believe, runs out at its north-east corner, although I could not absolutely see the ice right through the narrow straits, but there is little doubt in my mind that it does so. Armitage took here an observation for double altitudes; and after packing up we continued our march with the pony—which was very weak and went badly—and our five remaining dogs. We still continued our march along the low land, and on the 10th were confronted by open water coming right up to the glacier face, which at this point began again. This obliged us to take to the high glacier land, and on the following morning we commenced what was a very laborious task, that of dragging the sledges up the steep incline on to the glacier itself. This day we nearly lost our pony and two sledges. Suddenly, without warning or any indication on the surface to show its presence, the pony dropped all four legs into a crevasse, and lay suspended over a deep black abyss upon a bridge of snow. Fortunately, she was too frightened to struggle, otherwise both she and the sledges would have disappeared. But luckily she did not move a muscle. Armitage, seeing what had happened, at once came to my assistance, but unfortunately stepped off his ski to give me a hand, and at once dropped in above his hips. Fortunately, he got out while I was endeavouring to hold the pony up. We passed a line round her neck, and managed to extricate her from her perilous position. She had hardly gone another hundred yards before she dropped both hind legs down a similar chasm. There was nothing whatever on the surface to indicate the treacherous character of the glacier we were travelling upon—not even a slight depression in the snow. When we pitched our camp for the night, I carefully sounded all round the immediate neighbourhood, to endeavour to ascertain the presence of crevasses.

The bad weather still pursued us, and kept us in camp for the next three days. This gave the finishing touch to our poor pony. On the evening of the second day, when in the tent, I heard her struggling to get upon her feet. I went out to render assistance, in which Mr. Armitage shortly afterwards joined me. We tried for an hour to get her upon her legs, but found her too weak to stand. I then knew it was all over with her. We tucked her up as comfortably as we could in her blanket-coat, and gave her the last handful of oats, kept for an emergency. This was the end of her. Next morning I found her quite dead, and frozen hard. We both of us felt very sad about it. The old pony had become a great pet with us, and at the hut we viewed her as quite one of the family. In addition to that, with her died more than half our draught-power.

When the weather had cleared, we set to work to pick out the most necessary articles for our journey, and discarded everything not absolutely essential. Three sledges were left behind, in addition to a quantity of our equipment. We then continued our march, struggling up the steep glacier-slopes; but soon found that we were obliged to go at least three times over the ground to get along at all, and that with considerable labour. I hauled in front of the dogs, and led the way. Armitage urged them on by shouting and yelling, and, whenever there was a check—which occurred every 5 or 10 yards—by hauling and tugging at the sledges to start the team again. We had at this period two canoes, in addition to our tent, other equipment, and food, and with only five dogs it was not easy to get along at all. The mists now became exceedingly dense, so much so that I do not exaggerate when I say that on many occasions we could not see beyond the points of our ski with anything approaching distinctness. The frost-rime was also exceedingly troublesome. It coated our equipments and clothes with ice, and every morning before we broke up camp we had to remove ice 3 to 4 inches in thickness from our belongings. Our furs, too, and clothes got wet from the great fluctuations in temperature. When sitting in our tent with furs on, all this ice turned to water, and as soon as we went outside, our clothes became as stiff as sheets of iron. Occasionally we would get exceedingly clear intervals of an hour or two, and from an altitude of 1450 feet I could see no land whatever off the coast. Gillis Land, I was convinced, does not exist anywhere near the position assigned to it on the charts.

We would march for half a day, or possibly one day; then would come a driving gale and dense snow from the south-east, which would no sooner cease than back the wind would come from the north-west. This would go on for three, or even four, days at a time, when we would start again, and after another similar interval of fine weather the dose would be repeated. On the 19th we endeavoured to reach the sea-ice, being utterly tired of the charming conditions we found at the high altitude of the glacier. I ran down on ski to the head of Nordenskjöld bay, having crossed behind Cape Mary Harmsworth, which we found to be the most westerly point of Franz Josef Land. I, however, found that the sea-ice was in a broken-up condition, so we had to continue our march over the top of Cape Lofley, when I again went forward to reconnoitre. We fortunately found a certain amount of fast ice at the head of Weyprecht bay, and that night we camped at the edge of the glacier-face, heartily glad to be off that horrible glacier country. The next two days were occupied in crossing this bay, the ice of which was in an exceedingly tumbled-up condition. We soon found, however, that it was impossible to round Cape Ludlow, owing to the broken-up state of the ice right up to the glacier-face. There was nothing for it but to strike up Weyprecht bay, and take to the glacier again. This we did by hauling our sledges by purchase up the perpendicular glacier-face, aided by a snowdrift. Here again bad weather promptly checked us. For three days we were camped on the top of Cape Ludlow, and here we got the first bear that we had seen since we

CAPE CROWTHER: CAMP AND BOAT. JULY, 1897.

left the hut six weeks before. The blubber came in very handy in a fat-lamp which I made out of a tin for cooking purposes. We were glad of the kill in many respects, for we were uncomfortably short of many things. Our spirit, which we used as fuel, was almost exhausted; and the meat itself was a great addition to our larder. The dogs, too, were all the better for the feast they now enjoyed. We continued our climb up the glacier, and after travelling for a day we were again stopped by a gale of wind which blew to the strength of a whole gale, cutting the snow off the cloth of the tent, and blowing up one side of it, and so filling the tent with snow. We had to put up with this unpleasant condition of things the greater part of one day, as we could not open the tent to go outside and make it fast, lest it should be blown away. As soon as it cleared, I took bearings and photographs of the surrounding country, and then we started off down the glacier on our way for Cape Neale. We got down on to sea-ice after some considerable trouble, and had to go a long way towards the head of Cambridge bay before we could find a low-enough portion of the glacier-face to enable us to reach the floe.

The bad weather had been so exceedingly persistent that I found it was necessary to utilize every fine moment accorded us, and on many occasions we marched for twenty-four hours at a stretch, and on one or two occasions literally from the time one gale ceased until another one began. In Cambridge bay and all round Capes Neale and Crowther, we met with the roughest and most crushed-up ice that I had ever seen anywhere. Taking on single sledges and retracing our steps was the constant order of the day. We left behind one of the canoes in Weyprecht bay, as we found it quite impossible to get along with it, and we had to trust to not requiring it.

Upon Cape Neale, in 1895, we had placed no less than four cairns with records, but we found, on visiting them again, that the bears had broken off all the flags that had flown above them. We left another record, and a "Jack" enclosed in a tin in a cairn on the shore, and then continued our journey. At Cape Crowther we were again detained for three days by bad weather, and then pushed across Gray bay. We again found ourselves cut off by open water on nearing Cape Grant, and it was not until we neared the head of Gray bay that we found even a possible drift to help us up the steep glacier-face of 50 feet. We hauled our sledges up by purchase with great difficulty, and again began our climb up the steep glacier behind Cape Grant. The following day we descended on to the ice at the head of Josephine Peary bay. Open water extended some distance into Nightingale sound. Upon Cape Stephen we stopped for a few minutes for lunch, and after a march of twenty-four hours reached Eira House, which Mr. Smith had erected upon Bell island in 1882. We arrived here at 11 a.m. on June 5. Four hours afterwards we were joined by Dr. Koettlitz and Messrs.

Bruce and Wilton, who, having become uneasy through our being ten days overdue, had started off to meet us with a sledge of provisions. We had succeeded in defining the extent of western Franz Josef Land, mapped in its shores, and had established the non-existence of Gillis land. Mr. Armitage had been most assiduous in taking regular meteorological observations throughout the journey, and had taken astronomical observations of position whenever the conditions were at all suitable. We were away for two months, but only got thirteen and a half tolerably fine days.

After staying for ten days at our hut to refit and break in two puppies and three small bitches for sledging (I was obliged to press

CAIRN ON SPIT OF CAPE MARY HARMSWORTH. AUGUST, 1897.

these very unsuitable animals into the service owing to the dearth of draught-animals), my intentions were to go east as far as Brady island and complete the odds and ends of unmapped coast in that direction. On nearing the high cape at the south-east corner of Hooker island, the ice became exceedingly thin; but, owing to the fact that it was, and had been, snowing heavily all day, the extremely treacherous nature of the ice was not clearly discernible. When within 400 yards of the shore, our sledge broke through the ice from stem to stern. I attempted to step off my ski to get a better purchase in hauling it out, but found that the ice was so thin that it would not bear my weight without them, and when trying to haul in my snowshoes the extra pressure so weighed down the ice that I had to desist. We had brought no canoe or boat, as we had insufficient draught-power to haul it. Mr. Armitage and I managed to get a few things from the rear of the sledge by cutting open the sledge-bags; but the provisions, being in bags weighing from 50 to 70 lbs. apiece when dry, had now become exceedingly heavy, owing to the water in them. The sledge finally turned over, and all the provisions, with the exception of a handful put out for lunch, went to the bottom, and all our cartridges were soaked with water. I was still reluctant to be defeated at the last moment, and endeavoured, by approaching Hooker island further to the westward, to reach the glacier, and thus ascend Cape Cecil Harmsworth, and map in the surrounding country from there. We soon found, on approaching the shore, that rotten ice intervened and stopped us. Having no provisions, and the road to the east being completely cut off, there was nothing for it but to return; and to avoid, as far as possible, the inconvenience arising from shortness of food, we marched for 25¾ hours at one stretch, and covered 41½ miles. The following day we marched 20 more miles back to the hut.

In July the *Windward* arrived, and I then found that it was impossible for any of us to remain longer, as Mr. Harmsworth did not wish to send out the ship again. On our way home, owing to the enterprise and good nature of Captain Brown, we were able to steam round Cape Mary Harmsworth, where, on the spit beyond the icy portion of the cape, we discovered a large breeding-place of the ivory gull, where literally they were nesting in hundreds upon the ground. We here made many collections of scientific importance, and then steamed 50 miles to the north-west of Cape Mary Harmsworth without seeing a sign of land. I also took photographs of the whole coast-line, including Cape Ludlow, Cape Lofley, and Cape Mary Harmsworth. I was anxious to endorse the opinion I had formed during the spring sledging of 1897 that Gillis Land does not exist, knowing how hard land dies supposed to have been once seen. However, in addition to no land being seen at our furthest point to the north-west, we obtained soundings in 223 fathoms. We then steamed through open water, with no land in sight, towards the easternmost of the Johannessen islands, passing within 10 miles of the supposed coast. We could still see no land; neither is there a chain of islands, as has been supposed in some quarters, reaching from Franz Josef Land to Spitsbergen. This, I think, will set at rest any doubt as to the superiority of Spitsbergen, when compared with Novaya Zemlya, as a line of retreat from Franz Josef Land to civilization.

We continued our voyage to London, passing to the east of Hope island and Bear island. There was exceedingly little ice in the sea, and nothing whatever to stop even the *Windward* passing through. Such an open year I had never before seen.

So far from viewing Franz Josef Land as a favourable route to the pole, my experiences now lead me to believe it to be one of the worst, and although I have, in common with other arctic explorers, the greatest desire to stand upon that mathematical point, still I have no sympathy with an attempt to reach the pole as a mere athletic feat alone, but consider that geographical and other scientific work should always be included in the plan. Whatever our success may be, I will leave others to judge; but whatever success we have attained is entirely due to the hearty goodwill and devotion to duty of my companions. Mr. Armitage was our astronomical observer, and was also in charge of the meteorological observations. To him, also, is due the magnetic work. A better fellow in every way I could not have met with. Mr. Bruce was our zoologist, a work which, in that part of the world, is frequently carried on under circumstances the reverse of agreeable. It is no pleasant job to dabble in icy-cold water, with the thermometer some degrees below zero, or to plod in the summer through snow, slush, and mud many miles in search of animal life, as I have known Mr. Bruce frequently to do. Mr. Fisher, as you know well, is a most ardent botanist. To him are entirely due the satisfactory results in the botanical section. In many other ways, outside his special department, Mr. Fisher gave evidence of goodwill and energy. Dr. Koettlitz, in addition to being our medical man—to whom we owe the remarkable record of good health —was our geologist. In this, as in every other duty that Dr. Koettlitz had to perform, he was most untiring and conscientious. Mr. Wilton was our master of hounds. In this duty, as in every other, scientific or otherwise, he was most willing and hearty. Hayward undertook the arduous duties of cook at the hut, which office was anything but a sinecure. These gentlemen are present here to-night, and I have asked them each to say a few words with reference to their particular departments,* which I have barely myself touched upon, as I consider that men who do good work should be allowed to speak for themselves and share any honour there is.

I trust you will excuse the sketchy outline of this paper, but it is quite impossible to give, in the short space of an hour and a half, anything like an accurate idea of the journeys extending over a space of more than three years.

Our immunity from scurvy I attribute to the use of fresh meat, and to the care with which all tinned provisions were examined before being used. With proper precautions, I consider that any intelligent body of men may keep in good health in the arctic—at all events, for a certain time. The thing most to be dreaded is the peculiar mental effect that total seclusion from mankind produces. Although we were all as jolly and happy a party as ever went to the arctic, still we were all aware of the effect that the long cutting-off from civilization produces.

I cannot close this paper without referring to the good advice and

* These are printed as an Appendix to the paper.

assistance rendered to the Expedition and myself, from what I may be forgiven for describing as the "Old Guard of the Arctic," who in times past have so gallantly upheld British prestige within the polar area. To Sir Clements Markham, Sir Erasmus Ommanney, Sir Leopold M'Clintock, Admiral Markham, Sir Allen Young, Sir Vesey Hamilton, Mr. Leigh Smith, and many others whom I could mention, but time will not admit, I am indebted for much kindness and help; to Dr. Neale, who was with Mr. Smith on two of his voyages, for valuable assistance he has given me in many ways. I do not intend this as a list of acknowledgments, for I hope to be able to thank many others at no distant date.

The PRESIDENT: It now only remains for us to express our admiration of the way in which this expedition has been conducted, and more especially of the journey that was made by Mr. Jackson and Mr. Armitage in the present year. I think, and I believe that Sir Leopold M'Clintock and Sir George Nares will agree with me, that the journey round the western island of the Franz Josef group is amongst the most important that have been made in recent times. I do not exactly remember the greatest distance that Mr. Jackson walked; I think 41 miles in one day, and 20 in another. I recollect few marches of the kind in other arctic expeditions, although it is true that Jackson had not a very heavy weight to drag with him. I am sure you will carry with acclamation a vote of thanks to all connected with this expedition. I desire first to mention the name of Mr. Harmsworth. In the reign of Queen Elizabeth, when we had such long lists of men who did admirable work for their country, those who stood in the front rank of patriots were the men who sent out the arctic and other expeditions, like Sir Thomas Smith, the first chairman of the East India Co.; like Sanderson; like Sir Dudley Digges; and like Sir Felix Booth, who enabled the Rosses to discover Boothia. Mr. Harmsworth is a worthy successor of these patriotic merchant princes, and to him, first of all, our thanks are due. I must also mention the name of Mr. Montefiore Brice, who did such hard work in equipping and organizing the expedition; but above all our thanks are due to the gallant explorers. I now ask you to pass with acclamation this vote of thanks to Mr. Jackson and his companions, and also to Mr. Jackson himself, for the trouble he has taken in preparing his interesting paper, and showing us the series of views on the screen.

I beg to convey the thanks of the meeting to you, Mr. Jackson, and to your companions, the members of the expedition.

APPENDIX TO MR. JACKSON'S PAPER.

METEOROLOGICAL, MAGNETIC, AND ASTRONOMICAL OBSERVATIONS.

By Lieut. ARMITAGE.

OF course the results of the meteorological and magnetic observations have not yet been worked out by experts in those sciences, and I will confine myself to our practical work. During the whole of our stay in the north, we took four-hourly meteorological observations from 8 a.m. to 8 p.m., with the exception of the first two winters, when we made continuous two-hourly observations, which consisted of barometer, thermometer, and anemometer readings; observations of clouds, snowfall, the general appearance of the weather, and any phenomena that might occur. For the last year, at Mr. Bruce's suggestion, so long as the sun was above the horizon, he and I made observations of the rainband every day at noon, and generally found it conspicuous by its absence.

The movements of the ice, the opening and closing up of streams of water, their direction, and the extent of open water were also noted in the meteorological record. The prevalent winds were from an easterly direction, generally east by south, and east-south-east.

On only one occasion did we have more than light airs or winds from the south-west at our level at Elmwood, and that was in the summer of 1896, although I have frequently heard the wind from that direction blowing strongly among the cliffs 700 to 900 feet above us. Gales were unpleasantly frequent from every other direction, especially during the late autumn and winter months. On several occasions, after four or eight hours of light south-westerly airs, we would experience a furious blow from the north and north-east, as though the powers that be at the pole were determined that no intruder should invade their dominions. During our sledge journey, in the spring of this year, we experienced gales from the south-west on two occasions, while at Elmwood, some 40 miles south of us, they had calms and light airs.

On comparing some of my observations with those of Dr. Nansen, taken at his winter quarters 80 miles north of us, I found that he had often similar weather to us. We never had such low temperatures as many other expeditions; but with us wind was no respecter of cold, and it was not very uncommon to have a gale when the thermometer showed over 70° of frost. The temperatures were most erratic, and although the mean temperatures were, with one or two exceptions, fairly regular for the same months in different years, we have had differences of 60° in forty-eight hours. Our highest registered temperature was +43° Fahr., the lowest −54° Fahr.

I made a point, during the winter months, of noting down observations of the aurora borealis at the same time as I made my weather observations. From what I had read and heard of the brilliant northern lights, I must confess that, on the whole, I was disappointed by their display at Elmwood. As a general rule, the aurora consisted of faint straw-coloured bands or arches of light, stretching from the east through various altitudes to, or nearly to, the western horizon, often with streamers rising from them towards the zenith. Of course, on some occasions we had exceedingly brilliant displays, with a corona in the zenith, from which long streamers of many hues radiated, circling round the heavens, first in one direction and then in the other, gradually disappearing, and again approaching us, forming into many different fantastic shapes, until the eye was dazzled and the brain bewildered by what the poor Esquimaux may well have thought to be the shades of the departed. The most brilliant auroras occurred during calms or gales of wind. I have often listened intently to distinguish some sound from the aurora, but have never been able to do so, though on a very calm night the movements of the ice, the slightest sound being so audible, would lead one to believe that there was some. I have seen the aurora apparently so close as to be between the cliffs at the back of the house and myself, and have occasionally seen it bright enough to cast a shadow, and to eclipse stars below the third magnitude. On the latter occasions it also appeared very dense. It has also appeared to struggle up against a gale of wind, and be driven back to that point of the horizon from which it ascended, although at other times it has quickly covered the heavens, rising against a furious gale.

I made my magnetic observations in a wooden structure which had been specially built before our departure from England. It was warmed with lamps before I commenced work in it, for I found that the condensation of my breath on the instruments seriously interfered with the observations. The observations with the dip-circle for inclination were fairly regular and steady; but when observing for the horizontal force and declination, the needle was often most erratic in its motions—so much so, that I have sometimes had to discontinue the observation. This most frequently occurred when there was much display of aurora, and has, on occasion, been succeeded by a violent gale of wind. With regard to my observations for position, I will only say that, in my opinion, a small theodolite is most necessary for travelling in those latitudes, and that all instruments should be specially fitted with a view to keeping the mouth and nose as far away from them as possible.

I cannot speak too warmly about the very enthusiastic assistance, often at inconvenience to themselves, given me by my comrades whenever I required it, and also of the pluck and perseverance of my leader. I wish to express my admiration of the way in which Mr. Leigh-Smith has laid down the positions of those parts of southern Franz Josef Land which he visited. Before I sit down I feel that I must pay homage to the many gallant men who have striven in the polar regions before us: to those of all the nations who have helped to make the world known to us as an open book; and more especially to those heroes of our own country who have made us proud of the name of Briton, and to him with whom we claim a common descent from the Norsemen. I would also give my heartiest thanks to Sir Clements Markham and his colleagues in the Royal Geographical Society, for their great kindness and encouragement to a young and unknown man like myself. It is such encouragement which makes us endeavour, no matter how difficult the circumstances which we may work under, to deserve success.

Brief Sketch of the Geology.

By Dr. Reginald Koettlitz.

When news first reached the world that a new land had been discovered in the arctic regions to the northward of Novaya Zemlya and Spitsbergen, this land was described by its discoverers, Payer and Weyprecht, as being of large if not continental proportions. Julius Payer judged this to be the case for two reasons: firstly, because all the land he could see—and he had extensive views from the heights he ascended to—had every appearance of being, in his judgment, of great size; and, secondly, because of the large size of the icebergs he thought he saw and described, that these bergs could only be shed by glaciers coming off an extensive tract of land. It will be remembered he compared them, both in size and shape, to the antarctic bergs seen and described by voyageurs to the south.

Mr. Leigh Smith was the next to visit this land, and if he does not agree with these conclusions of Payer, he at least does not disagree with them in anything published by or through him.

It is on account of these supposed proportions of this newly discovered land that Payer goes so far as to recommend it as a likely route polewards, for he presumed that the land stretched for an indefinite extent in that direction.

Upon these reports as a foundation, this route towards the pole was also recommended by several arctic authorities, and it was for the same reason that Mr. Jackson planned his expedition to Franz Josef Land. You can, therefore, judge of his dismay when we found, on the first journey northward, that this report of Payer's had no foundation in fact, and upon that and subsequent sledging expeditions saw that this land was nothing more than a broken-up mass of land forming a group of islands; so that we may say that the discoveries of Dr. Nansen, taken in conjunction with those of our expedition, conclusively prove that this supposed continental land is merely an archipelago of small islands, not extending far north.

Again, in the course of, I think I may say, a continued series of observations, such as no men have ever had the opportunity of making here before, we never, also in the remotest sense, ever saw anything like the large-sized icebergs described by Payer so graphically as being of such great proportions.

We can, therefore, now say that Franz Josef Land is formed of the fragments of an old tableland which was once of fairly large size, and which was no doubt connected with other lands from which it is now separated by considerable tracts covered by the sea.

The earliest geological history of this land, which we learn by what can be read in the rocks, is that, at least in the more southern part, it formed part of the shore of a land which has now disappeared, and that the time when such was the case was the Lower Oxfordian of the Jurassic period, for sandstones and shales containing plant remains, beds of lignite, and other evidences of littoral and estuarine conditions are among the lowest of the beds of stratified rock which I found there. Evidence of oscillations of level now show themselves, for such beds as those described are succeeded by those of purely marine origin, the age of which can be plainly stated, because ammonites so well known and so limited in zone as *Ammonites Macrocephalus* and *A. Modiolaris* were found in them.

I cannot do better than here quote what Messrs. Newton and Teall, who have so ably examined and reported upon the geological specimens I sent home last year, say upon this point, in a paper read before the Geological Society on June 23 last, and to be published shortly in the *Geological Journal*, and that is: "Owing mainly to the brilliant researches of Neumayer, it is now generally recognized that the Jurassic sea reached its greatest extension in the present land areas during the Callovian and Oxfordian periods. Hydrocratic and geocratic movements alternated during Jurassic times, with a decided balance in favour of the former, and a recession of the coast-line towards the north. Even in the north of Scotland we find no decided evidence of the proximity of land during the Oxfordian period, although the lower portions of the Jurassic formation are represented by littoral and estuarine deposits.

"Under these circumstances, the discovery of Macrocephalus beds in Franz Josef Land, in association with plant-bearing strata, is of special interest. It extends the range of this ammonite several degrees towards the north, and shows, in all probability, that during the period of its existence a coast-line lay somewhere in this direction. Marine deposits of Callovian and Oxfordian age are now known to range from Sutherland to Cutch, and from Franz Josef Land to the north of Africa, and *Ammonites Macrocephalus* is one of the most widely distributed of all Jurassic ammonites."

The oscillations of level above mentioned are shown by the extraordinary number of different-coloured thin strata of clay, shale, and sand, which latter is often false-bedded, and frequently has many rounded water-worn pebbles of all kinds embedded among it. Other ammonites, as well as belemnites, pecten, and avicula remains were also interspersed among these marine strata, which were found in places to continue in an unbroken series for quite 500 feet above sea-level.

Now succeeds a rock through which the distinctive character of Franz Josef Land is formed—that is, the plateau or tableland formation, which so strikes the observer, namely the basalt or dolerite, which forms its principal feature, and which largely, through the rocks *in situ* and the *débris* falling from it, masks and covers over as well as preserves the stratified rock underneath it. Mr. J. J. H. Teall, of the Geological Survey, has made a most exhaustive microscopical and chemical examination of the specimens sent home last year, for details of which I would refer any one interested to the next published number of the *Geological Journal*. I will, however, quote his conclusion, in which he says:—

"It is evident, therefore, that the basalts of Cape Flora and Hooker island are similar to types widely distributed in the Brito-arctic volcanic province. They differ from the more common holocrystalline opitic dolorites in containing a small quantity of interstitial matter. The general result of this examination is to confirm the conclusions of Payer, Etheridge, and others, that Franz Josef Land belongs geologically to an extensive region of plateau-basalts, including such widely separated localities as Jan Mayen, Iceland, Greenland, the Faroe islands, the west of Scotland, and the north of Ireland."

This basaltic rock formation is of considerable thickness, namely, from 500 to 600 feet or more in perpendicular height, and, when viewed carefully, can be seen to be composed of successive tiers to the number of seven or eight or more, between which tiers one can frequently find thin layers, or strata, of clay, sand, and sandstone, generally from 1, 2, to 4 feet in thickness, similar in every respect to those one finds underneath. In one of these strata, between the second and third tier of basalt, and quite 100 or more feet above the lower edge of the basalt formation where it is in contact with the main stratified rocks below, I found more of the plant fossils which Dr. Nansen speaks about in his book as having been found on a nunatak protruding from the glacier to the north-west of Elmwood, and which he sent to Dr. Nathorst, who considers them of Upper Jurassic age. This stratum was a continuation of the bed on the nunatak, which I had also found and shown Dr. Nansen, and I afterwards found and traced it for several hundred yards on about the same level as the nunatak bed, and quite a mile away, proving to my judgment conclusively that the bed on the nunatak, which Dr. Nansen and I were doubtful as to whether it had been moved from its bed by the lava-flow, had not been, but was *in situ*, and was part of this stratum, which was 2 feet in depth, and undisturbed. This fact, together with other considerations, which I will detail shortly, have an important bearing upon the probable age of these basaltic lava-flows, and also upon the question as to whether they are intrusive sills or not. Mr. Teall, I know, leans to the opinion that the basalt of Franz Josef Land is of Tertiary date, in the same way as similar formations in Scotland, Ireland, and other places, and that the apparent interstratification is due to intrusive sills. I must say, however, after considering the points he has raised, that the balance of evidence is unquestionably in favour of Jurassic date. My reasons briefly are: (1) that the strata which I saw between the tiers of basaltic rocks are so thin and level, and show so little evidence of displacement by lava having been intruded between them; (2) we cannot see that heat has materially altered these strata; (3) upon or among the middle tiers of basalt I have found fair-sized and intact branches of wood, which have undoubtedly been charred into charcoal, which is almost as light as though recently burnt, and which must have been growing in the sedimentary rock, among which I found it, upon the upper surface of the first or lowest tier of basalt, and been charred by being overwhelmed in a surface-flowing mass of lava; and (4) because, unlike what is usually found among intrusive sills, this basalt is vesicular or amygdaloidal on the upper and lower borders of a tier, at which position it is generally more compact in intrusive sills, and thus agrees more with the conditions of a surface-flow.

It is upon these grounds that I base my belief in thinking the date of some, at least, of these basalt-flows to have been in Jurassic times.

If the above is correct, then there is no evidence of any rock *in situ* being of later times, and therefore any strata that may have been laid down after this has disappeared through denudation, or is lying under the perpetual ice-sheet that covers these islands.

At this time, therefore, if I am correct, this land was above sea-level; trees and plants were growing upon it; the climate was very different to what it is now, for verdure, and that luxuriant, clothed the surface, much of which was also woody. In fact, we can see that, judging by the species and genera of plants which have been recognized, the climate was a cool, mild, and genial one. It was at the same time connected, in all probability, with other lands—most likely, judging by the similarity of the basalts, with Spitsbergen, Scotland, Ireland, the Faroe islands, Iceland, Jan Mayen, and Greenland. There is also evidence, it appears to me, judging by the fossils found—both plant and animal—of the land having been once or more connected with Northern Europe and Siberia.

The results, which may be obtained when the examination of the specimens which I brought home this year is completed, I cannot of course give you at present, but what I have here given you are in brief a few of the facts which, up to the present, we are in possession of.

Flora of Franz Josef Archipelago.

By Harry Fisher.

In the *Geographical Journal* for December, 1896, pp. 560-563, I made some remarks on the above. Since the publication of that account I have had opportunities of studying this flora, and of comparing the results with those of almost every other known arctic region. A full account will shortly be presented to the Linnean Society. Mr. Armitage has told you that south-westerly winds are almost unknown in Franz Josef Land. I believe this will account, to some extent, for the flora being more scanty and stunted on the whole than that of almost all the other arctic regions. The summer temperatures are lower than elsewhere. There is no doubt that the presence of the Gulf Stream on the west and north-west coasts of Spitsbergen will account for the luxuriance of the flora up to Brandewjne bay, whereas the east coast of North-East Land resembles Franz Josef Land. The Gulf Stream, however, will not account for the comparative richness of the flora of Melville island, of Grinnell Land, and of Port Foulke, the last named being on the Greenland side of Smith sound; these are separated by channels of inconsiderable width from the mainland. To the north of Port Foulke is the great Humboldt glacier, which has been considered to form a barrier* to the northward progress of the flora on the west side of Greenland. We know next to nothing of the plant-life on the lands to the north of Peary channel; but I expect an extension of the Grinnell Land flora will be found there, and probably an arctic Siberian type also. The most northern land in Asia, Cape Chelyuskin, has a smaller flora even than Franz Josef Archipelago (and most of the plants are as dwarf), notwithstanding that it is on the mainland of a vast continent. This can only be accounted for by supposing it to have been submerged until comparatively recent times; but the flora of arctic Siberia is generally poor in species.

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* See Sir J. D. Hooker's 'Outlines on Distribution,' etc.

There is one zoological fact of interest to the botanist. Young snowy owls visit Franz Josef Archipelago every summer; two of these handsome birds were killed on Cape Flora, and I found pellets and feathers of this species on all the capes which we visited. Several birds were seen, besides the two which we killed. Does not their presence indicate the existence of the lemming, and therefore the willow, in recent times?

It is difficult to understand why some of the plants maintain an existence under such unfavourable conditions as the present, unless they are, as they appear to be, dying-out remnants of a typical arctic flora. I am thinking of the starved colony of *Graphephorum Fisheri* Asa Gray (a grass), composed of about twenty lifeless-looking individuals on Mabel island, and not seen elsewhere; and also of *Stellaria longipes* and Goldie, which presents a similarly lifeless appearance. Of this two flowers only were seen; they were on Cape Neale. Even flower-buds were not found elsewhere. The bald-leaved *Cerastium* makes no attempt at flowering. A few other plants merely exist. Unless the conditions improve, most of these plants will disappear; not, as in warmer climes, to be replaced by others, I fear, there being already abundance of spare ground untenanted by any plant. It is very remarkable that I should have found seedlings of the poppy (*P. nudicaule* L.), the scurvy grass (*Cochlearia fenestrata* Br.), and *Draba leptopetala* Fr. This was quite unexpected, for I know of nothing of the kind from similar latitudes. The anthers and stigmas of the poppy, so far as I had time for observation, were ripe at the same time. There are no insects which are likely to have assisted in fertilization in this case; but, as regards the scurvy grass, my observations lead me to the conclusion that diptera may occasionally assist, but at the same time they are more certainly foes than friends, inasmuch as their larvæ feed ravenously on the floral organs of this species. Seedlings of the scurvy grass were found on Gully rocks and on Cape Flora, sparingly. Those of the poppy were seen in one place on the latter cape. Seedlings of the *Draba* were found on Cape Flora, but in such limited quantity that they only occupied half a square inch. I look upon this last rather as an accidental result. The case of the poppy is a little stronger, and *Cochlearia* (scurvy grass) probably increases to some extent by seed in most summers. All attempts at solving the problem of the derivation of this flora are purely theoretical. The depth of the sea between Novaya Zemlia, Spitsbergen, and Franz Josef Archipelago only throws a little light on the subject. Geology and ocean currents render little service; possibly the working out of the driftwoods may throw some light on this obscure subject.

A large number of specimens of driftwoods were collected, and have been entrusted to Prof. Carr, M.A., F.G.S., F.L.S., of the University College, Nottingham, for examination. Of all of these numerous microscopical sections have been made, which will be compared with similar sections of known woods from Siberia, arctic Europe, and North America (prepared from specimens kindly supplied by the director of Kew gardens, supplemented by some in the Fisher collection in Nottingham Natural History Museum from the Russian Empire, all of which are authenticated by Dr. Regel and Herder). These driftwoods are mainly coniferous, but a few are non-coniferous, and it is hoped that the exhaustive examination to which they will be subjected will prove their identity and probable place of origin. The labour of collecting and sledging these woods, many of which were huge trunks, was borne by Messrs. Jackson and Armitage and Dr. Koettlitz; some few were collected by Mr. Child and myself, my own task being a light one, consisting of cutting suitable pieces for examination and for specimens, etc., chiefly from the heaps which three of us made on Capes Gertrude and Flora. On Cape Mary Harmsworth Dr. Koettlitz collected woods, and Mr. E. Else brought a fine piece also. These are now in Prof. Carr's hands. A fine section was made on ("Tween") Cook's rocks by Mr. Child; this is with the others.

There are certain plants in Franz Josef Archipelago which give a colour to the landscape, occurring as they do in patches or carpets up to an altitude of 500 feet. The poppy is the most showy, but several mosses rival this flower in brilliancy. I have previously mentioned in this *Journal* the bright colour of these plants, but I did not specify them. There are four species which I ought to particularize: *Splachnum Wormskiöldii* Hornem., brilliant green; *Aulacomnium turgidum* Schwgr., pale yellow-green; *Bryum obtusifolium* Lindb., red to crimson and purple; *Orthothecium chryseum* Lorenz, golden yellow. It is interesting to find that these mosses flourish in the neighbourhood of loomeries, and that in their absence they become quite scarce. This is particularly the case as regards *Splachnum*. "The Splachnum family are remarkable amongst mosses for the preference they exhibit for growing in bogs, on the droppings of animals such as sheep, cattle, or foxes, sometimes occurring also on the bones of dead animals."

I have submitted these characteristic mosses mentioned above to Mr. E. M. Holmes, the curator of the Pharmaceutical Society's Museum, who is well known as an accurate bryologist, and I am indebted to him for the names cited above. I have previously mentioned the lichens which give a colour to the rocks, boulders, etc.

May I here express my admiration of the botanical work of Englishmen in the polar American islands?—notably, Captain Sabine and his companions of the Parry Expedition in Melville island, Dr. Richardson, the naturalists of Nares' Expedition, and also Sutherland, Taylor, Markham, Scoresby, Walker, and others; and in the arctic regions of the eastern hemisphere one cannot fail to appreciate the grand work of the Scandinavian and Russian botanists. Such names as Fries, Cleve, Malmgren, Kiellman, and others will always stand as authorities on arctic plants.

Dr. Nansen's botanical work on the ice-floes in the farthest north yet reached by man is not yet published, but I have had the pleasure of seeing his beautiful drawings of a most interesting microscopical flora. I look forward with deep interest to the publication of his scientific work. Dr. (now Sir Joseph) Hooker's work in, and writings on, the antarctic flora are a boon to the future student in that region. I trust the time is near when we shall have an appendix to the unique and renowned 'Flora Antarctica' of our illustrious botanist.

The Zoology of the Expedition.

By W. S. Bruce.

The zoological collection promises to be very interesting, but at present it is difficult to say much, since the preliminary work of assorting is not yet complete, and that of identification not more than begun. Any list, therefore, is merely provisional. The collection chiefly consists of smaller vertebrate and invertebrate forms. Richest of all will perhaps be the micro-organisms, upon which a considerable time was spent all through the winter months, many specimens having been drawn from living or freshly mounted preparations.

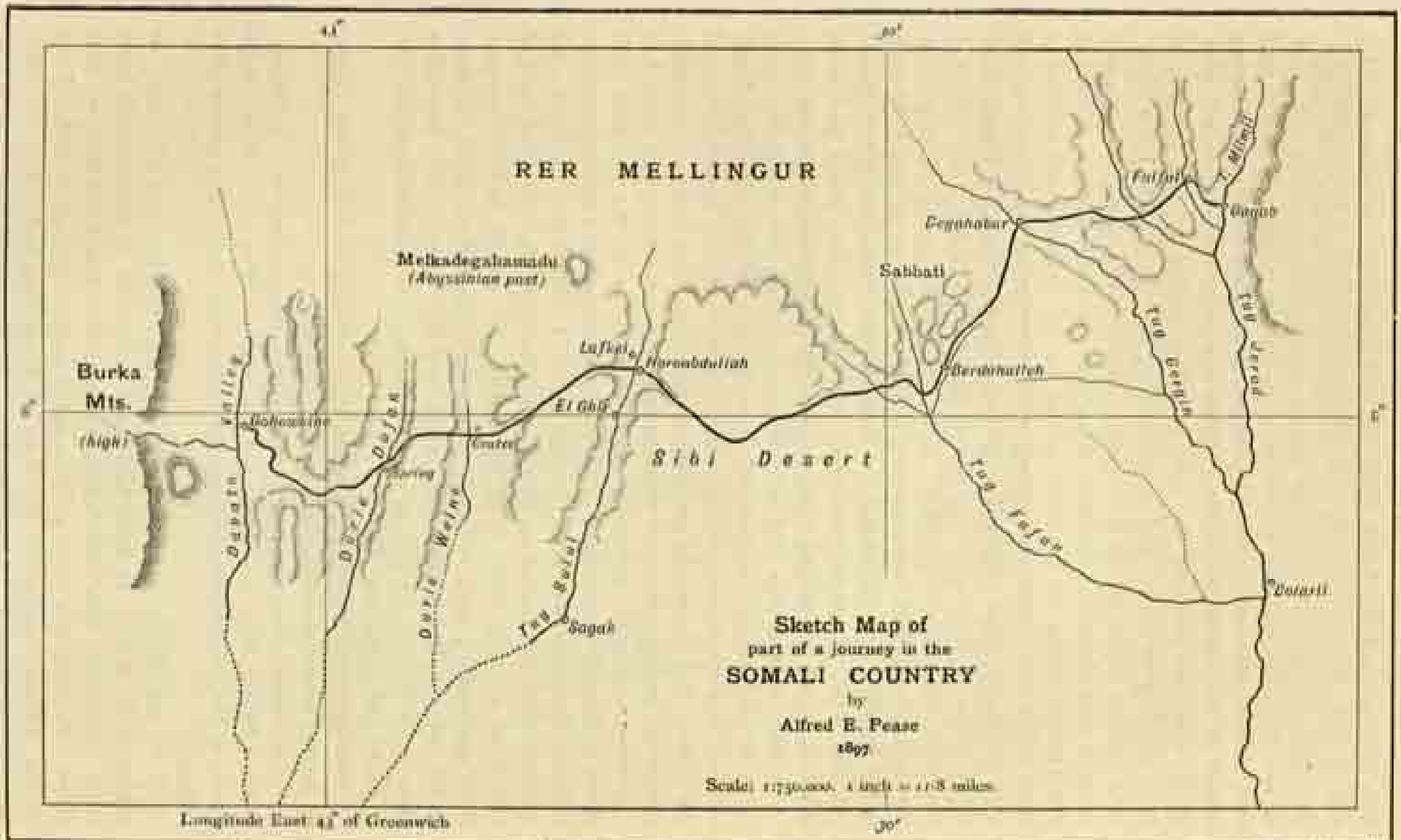
Among Protozoa, the Infusoria are well represented. There are sponges and cœlenterates, the latter including hydrozoa, scyphozoa, and ctenophora. Worms are rich in the number of species, and include sipunculids, rotifers, polyzoa, leeches, chætopods, nematodes, etc. Sea-urchins and brittle stars were very plentiful, and the collection also includes several starfish, sea-cucumbers, and feather stars. The sea-cucumbers were mostly obtained from the stomachs of walruses, in which were also found the interesting worm known as *Priapulus*, and various molluscs. Crustacea were obtained in large numbers; insects are but poorly represented. There are no moths or butterflies. Five or six species of acarina and spiders were obtained; sea-spiders, or pycnogonida, are well represented. To this invertebrate list has to be added a considerable number of bivalves and gasteropods. Among vertebrates, sea-squirts, appendicularia, and probably four or five species of fish complete the series, apart from birds and mammals. Of birds, it may be stated there are at least three new species for Franz Josef Land. It is interesting to note that the only land mammalia are the bear and the fox.

The collection was mostly marine, and was obtained from all depths down to 234 fathoms; the greater proportion, however, consists of animals obtained near the shore at depths varying down to 18 and 26 fathoms. The interesting discovery of bones of walrus, cetaceans, and deer on the gigantic raised beaches will be dealt with by the geologist.

A VOLCANIC CRATER IN NORTHERN SOMALILAND.

By ALFRED E. PEASE, M.P.

On February 5, 1897, after leaving Horoabdullah, we ascended the hills to the west of the Tug Sulul. These hills are not very dissimilar in conformation and appearance from those that border the Tug Milmil between Hagal and Gagab. Their sides are faced with jagged rocks and low cliffs, whilst on the tops you find amongst the bush large bare slabs or tables of rock, for the most part covered or sprinkled with loose stones —the rock for the most part is of a light yellowish to reddish buff, here and there in watercourses a deep grey. For about four hours after reaching the summit, we passed over a plateau, covered like the rest of the hills with scrub and the usual Somali vegetation (still rocky and stony). Then we descended (still travelling west) a ravine, which led us down to a narrow valley, perhaps a mile in width at this point. On leaving the eastern rocky hills, we continued nearly half a mile down a very gentle plane to a river-bed, which was walled in with basaltic-looking rocks, which were very black or dark red-brown, and which in places went down in steps of about 6 to 10 feet; the river-bed was paved with the same rocks in slabs and steps. The ground between the hills we had just left and the river-bed was very peculiar, the soil being powdery and of a different consistency to any we had passed over or met with subsequently; it was of a similar red tint to the ordinary soil, but dirtier and very heavy walking, and my wife complained of it and remarked on it. On this (the east) side of the river-bed, up to the crater from the river-bed, the bush was especially luxuriant, and several shrubs we seldom met with were common. The dirty powdery soil from A to the crater was practically devoid of vegetation; such as there was had a poor and sickly appearance. We returned on our tracks about 300 yards into the bush, and whilst hunting for a good shade for "tiffin camp" and awaiting our caravan, we discovered an old crater shut in and overhung on one side by the bush. It is very distinct. The mouth is to the eye perfectly circular, the diameter of the mouth not more


RER MELLINGUR
Melkadegahamadu
(Abyssinian post)
Burka
Mts.
(high)
Sabbati
Gagab
Lafiai
Horoabdullah
El Ghil
Sibi Desert
Tug Bulal
Sagah
Tug Gergin
Tug Jerad
Tug Fafan
Dolarli
Daguto Valley
Dorie Dofan
Dorie Waine
Sketch Map of
part of a journey in the
SOMALI COUNTRY
by
Alfred E. Pease
1897
Longitude East 43° of Greenwich
30'

than 100 feet, and the depth about 35 or 45 feet; it was formed, as far as I can tell, of lava. The lip was, perhaps, from 1 to 3 feet higher than the surrounding ground, which sloped gently down towards the river on the west side, and was almost level or rose very slightly on the east side. There were one or two shrubs growing in the "crater." Having looked at the crater, we thought little more about volcanoes till after lunch, when we resumed our march, and remarked on the patches of lava, which grew larger and more distinct as we approached the river-bed. Across the river-bed the country resumed its ordinary aspect, and the hills rose almost immediately from the bed of the stream. Crossing this narrow ridge, we bent left-handed in our descent, and entered a much wider valley with a large tug, which we marched up till we reached some curiously white chalk-like cliffs and earth, where we found, close to the banks of the tug, a native well about 25 feet deep, into which I descended down notched poles. It is a perennial spring of very clear (for Somaliland) but very sulphurous water. The water was very cold, and I drank it with pleasure; but I think Mrs. Pease and Sir E. Loder did not want a second mouthful. Beyond this, we never met with anything at all resembling these white cliffs or sulphurous springs.

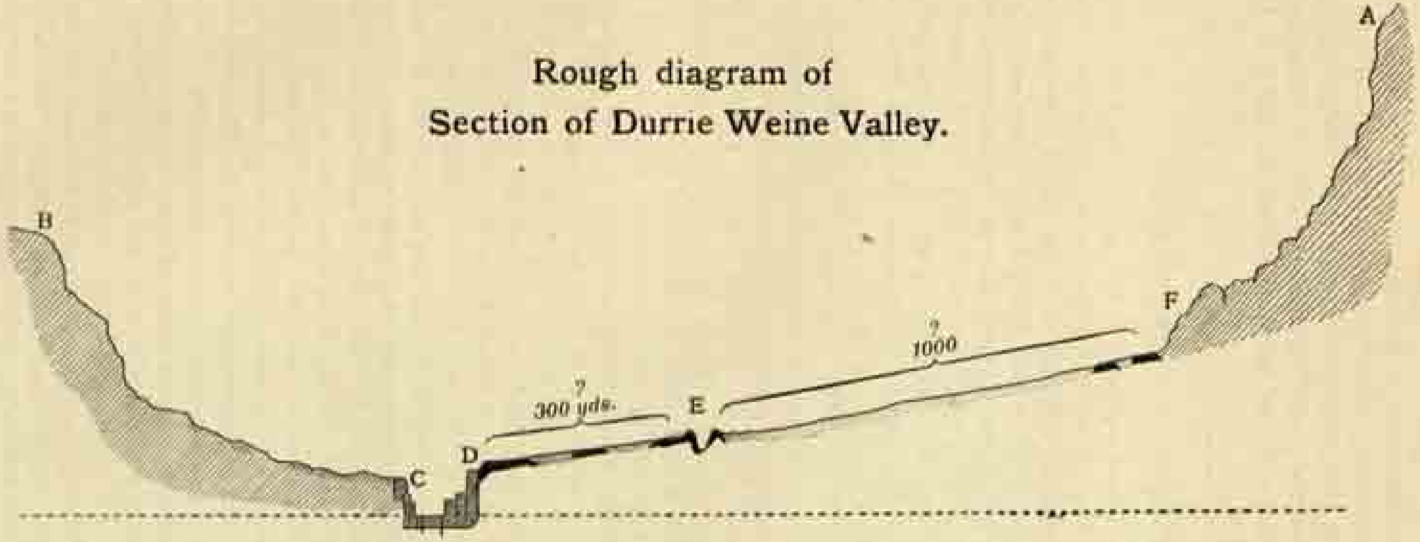
It may seem strange that both in going and returning about a week later, we never made any careful investigation of the neighbourhood, nor kept any specimens of lava or rocks, nor even took a photograph of the crater; but it must be understood that none of us had any acquaintance with geology, that the weather was excessively hot, and none but absolutely necessary exertion is easily undertaken in the greatest heat of the hottest of Somali days. We were marching into a strange country, and our thoughts more intent on our point of destination, and our eyes in examining the tracks of zebras and other animals. Besides, we had had some exciting days at Horoabdullah, for which the Abyssinians were responsible, and, owing to news that reached us in the Dahato valley, we marched hard and fast back over this ground with few other ideas than that of placing as great a distance as possible between the Habasha and ourselves.

Our marches from Horoabdullah were—Horoabdullah to the crater, 5¼ hours; crater to sulphurous spring, 1½ hour.

The names given to these two valleys are suggestive: (1) Durie-weine (*durie* = dirt, and *weine* = big), crater valley; (2) Durie-dúfán (*durie* = dirt, and *dúfán* = the grease or food left round the mouth after eating).

I do not think that there was any sign whatever of a volcano or crater on A (or B). If there had been a crater on A, there would have been, I presume, lava beds and streams on the side of the hill, whereas these hills were the usual scrub-covered rocks. I noticed nothing out of the ordinary course till the foot of A was reached, when we came into the peculiar soil I have already mentioned. Had there been a lava

Rough diagram of Section of Durrie Weine Valley.



A to F. *Western Scarp of Rocky Hills.*
F to E. *Dirty powdery soil with scant bush.*
E. *"Crater."*
E to D. *Covered with thick luxuriant bush and high trees, with bare patches of lava bed showing through soil, larger and more distinct at* D
C. *Black and red-brown rocks walling and flooring river bed.*
C. to B. *Eastern Scarp of ridge same nature as* A-F *covered with Scrub.*

bed on the east side of the crater to any extent, which was continued up the side of A, I think the suggestion that the crater was a "secondary" one, or blow-hole, would have some probability, as it is a curiously small one. There is, however, the possibility that the lava bed came down the valley, and that a larger or real crater exists up the valley to the north.

HANDBOOK OF CLIMATOLOGY.

The *Handbuch der Klimatologie*, published in Ratzel's Geographical Series in 1883, has been the standard work of reference on the subject since its publication. The enormous extension of the system of meteorological observations in all parts of the world, civilized and otherwise, during the last few years, as well as the very considerable advances made in our knowledge of the general conditions controlling and determining climate, have been sufficient to make any work of so long standing distinctly out of date. The period has, however, brought forth no meteorologist whose learning and critical skill can compare with those of Dr. Julius Hann, and it is therefore a matter of congratulation that Dr. Hann has been able to occupy the first months of retirement from active official life in completing a re-issue of his great treatise.

Although the general plan of the work remains sufficiently the same to justify the title "second edition," the framework has been enlarged and strengthened, so as to bear the additional weight laid upon it, and each part of the book has been re-written and developed to such an extent, that what was formerly a section is now a separate volume. Hence we have now vol. i. devoted to the general principles of climatology—the normal climate produced by the sun supposed to act on a uniform surface; the modifications introduced by the distribution of land and sea; the climate of elevated regions; mountain winds, and the secular variations of climate. Vol. ii. is entirely occupied by accounts of special climatic regions in the tropics, and vol. iii. deals similarly with the temperate zones and the arctic regions. In every part we find an enormous increase in the amount of material dealt with, and the unceasing vigilance in noting every small contribution to the subject, published in no matter how obscure a journal, has covered the ground as easily as before, an achievement which might surprise any one not familiar with the bibliographical work of the *Meteorologische Zeitschrift*, which is always as near perfection as seems possible.

It is impossible, within the narrow limits of space, to give anything like a detailed comparison of the two editions of this book, although a more instructive study in not only meteorology, but geographical history could scarcely be found. Great progress is shown in the exact measurements of solar radiation, which must form the ultimate basis of all meteorological inquiry, and of the thermal constants concerned in different parts of the Earth's surface; and still greater progress in the general application of these exact measurements to the endless complexity introduced by geographical conditions. It may be permissible to associate these advances chiefly with the names of Langley, von Bezold, Zenker, and of Dr. Hann himself. Another important step is the recognition of the true position of oceanic currents as climatic factors: the drift current, constantly reacting directly on the atmospheric conditions which produce it, is recognized as a vastly more important element than the current produced by forces acting outside the region it traverses. The credit of placing these in their proper relations is chiefly due to Pettersson, although the results followed, in a sense, from the work of Zenker.

In the two volumes of descriptive climatology, it is noticeable that British workers take a much more prominent position than elsewhere; we have nothing to be ashamed of so far as the making of meteorological observations are concerned. Our Indian meteorological service remains unique of its kind; nearly all our colonies show good progress in the establishment of observing-stations; while in regions of tropical Africa absolutely unexplored in 1883, the British Association Committee renders a good account of itself.

THE HYDROGRAPHIC EXPLORATION OF LAKE BAIKAL.

In the summer of 1896, a special expedition, under Th. K. Drizhenko, in connection with the Siberian railway, was sent out to explore Lake Baikal, and the report of the explorations is now published in the *Izvestia* of the Russian Geographical Society (1897, vol. ii.). The expedition had at its disposal the steamer *Innokentiy*, and was provided with a Danish deep-sea sounding apparatus, astronomical, magnetical, and meteorological instruments. Unhappily, the Danish apparatus was lost, with most of its wire, when the first sounding was taken, and another apparatus, with 622 fathoms of wire, had to be improvised.

The expedition went all round the shores of the lake, verifying as far as possible the old maps, and making several new determinations of latitudes and longitudes, as well as magnetic observations. The surface temperature of the water was measured, and soundings were taken each 7 to 15 miles, for a few miles off the coast. Deep-sea soundings were taken across the lake along seven different lines—those which were made in the northern part of the lake being especially interesting, as the southern part had been explored years ago by the Polish exiles, Dr. Dybowski and M. Godlevski.

With all these data, old and new, M. Drizhenko has compiled a preliminary navigation map of Lake Baikal, on the scale of 6·7 miles to an inch, and a reduced copy of it (20 miles to the inch) is published in the

Izvestia. It offers a considerable interest, as it gives the positions of the 100-fathom and the 300-fathom lines all round the shores of the lake. That the south-western part of Lake Baikal is very deep, was already known from the soundings (on the ice) of Dybowski and Godlevski, who found depths down to 747 fathoms. The engineer Bogoslovskiy found, later on, a maximum depth of 791 fathoms (*i.e.* at least 3200 feet below the sea-level). It was believed, however, that in its northern half Lake Baikal must be much more shallow; but it now appears, from M. Drizhenko's soundings, that even between Olkhon island and Svyatoi Nos peninsula, where the lake is very much narrowed by the mountains, depths greater than 622 fathoms were found, and even at its north-eastern extremity the bottom of the lake lies at a depth of 476 fathoms, *i.e.* at least 1360 feet below the level of the sea. Taking into account all the shallow parts of the lake along its shores and opposite the deltas of the Selenga and the Angara, it appears that on only eight per cent. of its area it has a depth of less than 30 fathoms. With the exception of the deltas and the small Ushkanii islands (near Svyatoi Nos), the 100-fathom line runs as a rule very near to the shore, especially along the north-western coast.

The measurements of magnetic declination gave results which speak highly in favour of General Tillo's *Tables fondamentales du magnétisme terrestre*. The measured declinations differed by only $1\frac{1}{4}°$ to 2° from the theoretical ones.

The measurements of temperature of water show that, while at the mouths of the big rivers the surface temperature (in summer) reached from 48° to 56° Fahr., and even attained 67° in one bay, it varied only from 38·1° to 38·6° in the open parts of the lake, and remained unaltered down to a depth of 500 fathoms. It may be said that the superficial layer of water, which has a temperature above 39°, attains in the best cases a thickness of 30 fathoms only (at the mouths of the rivers and near the shores), the whole mass of the water of the lake having a temperature of from 38° to 39·2°, even during the hottest months of the year.

Owing to the sudden changes of wind, to the fogs (in 1896 fog covered all the lake from July 13 to August 1), and to the want of protected bays (of which only four are known), navigation on Lake Baikal is combined with considerable difficulties, especially for sailing-boats. At the present time the lake is navigated by ten steamers, which run thrice a week across the lake from Listvenichnoye (head of the Angara) to Posolskoye (Selenga), and five times every summer carry the post from Listvenichnoye to the upper extremity of the lake.

So long as the railway is not made along the southern shore of the lake, it is intended to carry over the trains (25 carriages) by means of an ice-breaker, which will run from Listvenichnoye to Mysovaya. This ice-breaker, which reminds one by its shape of Nansen's *Fram*, is intended to break ice one metre (3·3 feet) thick, and is provided, therefore, with an iron armature 9 feet wide. Its length is 290 feet, its width 57 feet, and its tonnage is 4200 tons. Its engines, 3750 horse-power, working on three screws, are calculated so as to give a speed of 13 knots. The *Engineer* describes the ice-breaker, which is being built in London, as a quite unique enterprise in the history of ice-breakers.*

A second hydrographic expedition, consisting of ten officers of the navy, was at work last summer as well, for continuing the exploration of the great lake.

THE CLASSIFICATION OF GEOGRAPHY.†

By HUGH ROBERT MILL, D.Sc.

The definition of geography has been attempted times without number by people approaching the subject from the most diverse standpoints, and possessed in widely different degree of practical knowledge regarding the aims and content of the science. It will probably not be seriously disputed that different definitions may be employed for different purposes, provided that they are not in actual contradiction, and perhaps the oldest and simplest definition—The Description of the Earth's Surface—remains the most useful. Those who limit this definition to a description of the natural and artificial divisions of the Earth's surface deal only with that part of geography which has been specifically termed Chorography or Topography. This concerns itself merely with detailed description, while the other part of geography has to take account of general conditions. At the outset a distinction must be made in studying or in teaching geography between the General and the Special.

The General in geography deals with the aspects in which the Earth's surface may be considered; the Special has to do with the divisions, natural and artificial, into which the Earth's surface is cut up, each of which may be considered in any or in all of the general aspects.

In any classification made for purposes of systematizing geographical knowledge or for recording geographical literature, there must thus be two separate categories; one for general aspects, the other for terrestrial divisions. Most facts would require to be entered in one only of these categories, but a certain number would have to appear in both. There are certain general rules which hold good for every kind of classification. Of these, the first is to have units of division of approximately equal value, each of which may be subdivided, and each subdivision, if necessary, still farther analyzed. The process may go on to any extent, but it is absolutely imperative that divisions of the first, second, and third order be distinctly separated. For purposes of ready reference to subdivisions, a system of symbols is convenient, which will designate by a few signs the place each subject occupies in the classification. These symbols should be so selected that by means of them subjects can be arranged in their proper order by any one who can recognize figures or letters, though perfectly ignorant, it may be, of either the subject classified or the language used.

At the risk of being tedious, I must dwell upon the fundamental condition of

* The ice-breaker *Nadezhnyi*, which has been built at Copenhagen for Vladivostok, is only 180 feet long, 42 feet in beam, 1500 tons; engines, 2500 horse-power; maximum speed, 11 knots; cost, £43,000. It gave excellent results in the Baltic sea. It cut ice, 25 inches thick, at a speed of 3½ to 4 knots. It made its way for a mile in ice 7 feet thick; but it was stopped by ice which had a thickness of 15 feet.

† Paper read to Section E (Geography) of the British Association at Toronto, 1897.

the subordination of the orders of subdivision. This is recognized instinctively in a genealogical tree, where PARENTS, CHILDREN, grandchildren, *great-grandchildren* represent four orders. Confusion would result if the individuals of all or of any two of these orders were arranged alphabetically or even chronologically. It may not, at first sight, appear that geography is susceptible of division into orders of fact or of territory comparable in distinctness to human generations; but experience in the classification of titles of geographical papers soon teaches that it is so. But while the several orders must be kept distinct, it is sometimes convenient to associate two or more together for temporary purposes, and in the choice of units the possibility of aggregation, as well as of subdivision, should be kept in view.

While all that has been said applies equally to a classification for registering work done, or for directing future investigations, the former is the more practically important object. I have approached the subject from the experimental point of view, and my experience has been obtained in preparing the Subject-Catalogue of the Royal Geographical Society's library. While the subject-headings (which, when complete, will considerably exceed 100,000) were being collected, I commenced in 1892 to classify the notices of additions to the library which appeared monthly in the Society's publication. At first it was only necessary to employ divisions corresponding to the first order for arranging the cards on which the respective titles were pasted. When one of the first divisions contained about fifty cards, they were subdivided into groups of the second order; and in those cases where the cards in any group exceeded fifty, they were subdivided again into sub-groups of the third order. It has not yet been necessary to go further. By this method the bewilderment produced by trying to grasp the multiplicity of detail in a complete theoretical scheme was avoided, only so many subdivisions were in use at any time as were absolutely required; and the need of further analysis was felt before the step was taken. By the time the whole mass of titles for the subject-catalogue is complete, the experimental section will serve as a skeleton classification tested by continual use, for, comprising as it does the additions for the latest years, it is naturally the part most frequently referred to.

After building up the scheme of a practical subdivision, I have been able to compare it with the very comprehensive schemes elaborated by the editors of the *Annales de Géographie* for their annual selected bibliography, and with Herr Baschin's *Bibliotheca Geographica*, the exhaustive annual bibliography published by the Berlin Geographical Society. These have suggested certain modifications and improvements, and the combined result is presented in this paper. That this result is final I do not claim, for if it is to live it must continue to improve; but, however imperfect, it has been evolved by practical work, it represents what appear to be the natural lines of cleavage in the existing literature of the subject, and even in those parts where it is confessedly weak in theory it has stood the test of practice.

In my work at the Royal Geographical Society, I am only beginning to feel the need of a system of symbolic notation; but in view of the ultimate necessity for adopting such a system, it has been carefully considered. The most convenient system would be such a combination of letters or figures as would suggest the subject to the mind without reference to a table. But at the best this could only be used for divisions of the first or second order, and if a table must be referred to for groups of the third order it may as well be made complete. An arbitrary arrangement of letters and figures is much more likely to be useful to geographical workers in general than a mnemonic system. The contractions or letters indicative of places, say in Africa, differs greatly in different languages. Where we find *fwa*, *gea*, cs perfectly convenient for French West Africa, German East Africa, Congo State, the official names of Afrique occidentale française, Deutsch Ost-Afrika, and

Etat Independant du Congo, do not fit them at all, and we should be worse off with *acf*, *doa*, *etc* than with a single arbitrary letter. As a practical worker, I feel the superiority of a simple consistent arbitrary notation of perfect flexibility, over one which can only plead the help of a mnemonic in one language as a reason for clumsy symbols which are difficult to combine or to arrange. In order that the work already done may not be thrown away, if it should be desirable to combine it with the bibliography of other sciences in such a work as the Subject-Catalogue of Scientific Literature on which the Royal Society is now engaged, the symbols suggested are put forward here in a purely tentative manner.

Looking at the question of a symbolic classification from the practical point of view of convenience to the cataloguer, printer, and proof-reader (*i.e.* as elements of accuracy in the printed reference), and to the student consulting the record, it seems to me desirable to indicate each selected science by a rational symbol which shall suggest the name, but at the same time to select a symbol of *one letter only* in order to avoid cumbrousness and minimize the risk of mistakes. For example, instead of Gr and Ge for Geography and Geology, **G** and Γ might be adopted.

Assuming **G** as the general symbol for Geography, taken by itself it would be used alone to indicate a discussion on geography in general; qualified by the index for mathematics, meteorology, magnetism, geology, botany, zoology, or anthropology, it would indicate a general discussion of any one of the branches of physical geography; while additional indices could be used in a geographical bibliography to include aspects of the subject, such as historical and political geography, which might justly be excluded from consideration in a catalogue of physical sciences. I should suggest, however, the use of one or two general indices, such as one for bibliography, and one for biography, as it would be exceedingly useful to have lists of publications dealing with these matters under the heads of the various sciences.

If it were only sufficient to indicate localities as one does in a map index, the Earth's surface could be most conveniently divided into eighteen zones of 10° in latitude, labelled A to R, and twenty-four gores of 15° in longitude, labelled *a* to *z*; each of the 432 areas, designated by such letters as A*a* to R*z*, being subdivided into 150 "degree-squares," *e.g.* A*a*1, R*z*150, such as form the units for the laying out of townships in Canada and the United States. This mathematical system, although very attractive in its simplicity, would fit in neither with the conventional limits of countries, nor the natural limits of regions to which almost all distributional discussions are adapted, and therefore it need not be farther considered. The "degree-square" unit has indeed been adopted in a new index of fixed positions in the United States as a subdivision of each individual state; it is generally used in plotting oceanographical data, and occasionally for meteorological results; but it is only appropriate for such purposes.

With regard to the symbols for topographical geography, I would suggest that each division of the first order (*i.e.* continents and oceans) should be indicated by a capital letter, and each subdivision of the second order by a small letter added to the appropriate capital. Thus two letters, *e.g.* A*a*, would indicate every one of the two hundred (or thereabouts) divisions of the second order (*i.e.* countries or regions). Divisions of the third order (states, provinces, etc.) would be shown by an added numeral; so that each complete reference, *e.g.* A*a*20, would show the continent and country, as well as the province indicated.

If a symbolic notation such as is suggested here were adopted in a catalogue referring to all sciences, it would be convenient if a special type could be set apart for geography; the letters might be either ordinary roman Aa, italic *Aa*, or gothic 𝔄𝔞. A strong claim which can be put forward for this is that every science is directly concerned with distributions, and that the formulæ for places would probably be more generally used than any others in combination with those of various sciences. It would obviously be of vast convenience if a symbolic notation could be agreed upon as applicable to all languages, and to other purposes than purely geographical bibliography.

In considering General Geography, a difference arises between the classification of a geographical library and that of geographical literature in a scheme which admits of all the sciences occupying their appropriate place. In the former case, room must be found for references to many of the sources of geographical facts in astronomy, physics, geology, etc.; in the latter this is not required. But although the following is fuller than may be necessary in a classification dealing with purely geographical works, it may be depleted by the withdrawal of groups of the second order without affecting the general scheme.

Classification of Geography, with Arbitrary Symbols.

G GEOGRAPHY IN GENERAL

Gα	MATHEMATICAL GEOGRAPHY IN GENERAL
αa	Geodesy
b	Latitude and longitude determination
c	Surveying
d	Navigation
e	Time standards
f	Cartography in general
f1	*Projections*
2	*Representation of features*
3	*Relief maps*
g	Globes, telluria, etc.
h	Geographical instruments
Gβ	PHYSICAL GEOGRAPHY IN GENERAL
Gβa	Geophysics in general
a1	*Internal temperature*
2	*Volcanic phenomena*
3	*Earthquakes*
4	*Earth-movements*
5	*Terrestrial magnetism*
Gβb	Geomorphology in general
b1	*Volume-relations of heights and hollows*
2	*Mountains and plateaux*
3	*Mountaineering*
4	*Glacial phenomena*
5	*Valleys*
6	*Coasts*
7	*Islands*
8	*Plains*
9	*Coral formations*
10	*Dunes and loess movements*
11	*Caverns*
12	*Geological formations (e.g. geological maps)*
Gβc	Climatology in general
c1	*Distribution of pressure and wind*
2	*Distribution of air-temperature*
3	*" " rain and snow fall*
Gβd	Oceanography in general
d1	*Tides*
2	*Ocean currents*
3	*Temperature and salinity of water*
4	*Oceanic deposits*
βe	Land waters in general
Gβ	PHYSICAL GEOGRAPHY IN GENERAL—*continued.*
e1	*Springs and underground water*
2	*Rivers*
3	*Lakes*
Gγ	BIO-GEOGRAPHY IN GENERAL
γa	Phyto-geography
b	Zoo-geography
c	Oceanic life
Gδ	ANTHROPO-GEOGRAPHY IN GENERAL
δa	Ethnography in general
a1	*Races of man*
2	*Religions and customs*
3	*Migrations*
δb	Historical geography in general
b1	*Development of geographical theory*
2	*Ancient discovery (to Ptolemy)*
3	*Mediæval discovery (to 1450)*
4	*Discovery* (1450-1600)
5	*Modern discovery* (1600 *to date*)
6	*Biographies of geographers*
δc	Political geography in general
c1	*Boundaries*
2	*Colonization*
δd	Commercial geography in general
d1	*Natural distribution of commodities*
2	*Ocean-routes and coaling-stations*
3	*Roads and railways*
4	*Canals and inland navigation*
5	*Tariffs and international trade*
δe	Medical geography
δf	Place-names
δg	Geographical education in general
g1	*Methods of primary education*
2	*" advanced education*
3	*Geographical text-books and atlases*
4	*Appliances for teaching geography*
δh	Geographical bibliographies, catalogues, etc.

SPECIAL GEOGRAPHY.

(*Topographical Divisions.**)

A THE WORLD AS A WHOLE
Aa General distributions
b Gazetteers, etc.

B THE LAND AS A WHOLE
Ba The British empire
b The Russian empire
c The Turkish empire
d The Dutch colonies
e The French colonies
f Travels round the world

C EUROPE IN GENERAL
Ca Iceland
(bc Scandinavian peninsula)
b Norway
c Sweden
d Denmark and Færoes
d1 *Denmark*
2 *Færoes*
(cde Baltic shores)
e German Empire as a whole
e1 *Prussia*
2 *Saxony*
3 *Wurtemberg*
4 *Alsace-Lorraine*
5 *Baden*
6 *Bavaria*
7 *Other states*
f Holland
g Belgium
h France and Corsica (to be subdivided)
i British Islands
i1 *England*
2 *Wales*
3 *Scotland*
4 *Ireland*
5 *Isle of Man*
6 *Channel islands*
(jk Iberian peninsula)
j Spain
k Portugal
l Pyrenees (including Andorra)
m Italy
m1 *Continental Italy*
2 *Sicily*
3 *Sardinia*
n Alps
o Switzerland
(pq Austria-Hungary)
p Austria
p1 *Alpine provinces (Tyrol, Salzburg, Carinthia, and Carniola)*
2 *Coastland and Dalmatia*
3 *Upper and Lower Austria*
4 *Bohemia and Moravia*
5 *Galicia and Bukovina*
6 *Bosnia and Herzegovina*

C EUROPE IN GENERAL—*continued.*
q Hungary
q1 *Croatia and Slavonia*
2 *Hungary proper*
3 *Transylvania*
r Russia in Europe
r1 *Northern Russia*
2 *Finland*
3 *Baltic provinces*
4 *Western provinces*
5 *Central and southern provinces*
6 *Ural provinces*
(s-x Balkan peninsula)
s Rumania
t Servia
u Bulgaria
v Montenegro
w Turkey in Europe
x Greece
y Crete
z Mediterranean shores

D ASIA IN GENERAL
Da Russia in Asia
a1 *West Siberia*
2 *East Siberia (including Sakhalin)*
3 *Caucasus*
4 *Trans-Caspian and Turkestan (including Khanates)*
b Turkey in Asia
b1 *Islands off Asia Minor (including Samos)*
2 *Asia Minor and Armenia*
3 *Syria and Palestine*
4 *Mesopotamia*
5 *Turkish Arabia*
c Arabia, independent
d Cyprus
e Persia
f Afghanistan
g Baluchistan
h Himalayas as a whole
i Indian Empire
i1 *Himalayan states*
2 *Punjab*
3 *N.W. Provinces and Oudh*
4 *Bengal*
5 *Assam*
6 *Bombay*
7 *Central India*
8 *Haiderabad*
9 *Mysore*
10 *Madras*
11 *Burma*
12 *Maldives and Laccadives*
13 *Andaman islands*
j Ceylon
k Siam

* In a large collection of titles, each of the following special subdivisions would be further subdivided into the foregoing *general* groups.

D ASIA IN GENERAL.—*continued.*
l French Indo-China
*l*1 *Tonkin*
2 *Annam*
3 *Cambodia*
m Chinese Empire
*m*1 *China proper and Manchuria*
2 *Mongolia*
3 *Eastern Turkestan*
4 *Tibet*
n Korea
o Japan, including Formosa, Bonin, and Kuriles
p Malay States and Straits Settlements
q British Borneo
r Dutch East Indies
*r*1 *Sumatra*
2 *Java*
3 *Dutch Borneo*
4 *Celebes*
5 *Moluccas*
s Phillipines
(*qrs* Malay Archipelago to Wallace's line, as a whole)

E AUSTRALASIA
E*a* Australia in general
b Queensland
c New South Wales
d Victoria
e South Australia
*e*1 *The Province*
2 *Northern territory*
f Western Australia
g Tasmania
h New Guinea as a whole
*h*1 *British*
2 *Dutch*
3 *German*
i New Zealand
j New Caledonia and Loyalty islands

F PACIFIC ISLANDS IN GENERAL
F*a* Micronesia
*a*1 *Ladrones*
2 *Caroline and Palau islands*
3 *Marshall islands*
4 *Gilbert islands*
5 *Ellice islands*
b Melanesia
*b*1 *Bismarck Archipelago*
2 *Solomon islands*
3 *New Hebrides*
c Fiji
d Polynesia in general
e Hawaii
f Central Polynesian sporades
g Western Polynesia
*g*1 *Tukelau islands*
2 *Samoa or Navigators islands*
3 *Tonga or Friendly islands*
h Southern Polynesia
*h*1 *Tubai or Austral islands*
2 *Cook or Hervey islands*
i Eastern Polynesia

F PACIFIC ISLANDS IN GENERAL.—*contd.*
*i*1 *Marquesas*
2 *Society islands, including Tahiti*
3 *Paumotu or Low Archipelago*
4 *Easter island*

GHI AMERICA AS A WHOLE

G NORTH AMERICA AS A WHOLE
G*a* Dominion of Canada
*a*1 *Nova Scotia*
2 *New Brunswick*
3 *Prince Edward island*
4 *Quebec*
5 *Ontario*
6 *Manitoba*
7 *North-West Territories*
8 *British Columbia*
9 *Labrador*
10 (*Canadian Rocky mountains*)
b Newfoundland
c Alaska
d United States
(With over fifty numbered subdivisions into states and other districts)
e Mexico
f Rocky mountains as a range
g Great Lakes of the St. Laurence

H CENTRAL AMERICA AND WEST INDIES IN GENERAL
H*a* Central America in general
b Guatemala
c Honduras
d British Honduras
e San Salvador
f Nicaragua
g Costa Rica
h West Indies in general
i Cuba
j Jamaica
k Haiti island
*k*1 *Haiti*
2 *San Domingo*
l Bahamas
m Porto Rico
n Virgin islands (Danish)
o British Leeward islands
*o*1 *Virgin islands (British)*
2 *Anguilla*
3 *Antigua*
4 *Barbuda*
5 *St. Kitts*
6 *Nevis*
7 *Montserrat*
8 *Dominica*
p British windward islands
*p*1 *Sta. Lucia*
2 *St. Vincent*
3 *Grenada and Grenadines*
q French West Indies
*q*1 *Guadeloupe*
2 *Martinique*
3 *Smaller islands*
r Barbados
s Trinidad and Tobago
t Dutch West Indies

I SOUTH AMERICA IN GENERAL
a (Andes as a whole)
b Colombia
b1 *Isthmus*
2 *Cordillera and coast*
3 *Llanos*
c Ecuador
d Peru
d1 *Coast*
2 *Sierra*
3 *Montana*
e Bolivia
e1 *Sierra*
2 *Yungas*
f Chile
g Tierra del Fuego as a whole
h Argentine Republic
h1 *Patagonia*
2 *Pampas*
3 *Chaco*
i Uruguay
j Paraguay
k Brazil
(divided into 18 states)
l French Guiana
m Dutch Guiana
n British Guiana
o Venezuela

K AFRICA IN GENERAL
Ka Marocco
b Algeria and Tunis
c Atlas range
d Tripoli
e Egypt
e1 *Lower Egypt*
2 *Upper Egypt*
3 *Egyptian Sudan*
f Sahara (beyond boundaries of countries)
g Spanish West Africa
h French West Africa
h1 *Senegal*
2 *French Sudan*
3 *French Guinea*
4 *Ivory Coast*
5 *Dahomey*
i British West Africa
i1 *Gambia*
2 *Sierra Leone*
3 *Gold Coast*
4 *Lagos*
5 *Niger Coast Protectorate*
6 *Niger territories*
j Sudan in general
j1 *Eastern Sudan*
2 *Upper Guinea and bend of Niger*
k Liberia
l German West Africa
l1 *Togoland*
2 *Cameroons*
m French Congo
n Congo State
o Portuguese West Africa
p German South-West Africa
q British South Africa

K AFRICA IN GENERAL—*continued.*
q1 *Cape Colony*
2 *Natal*
3 *British Bechuanaland*
4 *South African protectorates (to Zambesi)*
r Boer Republics
r1 *South African Republic (Transvaal)*
2 *Orange Free State*
p–s South Africa in general
s Portuguese East Africa
t British Central Africa
u Madagascar
v German East Africa
w British East Africa
w1 *Zanzibar and Pemba*
2 *Mombasa and coast to Lake Rudolf*
3 *Uganda and Unyoro*
x Somaliland
y Abyssinia and Galla Land
z East African Lake Region

L POLAR REGIONS IN GENERAL
La Arctic regions in general
a1 *Franz Josef Land*
2 *Spitzbergen, Jan Mayen, and Bear island*
3 *Greenland*
4 *Smith's Sound region*
5 *Arctic archipelago north of America*
6 *Bering Strait region*
b Antarctic regions in general
b1 *Grahamsland and neighbouring region*
2 *Victoria Land and neighbouring region*

M THE SEA AS A WHOLE

N ATLANTIC OCEAN as a whole
Na North Atlantic in general
b Eastern seas, etc.
b1 *Barents sea*
2 *White sea*
3 *Kara sea*
4 *Norwegian sea*
5 *North sea*
6 *Baltic sea*
7 *Bay of Biscay*
8 *Mediterranean sea*
9 *Black sea*
10 *Gulf of Guinea*
c Western seas, etc.
c1 *Davis strait*
2 *Hudson bay*
3 *St. Lawrence bay*
4 *Gulf of Mexico*
5 *Carribbean sea*
d North Atlantic islands, etc.
d1 *Azores*
2 *Newfoundland banks*
3 *Bermuda*
4 *Madeira*
5 *Canaries*
6 *Cape Verde island*

N	ATLANTIC OCEAN as a whole—*continued.*
e	South Atlantic in general
f	South Atlantic islands
*f*1	*Ascension*
2	*St. Helena*
3	*Fernando Noronha*
4	*Trinidad (islet)*
5	*Tristan da Cunha*
O	INDIAN OCEAN IN GENERAL
O*a*	Red sea
b	Persian gulf
c	Arabian sea
d	Bay of Bengal
e	Andaman sea
f	Mozambique channel
g	Sunda-Australian bight
h	Great Australian bight
i	Oceanic islands
*i*1	*Chagos archipelago*
2	*Mauritius*
3	*Réunion*
4	*Rodriguez*
5	*Seychelles*
6	*Keeling island*
7	*Amsterdam and St. Paul islands*
8	*Christmas island*
P	PACIFIC OCEAN IN GENERAL
P*a*	North Pacific
b	Bering sea
c	Sea of Okhotsk
d	Sea of Japan
e	East China sea
f	Yellow sea
g	South China sea
h	Celebes sea
i	Pelew sea
j	South Pacific
k	Sunda sea
l	Sulu sea
m	Banda sea
n	Arafura sea
o	Coral sea
p	Tasman sea
Q	SOUTHERN OCEAN IN GENERAL
Q*a*	Antarctic sea
b	Oceanic islands
*b*1	*Gough island*
2	*Sandwich islands (south)*
3	*South Georgia*
4	*South Orkneys*
5	*South Shetlands*
6	*Bouvet island*
7	*Crozet island*
8	*Kerguelen island*
9	*MacDonald and Heard islands*

HYDROGRAPHY OF THE UNITED STATES.*

By FREDERICK HAYNES NEWELL, Hydrographer U.S. Geological Survey.

IN considering hydrography as a branch of geography, it may be claimed that the period of exploration has passed. The location of nearly every stream or source of water is fairly well known and represented on the ordinary maps of states and counties. The next stage of progress, that in which accurate information is obtained as to volume and fluctuations of the water resources, may be said to be fairly entered upon. In few localities, however, can it be held that there exists information concerning the waters sufficiently definite to suffice for ordinary engineering or civic requirements, excepting possibly in the case of some of the principal harbours and larger navigable streams.

THE FIELD OF INVESTIGATION.

The territory to be studied in obtaining a knowledge of the hydrography of the United States is not only large, but is highly diversified in character. The problems encountered have great variety not only in kind, but in magnitude of scope, and in practical application. While intimately connected in some respects, the subjects of hydrographical study have a natural classification based largely upon geographical divisions, the western or arid part of the country demanding investigations differing widely in purpose from those of the eastern or humid sections. In following out this classification, the rivers of the Atlantic slope, taken in order from north to south,

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come first; then the Mississippi river and its tributaries from the Appalachians westerly to the Rocky mountains; then come the Texan or Gulf streams, including the Rio Grande; then next to these the great Colorado river, flowing south-westerly into the Gulf of California; after these may be taken up the lost rivers, or the drainage of the vast interior basin of the continent from which no streams escape to the ocean; and, finally, the Columbia and other rivers flowing into the Pacific, the most notable of these being the Sacramento and its tributary the San Joaquin.

The Purposes of Investigation.

The direct objects of the various investigations bearing upon the hydrography of the country are distinctly economic. Each has in view the accomplishment of some result which shall render available to a larger degree the natural resources, adding to the wealth, comfort, or health of the people. Indirectly, however, facts of broad scientific interest are developed, though the work may not have been planned to this larger end. It is well to keep in mind the object or motive of the various classes of work in order to better comprehend the causes of deficiencies or want of symmetry of the resulting body of facts.

The first in time, if not in importance, of the objects of hydrographical investigation are undoubtedly those pertaining to navigation. Since the period of the first discovery of the continent, explorations and minute mapping of the shores, harbours, and navigable rivers, have been almost continuously carried on. The body of facts thus accumulated is in what may be termed a complete form, requiring for the most part merely the continual revision and refinement necessitated by changing conditions and by the more exacting demands of commerce. The methods and results of the surveys of navigable waters are so well known, and have been so widely extended throughout the world, that comment here is not necessary.

Next to the demands of commerce for information concerning waters are those of manufacture. In the former case water furnishes the means of transporting the goods, and in the latter, through its motion in the descent from higher to lower levels, furnishes power to drive the complicated machinery which has replaced manual labour. It would be a comparatively trivial matter to ascertain the extent and value of available water-powers if the streams continued with unvarying flow through seasons and years, but with their constant fluctuations day by day, the problem becomes one requiring years of measurement to determine what may be considered as the available or economic power to be realized. At certain seasons of the year the amount of water is vastly in excess of any possible utilization, and then is a source of danger to structures and to population. At other times the quantity drops below the capacity of the water-wheels or other machinery, and storage of flood-waters must be resorted to. In contemplating a new enterprise, it is necessary to know the range in the behaviour of a stream through many years in order to determine the necessary dimensions and strength of structures to be erected, and to make suitable provisions for tiding over the times of deficient supply. The question of probable profit or loss may be determined by the record of a few days' low water in the past. In illustration may be cited the case of a great water-power enterprise for which capital had been raised and thorough examinations made. It was found, however, that no trustworthy records could be found of the behaviour of the river in the past, but the assumptions of the engineers, based on incomplete data, seemed to show that the possible short period of low water might eat up the profits of the enterprise. The project was therefore abandoned. The phenomenally low water of subsequent years, however, never reached the minimum predicted, and it is now obvious that, had the works been erected, failure would not have resulted from this cause. The utilization of the water-power of the country demands, therefore, the most careful examination conducted through many years, so that on the one hand costly experiments may be obviated, and that on the other these natural resources may not be undervalued.

In the United States there has arisen a third demand for knowledge of the water resources which in political and social importance ranks even above the needs of navigation and manufacture. This is through the extension and higher development of agriculture by the artificial application of water. The nation as a whole has been, and still is, a great landowner, having now in its possession and at the disposal of Congress one-third of its area, not considering Alaska. This one-third includes some of the richest and most fertile areas of the continent. It is for the most part open to settlement and private acquisition under what is known as the Homestead Act, but it is practically unavailable to the settler, usually a man of small means, because of the fact that the climate prevailing throughout the vast extent of public land is too arid to allow of the growth of ordinary farm crops. Irrigation must be practised, and, where employed, has been notably successful and remunerative; but the supply of water is scanty, and in many cases, before an acre of the best land can be cultivated, enormous expenditure must be made in the construction of reservoirs, canals, and ditches, putting it beyond the power of farmers or groups of farmers to make even a beginning.

Throughout the greater part of the western half of the United States all land values are dependent upon the ability to secure perennial supplies of water. The fluid, which in the east is in excess, and in many localities is literally free as air, becomes, as the supply diminishes, a valuable commodity. A spring of moderate capacity, found within the arid region, may be more highly prized than a mine of precious metal. It is a never-ending source of revenue. The limitation of the supply of moisture puts a premium upon careful farming, for with the warm cloudless days and the application of a proper amount of water, combined with thorough cultivation, the largest results are obtained from the minimum acreage. Economy of effort and density of population are thus favoured by the employment of water in agriculture.

The utilization of the vast extent of fertile public land is a question of great national importance, not only from the standpoint of the citizen as owners of the land, but from many other sides. The arid lands now desert are capable of furnishing homes for a population of millions, and, if properly utilized, will serve for many decades as an outlet for the congested population of the eastern cities, furnishing a possible solution for some of the most pressing social problems of the day. Before plans involving the utilization of these lands can be made, it is necessary, however, to obtain accurate knowledge as to the available water-supply both above and below ground, and of possibilities of conserving floods and of raising water by machinery from lower to higher levels. With the fluctuations which take place from year to year, it is obvious that such investigations must be continued for times sufficiently great to give the ordinary range of conditions.

There is yet another series of investigations which, though individually of local concern, are yet found wherever civilization progresses. These pertain to the supply of water for domestic and municipal use. The quantities to be secured are relatively small, almost insignificant in comparison with those required for navigation, water-power, or even for irrigation, the supply of water for a city of ten thousand people being not greater than that needed to irrigate a farm of 150 acres. But while the quantities are small the quality is of prime importance, for upon it depend matters of life and death to communities. As a rule each city or town, or in the country each family, makes its own investigation regarding sources of water, but as population increases the opportunity of enjoying an unpolluted source of supply rapidly decreases. Especially is this the case with cities which from their location are compelled to draw water from streams flowing for a considerable distance, and possibly crossing state lines. Such streams, in our present state of civilization, receive with the drainage of the country the sewage from towns and institutions, together with the offscourings and refuse of all descriptions. The time is rapidly approaching when vigorous steps must be taken to prevent stream pollution, and in the mean time a thorough knowledge must be obtained of all possible sources of supply.

Passing over many minor demands for hydrographical investigation, there may be taken up, as of general interest, the class of facts geological in character which pertain to the eroding and transporting power of running water. These matters have interest, however, not only to the student of geology tracing out the operations by which the present aspect of the Earth has been produced, but also to the engineer who is concerned with the stability of Earth and rock, and the formation of bars or obstructions in rivers or harbours. Comparatively little observation has been directed specifically to such matters, investigators being content with the derivation of a few somewhat empirical formulæ as to the ability of streams to carry material of certain form and weight.

The Investigation.

From the foregoing abstract of the objects of hydrographical investigations, it is obvious that such work must be carried on by many men and by various methods. With the rapid development of the country, and the impossibility of predicting future needs, it has been impracticable to lay out broad lines of research, and field-work has, in fact, been devoted to the purposes of the moment. In reviewing the results that have been attained, it may properly be claimed that the pioneer efforts on the one hand are traceable to the efforts of Thomas Jefferson in his advocacy of the establishment of scientific surveys, later realized in the operations of the Coast and Geodetic Survey. On the other hand, as applies to the hydrography of the country at large, the foundations may be said to have been laid by the Smithsonian Institution. The history and operations of the Coast and Geodetic Survey have been so fully discussed by others, that it is not necessary, at this time and place, to enter upon them, and the importance of the achievements of this organization call for more space than can here be given.

Brief reference only can be made to the work of the Smithsonian Institution, the mother of many important governmental bureaus of investigation. It has apparently been the policy of the guiding spirits of this institution, in their attempts "to increase and diffuse knowledge among mankind," to inaugurate scientific work on all lines, and when any one investigation attained a growth such that public interests ensured its continuation, to dismiss from the parent home this offspring as a separate bureau—usually attached to some one of the executive departments. In this way the Fish Commission—an independent organization—took its origin; also the Weather Bureau, now a part of the Department of Agriculture; possibly the Geological Survey, one of the bureaus of the Department of the Interior, may also be traceable to the explorations fostered and encouraged by the Smithsonian funds. It is apparent that the first systematic studies of the water resources of the United States, and the discussion of their possibilities and limitations, is due to the stimulation afforded by this institution. Work of this character has, however, been almost entirely abandoned by the Smithsonian, because of the fact that original research in this line has been taken up systematically by younger organizations.

The construction of public works for coast defence and for the improvement of navigation has been entrusted to the supervision of engineer officers of the army. The preliminary work of ascertaining physical conditions has necessitated the acquisition of a considerable body of facts in regard to the rivers and harbours, especially in the immediate locality of points where works of improvement are undertaken. The study of hydrography carried on under such conditions is of necessity fragmentary and incomplete, but it is yielding data which, when rounded out and supplemented, must be of inestimable value in the progress toward better knowledge. Each year is adding to the accumulation of data, through the maintenance of tidal gauges and of observations of river height on navigable streams—such, for example, as the Mississippi, Missouri, Ohio, and their principal tributaries, and the larger rivers entering the Atlantic and Pacific oceans. Besides these operations, and the surveys of the Mississippi and the Missouri rivers, various engineer officers are from time to time making special examinations of streams large and small, reporting upon the practicability or advisability of removing obstructions and of providing locks and dams for maintaining navigable stages during times of low water. The information thus had, is, for the most part, published in the annual reports of the Chief of Engineers.

The work of the Weather Bureau, in many of its divisions, is of prime importance to the knowledge of the hydrography of the country. It lies at the root of the matter in that, through the records of precipitation, facts are obtained as to the distribution of rainfall over the surface of the land. These observations are being carried on at many hundreds of localities, a few of these being at stations provided with trained salaried officers, but, for the most part, through co-operation of persons who voluntarily give their time to the measurement and recording of rainfall, and also of changes of temperature. In addition to this, the bureau maintains, on a number of the more important streams, a system of gauges under the charge of local paid observers, these being so placed as to give information concerning the rise and fall of the streams at localities where the information will be of value in making flood predictions. The system of warnings based upon these observations has proved of great value, not only to commerce, but also to all of the inhabitants within areas liable to inundation. Through the notices timely given, it has been possible to save from destruction property valued at many thousands of dollars, and doubtless many lives. These observations are as a rule continued only during the flood season, and are discontinued throughout the winter, especially in the case of rivers covered with ice during a great part of this season.

The investigations of the Geological Survey, through its Division of Hydrography, are designed to give a general yet thorough knowledge of the distribution of water throughout the country—both above and below ground—its fluctuations in quantity from time to time, and the factors which govern its availability in contributing to the prosperity of the citizens. In view of the limited resources available for the purpose, it is not practicable to measure all streams, or to carry on studies of underground waters in all places, but attempts are made to select the more important or typical localities, and obtain facts which will be not only of local value, but have a broader application. There are two classes of work involved: one of a somewhat simple engineering character, consisting of measurements of the discharge of rivers at designated points, and computations of the daily flow; the other less direct, necessitating a thorough examination of geological conditions, and the bearing of these upon the occurrence of water and its motion underground.

The measurement of water in the river differs from the ordinary meteorological operations in that we are dealing with a constantly varying quantity, the natural streams fluctuating from moment to moment often by perceptible amounts. Thus extreme accuracy is practically impossible even if desirable, for the amount ascertained for one hour in the day on a given date may not again be equalled in a decade. A considerable number of measurements, whose errors, though relatively large, are not cumulative, must therefore be made, and at times and seasons when they are representative of prevailing conditions. The expense, however, of frequent measurements is usually prohibitory, and therefore a further method of approximation must be employed, this consisting in maintaining continuous observations of the height of water of the stream, or daily or periodical records made at intervals so short that there can be no extreme variation between them. This is the course adopted, the assumption being that the quantity of water in a given stream in a general way follows the height upon a fixed gauge. That assumption, however, is in error wherever a stream is eroding or modifying its channel to a notable degree. Then the height of water means little or nothing unless taken in connection with the shifting form of cross-section.

The operation of river-measurement, as now carried on, consists in establishing a gauge at some point favourable for measurement and for observation. Readings of height of water are made, and records are transmitted to the local engineers or hydrographers; at intervals of a few weeks the hydrographer visits the stations under his charge, measures by means of a suitable device—usually an electrically recording current-meter—the velocity of the water, obtains by direct measurement the depth and width, and from these facts computes the discharge for the height at which he happens to find the stream. The results thus obtained are assembled, and from measurements made when the stream is at high and low stages and at intermediate points a graphical curve is constructed, representing what may be termed average relationship between height of water and quantity flowing. From this curve a table is constructed, which gives the ordinary flow for each tenth of foot at which water stands on the gauge. The table is used in converting the daily record of height into a statement of discharges, from which may be had the maximum, minimum, and average flow for any particular month or year. Such river stations are being maintained at about a hundred and fifty localities, these being for the most part in the western half of the United States, where the question of water-supply has an immediate bearing upon the utilization of the arid public domain. Where the channel of the stream is of such an unstable character that these simple operations are not applicable, more frequent direct measurements of discharge must be made, as it is usually impracticable to attempt to improve or rectify the channel for the purpose of measurement.

A knowledge of underground waters is based upon a systematic examination of the materials which form the outer covering of the Earth. In order to obtain facts concerning the quantity and quality of the contained water and of its probable hydrostatic pressure, it is essential to know not only the topographical structure, but also the attitude and character of the rocks for a considerable distance beneath the surface. Operations are being carried on mainly within the Great Plains region, where living streams are rare, and where the surface of the ground is so nearly level that it is impracticable to store water in reservoirs or tanks. Here wells must be depended upon to a large extent to furnish not only drinking-water, but the supply necessary for cattle and for the cultivation of gardens and shade trees about the homes of the people. In this country, characterized by uniformity, the rocks are continuous in character over great areas, and examinations involving a considerable portion of the continent must be made before local matters can be determined. The underground structure, however, is not as simple as might be inferred from the surface, for the older and deeper rocks have in many places been decidedly flexed, or even faulted, especially at points near the foothills. Thus, while predictions can be made as to the thickness of the rocks over considerable areas, and the depth to certain water-bearing strata, yet these statements must be carefully checked by a thorough search for interrupting causes.

The method of work consists in careful examination of the surface rocks of all places where outcrops may be expected, and the collecting and comparison of records of wells, especially those of notable depth. The exposure of the upturned edges of the Plains rock against the mountains affords opportunities of the estimation of the thickness, and this in turn is checked by the examination of outcrops in ravines and by measurements obtained from deep wells. The character of the containing beds must be determined from those outcrops and from the borings, and, in short, every available fact and inference must be utilized in adding to the mass of information.

Results.

The results of the various branches of hydrographical investigation, when rounded out, give a complete history of the progress of the cycle of existence of water in the form of fluid, from the time it reaches the Earth as rain until it is again returned to the air by evaporation, or fixed more or less permanently in the tissues of plants or the rock-crust of the Earth. This life-history embraces not only the progress of the water from point to point, but also its quantity, distribution, extent, and depth in the rivers and lakes and on the navigable coasts. The progress of events in such a history can be discussed under several heads, the principal of which are the quantity and distribution of the rainfall, the amount of water which runs off the surface of the ground forming streams, commonly known as run-off; next, the portion which is early evaporated from the soil or from plants growing in it; and, lastly, that which sinks underground, percolating for considerable distances to form relatively permanent underground waters, or to reappear, in part at least, in springs and ordinary or artesian wells.

The great body of facts thus far acquired, consist of measurements of rainfall made by the Weather Bureau, or records of river height kept by this organization and by various officers of the army, together with occasional discharge measurements made at irregular intervals. With this are the measurements and computations of daily and monthly discharge of various streams resulting from the field work of the Geological Survey, and a considerable body of facts relating to the occurrence and movement of water underground, resulting from the studies of various geologists. This somewhat heterogeneous mass of material is being digested as rapidly as possible by the Division of Hydrography of the Geological Survey, with the intention of preparing a systematic description of the hydrography of the United States.

One of the first results to be attained, but for which many more facts should be had, is the relation existing between rainfall and run-off under various conditions of topography and culture. Tentative conclusions have been drawn and expressed in the form of simple diagrams. If all the rain that fell upon the surface flowed off in the streams as from a roof, then with, say, 40 inches of annual rainfall there would be an equivalent depth of 40 inches of annual run-off; but, as a matter of fact, from the ordinary mountainous country only about 30 inches in depth of run-off may be expected, and from surfaces of less relief, as the rolling prairies and foothills, about 15 inches in depth of run-off per year. On the other hand, with 20 inches of rainfall, the amount running off from the mountainous country is approximately 7 inches, and from the prairies 2 inches. With half as much rainfall, or 10 inches in depth, only about 2 inches per year can be expected from the mountains, and practically nothing from the plains. In other words, with a mean annual rainfall of less than 10 inches, or from 10 to 15 inches, no living streams can be expected outside of the mountains, and, as shown by the map of the United States, rivers rising in regions of such aridity disappear upon reaching the lowlands, so that the arid region of the west is characterized by its lost streams.

Another set of results being obtained is in regard to the average discharge of the rivers of the country. It is recognized that with the great seasonal and climatic oscillations that take place the streams have great range, and may never flow for any considerable length of time at their average rate, but, nevertheless, even with these wide and irregular variations it is a matter of considerable moment to know what has been, for a period of ten years or more, the average discharge of the streams at certain points. This average discharge, when represented diagrammatically on a map, enables the student to see at a glance the relative importance of various rivers, as well as their length and position.

Having ascertained approximately the average quantity of water carried by rivers at various portions of their course, it becomes practicable, using this as a base, to study the variations from this mean, and to have a standard by which to express the relative quantity of floods or the relative deficiency of droughts. The intensity and duration of these are matters of great importance, both in their practical and scientific application, and can only be satisfactorily discussed when results have been obtained covering a considerable range of time. When such data have been assembled and arranged for convenience of reference, it will be possible for individuals, officials, engineers, or promoters to discuss the practicability of enterprises designed to add to the health, comfort, or wealth of the people.

SCIENTIFIC GEOGRAPHY FOR SCHOOLS.*

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I PROPOSE, in the time at my disposal, to offer one or two suggestions for improving the geography work in our common schools, which at present here in America, and particularly in the United States, is recognized as the poorest-taught subject in the curriculum. While other subjects have undergone tremendous changes in the last few years, geographical teaching has remained practically dormant until within the decade. Much is being done at the present time in the line of so-called improvement, but a great deal of the energy is, to my mind, misapplied, because it is unscientific and superficial. My excuse for bringing this subject before a meeting composed so completely of scientists is because the teachers of this country need scientific help if they are ever to improve the work in geography. Many scientists fail to realize that the reason why their scientific labours are so little appreciated is because they themselves have neglected to train the public spirit, which should follow them and be interested in them. We have in the United States a few scientific geographers who are aiding greatly school teachers and pupils, working arduously and earnestly with the hope of doing some good in this generation and more in the next. Those of us who are making this task our life-work, while we are at the same time attempting to do something in scientific geography, feel that

* Paper read in Section E (Geography) at the Toronto Meeting of the British Association, August, 1897.

we need the help and the interest of every geographer in this country and abroad, if we are to produce the results we so eagerly wish for in making geography hold the place in the minds of the people that by right belongs to it.

Until within a few years, the geography taught in the schools has been very largely what is termed "sailor geography." It trained the mechanical memory and gave a vast knowledge of details, often of little use to the learner, to be forgotten as soon as school was out. This old form is now giving way to what is commonly called "rational" geography, in which the child is taught to reason, and in which the subject is made to become a mental stimulus. There is still room, however, for great improvement. At present there is a great deal of argument among school superintendents and principals as to the psychological position of geography, as to its ability to produce mental training, and as to the stage of mental development at which it can best be introduced. Those of us who have the cause of geography so thoroughly at heart need not stop to discuss this subject. We are thoroughly convinced that geography is as capable of mental training as any other science. If we are in doubt, we can be reassured by reading the excellent papers of Mr. A. J. Herbertson * and Mr. B. B. Dickinson,† which have appeared in the last year.

Leaving aside, then, the question as to the power of geography, let us see what the aims of geographical education are and what they should be. Hitherto the aim has been to give a knowledge of the world in its relation to man, and in some cases a knowledge of the world with very little thought of man. Now, we recognize that the teacher has not accomplished his task or fulfilled his duty thoroughly until he has trained his pupils in the ability to gain more education after they have left him than they have gained with him. They must leave school with the ability to study, to interpret, and to apply; with the power of gaining knowledge for themselves from maps, text-books, encyclopedias, books of travel, and all other sources of geographical information. If the end to be sought by geographical teaching is the power of knowing and applying one's self, then surely this power is more important than mere information. Incidentally, geography should train the pupils in an understanding of the features of the Earth, of their origin and structure, of their life-histories and their ends; it should develop in the pupils a love for nature and out-of-doors, a desire to study geography first hand and to come in contact with the Earth; it should leave them in a questioning spirit and with the power of thought.

All these points have been more or less dwelt upon by our teachers and geographers, but there is another point concerning which we hear less, and it is this: that the training in geography should be along scientific lines, and should lay the basis for scientific thought which the pupils may use in the later years. If the three steps which any scientist must follow, before he comes to a decision, are those of observation, inference, and proof, then our training is unscientific if we stop with mere observation and the study of relationships. We should early develop in our children the power of prophecy, and, what is further, the power of proving the prophecy. By prophecy I do not mean guessing, but I mean the power of foretelling the relationship of man to any part of the world from the study of a good

* 'On the Importance of Geography in Secondary Education, and the Training of Teachers therein.' By Andrew J. Herbertson. 'Rep. Sixth Inter. Geog. Cong.' (John Murray, London, 1896), pp. 83-87.

† 'Geography as a School Subject (an attempt to show that Geography can be taught as a training of the mind).' By B. Bentham Dickinson. Printed for the Geographical Association, 1896.

map or other representation of that region. From an experience of a few years in teaching, I know that this power of prophecy can be developed early in the child-life, and that it is vastly helpful in the future training of the children. The prophesying, however, must be founded on familiar conditions, and must start in a simple way. We all know that the German custom of making home geography the centre for future study of the world is becoming to be recognized as the true beginning for geographical work. If the home geography is so taught in the early years that the children get an understanding of the causal conditions, it becomes a basis for the study of prophetic geography later.

From the home geography we should go to a map representation of the facts, and from the home maps to maps of other regions drawn in a similar way. From these latter maps the pupils should be able to read the physical conditions, and to prophesy from these conditions certain great lines of geographical development. Climatic conditions, the lines of drainage, the character of the topography, the altitude, the occupations of the people, the places of residence, the manner of life, the lines of communication by water or rail—or the lack of them—the probable position of the great centres of population, and many other points, should at once be suggested to the child as the only results possible under such conditions.

In this development we have followed two of the steps of scientific reasoning: we have observed the home geography and the conditions abroad, and we have drawn our inferences from these conditions as to what their effects must be. The third step is the proof, the analysis, the decision as to whether the inferences have been true. That proof comes in the study of facts as they are given in the sources of information in the hands of the child or teacher. If these three steps be followed, the children are early led to appreciate the relationship between cause and effect, and to see that all is not chance in the world. Furthermore, they are given a mental stimulus and a training in right thinking that will be a help to them ever after.

During the last two years I have introduced this work into the school with which I am connected—the Teachers' College, New York City—and the results have been more pleasing than I had even expected. Children whose average age was eight years have, after a study of the home geography and a knowledge of the globe shape of the world, taken up a somewhat detailed study of the United States, and from a physical map prophesied simply, and yet accurately, all the conditions which I have suggested above, practically emphasizing the points of climate, drainage, topography, and occupations in the great central plain and mountain regions. In the succeeding grade, where the children average nine years of age, they prophesied from a physical map of Palestine all the primary geographical conditions of that region, and with such extreme accuracy that the teacher carrying on the work was as surprised as I was. This work has been done by teachers not particularly trained in geography, and who have only attempted the new geography within the last two or three years. Of course, much depends upon the ability of the teacher to keep the prophesying of a degree and quality in sympathy with the ability of the child. Naturally more work, and more detailed work, can be accomplished in the latter years than in these years, but these two illustrations show most clearly how it is possible to start scientific thought early in our school work. The teachers in our institution value this work, and recognize that it is going to be extremely important and a very great help in the later work in history, literature, science, etc.

The kind of generalization and the kind of prophecy that is possible in geographical work is different from that in any other line of science, and I feel that we should all make an effort to incorporate scientific geographical teaching in our grade schools. I believe that geographical teaching along the lines suggested is more scientific than that followed in many of our institutions, and if this line of thought be a valuable one, as I deem it to be, we should do all in our power to assist it. The common school-teacher not being trained as a scientist, it becomes the duty of those whose thought is scientific to help the non-scientific. A great many of the teachers of the United States recognize that the source of help to which they must go are the men scientifically trained as experts in the particular subjects in which they are interested. The geographers of the United States are having a tremendous demand upon them at all times for help and assistance, yet they are so few that their work, important as it is in certain localities, lacks geographical breadth and area.

We need the help of every geographer if we are to secure an immediate improvement in geographical teaching. First we need to persuade the superintendents and those in authority that geography is a science, and capable of giving scientific training. There is much writing and talking on "What is Geography?" but there is less on what it can do. We know what it can do, and we need to prove to others the strength of our position in reference to this subject.

At present there are but a few universities in this country where geography is taught scientifically, and the aid from the scientists must therefore be given to all stages of education, from the earlier to the more mature years. This assistance will, as I have said before, perhaps secure little return in this generation, but surely the next generation will profit thereby.

There are several lines in which scientists can help in geographical work. First and foremost is the necessity that geographers should publish their results in such a form and in such a place that teachers can make use of them. Much that is valuable is now not at the service of teachers, because buried in scientific bulletins and periodicals. Furthermore, many of our geographical results are given to the world in terms unintelligible to the lay reader, because phrased in roundabout statements or unusual words. We need to be more simple, more concise, and hence more clear. Teachers cannot afford the more costly scientific publications, and hence there is need that scientific geography be published in such a form that teachers may have access to it. The writer has endeavoured to do his little in this regard by publishing a journal of school geography,* which, though youthful, has met with such a good success that I think it a sign of the times and of the opportunities of the times. Our padagogical papers are full of geographical material, but most of it is rubbish, and geographical only in the mind of the writer thereof or by courtesy. Every geographer can assist in this good work, and help the papers of the country by giving them accurate facts.

Yet by this means of assistance alone teachers may become loaded with a mass of facts, dangerous because of their inability to apply it scientifically. Hence scientists can do much, though more local perhaps in its effect, by the giving of courses of definite lectures for the teachers of their neighbourhood. Much is being done, as you know, in this way abroad, and something in this country; but we should all of us be at the task, for in combination only is there a possibility of success.

Again, our schools need better and cheaper maps, more and better models and globes, lantern slides, etc.; and the selection of these should be managed by scientific men. Much credit is due to the work of Mr. B. B. Dickinson and the Geographical Association of Great Britain. Would we had several similar centres of geographical information—geographical information bureaus, if you will—in this country! Here is a chance for beneficial help that needs attention at once.

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* The *Journal of School Geography*, a monthly journal devoted to the interests of the common school teacher of geography. Lancaster, Pa. One dollar a year.

As America is a country which is considered practical, we can help our cause by showing what applied geography is. If the geographers of this country and abroad would produce more publications showing the relation of the geographical conditions to history and progress, to literature and art, to human conditions of all kinds, the science would be helped, and the common people would soon learn to recognize the claims of geography and the need of improving the teaching of it. Prof. Charles R. Dryer, of Terre Haute, Indiana, has led the way in this work in this country by his recent publications of his Studies in Indiana Geography,* and I hope many geographers will soon follow his example in other states.

I have spoken as a teacher and student of teaching, and have tried to show some of the helps we teachers need in our efforts to improve geographical teaching in this country. So far as I know, we have few schools where geography is taught in accordance with the plan I have outlined briefly. The number is increasing annually, however, and there is an ever-increasing demand for teachers of the so-called new geography.

Enthusiastically interested in the cause of geography as a geographer, and recognizing some of the difficulties that teachers have to deal with, I have ventured to summarize these conditions here, that they may receive some discussion, and I hope some recognition. I appeal to you all, therefore, whether you be from across the water or not, to give your active sympathy and cordial co-operation in the vast problem which awaits us—the improvement of geographical teaching along scientific lines.

THE HIGHLAND CONTROVERSY.

AFTER the formal meetings of the Sixth International Geographical Congress came to an end, a number of excursions, organized under its auspices, set out under duly authorized leadership. It may be supposed that each of these started with an equal amount of energy, for the distances traversed were inversely proportional to the members constituting them, the long-distance excursion to the remote highlands of North-Western Sutherlandshire being undertaken by one member of Congress alone—Prof. Penck, of Vienna. Under the guidance of Mr. John Horne, Prof. Penck explored many of the more important districts very thoroughly, favoured by exceptionally good weather; the results of his observations are to be found in a recently published paper, which must be regarded as a very striking contribution to what is already a very voluminous literature, one which seems not unlikely to add yet another to the many "heresy-hunts" which have from time to time beset this troubled region.†

Taking up the matter from the wide standpoint of mere earth-structure, Prof. Penck's attention is first concentrated on the conditions under which the Torridon sandstones were laid down upon the Archæan gneiss, and the first part of his paper consists of a careful examination of the appearances observed along the line of junction of these two formations. The structure of the Torridon breccias, as seen, for example, on the south side of Loch Torridon, on Loch Maree, and at the Gairloch, and the characteristic forms of the surface of the gneiss near Quinag, Loch

* 'Studies in Indiana Geography.' By Charles R. Dryer. Inland Publishing Co., Terre Haute, Ind., 1897. Pp. 113.

† "Geomorphologische Probleme aus Nord-west Schottland." Von Albrecht Penck. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, Band xxxii. (1897), No. 3, pp. 146-191.

Assynt, and elsewhere, are rigorously examined for traces of submarine, lacustrine, or even glacial conditions, and compared with deposits known to have been laid down in any one of these; but in each Prof. Penck finds them wanting. Then follows an inquiry into possible formation by the erosion of pre-Torridonian mountains by running water, but here again the evidence is unsatisfactory; and the surface appearances of the gneiss and the texture of the lower Torridon beds can only be accounted for by supposing the existence of a dry continental climate, the main erosive agents being large changes of temperature, wind, and occasional torrential rains of the "cloud-burst" order. Comparing the situation with that now to be found in the wadis of the Sinai peninsula, recently examined and described by Dr. J. Walther, and photographed by Dr. Natterer, this view is confirmed, and Prof. Penck concludes that the Torridon sandstones were in the first place laid down under arid conditions on a base which had never previously sunk to sea-level.

As time went on the climate became moister, for the Torridon sandstone, like the Dala quartzite of Sweden corresponding to it, bears traces of river-erosion, and with the beginning of the Cambrian period the sea invaded the whole region, bringing with it a highly organized fauna of obviously foreign origin—only, however, after the formation of the most typical "plane of marine erosion" known to the European continent, involving the removal of a great part of the deposits laid down.

The second part of Prof. Penck's paper deals with the bewildering problems of the Ben More and Moine thrust-planes, and here we are confronted with a long and closely reasoned argument very difficult to describe in brief, partly because of its essentially complex nature, and partly because it treats of matters of geomorphology which are commonplace to students of Prof. Penck's great treatise, but are not yet sufficiently familiar here to have established English equivalents. The simplest way seems to be to reverse the order followed by Prof. Penck, and to discuss, as it were backwards, the formation of the type of mountain ranges produced by folding or bending of strata which have been laid down as horizontal sedimentary beds. These bends or folds are assumed to be ultimately due to shrinkage of the globe as a whole, producing lateral pressure, and consequent irregularities of yielding near the outer circumference. But the minute and accurate geological surveys, which alone afford reliable information about the occurrence of such irregularities, are too small in number and too restricted in area to present the phenomena in anything like completeness: hence it is necessary to fall back on experiment on the small scale, a proceeding more than usually risky with so many unknown quantities. Upon the observed changes in thickness and density of strata known to have been subjected to strains of the given type, Prof. Penck bases calculations which lead to the result that the deformations to be considered are restricted to a small thickness of strata near the surface of the earth; and it is, as usual, assumed that the rigidity of these strata decreases from the surface downwards. The experiments of Cadell, Willis, Forchheimer, and others, in which beds of sand, plaster of Paris, etc., arranged so as to be more and more plastic from above downwards, and resting on a rigid surface of wood, were subjected to lateral pressure, are therefore to be accepted as in some degree representing the conditions under which the "fold" type of disturbance has actually taken place.

Prof. Penck devotes a section to an elaborate discussion of these experiments, and although he admits that the line of investigation has not yet been exhausted, he finds that the normal disturbance is as follows: Lateral thrust produces—(1) a surface layer of simple sliding, without distortion (*Ueberschiebungen ohne*

Auswalzungen); (2) an intermediate layer of folding and dislocation recognizable by rotation and inversion of strata (*Faltung mit Faltungsverwerfungen, hauptlich durch Auswalzungen und Umkehrungen der Schichtfolge*); and (3) a layer of quite plastic material with primary sliding without rotation or inversion (*ein Niveau mit primären Ueberschiebungen ohne Auswalzungen und Schichtumkehrungen*).

The conditions represented by the surface layer are naturally exposed only where there has been little denudation, and we are referred to the North German plain, where a gently undulating surface is succeeded, at no great depth below the surface, by an extraordinarily involved series of rocks, very puzzling to decipher. The second layer, contorted and faulted so as almost to defy analysis, is laid bare in the Appalachian range, and in the Alps; a double fold peculiarly characteristic forming the Glarus Alps, here specially described. The third and last layer, exposed by practically destructive denudation, is represented by the great thrust-planes of the north-west highlands of Scotland. Each of these layers, as is indicated by the experiments, glides almost insensibly into the one next to it. Prof. Penck here specially describes his personal examination of the second and third.

TO FIND THE ANGLES FROM THE VERTEX OF THE MOON FOR AN OCCULTATION PREDICTED BY MAJOR GRANT'S APPROXIMATE METHOD.*

By E. A. REEVES, F.R.A.S.

In the number of the *Geographical Journal* for June, 1896, there appeared an excellent paper by Major S. C. N. Grant, R.E., in which he describes his graphic and very practical method of predicting the circumstances of an occultation with sufficient accuracy for the purposes of an explorer. This method, although it does not attempt at great precision, will, with moderate care in working, enable a person to determine whether an occultation which is given in the 'Nautical Almanac' will be visible in any place on the Earth's surface of which the latitude and approximate longitude is known, and, if so, will give, within a few minutes, the time of its occurrence. It also provides the means of ascertaining the angle, as measured from the *north point* of the moon, of immersion and emersion. Unless, however, an equatorially-mounted telescope should happen to be used, which can rarely be the case, it is impossible to say, with anything like certainty, where the north point of the moon is. What an explorer, who usually carries a telescope with the ordinary alt-azimuth mounting, requires is some means of finding the angles of immersion and emersion from the *vertex* of the moon, and the following is a simple method of approximately ascertaining these angles.

Upon the diagram showing the circumstances of the occultation already plotted according to Major Grant's method, the positions of the moon's centre, as effected by parallax, at the whole hours selected, and at immersion and emersion, are shown, and the perpendicular lines on the paper represent the celestial meridians, or lines running in a true north and south direction.

In the example here given, let it be supposed that we require to find the approximate angle from the vertex at immersion, which it has been ascertained will take place at $10^h\ 19^m$. The nearest hour to this is, of course, 10^h, for which

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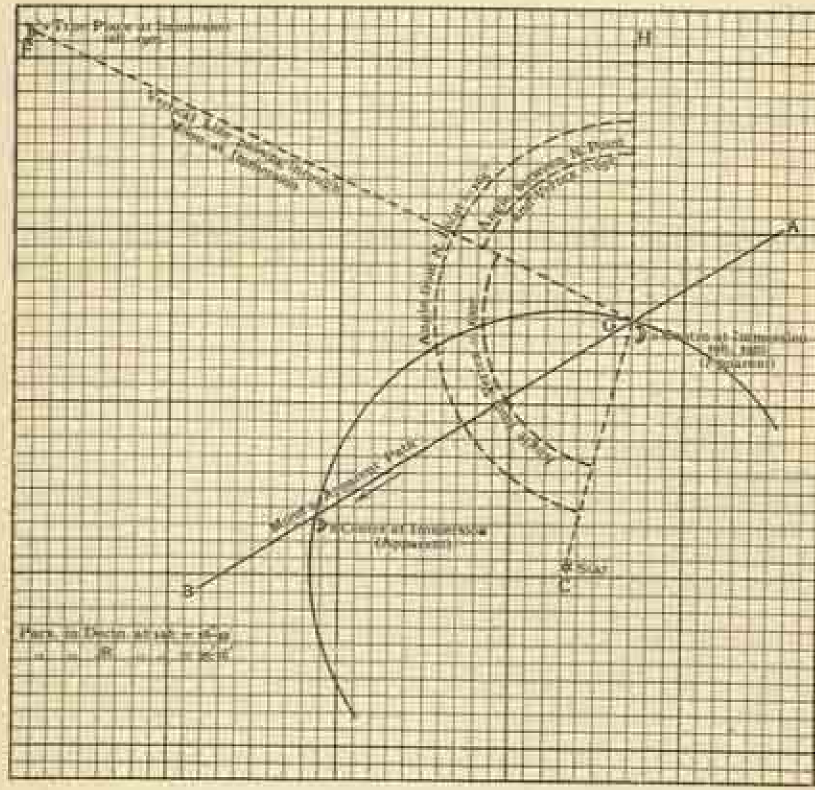
* An appendix to Major S. C. N. Grant's Approximate Method of predicting the Circumstances of an Occultation (*Geog. Jour.*, vol. vii. p. 649).

we have found the parallax in declination to be 16′ 49″, and the parallax in right ascension, 35′ 16″. With these quantities we can turn to the diagram (corresponding with the second in Major Grant's paper) and proceed as follows: Mark off on the diagram the true position of the moon at the time of immersion by means of the parallaxes in declination and right ascension previously found, thus: Taking, as before, each small square on the diagram to represent one minute of arc, mark off the required number (16¾ nearly), counting up from the apparent place of the moon at immersion ($10^h\ 19^m$). (We count *up* in this case, as the true declination of the moon is further north than the prepared or apparent declination; if the opposite had been the case, we should count *down*.) Make a mark at this point,



and then count off to the east or west (left or right) the number of squares and parts of squares equal to the minutes and seconds (in arc) in the parallax in right ascension for the first hour (10^h), also previously computed, and mark this spot clearly. This is shown by F. (When the hour angle is west count off to the left, and when east to the right, of the north-and-south line passing through the moon's apparent place at immersion.) This point, F, will approximately represent the *true* place of the moon at immersion. Next, with a ruler on the point F and the apparent place of the moon at immersion, G, draw a line, FG, connecting these two points. Then FG represents a portion of a great circle passing through the moon's centre and the zenith; and the angle FGC is the angle of immersion, measured from the vertex of the moon.

To find the angle at emersion, all that is required is to go through the same process again, using the parallaxes worked out for the next hour (11^h), and measuring from the moon's apparent place at emersion.

When the parallaxes in declination and right ascension do not vary much between the two hours for which they have been ascertained by Major Grant's method, it will be near enough for practical purposes to use the quantities as they are worked out for the nearest hour without applying any correction for the change during the elapsed interval of time; but when the difference is considerable, a correction should be made, which can be done very readily by applying the proportional part for the elapsed interval, ascertained by means of the change in one hour, which is already given. Then, with these corrected parallaxes, turn to the diagram and proceed as previously described. The resulting angle from the vertex in the present case would, of course, be nearer the truth if this correction had been made; but the difference is only about 2°, which, from a practical point of view, is unimportant.

The angles from the vertex can be found in this way in a few minutes, and, although the results may not be exact, they are quite near enough for the purposes of an explorer, who only wants to know at what part of the moon's disc to direct his telescope.*

The last four lines of the calculation should therefore be altered as follows :—

Star's right ascension	$3^h\ 29^m\ 45^s$	Declination ...	23° 26′ 41″ N.
Moon at 18^m	$3^h\ 29^m\ 28^s$	Declination ...	23° 9′ 14″ N.
Difference in time ...	17^s		
" " arc ...	4′ 15″		17′ 27″

A diagram drawn in accordance with the calculation as printed in Major Grant's paper shows that, since the circle drawn from the star as centre, with a radius equal to the moon's semi-diameter, does not cut the line of motion of the moon's centre, no occultation would take place.

THE GEOGRAPHICAL ASSOCIATION.

The Annual Meeting was held in the hall of the Society of Arts, on December 23, Mr. Douglas W. Freshfield, President, in the chair. The *Annual Report* drew attention to the important step taken by the Victoria University in making geography a University subject, by including it in the Preliminary Examination in place of physiography. Reference was made to the appearance of Dr. H. R. Mill's most useful book, 'Hints to Teachers and Students on the Choice of Geographical Books,' a work undertaken at the special request of the Committee. Applications for a *Syllabus* of geographical teaching having been from time to time received, the Committee had, after much consideration, decided to print and circulate for criticism, (1) a general syllabus for Secondary schools; and (2) a scheme of study setting forth the minimum of geographical knowledge that might fairly be required of a boy on leaving the Preparatory school at the age of fourteen. The first experimental copies of coloured *lantern slides*, made by a new process, on which the hon. secretary

* On the diagram at the end of Major Grant's paper, the position of the star, S, has been erroneously plotted, and to bring the calculation in his paper in harmony with the diagram, we must assume the right ascension and declination of the star occulted to be $3^h\ 29^m\ 45^s$ and 23° 26′ 41″ N. respectively.

had been engaged during the past twelve months, had been approved by the Committee, and it was expected that some of the new slides would soon be ready for use. Specimens of the first four maps of the series of *Autograph Hand-maps*, designed to take the place of the unsatisfactory outline and memory maps in common use, were exhibited at the meeting, and it was stated that they would shortly be obtainable from the publisher. Arrangements were being made with Prof. Dodge, of the Teachers' College, New York City, for making his *Journal of School Geography* better known in this country, and for supplying occasional papers and notes of special interest to British teachers. Finally, the Committee had the pleasure of announcing that Mr. Douglas W. Freshfield, late Hon. Secretary of the Royal Geographical Society, had accepted their invitation to become the first President of the Association.

In moving the adoption of the Report, Mr. H. J. Mackinder, Reader in Geography at Oxford, said that it was a record of solid work and progress in a variety of ways, which would compare favourably with the results of any previous year. He was, however, disposed to question the advisability of getting geography recognized in the entrance examinations at the Public schools. To do so might seem to suggest that geography was an elementary subject, which might be laid aside when a boy left the Preparatory school. He also doubted whether it was desirable to issue any general syllabus at all. A bad teacher might wish to have a syllabus prescribed, but the inevitable tendency would be to stereotype teaching and discourage all originality; and the evil would be greater in proportion to the authority with which the syllabus was invested. With this word of warning, he congratulated the Committee on the work they had done, and wished them success in the future. The motion was seconded by Mr. A. C. Bartholomew, Reading, and carried, as was also the adoption of the treasurer's report.

The officers and committee for 1898 having been elected, the Chairman gave a short address, in which he traced the steps taken by the Council of the Royal Geographical Society during the last eleven years to improve the position of geography in the educational system of the country. Their more recent policy had been to teach the teachers, and this had borne fruit in the excellent work done by Mr. Mackinder at Oxford and Reading and in London. The Council was not, however, an educational authority, nor had it much practical acquaintance with the details of teaching. For this reason it ought, he considered, to be glad to see its efforts supplemented by the Geographical Association, which had originated independently among the Public school masters themselves, with aims that were not too ambitious, but thoroughly practical. After mentioning some of the ways in which the Association could do useful work, he spoke of the need for class-books of a literary character—books like Huxley's 'Physiography,' which could be read with pleasure for their style as well as for their substance; and, in conclusion, he acknowledged the support and encouragement which the Association had received from the Royal Geographical Society and the Royal Colonial Institute.

Dr. H. R. Mill, Librarian of the Royal Geographical Society, then gave a lecture on "Some Hints on teaching Geography," illustrated by a great variety of original lantern slides of maps, diagrams, and scenery. Alluding to the remarkable ignorance of geography that prevailed in this country, he said it was not a subject which could be learned merely by reading. Another widespread delusion was the superstitious reverence for the supposed accuracy of geographical facts. But these were not like the facts of mathematics, and teachers should deal with round numbers, as being really representative. Geography had been well defined as "the Science of Distributions," and he threw upon the screen a series of maps specially prepared to illustrate "distributions" of various sorts, from rainfall to religions. Perhaps the most important hint he could give them was that geography must not be taught by any hard and fast method. In fact, every intelligent teacher might have his own method. Geography touched on so many other sciences, on so many human interests, that any teacher with a hobby or a natural aptitude for any study could find some avenue of approach which would enable him to enter enthusiastically into the subject, and from which as a centre he could teach all that the pupil required to know.

The lecture was followed with keen interest by the representative body of teachers present, and the proceedings closed with a vote of thanks to the chairman and lecturer, proposed by the Rev. J. Ll. Dove, Haileybury, and seconded by Dr. A. V. Markoff.

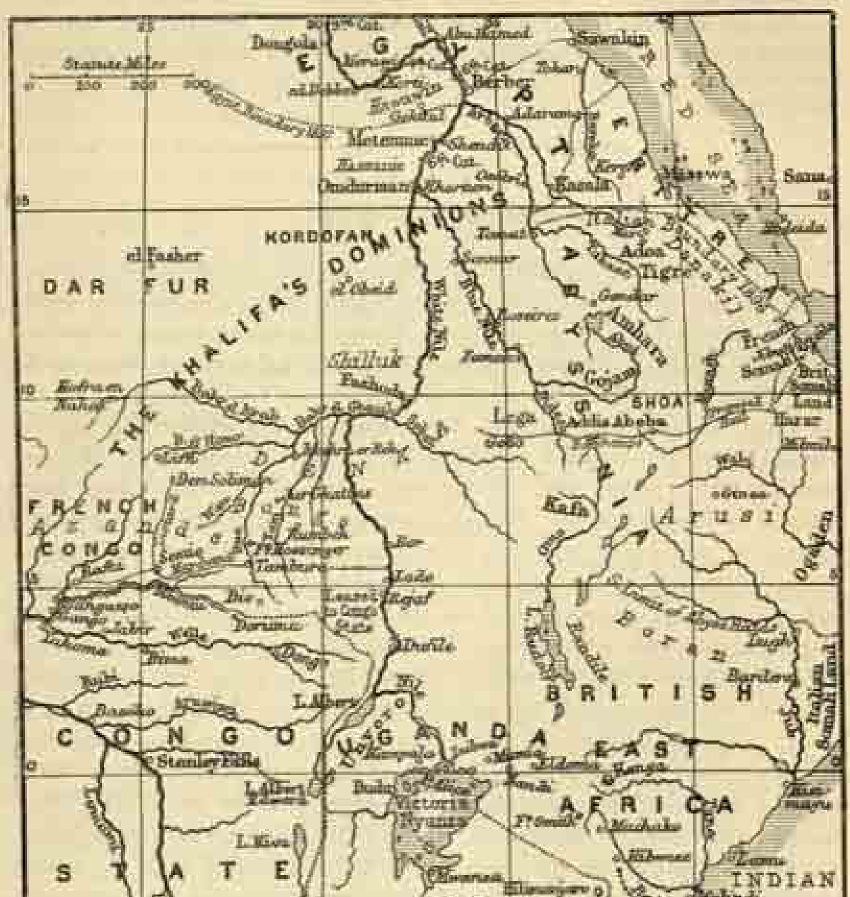
THE UPPER NILE.

So many conflicting reports with respect to the operations of French exploring parties in the valley of the upper Nile have recently been put in circulation, that it is worth while to present a concise statement of what really seems to have happened, as far as can be judged from the scanty information available.

When the French, in 1894, had compelled the authorities of the Congo State to withdraw to the south of the Mbomu river, and to abandon the greater part of the vast territory of which they had secured a lease from the British Government, preparations were set on foot for occupying not only the countries of the Azande, or Nyam-nyam chiefs, within the basin of the Congo, but also to extend French influence beyond the watershed, to the old Egyptian province of Bahr-el-ghazal and the upper Nile. The scheme proposed seems to have been of a most ambitious nature, if the French Press can be looked upon as the exponent of the actual intentions of the French Government. Captain Liotard, who had been appointed commissioner of the Mbomu valley, was to have pushed on to Meshra-er-Rek, where he was to have embarked for Fashoda, an important post on the White Nile held by the forces of the Khalifa, whilst a friendly force of Abyssinians, led by the Marquis de Bonchamps, was to have moved upon the same place from the eastward. Captain Liotard was reported to have occupied Meshra on July 25, whilst the Abyssinian force is stated to have left the Lega country on July 22. This combined advance would thus appear to have been timed most admirably, so far as French interests are concerned.

But months have elapsed since then, and no information whatever has been received in confirmation of these favourable reports. Captain Liotard, starting from Bangasso, made his way up the Mbomu, and claims to have secured the adhesion of the Azande sultans Rafai and Semio. He reached the river Sue (Swe), where he built and garrisoned Fort Hossinger. Supplies failing him, he was compelled to turn back, and in June last occupied Dem Soliman, the old zeriba of Ziber Pasha.

The expedition under Captain Marchand, which was to support this forward movement, arrived at Bangasso in April or May. His force was considerable, for, in addition to twelve Europeans, he had with him several companies of coloured troops. A steam-launch, the *Faidherbe*, was



SKETCH-MAP OF THE UPPER NILE REGION.

carried on the heads of porters, in pieces, as were also four steel barges. A smaller launch, the *Jacques d'Uzès*, was to follow. Progress along the Mbomu proved difficult, not only because of the physical features of the country, much of which is flooded at that time of the year, but also because of the unwillingness of the porters, who deserted whenever an opportunity offered. This need hardly be wondered at, for we learn, on the authority of one of the members of the expedition, that these men were forcibly impressed into the service of the expedition, and received no pay. Notwithstanding these difficulties, Captain Marchand reached the Sue (Swe), in Tambura's country, on August 27. Leaving Captain Germain and Lieut. Dyé in charge of the station, he started himself on a reconnaissance in the direction of Rumbek, whilst Lieut. Mangin was sent down the Sue to Fort Hossinger.

Since then no direct news from the expedition has been received—at all events, none has been made public. We learn, however, that Captain Germain has returned to Bangasso with orders to take up the *Jacques d'Uzès*. Captain Liotard, who came to Semio's on September 11, knew apparently nothing about a disaster, which, according to native rumour, had overtaken Captain Marchand's expedition. A similar rumour reached the Khalifa's camp at Omdurman, and was brought to Europe by Soliman Bey Unger, an Austrian in his service, who was interviewed at Constantinople in October last. The latest report is that the expedition was cut to pieces at Tombo's, and that only one of the officers succeeded in making his escape. Tombo is the name of an Azande sultan, whose son, Ngongo, in Dr. Junker's time, resided at a place in lat. 5° 25′ N., long. 28° 10′ E., about 30 miles to the east of the locality where Captain Marchand is reported to have reached the river Sue.

Our sketch-map shows the localities mentioned in connection with these French expeditions, and their relative positions with reference to other places in the Sudan. Fort Lubwa, where Captain Macdonald is holding at bay the mutinous Sudanese, lies far to the south, on the shores of the Victoria Nyanza. The recent expansion of Egypt on the upper Nile is likewise indicated. Kassala was taken over by Colonel Parsons on December 25, and since then the garrisons of the Khalifa have been expelled. The Egyptians now hold the valley of the Nile as high up as the Atbara, and the whole of the region to the east of that river, including the countries of the Bisharin and Hadendoa. They have pushed to within 200 miles of Khartum.

THE MONTHLY RECORD.

EUROPE.

The Climate of London.—At a recent meeting of the Royal Meteorological Society, Mr. R. C. Mossman, of Edinburgh, read the second of an important series of papers he is preparing on the meteorology of London. This communication refers to the seasonal variations of the phenomena classed as "non-instrumental," and the period under investigation extends from the year 1763 to 1896. A series of frequency curves has been deduced from the long-period averages, and a number of points of interest are brought out. Thunderstorms show a maximum frequency from the beginning of June to the middle of August, and a minimum between

October and March. During January fogs are considerably above the average in number, but they diminish rapidly after the middle of February, falling to a minimum at the beginning of July; a marked increase takes place during September, and the maximum occurs between November 5 and 24. Snow falls most frequently just after New Year, often also in the beginning of March: there is a curious increase in snowstorm frequency about the middle of April—at the time of the "borrowing days" (Old Style), and an equally remarkable decrease at the beginning of December, where there is a mild stormy period of exceedingly regular occurrence. Storms are most frequent at the end of January, and most rare in August. The observations go directly against the belief in increased storm-frequency at the vernal equinox, and a little support given to equinoctial gales in the autumn is more apparent than real, as the equinox marks the beginning of a transition stage from summer to winter conditions.

The Norwegian Fishing-grounds.—We have received from the author, Dr. Johan Hjort, copies of an important paper on the oceanography and biology of the Norwegian fishing-grounds, reprinted from the *Videnskabsselskabets Skrifter*, and also republished in English. The greater part of the paper is devoted to a discussion of the relations existing between such food fishes as herring, cod, and mackerel, to their "prey," now usually known by the general title Plankton, and is therefore not strictly geographical. It is shown, however, that of the two distinct herring-fishing seasons in Norway, the one occurring in spring is due to the herring coming into shallow water to spawn, while the summer fishing is due to their coming inshore in search of food; and the success or failure of these fishings is shown to be directly traceable to the oceanographical, ultimately to the meteorological conditions: at one season the fishing-grounds may be inundated with warm salt water favourable to the fish, at another with cold fresh water, which they avoid by keeping out to sea or remaining at inaccessible depths. Dr. Hjort's work is of great importance as affording further proof of the validity of the methods introduced by the Swedish investigators, and the propriety of extending their application to such comparatively open areas as the "leads" on the western coasts of Norway. Dr. Hjort's observations began in August, 1893, simultaneously with those of the other nationalities concerned in the international survey of the North Sea, and this paper brings him up to February, 1895.* The British observations, begun at the same time, ceased in May, 1894; but there is little doubt that the methods of investigation would apply equally to our own fisheries.

New Austrian Geographical Publication.—We have received the first number of a *Geographischen Jahresbericht über Oesterreich*, which has lately been issued under the auspices of the Austrian Ministry of Education, and editorship of Dr. R. Sieger, of Vienna. The object of the new publication, in the preparation of which Dr. Sieger has been assisted by a number of well-known geographers, is to present a general view, from a strictly geographical standpoint, of the most important works which have appeared during each successive year on Austria or any parts of that country, whether independently or in periodical publications. It is not a mere bibliography, but the notices which are given of the various works enable a clear idea to be gained of the general nature of their contents, especially in the case of those which are not widely accessible. Although naturally the greater number of entries refer to works published in Austria, foreign works are also included. The entries are classified geographically, the first part dealing with general works, the second with those relating to special districts, under the four

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* A second shorter paper, published quite recently in *Naturen*, contains observations and discussion for 1896 and the first quarter of 1897.

headings: (1) Alpine provinces; (2) Karst-lands and Adriatic; (3) Sudetian provinces; (4) Karpathian provinces. In the choice of works to be noticed, Dr. Sieger has considered the practical interests of geographers, and the publication should be of much help to all students of the geography of Austria, both in the country itself and abroad. The present issue deals with 1894, but it is hoped in future to diminish the interval between the date of the works reviewed and the appearance of the *Jahresbericht*.

The Population of St. Petersburg.—In the last issue of the *Izvestia* of the Russian Geographical Society (1897, vol. iii.), Prof. I. I. Wilson gives a very interesting review of the results obtained by the last census of St. Petersburg. The immense work of collecting and verifying the census bulletins was done by 2800 persons—of whom only a few were paid in the remotest parts of the town, the remainder being unpaid volunteers, amongst whom were, 497 military officers, 654 civil service officials, 1024 students of the university and the military high schools, and 603 other persons. The number of volunteers was so great that only part of those who offered their services could be accepted. On February 9, 1897, the population of St. Petersburg was 1,267,023, of whom 134,346 were in the suburbs recently annexed to the capital. The growth of population in St. Petersburg was as follows (without the just-mentioned suburbs):—

December 22, 1869	... ...	767,963
" 27, 1881	... ...	861,303
" 27, 1890	... ...	954,400
February 9, 1897	... ...	1,132,677

The surplus of births above deaths since 1890 having only been 28,000, the growth of St. Petersburg is chiefly due to immigration. The periphery of the town and the suburbs show, of course, the greatest increase. The peasants, who come to the capital for work without ceasing to belong to the peasant class, make 57 per cent. of the population (72 per cent. in the suburbs). The proportion of women is 836 women per each 1000 men in the town, and only 743 in the suburbs.

Dr. Thoroddsen and Icelandic Geography.—The indefatigable explorer and student of Iceland, Dr. T. Thoroddsen, has published in the Icelandic language a history of the geography of Iceland, the first volume of which has been translated into German.* It deals with Icelandic geography down to the close of the sixteenth century. In the course of his scientific study of his native country, Dr. Thoroddsen felt that it would be interesting to examine all that he could discover which had previously been written on the subject. The effort to do so revealed so much of interest to his countrymen, that he resolved to compile a summary for their use which should contain practically everything of scientific or historical value. The first section deals with the question of Thule; the author considers that this name could not apply to Iceland, the discovery of which as an uninhabited land he traces to Irish monks in the eighth century, who were living there when the first of the Northmen arrived. The colonization by the Norsemen and the early civilization of Iceland are then described, with extracts from the Sagas and early writings, giving descriptions of the country. The history of the island since the Reformation occupies half the book. The record of the intercourse between Iceland and

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* Th. Thoroddsen, 'Geschichte der Isländischen Geographie.' Autorisierte Uebersetzung von August Gebhardt. Erster Band. Leipzig: Teubner. 1897.

the countries of Europe is full of interest, as showing the competition which existed in the sixteenth century between the fishermen of various nations. Dr. Thoroddsen intends to complete his many years' exploration of his native island next summer, after which he will publish a complete topographical and geological map, as well as a series of memoirs.

ASIA.

The Longitude of Madras.—Our attention has been called to a misstatement of the longitude of Madras which occurs in the article in our last number on the Indian Survey Report for 1895–96. On page 60 the value as recently determined is given as $5^h\ 10^m\ 59{\cdot}113^s$, whereas it should be $5^h\ 20^m\ 59{\cdot}113^s$. The operations by which this result was obtained were briefly described in the *Journal* for 1895 (vol. vi. p. 471), and we have lately received Captain Burrard's full report on the same (Calcutta, 1897). In summarizing the results of the work carried out by himself and Captain Lenox Conyngham, Captain Burrard remarks, "With no limit to time and no limit to expense, with more favourable weather and less frail observers, the recent determination could perhaps be *slightly* improved upon; but if future inventions ever greatly enhance the possible accuracy of scientific surveying, the triangulation of the great trigonometrical survey and the last measurement of the Madras longitude will be rendered obsolete together. The probable error of our final value of longitude, excluding the uncontrollable effects of gravity, is only 0·33″, and with this result no triangulation, however refined, will be able to compete at the end of 7000 miles, until a knowledge has been gained of the size and shape of the Earth, more intimate than at present seems attainable." Captain Burrard gives details (illustrated by a chart) respecting the four other series of observations by which the longitude of Madras had previously been telegraphically determined, carried out in part by American, German, and Russian observers. A comparison of results with those of the recent observations shows a maximum divergence of $0{\cdot}637^s$, whilst the result which agrees most closely, that obtained in 1874 by the route Greenwich, Berlin, Teheran, Karachi, Madras, differs by only $0{\cdot}103^s$.

Cession of Kiao-chau to Germany.—According to the agreement arrived at early in January between Germany and China, the latter leases to the former for a period of ninety-nine years the bay of Kiao-chau, on the south-eastern coast of Shan-tung, together with an area, a few square miles in extent, surrounding the bay. On this ceded territory Germany is at liberty to exercise sovereign rights, and to take all necessary steps for the protection and development of the territory. The limits of the concession appear somewhat vague, and will, no doubt, require demarcation on the spot. It comprises the whole inner basin of Kiao-chau bay up to high-water mark, together with "the larger tongues of land lying south and north of the entrance to the bay to the point where their natural boundaries are marked by suitable eminences, and also the islands situated within and before the bay." Some interesting details respecting Kiao-chau, which was formerly of great importance as a centre of trade, are to be found in Richthofen's 'China' (vol. ii. part 2, chap. vi.), where, in the section dealing with the harbours of Shan-tung, the future as well as the past importance of the place is discussed. The accompanying Atlas (Part i. plates 3, 4, East Shan-tung) may also be consulted with advantage. Useful information respecting Kiao-chau and its *Hinterland* is also given in the report of a lecture by Dr. F. Hirth, published in the *Oesterr. Monatsschrift für den Orient* (1897, No. 12, with map), and in an article in *Aus allen Weltteilen* (xxix. No. 4). The Admiralty Chart (No. 857) gives the results of a careful survey of the bay made in 1863 by H. B. Harris and G. Stanley of H.M.S.

Swallow, and shows the principal features of the immediate neighbourhood, though not extending as far as the city of Kiao-chau. Large-scale maps including the region in question have also been published by A. A. Fauvel ('Province du Shan-tung.' Paris: Lanée, [1878?]); and by C. Wäber ('North-Eastern China.' St. Petersburg: Ilyin, 1893). Much of the cartography of the province is, however, still derived from Chinese sources.

The Indian Mail.—In connection with the recent decision of the British Government to despatch the Indian mail in the future *viâ* Marseilles, on account of the insufficient harbour accommodation at Brindisi, a short article by Dr. J. Ichenhaüser, in *Aus allen Welttheilen* (xxix. No. 3), written before that decision was made public, is of interest. The writer points out that, though the ideal line for the transit of mails to India—overland from Calais to Bombay—is outside the range of practical politics (in spite of the comparatively short section still wanting to complete the connection), there are two other routes which would be much more feasible—those through Persia and Asia Minor. The first of these would lead by rail *viâ* Berlin to Petrovsk, on the Caspian; thence by steamer to Resht; and across Persia by rail to Bushire, on the Persian gulf, whence Bombay could be reached by steamer in five or six days, the total time required being twelve days. The second would lead through Germany, Austria, the Balkan peninsula, and Anatolia to Basra, and thence on by sea, the total time required being only nine days. As either of these routes, like that connecting Western Europe with the Trans-Siberian railway, would pass through the whole length of Germany, the writer considers it decidedly to the advantage of that country that one or other should be adopted.

Italian Scientific Expedition to Lake Urmia.—The twelfth number of the *Bolletino* of the Italian Geographical Society for 1897 contains a short note on a scientific expedition which started for Lake Urmia under the leadership of Prof. E. Paladini, on September 22 of last year. The principal object of the expedition is the complete study on the spot of the phenomenon of the steady rise of the lake-level, which, as already mentioned in the *Journal* (vol. x. p. 93), has been observed within the last five or six years. Prof. Paladini, who arrived at Tabriz in October last, is well provided with scientific instruments, and hopes both to shed light on the cause of the rise of the water, and also to be able to suggest means for preventing a further rise, if not for restoring the lake to its former level, as a large extent of cultivated land has already been submerged. Prof. Paladini is accompanied by a young engineer named Castaldi, a pupil of his own, and nephew of the Russian consul at Tabriz.

The Okhotsk and Kamchatka Expedition.—The first news from this interesting expedition has been published in the *Izvestia* of the Russian Geographical Society, in the shape of two letters from the leader of the expedition—the geologist, Bogdanovich. The first of these letters was written at the mouth of the Uda, in April, 1896. The expedition reached the port of Nikolaevsk (at the mouth of the Amur) in the autumn, and when the winter had set in they started along the sea-coast to Chumukan, a small port at the mouth of the Uda, which has grown instead of the abandoned Udskoi Ostrog. The journey, 360 miles, took twenty-nine days. It was made in deep snow, which attained a depth of from 4 to 5 feet, the thermometer falling at night to −40° and −50° Fahr. If one may speak of a pole of cold—M. Bogdanovich writes—we may speak also of a "pole of snow," and this region is undoubtedly such for the depth of its snow-covering. Nevertheless, M. Bogdanovich spent more than two months in journeys, on snow-shoes, during the winter. The country is now nearly quite desert, the little nomad population which it had some thirty years ago, when parties of gold-seekers wandered on the slopes of the Stanovoi range, having moved westwards into the basin of the Amur and the upper Zeya. The aim of all these journeys was to find the means of transport for the expedition on its way further north along the coast, to the seaport of Ayan; and the second letter of K. I. Bogdanovich is dated Ayan, October 27, 1896. The journey was undertaken with but nine miserable reindeer, but when the expedition was in a very critical state it fell in with Tunguses, who aided them in reaching Ayan. The Stanovoi system consists of a series of mountain ranges, the mutual relations of which it is very difficult to disentangle yet. It is only certain that, while the maritime slope of the Stanovoi consists of a series of mountain ranges, the north-eastern slope (towards the Lena) has the characters of an elevated massif, or tableland. Of the ranges parallel to the Jugjur (or Stanovoi) M. Bogdanovich mentions one which runs towards the north-east, between the Uda and its tributary, the Polovinnaya, or Maya river; and another range, Alskiy Khrebet, which also runs south-west to north-east, or north-north-east. About this last range M. Bogdanovich makes the very important remark that it forms the Great Shantar island, and "is undoubtedly a continuation of the Little Khingan" (Dousse-alin, or Bureinskiy Khrebet). The Jugjur and these two ridges consist entirely of crystalline granites, syenites, porphyries, and very few crystalline slates. Stratified deposits—clay slates, quartzites, sandstones, conglomerates, and limestones—appear only in the outer parts of the third ridge, where some lamellibranchiata, belemnites, and ammonites were found. They belong to the Mesozoic age, as well as the stems of trees discovered in quartzites. Gold was discovered in many places in the second range, parallel to the Jugjur. The astronomer of the expedition, N. N. Lelyakin, made six astronomical determinations on the way to Ayan, and at Ayan he observed quite successfully the eclipse of the sun of August 9, 1896.

On the Little Khingan.—M. P. Kropotkin writes: "It is known that before joining the Sungari, the Amur, which flows south-eastwards below Blagovyeshensk, suddenly bends south at Pashkova, and pierces, in a most picturesque valley or broad gorge, a very typical and beautiful range of mountains, the Little Khingan. The great river emerges from it at Ekaterino-Nikolskaya, resumes its eastern course, and enters a wide belt of lowlands, where it joins the Sungari. In these lowlands the Amur and the lower Sungari have, so to say, no determined bed. When the monsoons bring, in July and August, the usual torrential rains, the Amur (and the lower Sungari) inundate all the low mud-islands which exist in their beds, and spread for miles inland, often inundating even the Cossack villages, which have been built on relatively elevated spots. The Little Khingan is thus a marked limit, which separates the fertile elevated plains of the Zeya and the Bureya, thickly clothed with oak and birch bush, from the lowlands of the Amur; these latter stretching in a north-easterly direction along the left bank of the lower Amur, where they are covered with countless flat-shored lakes, acting as water-reservoirs during the rise of the water of the Amur. When I worked out, in 1875, the leading features of Siberia's orography ('Memoirs of the Russian Geographical Society,' vol. v.), and indicated that there is no such range as the Stanovoi khrebet which would run west and east between the tributaries of the Lena on the north and the Amur on the south, and when I consequently traced hypothetically the border-ridge of the great plateau in a north-easterly direction, so as to join the Great Khingan with the Jugjur (the range which runs along the coast of the sea of Okhotsk), I found great difficulties in indicating the northern and southern continuations of the Little Khingan. General considerations, my own observations on the Sungari, and Meglitskiy's observations in the basin of the Uda, induced me finally to include the Little Khingan in one immense range, or rather a series of short parallel ranges, more than 800 miles long, which I ventured to trace from the gulf of Pechili to the Shantar islands in the sea of Okhotsk. This range—purely hypothetical then—has since been traced on most maps, since Petermann had accepted my views in his well-known map of Asia in Stieler's Atlas; but it remained a hypothesis. Now it would appear, from Mr. Anert's explorations in Manchuria, which were mentioned in the January number of the *Geographical Journal* (p. 65), that the hypothesis must have been correct as regards the southern continuation of the Little Khingan in Manchuria. On the other side, Mr. Bogdanovich, who is undoubtedly a reliable authority in orography, makes a quite positive statement to the effect that there is no doubt as to the Little Kingan reaching the Great Shantar island. Of course, no definite conclusion can be arrived at until Mr. Anert's and Mr. Bogdanovich's explorations are published in full. But if it be proved that the system of mountain ranges pierced by the Sungari, the Little Khingan, and the Alskiy ridge of Bogdanovich, which makes the Great Shantar island, belong all three to one range—as I suppose they do—we shall have a very important feature of East Asian orography settled; a feature the more important, as that range would be a line of demarcation between the higher fertile plains of the Zeya (1000 feet high or more) and the Merghen-Tsitsikar higher plains of the Nonni-ula on the one side, and on the other side the above-mentioned typical lowlands of the lower Sungari and the Amur, which now offer almost insuperable difficulties to the engineers of the Trans-Siberian railway."

The Bukhtarma Glaciers (Altai).—Glaciers in the Altai mountains were only known on the Byelukha peak. M. Tronoff (*Izvestia* of the Russian Geographical Society, 1897, i.) now describes the glacier he has discovered at the head of the Bukhtarma river. It is about 2 miles long and 1½ mile wide. It has two side moraines, and reaches at its lower end the level of 7900 feet. Lake Bukhtarma, which is usually shown as traversed by the river, is 5 miles from it, on a mountain plateau. Another glacier, smaller than the preceding, was found at the headwaters of the Ukok river, tributary of the Alakh; while at the head of the Alakh, a big glacier, rising from an immense *névé*, was found. It has a length of about 2½ miles, and is 2 miles wide at its head. It ends in a wall about 150 feet high, the river issuing from a tunnel. All the plateau, which is known under the names of Kizen and Ukok, and which has a length of over 30 miles, is entirely covered with morainic deposits (boulders cemented by glacial mud) and small ponds; the glaciers must have covered it entirely, and must have flown down all the valleys much lower than they flow at the present time.

Inundations in Eastern Siberia.—According to a note by M. Obrucheff in the *Geographische Zeitschrift* (1897, p. 709), the past summer was marked by serious inundations in Transbaikalia, which destroyed villages, swept away crops, and did considerable damage to sections of the Trans-Siberian railway. The districts affected were those on either side of the Yablonoi range, watered by tributaries of the Selenga and upper Amur. The flood-water, which found its way to the Selenga, played much havoc in the valley of the latter also. It may be remembered that in the previous year much damage had been done to the railway by unusually heavy inundations in Eastern Manchuria (*Journal*, vol. ix. p. 220).

Explorations in Eastern Siberia and Mongolia.—M. Obrucheff also supplies to the *Geographische Zeitschrift* (1897, p. 710) some information respecting two Russian exploring expeditions in North-East Asia. The first was sent in the summer of 1897 by the East Siberian branch of the Russian Geographical Society to Lake Kosso-gol, in Northern Mongolia, and to the Munku-Sardyk mountains lying to the north of it in Eastern Siberia. The north and east shores of the lake were surveyed, and some soundings taken, whilst scientific observations of various kinds were made both in the neighbourhood of the lake and of the mountains. A previously unknown glacier was discovered on the northern slopes of the latter, and the glaciation of the group generally was fully studied. The other expedition is a private one, which began its operations last winter in the region between the sources of the Olekma and the Aldan, and is to continue its work during the present winter in the upper valley of the latter river. Since last spring this expedition has been under the leadership of mining engineer Lovitski.

Steam-navigation on the Amu-darya.—According to a note communicated to *Globus* (vol. 73, p. 20) from Tiflis by N. v. Seidlitz, a considerable extension of the distance navigated by the steamers of the Amu-darya flotilla is to ensue early in the present year. Hitherto these steamers have plied between Charjui, where the Trans-Caspian railway crosses the river, and Patta-Hissar, near Masar-i-Sherif, a distance of 250 miles. According to the new arrangement, they will proceed 125 miles further to Faizabad-Kala in 69° E. long., and thus supply a means of communication as far as the borders of Badakshan. Depôts are to be established here for the furtherance of trade. It is also announced that the Turkish Government is meditating the establishment of a service of steamers on Lake Van, an advantage already possessed by Lake Urmia since last year.

Journeys in Korea.—Baron von Grünau, German military *attaché* in Peking, has lately made some extensive journeys in Korea, during which he twice crossed the whole width of the peninsula. According to details given in *Globus* (1897, Nos. 10 and 20), and in *Petermanns Mitteilungen* (1897, No. 12), he appears to have diverged to some extent from the routes of previous travellers, and to have been able to rectify several errors which occur on our maps. On the first journey (made in June of last year), he proceeded along the coast southwards from Wonsan, and then crossed the mountain range which runs near the eastern side of the peninsula, by a very difficult pass not previously crossed by Europeans. From Changan-sa he returned to the mountains, and finally reached Seul after making a considerable circuit to the south-west. He speaks in glowing terms of the grand scenery of the mountainous parts of Korea, which, he says, surpasses anything to be seen in Japan. On the second journey he started from Seul and proceeded north to Pyeng-yang, and thence across to the east coast at Wonsan. Great difficulties were experienced in crossing the numerous unbridged rivers, which in many cases could only be done by swimming. The natives, however, showed themselves very ready to help, and are much praised for their honesty. From Pyeng-yang several old cities were visited. To what extent the route followed thence to the east coast deviated from that used by Mr. Campbell in 1889 in the reverse direction, does not appear.

The Federated Malay States.—The report for 1896, lately made to the High Commissioner by Mr. Swettenham, resident-general of the Federated Malay States, is of special interest, as embracing the first six months of the new *régime*, ushered in by the Federation Treaty of 1895, which took practical effect from July, 1896. The four states under British protection which were parties to the treaty were those of Perak, Selangor, Negri Sembilan, and Pahang, and under the new arrangement these agreed to—(*a*) federation for administrative purposes, with an undertaking to render mutual assistance; (*b*) the appointment of a resident-general as representative of the British Government; and (*c*) the organization of a force of Indian soldiers for service in any part of the Malay peninsula. The new system appears to be working well, and the progress reported as having taken place during the past few years is very satisfactory. European planting, especially the cultivation of Liberian coffee, is said to have made great strides in Negri Sembilan, and the same is reported of mining in Pahang. Irrigation schemes have been set on foot, and much has been done towards opening up new roads, one of which, running from the terminus of the Selangor railway to Kuala Lipis, the headquarters of Upper Pahang, is 84¾ miles long, and taps some of the most valuable districts of that state. The scenery passed through by it is described as exceedingly fine. Mr. Swettenham urges that attempts should be made to increase the number of cultivated products, and thinks that the rubber industry in particular might be prosecuted with success.

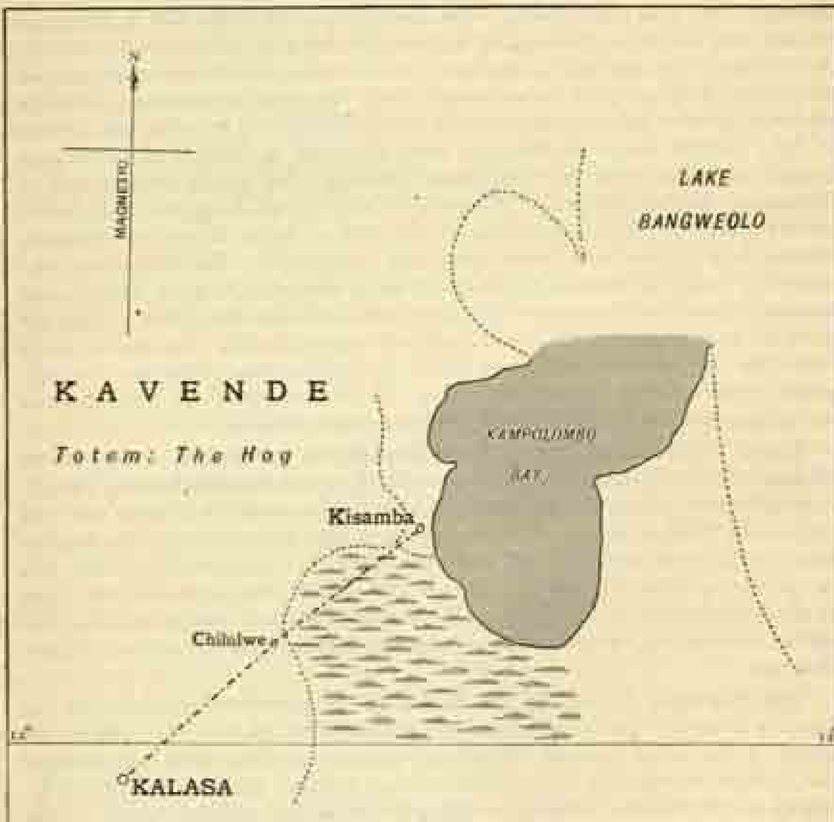
Journey up the Rejang River, Borneo.—A recent number of the *Proceedings* of the American Philosophical Society (vol. xxxv. No. 153) contains a brief report of a journey up the Pejang river in Borneo, by Dr. H. M. Hiller. The river was ascended to a point distant about 300 miles from the sea. The Rejang is the largest river in the north and west side of Borneo. It rises in the unknown mountains called Apoh Byang, and in its course to the sea is greatly obstructed by rapids and cascades. The general direction of the river is from east to west, and, roughly estimating, it is about 270 miles to Belaga, beyond which the distances have not been computed. At Sibu the mile-wide channel breaks into a delta, the mouths of which extend along the coast for 50 miles. Foreign timber ships enter the deep waters of the delta, while trading schooners and vessels of light draught ascend to Sibu and even to Kappit, a distance of 150 miles: beyond the latter place only canoes are possible. Sibu is the second town of importance in the province of Sarawak. Kanowit and Song are unimportant trading stations. Along the banks of the stream Dyaks, Kanowits, Tanjongs, Punans, Kayans, and other tribes have their habitations. The Punans are considered by many travellers to be the aborigines of Borneo. They are hunters, and not farmers, and in this respect differ from almost all the other tribes. They are described as strong, lithe, and active, and lead a nomadic life. To them is attributed the first use of the blow-gun and poisoned arrows. They are the only people in Borneo who practise polyandry. The Ukits are a similar tribe, and can be distinguished by the singular shield-shaped breast tattooing.

Lieut. Olufsen's proposed New Expedition to Central Asia.—Lieut. Olufsen will leave Denmark in March to undertake a new expedition to the Pamirs, principally with a view to the investigation of the race which inhabits the northern parts of the Wakhan valley. A considerable sum has been assigned for this purpose from the Karlsberg fund. He will also undertake a survey of Lake Yashil-kul, and on his return, which will not take place till the end of 1899, Lieut. Olufsen hopes to take photographs of the old ruins in the region south of the Sea of Aral. He will be accompanied by two young scientific specialists; they will winter in Upper Wakhan.

The Principal Branch of the Si-kiang.—In a short communication to the *Comptes Rendus* of the Paris Geographical Society (1897, p. 287), M. Brenier, the leader of the recent Lyonese commercial mission to China, after summarizing the principal geographical results of the various journeys made by himself and his colleagues, makes some remarks on the question of the principal branch of the Si-kiang, or West river. This is usually considered to be the Hong-chu-kiang, which rises not far from Yun-nan-fu, and is certainly the principal branch as far as mere length is concerned. In point of volume of water, however, he considers that the river of Liu-chau-fu, which enters the Hong-chu from the north, a little east of 109° E. long., is decidedly the most important, and offers greater facilities for navigation than the Hong-chu. This fact, he says, was also suspected by Mr. Bourne, who was in the province of Kwei-chau at about the same time as the French expedition. The Liu-chau river rises in the south-eastern, mountainous part of Kwei-chau, where the precipitation is considerable owing to the condensation of the vapours brought by the south-west monsoon. M. Brenier also states that existing maps are wrong in not showing the Hong-chu as the boundary between Kwei-chau and Kwang-si from the Yun-nan frontier to the point where it makes a sudden bend south. The banks here are not inhabited by aboriginal tribes (Miau-tse, etc.), but by a race allied to the Shans of Indo-China.

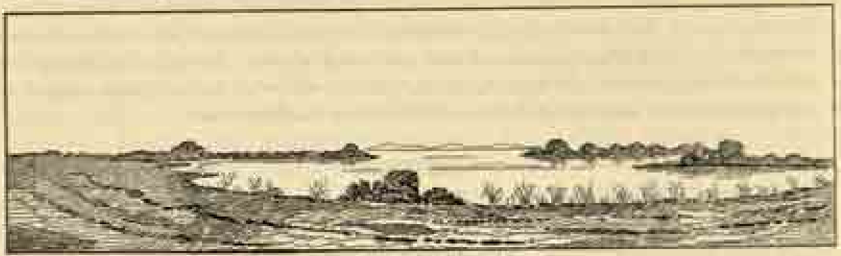
AFRICA.

Visit to Lake Bangweolo.—We have received from Mr. D. Crawford, one of the missionaries established for several years past near Lake Mweru, a short account of a visit made by him in July last to the southern parts of Lake Bangweolo, or Bangweulu, as he prefers to spell it. He writes from Kisamba (shown on Giraud's map on the western shore of the southern, swampy portion of the lake), which place he had reached, accompanied by Mrs. Crawford, by following



KAMPOLOMBO BAY—MAP.

the 29th meridian southwards from Lake Mweru through the Ushi country (evidently Giraud's land of the Wa-ussi). He had visited Mere-Mere, the chief who plundered Giraud's caravan, and obtained from him the sections of the boat left behind by that traveller. Although this journey was made at the height of the dry season, Mr. Crawford says that the outlook from Kisamba was over a lovely stretch of blue, *bonâ fide* lake, up which a deep-sea steamer could pass with ease. He complains that recent cartographers have shown an expanse of swamp where Giraud laid down open water, whereas in reality the swamps were first laid down by Giraud ('Les Lacs de l'Afrique Equatoriale,' p. 220), but have been shown on some subsequent maps as open water. It should be remembered, also, that when Thomson reached the southern shores of Giraud's



KAMPOLOMBO BAY—SKETCH.

region of swamps, the lake (in the dry season) was "neither to be seen nor heard of" (*Journal*, vol i. p. 109). The discrepancy in the accounts is apparently due to variation between different years.

The Subterranean Galleries of the Mitumba Mountains.—Lieut. Léon Cerckel, one of the Belgian officers in the Katanga district, has lately paid a visit to the cave dwellings of the Mitumba mountains, in the south-east Congo basin (*Mouvement Géographique*, 1898, No. 1). Although many travellers, from Livingstone downwards, have spoken of these caves, the principal of them, situated at Mokana, north-east of the Juo falls of the Lufira, had not previously been visited by a European. The passages by which the inner inhabited chambers are reached, traverse a chaotic mass of huge rocks which seem to have been subjected to some great convulsion. The caves, which attain a height of 12 feet or more, are very dark, and the sides are extremely uneven. The various outlets are generally marked by large trees, which are rooted in the actual orifice. Lieut. Cerckel also surveyed the previously unknown portion of the Lufira below the Juo falls. He found that the gorge by which the river traverses the Mitumba mountains becomes deeper and deeper until it attains a depth of about 500 feet, sometimes with precipitous sides. Below, the river is broken by rapids until it enters Lake Kassali. A sketch-map shows Lieut. Cerckel's routes and the results of his surveys.

Railway in German South-West Africa.—We learn from the *Deutsches Kolonialblatt* (1898, p. 5) that a short section of the new railway, starting from Swakopmund for the interior, was opened for traffic on November 20 last. Mr. Cleverly, resident magistrate at Walfish bay, was present at the ceremony. The distance of 6½ miles was performed by a locomotive drawing six carriages with one hundred and forty persons in about half an hour. The rapid strides made by the new port of Swakopmund are said to have much struck the British official.

Dr. Passarge's Travels in South Africa.—In a letter to Baron v. Richthofen, published in the *Verhandlungen* of the Berlin Geographical Society (1897, p. 475), Dr. Passarge gives some additional details (cf. *Journal*, vol. x. p. 212) respecting his investigations in the Lake Ngami region, which are chiefly concerned with the geology of the country. During several journeys towards the south and south-west of the lake, he was able to determine the principal directions of strike of the formations represented. They are two in number. South of Lake Ngami the "Maseganite" strata run in a curved line from west to east-north-east and north-east, and there is also a line of volcanic hills, composed of quartz-porphyry and greenstone, running in a parallel direction. Near Rietfontein, however, on the borders of Damara Land, the strike is from north-north-west to south-south-east, a direction which corresponds with that of the terraced scarp of the Damara highlands. The Maseganite (quartzite) formation above alluded to occupies a wide area, and is of Palæozoic age. The oldest rocks were found in the south on the Okwa river, and, according to Dr. Passarge, form the "mother rock" of the Maseganite strata. Owing to the absence of horizontal strata of any extent, the country is not favourable for artesian borings, although the recent surface formation of limestone contains water here and there. Proofs of a change of climate in this region are unmistakable, and the whole country is now subject to a rapid process of desiccation and conversion into a sandy waste.

AMERICA.

The Dominion of Canada.—The latest volume of Stanford's 'Compendium of Geography and Travel' is devoted to a description of Canada and Newfoundland,* by Dr. S. E. Dawson. The author has done his work thoroughly, giving a fuller and more satisfactory account of the Dominion than has previously been published. The author treats admirably of the history of Canada and of the several provinces, and shows how the Dominion has acquired its present individuality as a political whole. He gives due prominence to the resources of the country, pointing out how vast the hitherto untouched mineral wealth undoubtedly is; and he draws a truthful picture of the actual condition of the cities and towns of all the provinces from the Atlantic to the Pacific. After a general account of Canada as a whole, each province is dealt with separately in detail. There are several maps which are intended to show the provinces on a fairly large scale, and others on smaller scales for railways, climate, etc. The illustrations are all from recent photographs, and are numerous enough to convey a sound impression of the variety of natural scenery and the advanced state of agriculture, industry, and architecture in the Dominion. The high literary character of the work, and the judicious minimizing of statistics which convey little to a general reader, are points which may be specially commended. Copious references to authorities are given for each chapter, a valuable feature. The general reader can desire no more readable or more trustworthy introduction to the northern part of the American continent, and the fact that the book is written by a loyal British subject and enthusiastic Canadian will not be its least interesting feature.

Crater Lake, Oregon.—The members of the enterprising Mountaineering Club of Portland, known as the "Mazamas," have produced a special and finely illustrated number of their journal, *Mazama*, devoted to Crater lake, one of the most remarkable features of the western plateau of North America. Crater lake lies nearly in 43° N., 122° W., 85 miles by the shortest available route from a station on the Southern Pacific railway. The lake measures 6¼ miles in length, and is 4½ miles wide, its surface stands 6239 feet above sea-level; the water is almost 1000 feet deep in the deepest part; and the whole is surrounded by a precipitous rim of volcanic rock, the lowest point of which is 520 feet above the water surface, and the highest part is almost 2000 feet. The water is remarkably transparent and of an intense blue colour, the brilliance of which has struck all visitors. A small cinder cone near one side of the lake forms Wizard island, the top of which is occupied by a small and very perfect crater. There is, of course, neither outlet nor inlet. The inner slope of the rim, where not precipitous, forms a very steep talus, easy to descend in many places, but exceeding difficult to climb again. The outer slope forms the thickly wooded base of a mountain, which, to judge from the

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* Stanford's 'Compendium of Geography and Travel' (New Issue). North America, vol. i.: Canada and Newfoundland, by Samuel Edward Dawson, LITT. D. (LAVAL). Maps and Illustrations. London: Edward Stanford. 1897.

marks of glaciation, was a lofty and active volcano during the Glacial period. The truncation of this mountain—named Mount Mazama by the Portland mountaineers—is ascribed by Mr. J. S. Diller of the U.S. Geological Survey, not to an explosion, but to a collapse into a vast hollow produced by the draining away of molten material through vents on the lower slopes. The whole district has been carefully mapped and scientifically studied by the United States Government, and a photograph is given of a relief model constructed from the contoured map. This model vividly recalls the outline and configuration of some of the lunar craters. There is every prospect of this lonely hilltop chasm becoming a popular resort of tourists, but at the time when the Mazamas visited it, there was neither a stage running to the lake nor any accommodation for travellers when they arrived.

Grenada and Carriacou.—A report on the rocks and soils of Grenada and Carriacou, by Mr. J. B. Harrison, the Government analyst of British Guiana, has recently been issued, and is of interest both geologically and geographically. Mr. Harrison visited the two islands in the beginning of 1895, for the purpose of investigating the character of the soils, typical specimens of which were selected for analysis. Grenada is practically purely volcanic in its origin, the only signs of upheaval being raised limestone beaches towards the extreme north. The chief centres of eruption appear to have been in the neighbourhood of Mount St. Catherine, in that of the Grand Etang, near Mount Sinai, in the neighbourhood of the S.E. mountain, and in what is now St. George's bay. A perfect subsidiary ash crater, probably of later date than the mountain craters, is represented by Lake Antoine. After referring to the different classes of lava occurring on the island, the author treats of the soils examined, which are classified with relation to the parishes from which they were obtained. In referring to the agricultural capabilities of Grenada, he considers that coffee and tobacco may be recommended as subsidiary to the present staples. On the swampy land near the mouths of many of the smaller streams, rice could be profitably raised for local consumption. In his opinion, the future prosperity of Grenada lies in the more scientific treatment of the soil, and especially in the scientific regulation of the process of curing the cacao. The island of Carriacou, so far as examined, appears to consist of layers of volcanic ashes, which were deposited in the sea and afterwards covered with a foraminiferal shallow-water limestone. Later this was subjected to upheaval, with the result that part of the limestone was raised to at least 600 feet above the sea-level. The soils are good and fertile, but, possibly owing to the higher hills having been almost denuded of wood and forest, the rainfall is now so low as to render the cultivation of the majority of tropical crops unsuccessful. The yield of the cotton industry might be greatly increased, while certain districts on the hillside might be planted with logwood. But the only promising industry for this island appears to be the growth of sisal hemp. In the author's opinion, the nature of the soil and climatic conditions are such as to ensure the production of sisal fibre of very high quality.

Results of the Chilian Aisen Expedition.—We have already sketched in outline the work done by the Chilian expedition which last year explored the river Aisen (*Journal*, vol. x. p. 329). Its leader, Dr. Steffen, has since contributed an account of his explorations to the *Verhandlungen* of the Berlin Geographical Society (1897, No. 8–9), at the close of which he summarizes the principal results of the journey, geographical and otherwise. From the former point of view, the principal discovery is that the Aisen, like other recently explored rivers of the Pacific coast of southern South America, has its sources far to the east of the principal chain of the Andes, its basin stretching over the comparatively level country traversed by the Eastern sub-Andine ridges. This fact had been before hinted at by the Chilian Captain Simpson, but without being verified by personal investigation. It will probably give rise to considerable difficulties in the determination of the Chilian-Argentine boundary in this latitude. The route surveys, triangulation, and hypsometrical observations carried out by the expedition along the two principal branches of the Aisen, extended across the whole of the forest-region of the Cordillera to a point where they may in future be brought into relation with similar work from the east. The tributary streams could, of course, not all be explored, and some uncertainty therefore remains as to the extension of the basin to the north and south. The water-parting, however, seems to run, in the north, between the Aisen and Lakes Fontana and La Plata, bending again to the west in a very pronounced curve, and formed by a line of snowy crests. Towards the south it appears to run at a considerable distance beyond the furthest point reached by the expedition on the southern arm of the Aisen, named by Dr. Steffen and his companions Rio Simpson. On the return march new facts were gleaned with regard to the origin of the main branch of the Palena, and the configuration and settlement of its upper valley, as also with regard to the water-parting between the Argentine Rio Teca and the Corintos valley, drained towards the Pacific. Dr. Steffen considers the valley of the Aisen of considerable importance, both as a line of communication from the coast towards the interior, and a district suitable for the establishment of settlements. There is a small but secure harbour at the mouth of the river.

Journey across Southern South America.—Dr. P. Dusén, the Swedish zoologist attached to the Aisen expedition above described, has, since the termination of that expedition, made a boat journey from Lake Nahuel-Huapi to the Atlantic Ocean, following the course of the Limay and Rio Negro, some details respecting which are to be found in *Petermanns Mitteilungen*, 1897, No. 12, and in the *Verhandlungen* of the Berlin Geographical Society (1897, No. 8–9). The journey was made in company with a settler of German extraction named Karl Wiederhold, a large landowner on Lake Nahuel-Huapi, and one Chilian of the artisan class. As far as the mouth of the Collon Cura the voyage was a dangerous one owing to the rapids, especially that at the mouth of the Traful, but the rest of the journey involved no serious difficulties. The thermometer sank every night below the freezing-point, the lowest temperature recorded being 19°·4 Fahr. Before setting out on this voyage, Dr. Dusén had carried out scientific investigations in the Guaitecas and Chonos archipelagoes, paying special attention to the question of the former glaciation of the islands, as well as to their geology, flora, and fauna.

ARCTIC.

Danish Expedition to Melville Bay.—Mr. Edward Bay, a young man of scientific attainments and independent means, who was a member of Captain Ryder's expedition to the east coast of Greenland, 1891–92, and wintered in Scoresby sound, intends next year to proceed to Melville bay, with a Danish companion and a few Eskimos from the most northerly Danish colonies on the west coast. The party will start from Upernivik with boats, kayaks, and dog-sledges, and winter at a point on the coast of Melville bay for scientific purposes. Mr. Bay and the other young Dane will then the following spring proceed in the direction of Cape York, and then return the same year. Mr. Bay will this year go to Upernivik, and return to Copenhagen in one of the Government vessels, in order to make preparations for the expedition next year.

Danish Expedition to Greenland.—Dr. K. J. V. Steenstrüp, the well-known scientific explorer of Greenland, who has spent several years there, will this year, on behalf of "the committee for the geological and geographical exploration of Greenland," of which he is a member, proceed to Disko island to study the glaciers on this interesting spot.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Survey of the North Atlantic.—The Council of the Society have acceded to an application from Mr. H. N. Dickson for assistance in the work of carrying on a physical survey of the surface waters of the North Atlantic during the two complete years of 1896–97, and have made a grant of £100 to him. The general plan of the work was described in Mr. Dickson's paper, published in the *Journal* for March, 1896. In addition to the ordinary temperature observations, extracts of which have been obtained from the Meteorological Office, about thirty volunteer observers have assisted during the two years in collecting samples of surface water, to the number of about four thousand in all. These volunteer observers have included the owners of ocean-going steam-yachts, and the captains of "Atlantic greyhounds," whalers, telegraph steamers, "tramps," trading schooners, and steam-trawlers; and the number could have been greatly increased had funds permitted. Mr. Dickson informs us that the analyses of the samples, which have been made in the chemical laboratory of the University Museum, Oxford, are now nearly completed, and that they show that the samples have been collected and preserved with skill and carefulness by all the observers. The discussion of the immense quantity of material will necessarily occupy some time, but, to judge from the interest excited by the preliminary paper, we may expect important results from the extended inquiry. According to a recent Reuter telegram, the administration of the Lars Hjerta's Minne establishment in Stockholm has made a grant to Prof. Pettersson and his colleagues for a survey of the North Atlantic along the same lines as those followed by Mr. Dickson, but taking in latitudes below his limit (40° N.), and adding biological observations presumably of the kind made by Herdman and Garstang last year. It is, therefore, to be hoped that we are only beginning to take advantage of the services of the large number of willing, skilful observers always to be found amongst those who "use the sea."

GENERAL.

Honours to Dr. John Murray.—Dr. John Murray, F.R.S., has been elected a Foreign Member of the Russian Imperial Academy of Sciences, and the German Emperor, as King of Prussia, has created him a Knight of the Prussian Order *Pour la Mérite.*

Celebration in Honour of Toscanelli and Vespucci at Florence.—A committee has been formed at Florence under the presidency of the Marquis Torrigiani, to organize a celebration at Florence in the coming spring of the fifth centenary of the birth of Toscanelli and the fourth centenary of the principal voyage of Vespucci, which happen exactly to coincide. A circular which has been issued by the committee points out the important share taken by the city of Florence in the promotion of science and discovery, not only through the work of Toscanelli and Vespucci, but as having been in the fifteenth century the chief centre of science, commerce, and exploration in the whole civilized world, thus directly leading the way towards the great discoveries which followed. The celebration is therefore to be regarded, not only as in honour of the two distinguished names coupled with it, but of the city itself, which had, it is claimed, a good right to hand down to posterity the name of one of its sons as the appellation of the New World. The precise form to be taken by the celebration is not yet stated.

Prof. Guido Cora.—Prof. Guido Cora, after filling for sixteen years the professorship of geography to the Royal University of Turin, 1881–1897, has resigned his charge for the purpose of devoting himself solely to researches in the field of geography and connected sciences. He has transferred his residence (and also the editorship of his periodical *Cosmos*) to Rome (*viâ* Goito, 2).

Two Journeys in Northern Somaliland.—The photographs, from which the illustrations to Mr. Aylmer's paper were taken, were not by Mr. F. Gillett, but by Mr. F. Gunnis.

OBITUARY.

Gardiner Greene Hubbard.

Mr. Gardiner G. Hubbard, President of the National Geographic Society, of Washington, D.C., died at his country house near that city on December 11, 1897. Born at Boston in 1822, and educated there and at Cambridge, Mass., Mr. Hubbard was admitted to the bar in 1843, and attained considerable success as a lawyer during the twenty-five years in which he practised the profession. He was also widely known and respected for his breadth of mind and public spirit, as well as for his varied labours in the interests of his fellow-citizens and the world at large. In particular, his untiring work in the promotion of the teaching of speech to the deaf may be mentioned as leading to the most beneficent results. Although not strictly a scientist, Mr. Hubbard was an enthusiastic supporter of scientific work, and did much to further the practical application of scientific principles: a striking example of this is supplied by his services towards the introduction of the telephone into common use. To geographers he was best known in connection with the National Geographic Society, of which he had been president since its foundation, and to the welfare of which he devoted himself with untiring zeal. He was also a regent of the Smithsonian Institution, and president of the Joint Commission of the Scientific Societies of Washington.

Dr. Eugen Zintgraff.

The death has been announced of Dr. Eugen Zintgraff, well known for his journeys in the interior of the Cameroons in the early days of the German occupation of that territory. Dr. Zintgraff was born in 1858 at Dusseldorf, and was at first destined for the law, but afterwards devoted himself to the study of natural science, obtaining the diploma of doctor at Heidelberg University. He took part in Dr. Chavanne's expedition to the Congo in 1884, and early in 1886 read a paper before the Berlin Geographical Society on the lower Congo region. He soon afterwards proceeded to the Cameroons, of which the interior was then almost absolutely unknown, and showed himself most active in its exploration during a space of over five years. His first attention was devoted to the waterways near the coast, but afterwards he explored the country north of the Cameroons mountains, where he founded the Barombi station as a base for more extended operations early in 1888. The great *desideratum* then was the discovery of a route to the north-east by which the populous Hausa countries, with their enterprising race of traders, could be reached. With the object of effecting such a communication with Adamaua, Dr. Zintgraff set out in D.cember, 1888, from the Barombi station, and, in spite of the strenuous opposition of the Banyang people, succeeded in reaching the grass-covered plateaux which lie behind the coa-t zone of forests, and making his way across uninhabited wastes to Ibi, on the Benue, and subsequently to Yola, the capital of Adamaua. Dr. Zintgraff described this journey before the Berlin Society in May, 1890, and a report of his paper was published in the R.G.S.

Proceedings for that year (vol. xii. p. 358). He returned to the Cameroons for a couple of years, and subsequently travelled in East and South Africa. The traveller's health suffered severely from his exertions in the cause of geography, and he retired to the island of Teneriffe, where he died in December last. He continued until his death to take much interest in the development of the Cameroons, especially in the direction of the formation of European plantations. He was the author of a book entitled 'Nord-Kamerun, Schilderung der 1886 bis 1892 unternommenen Reisen.'

CORRESPONDENCE.

Maskat.

Lisbon, January 5, 1898.

The inscription of the Fort Maskat, which Captain Arthur W. Stiffe publishes in the *Geographical Journal* of December, naturally not having been taken by an impression, is incorrectly copied and interpreted.

The consequence is, that Captain Stiffe cannot reconcile the date of 1588, clearly indicated in the inscription, with the reference which that gentleman attributes to it, to the eighth year of the reign of King Henry, our cardinal king, whose reign did not last eight years, and who had already been dead for a similar number of years.

Notwithstanding the imperfection of the copy, the Portuguese restitution of the inscription is easy, and evidently the following: "Reinando o mui alto e poderoso Filippe, primeiro deste nome Rei e Senhor nosso, no oitavo anno de seu reinado na Coroa de Portugal, mandou por Dom Duarte de Meneses, seu Viso Rei e Governador da India se fisesse esta fortalesa e a fez Belchior Calaça, seu primeiro capitaõ e fundador, 1588;" and its translation as follows: "Under the reign of the very high and mighty Felippe, first of this name our Lord and King, in the eighth year of his reign in the Crown of Portugal, he sent by Dom Duarte de Meneses, his Viceroy and Governor of India, that this Fortress be made, which was done by Belchior Calaça, its first captain and founder, 1588."

Not only Dom Henry died on January 31, 1580 (and not 1579, as stated by Captain Stiffe), but also Dom Duarte de Meneses was appointed Viceroy and Governor of India, not by that king, but by Felippe II. of Spain, *the first of this name in Portugal*, the crown of which he usurped in 1580. The date indicated corresponds exactly to the eighth year of this reign, and the initial F of the name of the king inserted is very clear in the copy, in spite of its imperfection.

Dom Duarte de Meneses left Lisbon to assume his post in India on April 10, 1584, arriving at Cochim on October 26.

Maskat, where the Portuguese had established a kind of co-dominion, more commercial than military, suffered frequent oppressions and depredations by the Arabs and the Mohammedans of India, that is, by the *Arabios* and *Mouros* as they were then called. The Turks, according to Captain Stiffe, when they dared to descend to the sea of Oman, assaulted and destroyed Maskat, and the people of Mogor—the *Mogores* as they were called—advanced through all the "kingdom of Sinde," treating better or worse the Portuguese, who were trading there, according as to whether they were nearer or further from our sovereignty and the resolution shown by them. Besides this, the struggle between the Dutch and English for the dominion of the Persian gulf was already advanced and bitter, and caused our expulsion from the same. The necessity of fortifying Maskat according to our custom or after the European fashion became manifest, as it was an important strategical point for the navigation and trade of Ormuz, and for the route and crossing of the Sea of Oman. The work of fortification had already commenced, advantage naturally being taken of the rudimental native defences. Dom Duarte de Meneses therefore received instructions and gave orders to consolidate in a more secure manner the occupation of Maskat. He appointed captain for this post Francisco Velho, a man of confidence, who, however, being implicated in a process, was soon afterwards substituted by Belchior Calaça (read *Calassa*, and not Caleça), whom it was that in 1588 was effectively in Maskat as captain. "Who is at present serving," says a royal letter of February 6, 1589, approving the substitution, but recommending that, as soon as Calaça would finish the time of his service and Velho be freed from guilt, the latter should succeed the former. When this letter arrived, the viceroy had already died on May 4, 1588, the same year in which Calaça placed the inscription on the Fort *Capitao*, or Merani, and when, in front of the same, and with it completing the guarding of Maskat, on the sea side, the fort of *Saõ Joao*, or Jaladi, was already erected, having been concluded in the previous year, probably also by Calaça.

The rightful successor to Dom Duarte de Meneses was Mathias de Albuquerque, who succeeded him shortly afterwards, and who, having embarked for Lisbon, left here on May 8, 1590, as viceroy, arriving at Goa in May, 1591.

The fortification of Maskat continued, as did also the development and commercial colonization of this place, as well as the perils and threats which threatened it and all our posts and factories of the Persian gulf.

Another captain, Dom Jeronymo Mascarenhas, commenced a new fort in Maskat, which was continued during the time of the new viceroy, Mathias de Albuquerque, and was recommended in the royal letter of February 5, 1597. Maskat was in a certain manner a conventional dependency of the Government of Ormuz, and the viceroy himself proposed to Lisbon that this dependency should become effective. A royal letter of February 18, 1595, adjourned, however, this resolution, determining that there should be only communication and constant accord between Ormuz and Maskat. Antonio de Sousa Falcao was at this time captain of the latter. The occupation became defined and organized in a military administration. The permanent garrison was fixed at thirty soldiers, who, as Viceroy D. Jeronymo de Asevedo said on November 29, 1613, "rarely became effective on account of the manners and frauds which they were accustomed to practise." By "Alvara" of this date, D. Luiz da Gama, who was then about to govern Ormuz, was ordered, that of the seven hundred soldiers who ought to be at this latter garrison, twenty should be made to reinforce the garrison of Maskat, increasing thereby the latter to fifty, "so long as there should be any fear of its being attacked by enemies from Europe." And in this same decree was announced the project of sending from Goa a further thirty soldiers as well as a captain, apparently for the purpose of the special garrisoning of the last fort constructed.

En passant, and in order that Captain Stiffe may see that our occupation was not so exacting and violent as one might suppose by his sentimental remark regarding the method we employed to secure the respect of the natives, a method absolutely justified by the means, time, and by the circumstances, I would state that still in 1609, and afterwards, we loyally divided the revenue of the custom-house of Maskat with the sheiks, with whom we contracted, or, to be more precise, with their descendants.

It was intended in the above year, and orders were sent from Lisbon, to negotiate with these participators the cession of the share which they had in the fiscal revenue, for a reasonable compensation. But since those persons did not agree to give up their rights, the right, which might have been disputed, was respected, and it was also resolved, in view of the fact that they were interested in the development and fiscalization of the trade, to maintain the traditional *regimen* decreed in the royal letter of January 23, 1612.

Many other interesting things might be indicated which must be reserved for a special work, which will fill up the gap generally found in the histories of Maskat which deal with the period of Portuguese domination. My present intention was simply to offer Captain Stiffe an opportunity of correcting what he states regarding the inscription which is published in his excellent and beautiful articles in any new edition which they may have, as I sincerely hope may be the case.

I will not conclude, however, without observing to the distinguished writer that it is not absolutely exact that in 1650, through the loss of Maskat, the Portuguese were finally expelled from Oman. This expulsion took place some time afterwards. In 1690 our flag was still hoisted in what we called the *Congo* of Persia, at a factory, of which João da Silva was manager, and Jorge de Freitas secretary; and one of our fleets, commanded by Antonio Machado de Brito, cruised in the Persian gulf, establishing treaties with Bassora, Maskat, etc., and in 1695 we seriously projected the recovery of Ormuz. Persia herself at this time implored our assistance against the Arabs, and offered it against the Imam of Maskat.

If we had not suffered in Europe the ominous union with Spain, surely would have been different the fate to our dominion in the East, which we were the first to open to Christian civilization.

LUCIANO CORDEIRO, Hon. Corr. M.R.G.S.

London, January 15, 1898.

Referring to my paper on Maskat published in the December number of the *Journal* (p. 608), I have received a letter from Mr. Donald Ferguson, a gentleman evidently well acquainted with the language, criticizing the interpretation of the old Portuguese inscription, and suggesting the one given below, which is more probably the correct one, as it reconciles the discrepancy of data which had puzzled me.

I may say the reading I gave was furnished by a Portuguese gentleman, then employed under Mr. F. C. Danvers at the India Office in translating Portuguese records. I cannot ascertain his present address, or I should have referred it back to him.

It will be noted that the king's *name* is not given in full, only the *initial*, which has doubtless led to the difficulty. The letters in brackets are not in the original.

> "REINAODO HO MVI A(LTO)E F(IDELISSIMO) HE * PODEROZO F(ELIPPE) (?) † PRIMEIRO (?) DES(S)E NOME R(EI) HE ‡ S(ENHOR) § NOS(S)O NO HOUTAVO AN(N)O DE SEV REINADO NA C(O)ROA DE PORTUGAL MANDOV POR DON DVARTE DE MENEZES SEV VIZOR(EI) DA INDIA Q(U)E SE FIZES(S)E ESTA FORTALEZA A QV(ELL)A FIS (?) ¶ BELCH(I)OR CALAÇA S(E)V PRIMEIRO CAPITAO E FUNDADOR, 1588"

In English—

> "Reigning the most high, most faithful, and most mighty, Philip, first of this name, our king and lord, in the eighth year of his reign in the crown of Portugal, commanded by Don Duarte de Menezes, his viceroy of India, that should be made this fortress which (made?) Belchior Calaça, its first captain and founder, 1588."

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* For E. My translator here suggested HENRIQUE.

† For Felippe. My translator amended this F to E for "and."

‡ For E. § For Senhor.

¶ This word is obscure.

Of course, this was Philip the *second* of Spain, but first of Portugal, who was proclaimed king of the latter country in 1580 to 1581.

I hope, in view of the interest attaching to the subject, this explanation may not be deemed superfluous.

ARTHUR W. STIFFE.

P.S.—Perhaps I should have used the term "careful copy" instead of "facsimile" in the paper.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897–98.

Fifth Ordinary Meeting, January 17, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Charles Henry Akroyd; Thomas Fowell V. Buxton, M.A., J.P., M.C.C.; Noel Edward Buxton, M.A.; Henry Charlwood Carr, Lieut. R.N.R.; G. H. A. Elin; Henry Wilson Fox; W. M. C. Greaves-Bagshawe; William Cecil Harris, M.A.; Ernest Powell King, J.P.; Walter Leaf; F. C. Annesley Lyon, R.N.R., Commander; J. H. Newman; Percy C. Reid; Rev. G. Cullen Reed; William David Wade.*

The Paper read was:—

"Journeys in the East Coast Provinces of Siam." By H. Warington Smyth.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Ann. = Annals, Annales, Annalen.	P. = Proceedings.
B. = Bulletin, Bollettino, Boletim.	R. = Royal.
Com. = Commerce, Commercial.	Rev. = Review, Revue, Revista.
C. Rd. = Comptes Rendus.	S. = Society, Société, Selskab.
Erdk. = Erdkunde.	Sitzb. = Sitzungsbericht.
G. = Geography, Geographie, Geografia.	T. = Transactions.
Ges. = Gesellschaft.	V. = Verein.
I. = Institute, Institution.	Verh. = Verhandlungen.
Iz. = Izvestiya.	W. = Wissenschaft, and compounds.
J. = Journal.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Andorra. *A travers le Monde, Tour du Monde* 3 (1897): 385-388. **Romeu.**

En Andorre: une étrange Coutume judiciaire. Par M. Charles Romeu. *With Illustrations.*

Account of the quaint custom in Andorra of interrogating the corpse of a victim of accidental death.

Austria. **Sieger.**

Geographischer Jahresbericht über Österreich. Mit Unterstützung des hohen k. k. Ministeriums für Cultus und Unterricht . . . Redigiert von Dr. Robert

Sieger. I. Jahrgang 1894. Wien: Ed. Hölzel, 1897. Size 9½ × 6½, pp. xii. and 206. *Presented by the Publisher.*

This important new serial is noticed on p. 172.

Austria—Rain and Rivers. ——

Hydrographischer Dienst in Österreich. Jahrbuch des k. k. hydrographischen Central-Bureaus. III. Jahrgang 1895. Wien: W. Braumüller, 1897. Size 15 × 11. *Maps and Diagrams.*

A splendid record of work, containing a general part with particulars of rainfall and river observations in Austria, lists of stations, etc., and a river-basin map of the Austrian crown-lands, with lines of equal rainfall for 1895. Then follow special parts dealing, by means of tables of actual observations, statistical diagrams and large-scale rainfall maps for 1895, with the Austrian portions of the Danube, the March, Mur, the Drave, the Save, the Adige, the rivers of the coastland, of Dalmatia, the Elbe, the Oder, the Vistula, the Dnieper, Dniester, Sereth, and Pruth. It is unfortunate that this imperial work is not carried on in the same way in Hungary, and the results incorporated in these reports.

Faröe Islands. **Russell-Jeaffreson.**

The Faröe Islands. By J. Russell-Jeaffreson. London: Low & Co., 1898. Size 8 × 5½, pp. xiv. and 272. *Map and Illustrations. Price 7s. 6d. Presented by the Publisher.*

Gives a short history of the islands and the people, and proceeds to describe a tour through the Färoes, with many anecdotes and some local gossip. A map is given on which the author has entered some original information likely to be of use to a visitor.

France—Carcassonne. *A travers le Monde, Tour du Monde* 3 (1897): 393–396. **Gruyer.**

Carcassonne. Par Paul Gruyer. *With Illustrations.*

Carcassonne is one of the most perfect—if not the most perfect—of the walled cities which has retained the features of the middle ages.

France—Loire. *Ann. G.* 6 (1897): 450–455. **Laffitte.**

Les déplacements du confluent de la Loire et de la Vienne. Par M. Louis Laffitte. *With Maps.*

A note will be given on this paper.

Germany—Alsace. **Witte.**

Zur Geschichte des Deutschtums im Elsass und im Vogesengebiet. Von Dr. Hans Witte. . . . Forschungen zur deutschen Landes- und Volkskunde . . . . herausgegeben von Dr. A. Kirchhoff. Zehnter Band. Heft 4. Stuttgart: J. Engelhorn, 1897. Size 9½ × 6½, pp. [126]. *Map.*

After a comparison of Alsace with Lorrain, the author deals with the Germanization of Alsace in ancient times, and with the historical changes in the position of the Franco-German linguistic frontier.

Germany—Dortmund-Ems Canal. *Deutsche Rundschau G.* 20 (1897): 130–131. ——

Der Dortmund-Ems Canal. *With Map.*

The new canal from the heart of the Westphalian manufacturing region to the Ems, thus supplying a direct all-German outlet to the sea, and admitting coal from the Ruhr fields to compete in Hamburg with English coal.

Germany—Harz. *M.V. Erdk. Halle* (1897): 39–54. **Damköhler.**

Bevölkerung des Dorfes Cattenstedt bei Blankenburg am Harz. Von Oberlehrer Ed. Damköhler.

Discusses the statistics of the population of the Duchy of Brunswick for the period 1790–1893 in the case of Cattenstedt, accounting for the manner in which the population has varied.

Germany—Russia. *M.V. Erdk. Halle* (1897): 93–124. **Halbfass.**

Der Arendsee in der Altmark. Von Dr. W. Halbfass. Zweiter Teil. *With Diagrams.*

Germany—Saale. *M.V. Erdk. Halle* (1897): 1–27. **Grössler.**

Urkundliche Nachweise über den Lauf der Saale zwischen Halle und der Wippermündung und die an demselben gelegenen Wüstungen. Von Prof. Dr. H. Grössler. *With Map.*

Germany—Saale. *M.V. Erdk. Halle* (1897): 28–39. **Schroeter.**

Betrachtungen über die Laufveränderungen der Saale zwischen Halle und der Wippermündung bei Bernburg. Von O. Schroeter.

Germany—Thüringia. *M.V. Erdk. Halle* (1897): 92-93. **Reischel.**

Die Wüstung Breitenfurt bei Wenigensömmern. Von Dr. G. Reischel.

Greece.—Aetolia. **Woodhouse.**

Aetolia: its Geography, Topography, and Antiquities. By William J. Woodhouse. Oxford: The Clarendon Press, 1897. Size $10\frac{1}{4} \times 6\frac{1}{4}$, pp. xvi. and 398. *Maps and Illustrations. Price 21s. Presented by the Clarendon Press.*

This will receive further notice.

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* (2) **14** (1897): 492-554. **Lorié.**

De Stormvloed van December 1894 en het vraagstuk der Schelpvisscherij langs onze Kust. Door Dr. J. Lorié. *With Plates.*

On the effect of the storm of December 22, 1894, on the coast of Holland; and the question of the shellfish industry along the coast with reference to the variations in the depth of the water during the last two centuries.

Holland. *J. Manchester G. S.* **13** (1897): 1-46. **Mellor.**

The Cruise of the *Dolphin* in Dutch Waters, 1896. By Mr. E. W. Mellor. *With Map and Illustrations.*

An interesting account of the voyage of a yacht on the waterways of Holland.

Hungary—Waag. *Jahrb. Ungarischen Karpathen-V.* **24** (1897): 1-21. **Siegmeth.**

Topographische Skizzen aus dem Gebiete der Waag. Von Karl Siegmeth.

Description of the valley of the Waag, an impetuous mountain stream of the High Tatra, which forms a tributary of the Danube.

Iceland and Faroe. *Nouv. Archives Miss. Sci. et Littéraires* 7 (1897): 243-327. **Pilet.**

Rapport sur une mission en Islande et aux Iles Féroë. Par M. Raymond Pilet. *With Illustrations.*

Popular airs of the folk-songs of Iceland and the Faroes, and many interesting particulars regarding the people and the islands, with illustrations. The music of many songs is given, and the words both in the original and in a French translation.

Italy. **Günther.**

The Phlegræan Fields. By R. T. Günther, M.A. [From the *Geographical Journal* for October and November, 1897.] Size $10 \times 6\frac{1}{2}$, pp. 48. *Maps, Sections, and Illustrations.*

Italy—Earthquakes. *Mem. S.G. Italiana* 7 (1897): 81-164. **Baratta.**

Materiali per un catalogo dei fenomeni sismici avvenuti in Italia (1800-1872). Ricerche del socio M. Baratta.

Italy—Lakes. *Riv. G. Italiana* **4** (1897): 514-522. **Marinelli.**

Prima serie di aggiunte e correzioni al Catalogo dei laghi italiani di Olinto Marinelli.

Mediterranean—Cyprus. *J. Anthrop. I.* **27** (1897): 171-177. **Myres.**

Copper and Bronze in Cyprus and South-East Europe. By J. L. Myres, M.A., etc. *With Plate.*

Mediterranean—Malta. *J.R.I. British Architects* **5** (1897): 25-48. **Flower.**

Notes on Renaissance Architecture in Malta, with special reference to the Buildings of the order of St. John. By Arthur S. Flower. *With Plan and Illustrations.*

Mediterranean—Sea of Marmora. ——

Zap. Imp. Russian G.S. **33** (No. 2) (1896): 1-180.

Hydrography of the Sea of Marmora. Expedition, Imperial Russian Geographical Society, 1894. 1. Résumé des recherches hydrologiques. I. Spindler. 2. Selyanik Expedition in the Sea of Marmora. By N. Andrusoff. 3. Preliminary Report on Biological Researches of the Sea of Marmora. By Dr. A. Ostroumoff. *With Maps and Diagrams.*

Norway—Fæmund Lake Region. **Reusch.**

Forhand. Vidensk.-S. Christiania, 1896 (1897): 1-42.

Geologiske iakttagelser fra strøget i nord for Fæmundsjøen gjorte af forfatteren og andre under reiser for Norges geologiske undersøgelse af Hans Reusch. Med "An English Summary of the Contents." *With Illustrations.*

Norway. *Forhand. Vidensk.-S. Christiania*, 1896 (1897): 1-102. **Reusch.**

Geologiske iakttagelser fra Telemarken, Indre Hardanger, Numedal og Hallingdal gjorte under reiser for Norges geologiske undersøgelse af Hans Reusch. Med "An English Summary of the Contents." *With Illustrations.*

Rumania. *B.S.G. Com. Paris* **19** (1897): 569-589. **Brun.**

La Roumanie actuelle. Les habitants et leurs mœurs, la montagne et la plaine, le Danube et la mer. Par M. Jules Brun.

Rumania. *B.S.G. Română* **18** (1897): 31-108. **Ţiţu.**

Geografia comunei Comindăreşti din plasa Jijia-Ştefăneşti, districtul Botoşani, cu notiţe istorice şi tradiţionale de I. Ţiţu.

Description of the province of Comindarest.

Russia—Kherson. *Mem. Comité Geologique, Russe* **14** (1896): No. 2. **Sokoloff.**

Hydro-geological investigations in the Government of Kherson, by Dr. N. Sokoloff, with an appendix by W. Toporoff on Water analyses, and a geological map. [In Russian, with detailed *résumé* in German.]

Russia—Lake Onega. *B.S.G. Italiana* **10** (1897): 450-456. **Marinelli.**

Dati morfometrici sul Lago di Onega, nota del socio Prof. Olinto Marinelli.

Description of the depths of Lake Onega, with a hypsometric curve.

Russia—Murman Coast. *Iz. Imp. Russian G.S.* **33** (1897): 67-80. **Rippas.**

The Change of the Water-level in the relict-lake Mogilnoe, on Kildin island. By B. A. Rippas. *Tables and Diagrams.* [In Russian.]

Russia—Poltawa. *Globus* **72** (1897): 315-320. **Krause.**

Vegetationsskizze des russischen Gouvernements Poltawa. Von Ernest H. L. Krause.

Russia—Tsylma. *Iz. Imp. Russian G.S.* **33** (1897): 53-66. **Bartoniyeff.**

On the Copper Ore of the river Tsylma (N. Russia). By I. P. Bartoniyeff. *Map.* [In Russian.]

Servia. **Vivian.**

Servia, the Poor Man's Paradise. By Herbert Vivian, M.A. London: Longmans & Co., 1897. Size 9 × 6, pp. lvi. and 309. *Portrait and Map. Price* 15s. *Presented by the Publishers.*

The author states that "nothing serious has been written about Servia for some thirty years," presumably meaning no English book. The book treats in an enthusiastic manner of this little-known country, giving an account—parts of which have been published in weekly newspapers—of the life of the people in their political, social, economic, and intellectual relationships, with one chapter devoted to "Beautiful Belgrade," and another to "Towns and Country." A map of Servia on the scale of about 1 : 500,000 is given.

Sweden—Mining Industries. *J.S. Arts* **46** (1897): 61-78. **Brough.**

The Mining and Metallurgical Industries of Sweden, as shown at the Stockholm Exhibition. By Bennett H. Brough. *With Plan and Illustrations.*

Sweden—Öland. **Hemmendorff.**

Om Ölands vegetation. Akademisk Afhandling af Ernst Hemmendorff. Upsala, 1897. Size 9 × 6½, pp. viii. and 82. *Sketch-map. Presented by the University of Upsala.*

On the vegetation of Öland.

Turkey—Albania. *Mem. S.G. Italiana* **7** (1897): 15-44. **Baldacci.**

Itinerari albanesi del socio dott. Antonio Baldacci. *With Map.*

Travels in the west of Albania from Ballona as a centre.

United Kingdom—England—Dorset. **Eaton.**

Returns of Rainfall, &c., in Dorset in 1896. By Henry Storks Eaton, M.A. [From *Proceedings* Dorset Natural History and Antiquarian Field Club, vol. xviii., 1897.] Dorchester, 1897. Size 8½ × 5½, pp. 12.

United Kingdom—England—Devon. **Peek.**

Rousdon Observatory, Devon. Volume viii. Meteorological Observations for the Year 1896, made under the superintendence of Cuthbert E. Peek, M.A., London. 1897. Size 11 × 9, pp. 36. *Frontispiece.*

United Kingdom—England—Devon. *Nature* **57** (1897): 209-210. **Wheeler.**

The Northam Pebble Ridge. By W. H. Wheeler.

United Kingdom—England—Dorset. **Eaton.**
Dorset Monthly Rainfall, 1856-95. By Henry Storks Eaton, M.A. [From *Proceedings* Dorset Natural History and Antiquarian Club, vol. xviii., 1897.] Dorchester, 1897. Size 8½ × 5½, pp. 18. *Presented by the Author.*

A detailed record for each month since 1856 of the average rainfall in Dorset, with supplementary tables discussing the data. The total mean annual rainfall of Dorset for 1856-95 was 34·02 inches, compared with 24·22 inches for Greenwich. May was the driest month in Dorset (2·01 inches), and October the wettest (4·06 inches).

United Kingdom—Great Britain. ———
The Rivers of Great Britain, Descriptive, Historical, Pictorial. Rivers of the South and West Coasts. London: Cassell & Co., 1897. Size 18 × 10, pp. viii. and 376. *Illustrations. Price 42s. Presented by the Publishers.*

This beautifully illustrated volume is the work of many competent hands, who by their literary and artistic skill have done justice to their theme. The Southern Chalk Streams are described by Mr. W. Senior, the Rivers of Devon by Mr. W. W. Hutchings, those of Cornwall by Mr. H. W. Strong, the Severn in three chapters by Prof. Bonney, the Wye and the Usk by Mr. E. W. Sabel, the Rivers of South Wales by Mr. C. Edwardes, those of North Wales by Mr. A. Watson, the Mersey by Mr. W. S. Cameron, the Rivers of Lancashire and Lakeland by Mr. W. Senior, those of the Solway Firth by Mr. F. Watt, the Rivers of Ayrshire and the Clyde by Mr. John Geddie. The standpoint of the writers is not, as a rule, that of the modern geographer.

United Kingdom—Ireland. *J. Anthrop. I.* **27** (1897): 164-170. **Beddoe.**
On Complexional Differences between the Irish with Indigenous and Exotic Surnames respectively. By John Beddoe, M.D., etc.

United Kingdom—Scotland. *Z. Ges. Erdk. Berlin* **32** (1897): 146-191. **Penck.**
Geomorphologische Probleme aus Nordwest-Schottland. Von Albrecht Penck. *With Plate.*

This is a detailed description of the observations made by Prof. Penck in his excursion to the north-west of Scotland after the Geographical Congress in 1895. It is referred to in this number of the *Journal*, p. 163.

United Kingdom—Speleology. **Martel.**
British Caves and Speleology. By E. A. Martel. [From the *Geographical Journal* for November, 1897.] Size 10 × 6½, pp. 12. *Illustrations.*

ASIA.

Arabia. *Oesterreichische Monatschr. Orient* **23** (1897): 126-128. **Glaser.**
Der Damm von Mârib. Von Eduard Glaser.

On the ancient dam of Marib mentioned in the Koran, and on the discovery of its remains.

Asia Minor. *Mouvement G.* **14** (1897): 373-376. **Bastelica.**
En Asie Mineure, Le chemin de fer de Smyrne à Cassaba et prolongement. Par J. B. M. Bastelica. *With Map.*

Asia Minor. *Nouv. Archives Miss. Sci. et Littéraires* **7** (1897): 329-365. **Chantre.**
Rapport sur une mission scientifique en Asie Mineure, spécialement en Cappadoce (1893-1894). Par M. Ernest Chantre. *With Illustrations.*

Asia Minor—Cappadocia. *Mém. S.G. Genève* **36** (1897): 75-113. **Boissier.**
En Cappadoce. Par M. Alfred Boissier. *With Plates.*

A journey made in 1894 with M. and Mme. Chantre.

Asia Minor—Zonguldak. *Ann. Hydrographie* **25** (1897): 426-427. **Schmaltz.**
Der Kohlenhafen von Zonguldak im Schwarzen Meer, Vilajet Kastamouni, Kleinasien (Concessionirt der "Société Héraclée"). Von Kapt. W. Schmaltz. *With Plan and Illustration.*

Asiatic Turkey. *Rev. G.* **41** (1897): 451-466. **Zélenoï and Sissoïv.**
Notice explicative de la Carte de la répartition de la population arménienne dans l'Arménie turque et dans le Kurdistan, d'après les renseignements et données de l'ouvrage la *Turquie d'Asie*, par V. Cuinet (1890-94), par MM. Zélenoï et Sissoïv. Traduit du russe par M. Sosvil.

Central Asia. **Hedin.**
General Prschevalskij's Forskningsresor i Central-Asien. Efter de ryska, tyska och franska original-upplagorna af Sven Hedin. Förord af Prof. A. E. Nordan-

skiöld. Stockholm: A. Bonniers Förlag, [1891]. Size 9 × 6, pp. 456. *Portrait, Maps, and Illustrations. Presented by the Author.*

Dr. Sven Hedin here presents a translation into Swedish from the Russian, German, and French originals of General Prjevalsky's travels.

China and the Pamirs. *Contemporary Rev.* **72** (1897): 867–879. **Parker.**
China and the Pamirs. By E. H. Parker. *With Map.*

A history of the relation of the Chinese to the Pamir region and Central Asia, from the earliest times to the present.

China—Mongolia. **Franke.**
A travers le Monde, Tour du Monde **3** (1897): 321–323, 337–340.
De Pékin à la Frontière Russe. A travers la Mongolie et la Mandchourie. Par M. le Dr. Franke. *With Illustrations.*

China—Mongolia. **Malleson.**
Protocol Troitskosadsk-Kyakhta Br., Amur Sect. Imp. Russian G. S., *No.* 7 (1895): 3–23.
Excursion to Mongolia, along the watershed of the rivers Iro and Chikoi, summer, 1895. V. Malleson. [In Russian.]

China—Mongolia. **Shatin.**
Protocol Troitskosadsk-Kyakhta Br., Amur Sect. Imp. Russian G.S., *No.* 7 (1895): 25–32.
The Khunchir (Glycorhiza) Root Industry in Mongolia. N. Shatin. [In Russian.]

Dutch East Indies. **Timmerman.**
Kaartbeschrijving. Door J. Æ. C. A. Timmerman. *Overgedrukt uit de Encyclopædie, voor Nederlandsch-Indië, deel II.* Size 11 × 7½, pp. [28]. *Presented by the Author.*

A history of the cartography of the Dutch East Indies, including an account of the various surveys and lists of the published atlases and maps.

India—Assam. **Monahan.**
Annual Note on Crop Experiments in Assam for 1896-97. By F. J. Monahan. Calcutta, 1897. Size 13½ × 8½, pp. 16.

India—Burma. *Deutsche Rundschau G.* **20** (1897): 116–122. **Dürr.**
Die Karenen. Von Ludwig Dürr. *With Illustrations.*

India—Madras. **Burrard.**
Report on the Recent Determination of the Longitude of Madras. By Captain S. G. Burrard, R.E. Under the direction of Lieut.-Colonel St. G. C. Gore, R.E. Calcutta, 1897. Size 13½ × 8½, pp. 26. *Charts.*

This is specially referred to on p. 174.

India—Marine Survey. ———
Administration Report of the Marine Survey of India for the Official Year 1896-97. Bombay, 1897. Size 13 × 8½, pp. 8. *Presented by the Survey.*

India—Tinnevelly. *Mission Field* **42** (1897): 386–394, 422–429, 454–469. **Margöschis.**
Tinnevelly: being an account of the District, the People, and the Missions. By Rev. A. Margöschis. *With Map and Illustrations.*

Japan. *J. Tōkyō G. S.* **9** (1897): 345–352. **Suzuki.**
Topography of the Environs of Hamada in Iwami. By T. Suzuki. [In Japanese.]

Japan—Formosa. **Honda.**
M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens Tokio (1897): 469–473.
Eine Besteigung des Mount Morrison auf der Insel Formosa. Von Dr. Seiroku Honda.

A note on this ascent appeared in the *Journal* for January, p. 68.

Japan—Formosa. *J. Tōkyō G.S.* **9** (1897): 352–359. **Torii.**
The Aborigines in the Northern Part of Formosa. By T. Torii. [In Japanese.]

Malay Archipelago—Borneo. *P. American Philosoph. S.* **35** (1896): 321–328. **Hiller.**
A Brief Report of a Journey up the Rejang River in Borneo. By H. M. Hiller, M.D.
This journey is referred to in the Monthly Record, p. 179.

Malay Archipelago—Borneo. *P. American Philosoph. S.* **35** (1896): 309–320. **Furness.**
Glimpses of Borneo. By William Henry Furness.

This paper contains a detailed account of the life in a Kayan long-house in Sarawak.

Malay Archipelago—Sumatra. **Karácson and Fennema.**

Tijds. K. Ned. Aard. Genoots. Amsterdam (2) **14** (1897): 555–570.

De Vulkaan Kaba op Sumatra. Door A. A. von Karácson (met eene inleiding door R. Fennema en Kaarten No. III. en IV.).

The volcano is shown by a contoured map on the scale of 1 : 5000.

Persia. **Hedin.**

Konung Oscars Beskickning till Schahen af Persien år 1890. Skildrad af Sven Hedin. Stockholm: Samson & Wallin [1891]. Size 9½ × 6½, pp. xvi. and 480. *Portrait and Illustrations. Presented by the Author.*

A finely illustrated record of a journey to Persia *viâ* Constantinople and Tiflis, and of a short residence in Teheran.

Persia, etc. **Hedin.**

Genom Persien, Mesopotamien och Kaukasien. Reseminnen af Sven Hedin. Förord af professor Hermann Vámbéry. Stockholm: A. Bonniers Förlag [1887]. Size 9 × 6, pp. xvi. and 464. *Maps and Illustrations. Presented by the Author.*

Describes a journey through the trans-Caucasian district to Persia, various journeys through that country and in Mesopotamia, and a return through Turkey and Bulgaria.

Persia and Central Asia. **Hedin.**

Genom Khorasan och Turkestan. Minnen från en Resa i Centralasien 1890 och 1891. Af Sven Hedin. 2 vols. Stockholm: Samson & Wallin. [1892]. Size 10 × 6½, pp. 532. *Map and Illustrations. Presented by the Author.*

Illustrated description of a journey in Eastern Persia, with a visit to the Russian trans-Caspian provinces and Bokhara, and a farther journey eastwards to Kashgar. The illustrations include a number of clever sketches by the author, many of them typical portraits of Central Asian types.

Russia—Caucasus. **Dmitriyeff.**

Material Topog. Ethnolog. Caucasus **22** (1897): pt. **2**, 163–187.

Economic state and customs of the inhabitants of Free-Svanetia, Government of Kutais. By N. Dmitriyeff. [In Russian.]

Russia—Caucasus. *B.S.G. Marseille* **21** (1897): 150–162. **Fournier.**

Voyage au Caucase. Par M. E. Fournier.

A journey in the spring of 1895.

Russia—Caucasus. *Zemlevedenie* **4** (1897): 59–100. **Ivanovsky.**

Mount Ararat. By Al. Ivanovsky. *Illustrations.* [In Russian.]

Russia—Caucasus. **Leminadze.**

Material Topog. Ethnolog. Caucasus **22** (1897): pt. 2, 188–209.

Journey in the Rion defile. By Sh. Leminadze. [In Russian.]

Russia—Caucasus. **Machavariani.**

Material Topog. Ethnolog. Caucasus **22** (1897): pt. 2, 1–53.

Descriptive and historical sketch of the city of Artvin. By K. Machavariani. *Illustrations.* [In Russian.]

Russia—Caucasus. *Zemlevedenie* **4** (1897): 49–58. **Podozersky.**

Imeritia. By Podozersky. [In Russian.]

Russia—Central Caucasus. *Alpine J.* **18** (1897): 487–498. **Holder.**

Climbs among the Peaks of the Adyrsu, Central Caucasus. By H. W. Holder.

Russia—Siberia. *Aus allen Weltteilen* **29** (1897): 95–102. **Berghaus.**

Der jetzige Stand der transsibirischen Bahn. Von Major a. D. Berghaus.

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 82–85. **Bogolyulesky.**

Notice on Lake Baunt and its Hot Springs in Bergusinsk district, Trans-Baikalia. By I. S. Bogolyulaski. [In Russian. *Résumé* in German.]

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 25–48. **Bogoslovsky.**

The river Selenga in Trans-Baikalia and its navigation, with a map of its delta. By A. Bogoslavsky. [In Russian.]

The author describes the course of the Selenga, with reference to the variation in its water-level and velocity, shoals and rapids, and, by the aid of a rough sketch-map, the chief channels of the delta which admit vessels to Lake Baikal. A table of the dates of opening and closing of the river by ice from 1846 to 1893 is also given.

Russia—Siberia. *Zemlevedenie* **4** (1897): 1-28. **Ignatoff.**
On the Southern Altai Mountains. By P. Ignatoff. *Illustrations.* [In Russian.]

Russia—Siberia. **Jefferson.**
Roughing it in Siberia, with some account of the Trans-Siberian Railway, and the Gold-mining Industry of Asiatic Russia. By Robert L. Jefferson. London: Low & Co., 1897. Size $7\frac{1}{4} \times 5$, pp. 252. *Map and Illustrations. Price 6s. Presented by the Author.*

A popular account of a winter journey in Western Siberia, which the author appears to have found very uncomfortable. He travelled by the new Siberian railway to Krasnoyarsk, and thence by sledge to the gold-mines in the Sayan mountains.

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 44-81. **Levin.**
Fishing Industry of Olkhon Island (Lake Baikal). By N. V. Levin. [In Russian. *Résumé* in German.]

Russia—Siberia. *Iz. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 1-24. **Obrucheff.**
Excursion to the Gold-bearing District of the Rivers Sarma and Ilikta, in the Western Baikal Mountains. By V. A. Obrucheff. *Map.* [In Russian. *Résumé* in German.]

Russia—Siberia. *Petermanns M.* **43** (1897): 267-270. **Thiess.**
Das Gouvernement Jakutsk in Ostsibirien. (Nach den Angaben der Sitzungsberichte der Kaiserl. Russ. Geogr. Gesellschaft und des Statistischen Komitees in St. Petersburg. Mitgeteilt von Ingenieur F. Thiess.)

Russia—Siberia. **Vilkitzky and Ivanoff.**
Hydrog. Notices, St. Petersburg **18** (1897): 92-96.
Telegraphic Determination of the Difference of Longitudes of Yeniseisk and Krasnoyarsk. By Colonel A. Vitkovsky and Lieut. N. Ivanoff. [In Russian.]

AFRICA.

Abyssinia. *C. Rd. S.G. Paris* (1897): 313-319. ——
Voyage du prince H. d'Orléans et de MM. de Poncins et Mourrichon d'Addis Abbaba à Djibouti. *With Map.*

Africa—Historical. **Coudray la Blanchère.**
Nouv. Archives Miss. Sci. et Littéraires **7** (1897): 1-109.
L'aménagement de l'eau et l'installation rurale dans l'Afrique ancienne. Par M. du Coudray la Blanchère.—Rapport sur les recherches pour suivre pour déterminer le mode et les conditions de la colonisation et de l'exploitation jusqu'à l'arrivée des Arabes. *Maps and Sections.*

This Report deals with the methods of artificial water-supply and irrigation adopted in North Africa, west of Egypt, in the period anterior to the Arab invasion.

Algeria. *Rev. Scientifique* **8** (1897): 587-591. **Zaborowski.**
L'assimilation des indigènes de l'Algérie. Par M. Zaborowski.

British West Africa—Benin. *Globus* **72** (1897): 309-314. **Carlsen.**
Benin in Guinea und seine rätselhaften Bronzen. Von Dr. F. Carlsen. *With Illustrations.*

British West Africa—Gold Coast. *J.R. Colonial I.* **29** (1897): 36-40. **Richards.**
The Gold Coast Colony. By T. H. Hatton Richards. [Abstract.]

Canary Islands—Anaga. *Scottish G. Mag.* **13** (1897): 617-624. **Ossuna.**
Anaga and its Antiquities. By Don Manuel de Ossuna y Van Den-Heede. Translated by Miss M. W. Macdowall.

Canary Islands—Ethnology. *J. of T. Victoria I. (London)* **29** (1897): 239-262. **Dawson.**
On Specimens in the Peter Redpath Museum of McGill University, illustrating the Physical Characters and Affinities of the Guanches or Extinct People of the Canary Islands. By Sir J. William Dawson. *With Plates.*

Central Africa. *Mouvement G.* **14** (1897): 313-315. ——
La région des grands lacs. *With Map.*

Congo Basin. *Mouvement G.* **14** (1897): 397, 421, 433, 471, 505. **Cornet.**
La géologie du bassin du Congo d'après les connaissances actuelles. Par J. Cornet.

Congo State. *Mouvement G.* **14** (1897): 557-559, 565-567. **Wauters.**
Comment le Congo traverse la chaîne des monts de Cristal. Description du cours du fleuve entre Tshumbiri et Boma. Les bas-fonds de l'ancienne mer centrale du haut bassin congolien. Par A. J. Wauters. *With Map.*

East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 182-189. **Stuhlmann.**
Bericht über das deutsch-portugiesische Grenzgebiet am Rovuma. Von Dr. F. Stuhlmann.
Bemerkungen zur Karte des deutsch-portugiesischen Grenzgebietes an der Rovumamündung. *With Map.*
This is noticed in the *Journal* for December, vol. x. p. 637.

Egypt. *Ann. G.* **6** (1897): 456-460. **Brunhes.**
Les irrigations en Égypte. Par M. J. Brunhes.
A historical sketch of Egyptian irrigations from the time of the Pharaohs to the present.

Egypt—Ancient People. *B.S. Khédiv. G.* **4** (1897): 785-805. **Schweinfurth.**
De l'origine des Égyptiens et sur quelques-uns de leurs usages remontant à l'âge de la pierre. Par G. Schweinfurth.

Egypt—Nile Cataracts. *P.R. Artillery I.* **24** (1897): 511-524. **Butler.**
The Nile Cataracts. By Major-General Sir W. Butler, K.C.B.
Contains reminiscences of the Nile boat expedition of 1884-85.

German East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 206-222. **Berg.**
Das Bezirksamt Mikindani. Bericht des Bezirksamtmanns Berg.

German East Africa. **Fitzner.**
Aus allen Weltteilen **28** (1897): 735-746, 767-778, 817-824.
Die Pflanzungen in Deutsch-Ostafrika. Von Rudolf Fitzner.

German East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 234. **Kiepert.**
Begleitworte zur Karte 4. Von R. Kiepert. Neue Aufnahme von Pater Capus und Lieut. v. Wulffen in Unyamwesi.
The map is on the scale of 1 : 300,000.

German East Africa. *M. Deutsch. Schutzgeb.* **10** (1897): 169-176. **Stadlbaur.**
Turu. Von Lieut. Stadlbaur.

German East Africa. *Petermanns M.* **43** (1897): **289.** **Triloff.**
Die Schambalai oder West-Usambara, nach einer Skizzenkarte des Missionars Lang-Heinrich zu Wuga und verschiedenen gedruckten und ungedruckten Quellen, im Massstab 1 : 125,000. Bearbeitet von P. Hermann Triloff. *With Map.*
The map is on the scale of 1 : 200,000.

German South-West Africa. *Globus* **72** (1897): 297-299. **Gessert.**
Der Seewind Deutsch-Südwestafrikas und seine Folgen. Von Ferdinand Gessert.
Study of the sea-breeze on the coast.

German South-West Africa. *Deutsche Kolonialzeitung* **10** (1897): 512-514. **Rehbock.**
Deutsch Südwestafrika. Von Regierungsbaumeister Rehbock. *With Map.*

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* **10** (1897): 155-161. **Stein.**
Ueber den Ossa- (Lungasi-) See, Kamerungebiet. Von Premierlieutenant Freiherrn v. Stein. *With Map.*
This is noticed in the *Journal* for December, vol. x. p. 638.

German West Africa—Togo. *Globus* **72** (1897): 301-304. **Förster.**
Das deutsch-französische Grenzabkommen in Togo. Von Brix Förster. *With Map.*

German West Africa—Togo. **Gruner and Zech.**
M. Deutsch. Schutzgeb. **10** (1897): 143-154.
Die astronomischen Beobachtungen Dr. Gruners auf der Reise im Togohinterlande in den Jahren 1894 und 1895.
Astronomische Ortsbestimmungen von Graf Zech im Schutzgebiete von Togo. Berechnet von Dr. Fritz Cohn.

German West Africa—Togo. *M. Deutsch. Schutzgeb.* **10** (1897): 193-204. ———
Resultate der meteorologischen Beobachtungen des Grafen Zech und des Lieuts. v. Seefried in Kratyi.
Resultate der meteorologischen Beobachtungen des Missionars Seeger in Amedjowe.
Geographische Ortsbestimmungen des Grafen Zech im Togogebiet 1896. Berechnet von L. Ambronn.

German West Africa—Togo. **Seidel.**
Aus allen Welttheilen **28** (1897): 801–818; **29** (1897): 67–74.
Lome, die Hauptstadt der Togokolonie. Ein Kulturbild aus Westafrika. Von H. Seidel.

Madagascar. *B.S.G. Marseille* **21** (1897): 163–174. **Sikora.**
Sept ans à Madagascar. Conférence de M. François Sikora.
The narrative of an Austrian naturalist.

Marocco. *B.S.G. Genève* **36** (1897): 116–124. **Goll.**
Au Moghreb-El-Aksa, de mars à mai 1892. Par M. Hermann Goll.

Portuguese East Africa. *Mém. S.G. Genève* **36** (1897): 63–74. **Junod.**
Les Ba-Ronga de la baie de Delagoa, leur pays, leurs mœurs. Par M. Henri Junod.

Portuguese East Africa—Makua. *B.S.G. Lisboa* **16** (1897): 127–145. **Grove.**
Africa oriental portugueza. A Macua-Communicação do ex^{mo} socio Daniel Grove.

Portuguese West Africa. *J. Anthrop. I.* **27** (1897): 316–325. **Angus.**
A Year in Azimba and Chipitaland: the Customs and Superstitions of the People. By H. Crawford Angus.

Portuguese West Africa. *B.S.G. Lisboa* **16** (1897): 223–248. **Lecomte.**
Plan 'alto do sul de Angola. Missões portuguezas-Caconda, Catoco, Bihé e Bailundo . . . pelo Padre Ernesto Lecomte.

Portuguese West Africa—Benguella. *B.S.G. Lisboa* **16** (1897): 1–124. **Lecomte.**
Methodo pratico da lingua Mbundu fallada no districto de Benguella. Pelo Padre Ernesto Lecomte.

Portuguese West Africa—Cunene. *B.S.G. Lisboa* **16** (1897): 203–222. ——
Relatorio da viagem ao Cunene, comprehendida em outubro de 1896 pelo governador do districto de Mossamedes. *With Map.*

Sahara. *Rev. Française* **22** (1897): 699–702. **Foureau.**
Sahara: La 9^e exploration. F. Foureau.

Sahara. *Ann. G.* **6** (1897): 461–461. **Schirmer.**
L'exploration du Sahara. Par M. H. Schirmer.
A criticism of M. P. Vuillot's book on the exploration of the Sahara.

St. Helena. ——
Colonial Reports—Annual. No. 213. St. Helena. Annual Report for 1896. London: Eyre & Spottiswoode, 1897. Size 10 × 6½, pp. 16.

South Africa. **Coillard.**
On the Threshold of Central Africa. A Record of Twenty Years' Pioneering among the Barotsi of the Upper Zambesi. By François Coillard. Translated from the French and Edited by his Niece, Catherine Winkworth Mackintosh. London: Hodder & Stoughton, 1897. Size 9½ × 6½, pp. xxxiv. and 684. *Map, Portraits, and Illustrations. Price 15s. Presented by the Publishers.*
This will be noticed amongst books on Africa.

South Africa—Barotse Country. *Mém. S.G. Genève* **36** (1897): 41–61. **Bertrand.**
Notes résumées sur un voyage d'exploration au pays des Ba-Rotse. Par M. Alfred Bertrand. *With Map.*

South Africa—Railways. *J. R. Colonial I.* **29** (1897): 8–35. **Tennant.**
The Railway System of South Africa. By the Hon. Sir D. Tennant, K.C.M.G.

Tunis. *B.S.G. Genève* **36** (1897): 151–170. **Ladame.**
En Tunisie.—Le Bardo-Carthage-Bizerte. Races historiques: temps antiques et temps modernes. Par M. le Dr. Paul Ladame.

NORTH AMERICA.

Bering Islands. *Ir. E. Sib. Sect. Imp. Russian G.S.* **28** (1897): 109–135. **Gerasimoff.**
The Bering Islands and their Fur-seal Industry. By A. Gerasimoff. *Map.* [In Russian. *Résumé* in German.]
A criticism of the physical, geographical, and ethnographical parts of Stejneger's report on the Russian Fur Seal islands, published in the U.S. Fish Commission's *Bulletin* for 1896.

Bering Islands—Fur Seals. *Contemporary Rev.* **72** (1897): 846–853. ——
The Fur-Seals: the American Case. By a British Naturalist.

Canada. **Coleman.**
Glacial and Inter-Glacial Deposits near Toronto. By A. P. Coleman. [Reprinted from the *Journal of Geology*, vol. iii. No. 6, September—October, 1895.] Chicago. Size 9½ × 7. *Illustrations. Presented by the Author.*

Canada. **Dawson.**
The Physical Geography and Geology of Canada. By George M. Dawson, C.M.G., F.R.S. Toronto, 1897. Size 7½ × 5, pp. 48. *Presented by the Author.*

This is an abstract from the 'Handbook of Canada,' published last year for the British Association meeting in Toronto.

Canada—Agriculture. ——
Appendix to the Report of the Minister of Agriculture. Experimental Farms. Reports . . . for 1887, pp. 58; 1888, pp. 142; 1889, pp. 152; 1890, pp. 314; 1891, pp. 348; 1892, pp. 290; 1893, pp. 352; 1894, pp. 422; 1895, pp. 426; 1896, pp. 474. Ottawa, 1888–1897. Size 10 × 6½. *Plans and Illustrations. Presented by the Director of Central Experimental Farm, Ottawa, Canada.*

The experimental farms of Canada carry on a most important work with regard to the utilization of new land by the cultivation of the crops best suited to the soil and climate. For this purpose the products and methods of cultivation of other countries are carefully studied, and the reports contain many papers of general interest. They consist of reports from the director, horticulturist, chemist, entomologist and botanist, poultry manager, and the superintendents of the experimental farms at Nappan, N.S.; Brandon, Man.; Indian Head, N.W.T.; and Agassiz, B.C.

Canada—British Columbia. **Dawson.**
Some Observations tending to show the occurrence of Secular Climatic Changes in British Columbia. By G. M. Dawson, C.M.G., etc. [From the *Transactions* of the Royal Society of Canada. Second Series, 1896–97. Vol. ii. Section iv.] Ottawa: John Durie & Son, 1896. Size 10 × 7, pp. 159–166. *Presented by the Author.*

Canada—Nova Scotia. **Wrong.**
University of Toronto Studies. History, Second Series, vol. i. pp. 1–74. Louisbourg in 1745. The anonymous Lettre d'un Habitant de Louisbourg (Cape Breton), containing a narrative by an eye-witness of the siege in 1745. Edited with an English Translation by George M. Wrong, M.A., 1897. Size 11 × 7½. *Presented by the University of Toronto.*

A thrilling account of the siege of Louisbourg in an English translation, accompanied by the French text and a short introduction.

Canada—Ontario. **Bryce.**
The Lake of the Woods, its History, Geology, Mining, and Manufacturing. By George Bryce, LL.D. (The Historical and Scientific Society of Manitoba. Transaction, No. 49, February 23, 1897.) Winnipeg, 1897. Size 9 × 6, pp. 18. *Map and Illustrations. Presented by the Society.*

A brief historical account of an extremely interesting region, with notes on its present development and future prospects.

Canada—Ottawa. ——
Ottawa, the Capital of the Dominion. British Association for the Advancement of Science, Souvenir of Ottawa, Canada, 1897. Size 7 × 10, pp. 52. *Illustrations.*

Canada—Yukon District. *National G. Mag.* **8** (1897): 327–335. **Nelson.**
A winter weather record from the Klondike Region. By E. W. Nelson.

Canada—Yukon District. **Ogilvie.**
Department of the Interior. Information respecting the Yukon District, from the Reports of Wm. Ogilvie, Dominion Land Surveyor, and from other sources. Ottawa, 1897. Size 10 × 7, pp. 66. *Maps and Illustrations.*

This pamphlet is published by the Dominion Government to supply authentic information regarding the gold-bearing regions of the Yukon. It consists mainly of a detailed account of Mr. Ogilvie's explorations in 1887 and his subsequent reports.

Mexico. *B. American G.S.* **29** (1897): 249–260. **Wilson.**
Topography of Mexico. By Herbert M. Wilson. *With Map.*

This article is illustrated by a rough hypsometrical map of Mexico compiled from 2000 known altitudes. It gives a careful account of the detailed configuration of the country.

Mexico and Guatemala—Boundary. *B. American G.S.* **29** (1897): 281-330. ———

Mr. Blaine and the Boundary Question between Mexico and Guatemala. By the Mexican Minister at Washington.

Mexico and Guatemala. *Verh. Ges. Erdk. Berlin* **24** (1897): 397-413. **Seler.**

Herr Dr. E. Seler: Ueber seine Reisen in Mexico und Guatemala.

Mexico—Archæology. **Holmes.**

Field Columbian Museum. Publication 16. Anthropological Series. Vol. i. No. 1. Archeological Studies among the ancient Cities of Mexico. By William H. Holmes. Part ii. Monuments of Chiapas, Oaxaca, and the Valley of Mexico. Chicago, 1897. Size 10 × 6½, pp. 139-338. *Illustrations and Maps.*

Mexico—Baja California. *B. American G.S.* **29** (1897): 271-280. **Eisen.**

Explorations in the Cape Region of Baja California. By Gustav Eisen. *With Map.*

On the extreme south of the peninsula of lower California.

Mexico—Caves. *Aus allen Weltteilen* **28** (1897): 783-791. ———

Ein Ausflug nach den Höhlen von Cacahuamilpa.

Niagara Falls. **Gilbert.**

Niagara Falls and their History. By G. K. Gilbert.—National Geographic Monographs. Vol. i. No. 7. September, 1895. New York: American Book Company. Size 11½ × 8. *Illustrations.*

United States—Alaska. *L'Universo* **7** (1897): 323-328. **Abruzzi.**

La spedizione del Duca degli Abruzzi all' Alaska. *With Maps and Illustrations.*

A description of the ascent of Mount St. Elias by the Duke of the Abruzzi.

United States—Alaska. *National G. Mag.* **8** (1897): 322-327. **Dickey.**

The Sushitna River, Alaska. By W. A. Dickey. *With Map.*

United States—Atlantic Coast. **Shaler.**

Beaches and Tidal Marshes of the Atlantic Coast. By N. S. Shaler.—National Geographic Monographs. Vol. i. No. 5. July, 1895. New York: American Book Company. Size 11½ × 8.

United States—California. **Diller.**

Mount Shasta, a typical Volcano. By J. S. Diller.—National Geographic Monographs. Vol. i. No. 8. October, 1895. New York: American Book Company. Size 11½ × 8. *Illustrations.*

United States—Florida. *P. American Philosoph. S.* **35** (1896): 329-448. **Cushing.**

Exploration of Ancient Key Dwellers' Remains on the Gulf Coast of Florida. By Frank Hamilton Cushing. *With Plates.*

An interesting account of the discovery and exploration of ancient dwellings built on the coral keys on the west coast of Florida by a primitive shellfish-eating tribe. Minute plans of the shell-mounds, and illustrations of the utensils found complete the memoir.

United States—Harbours. **Bradford.**

Treasury Department, United States Coast and Geodetic Survey. W. W. Duffield, Superintendent. Bulletin No. 36. Table of Depths for Channels and Harbors, Coasts of the United States. Arranged and compiled by Gershom Bradford. Washington, 1897. Size 11½ × 9½, pp. 110. *Presented by the Survey.*

United States—Nevada, Lakes. **Russell.**

Present and Extinct Lakes of Nevada. By Israel C. Russell.—National Geographic Monographs. Vol. i. No. 4. June, 1895. New York: American Book Company. Size 11½ × 8. *Maps.*

United States—New England. **Davis.**

The Physical Geography of Southern New England. By William Morris Davis.—National Geographic Monographs. Vol. i. No. 9. November, 1895. New York: American Book Company. Size 11½ × 8. *Illustrations.*

United States—New Mexico. *B. American G.S.* **29** (1897): 261-270. **Duff.**

The Prehistoric Ruins of the Rio Tularosa. By U. Francis Duff. *With Illustrations.*

United States—Northern Appalachians. **Willis.**

The Northern Appalachians. By Bailey Willis.—National Geographic Monographs. Vol. i. No. 6. August, 1895. New York: American Book Company. Size 11½ × 8. *Map.*

United States—Oregon. ——

Mazama: a Record of Mountaineering in the Pacific North-West. Crater Lake Number. [Vol. i. No. 2.] Portland, Oregon, 1897. Size 10 × 7, pp. 139-298. *Maps and Illustrations.*

A special note on Crater lake is given on p. 182.

United States—Rainfall. **Henry.**

U.S. Department of Agriculture, Weather Bureau. Bulletin D. Rainfall of the United States, with Annual, Seasonal, and other Charts. Prepared . . . by Alfred J. Henry. Washington, 1897. Size 11½ × 9½, pp. 58.

United States—Schuylkill River. *J. Franklin I.* **144** (1897): 366-379. **Carter.**

The Upper Schuylkill River. By Oscar C. S. Carter. *With Sketch-map.*

A study of the effect of acid water from collieries on the river, and the amelioration due to tributaries bringing in much carbonate of lime in solution.

United States—Southern Appalachians. **Hayes.**

The Southern Appalachians. By C. Willard Hayes.—National Geographic Monographs. Vol. i. No. 10. December, 1895. New York: American Book Company. Size 11½ × 8. *Map.*

United States—Virginia. **Boyd.**

Grayson County, Virginia. By C. R. Boyd. Economic: Ores, Stones, etc. Analysis, Agricultural Products: Timber, Soils, Manufactures, Transportation, Summaries. Scientific: Geology, Mineralogy. Independence, Va.: Greek D. Brown, 1897. Size 8 × 5½, pp. 44. *Map. Presented by the Author.*

United States—Western States. **Denburgh.**

The Reptiles of the Pacific Coast and Great Basin, an account of the species known to inhabit California, and Oregon, Washington, Idaho, and Nevada. By John Van Denburgh, PH.D.—Occasional Papers of the California Academy of Sciences, V. San Francisco, 1897. Size 10 × 6½, pp. 236. *Illustrations. Presented by the Academy.*

CENTRAL AND SOUTH AMERICA.

Argentine—Patagonia. *National G. Mag.* **8** (1897): 305-319. **Hatcher.**

Patagonia. By J. B. Hatcher. *With Map and Illustrations.*

Mr. Hatcher's expedition is noticed in the *Journal* for January, vol. xi. p. 72.

Bolivia and Peru. *Aus allen Weltteilen* **29** (1897): 73-82. **Nusser-Asport.**

Kautschuk und Gold im peruanisch-bolivianischen Grenzgebiet. Von Chr. Nusser-Asport.

On the indiarubber and gold resources of the boundary district between Peru and Bolivia.

Brazil. **Princess Therese of Bavaria.**

Meine Reise in den Brasilianischen Tropen. Von Therese Prinzessin von Bayern. Berlin: D. Reimer, 1897. Size 10½ × 7, pp. xvi. and 544. *Portrait, Map, and Illustrations. Price 14s. Presented by the Publisher.*

The Princess Therese of Bavaria is to be congratulated on her literary style and on the excellent descriptions which she has given, not only of the scenes she visited in 1888, but of the large scientific collections which she brought back to Europe. The narrative takes the form of a diary illustrated with numerous photographs and reproductions of drawings from sketches by the authoress. The journey was no mere holiday trip to the coast towns and along the railways, but partook of a more adventurous character, including a journey up the Amazon and several excursions into the forest. Numerous scientific observations are interspersed, especially with regard to plants, the Princess being a keen botanist. Her collections included two new species. Special historical value is given to the book by the description of visits paid to the late Emperor of Brazil so soon before he was compelled to abdicate.

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* **4** (1897): 233-344. ——

Riqueza Mineral do Estado da Bahia.

On the mineral wealth of the State of Bahia.

Brazil—Minas Geraes. *Meteorolog. Z.* **14** (1897): 405-415. **Draenert.**

Das Höhenklima des Staates Minas Geraes, Brasilien. Von Prof. F. M. Draenert.

Central America. *Z. Ges. Erdk. Berlin* **32** (1897): 137–146. **Sapper.**

Die ersten Kriegszüge der Spanier im nördlichen Mittel-Amerika. Von Dr. Carl Sapper. *With Map.*

On the earliest Spanish expeditions in Northern Central America.

Chile. *Nouv. Archives Miss. Sci. et Littéraires* **7** (1897): 111–242. **Bel.**

Rapport sur une mission scientifique au Chili et dans le nord de la Bolivie (1888–89). Par M. J.-M. Bel. *With Maps and Plate.*

Observations made in 1888–89 during a stay of three months in Chile and six months in Bolivia. The names and tonnage of thirty-two steamers over 4000 tons, which make the voyage regularly to Chile, are given in a table; and many particulars of the routes are given in the text. There is a detailed itinerary of the journey on land, with an account of the geology. This is followed by a long list of the Chilian islands with their positions, and other lists of peninsulas, capes, gulfs, bays, etc., apparently transcribed from maps. A history of Chile follows; but there is no account of Bolivia.

Chile and Argentine. *Ymer* (1897): 199–220. **Dusén.**

Från Patagoniens vestkust till pampasområdet på Kordillerans östra sida. Af P. Dusén. *With Map.*

The map shows the whole course of the west-flowing Rio Aysen, on the scale of 1 : 200,000, but without latitudes or longitudes.

Paraguay and Bolivia. *Mem. S.G. Italiana* **7** (1897): 45–62. **Boggiani.**

La questione dei confini tra le repubbliche del Paraguay e della Bolivia. Nota del Socio Guido Boggiani.

West Indies—Caribs. *J. Anthrop. I.* **27** (1897): 293–315. **Rat.**

The Carib Language as now spoken in Dominica, West Indies. By Joseph Numa Rat.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Rock Carvings. *P. American Philosoph. S.* **36** (1897): 195–208. **Mathews.**

Australian Rock Carvings. By R. H. Mathews. *With Plate.*

The positions where the rock-carvings described are to be found are given in each case by exact references to the government map.

British New Guinea—Kiriwina. **Macgregor.**

Despatch reporting Visit to Kiriwina. By Sir William Macgregor. [No. 44.] 1897. Size 13¼ × 8½, pp. 4. *Presented by the Colonial Office.*

Hawaii. *Ann. Hydrographie* **25** (1897): 469–471. **Stege.**

Kahului auf der Insel Maui, Hawai-Inseln. Von Kapt. J. H. Stege.

Marshall Islands. *M. Deutsch. Schutzgeb.* **10** (1897): 191–192. ———

Verzeichniss der nunmehr endgültig berechneten geographischen Positionen der astronomischen Beobachtungspfeiler in der Südsee sowie der sich hieran anschliessenden Punkte in den bis jetzt vermessenen Gebieten.

Melanesia. *J. Anthrop. I.* **27** (1897): 181–191. **Pfeil.**

Duk Duk and other Customs as Forms of Expression of the Melanesians' Intellectual Life. By Graf v. Pfeil.

New Guinea—The Toaripi Tribe. *J. Anthrop. I.* **27** (1897): 326–334. **Chalmers.**

Toaripi. By the Rev. Dr. James Chalmers.

New Hebrides. **Le Gouz de Saint-Seine.**

A travers le Monde, Tour du Monde **3** (1897): 401–404.

Les Nouvelles-Hébrides, aperçu historique et géographique. Par le comte Jean Le Gouz de Saint-Seine. *With Illustrations.*

New Zealand. **Smith.**

Report of the Department of Lands and Survey, New Zealand, for the year 1896–97. By Stephenson Percy Smith, Surveyor-General. Wellington, 1897. Size 13½ × 8½, pp. xx. and 216. *Maps, Plates, and Sections.*

This Report maintains its character for geographical interest. It not only gives a full account of the surveys which have been carried out in the year, but admirable maps showing the progress of the survey as a whole, the system of roads throughout New Zealand, and detailed work in several districts, including the summit of Tongariro. The Report is illustrated by a number of very fine photographs of scenery, reproduced on a large scale.

Polynesia—Plant- and Tree-Names. *J. Polynesian S.* 6 (1897): 123-140. **Christian.**
On the Distribution and Origin of some Plant- and Tree-Names in Polynesia and Micronesia. By F. W. Christian, M.A.

Queensland. *P. and T. Queensland Br. R.G.S. Australasia* 12 (1897): 20-25. **Collins.**
The South-Eastern Highlands of Queensland. By R. M. Collins.

Queensland. **Rands.**
Queensland. Department of Mines. Geological Survey. Bulletin No. 3. Mount Cannindah Copper and Gold Deposits. By William H. Rands. Brisbane, 1896. Size 8½ × 5½, pp. 10. *Plan.*

Queensland. *Scottish G. Mag.* 13 (1897): 561-572, 624-635. **Thomson.**
Queensland. By J. P. Thomson. *With Illustrations and Map.*

Queensland—Cape York Peninsula. **Embley.**
P. and T. Queensland Br. R.G.S. Australasia 12 (1897): 26-29.
The Western Watershed of the Upper Portion of Cape York Peninsula. By J. T. Embley.

Queensland—Pikedale Goldfield. **Maitland.**
Queensland. Department of Mines, Geological Survey. Bulletin No. 2. Notes on the Pikedale Goldfield. By A. Gibb Maitland. Brisbane, 1895. Size 9 × 5½, pp. 10.

Rarotonga. *Chronicle London Miss. S.* (1897): 265-266. **Hutchin.**
Rarotonga of To-day. By Rev. John J. K. Hutchin.

South Australia. **Hübbe.**
South Australia. Journal of the Stock Route Expedition from South to Western Australia, 1895-96, under command of S. G. Hübbe, 1897. Size 13½ × 8½, pp. 50. *Presented by the Secretary of State for the Colonies.*

A note on this expedition will be given.

South Australia—Meteorological Observations. **Todd.**
1894. Meteorological Observations made at the Adelaide Observatory and other places in South Australia and the Northern Territory, during the year 1894, under the direction of Charles Todd, K.C.M.G., etc. Adelaide, 1897. Size 13 × 8½, pp. xiv. and 174. *Maps. Presented by the Adelaide Observatory.*

Western Australia. ——
Western Australia. Report of the Department of Mines for the year 1896, with Supplementary Notes on part of 1897. Perth, 1897. Size 13 × 8½, pp. 76. *Maps, Sections, etc.*

Western Australia. ——
Western Australia. Department of Mines. Gold-mining Statistics for the Half-year ending June 30, 1897. [Perth, 1897.] Size 13½ × 8½, pp. 28. *Diagram.*

The gold exported in 1895 exceeded 231,000 oz., in 1896 it was over 281,000 oz., and in the first half of 1897 the export was more than 265,000 oz.

POLAR REGIONS.

Arctic. *B.S.G. Romînă* 18 (1897): 135-200. **Assan.**
Călătorie în regiunile Polare nordice. Conferinţă ţinuţă de d. B. G. Assan. *With Maps and Illustrations.*

On a voyage along the coast of Norway to Spitsbergen in the *Erling Jarl* in August, 1896.

Arctic—Andrée's Expedition. *Verh. Ges. Erdk. Berlin* 24 (1897): 413-423. **Baschin.**
Die Abfahrt der Andrée'schen Ballon-Expedition zum Nordpol und ihre Aussichten. Von Otto Baschin.

Arctic—Andrée's Expedition. *Ymer* 17 (1897): 221-246. **Celsing and Ekholm.**
Andrées ballonguppstigning 1897. Af G. R. Celsing. *With Illustrations.*
Om Andrées ballongfärd under de tvä första dagarne. Af Nils Ekholm. *With Map.*

Arctic—Glaciers. *Rev. Scientifique* 8 (1897): 140-142. **Rabot.**
Les variations des glaciers arctiques. Par M. Ch. Rabot.

A comparison of the glaciers of Greenland with those of the Alps.

Arctic—Jackson-Harmsworth Expedition. **Brice.**

J. Manchester G.S. 13 (1897): 73–80.

The Jackson-Harmsworth Polar Expedition. By Mr. Arthur Montefiore Brice. *With Portraits.*

Greenland. **Putnam.**

The Scientific Work of the Boston Party on the Sixth Peary Expedition to Greenland. Report A. Magnetic and Pendulum Observations. By G. R. Putnam. [From *Technology Quarterly*, vol. x. No 1, March, 1897.] Pp. 56–132. Size 10½ × 7. *Maps and Illustrations. Presented by the Author.*

This records part of the work done by one of the independent scientific parties landed by Lieut. Peary in Greenland, and taken back by him in 1896. The observations are detailed, and the instruments employed minutely described and figured.

Greenland—Cornell Glacier. **Tarr.**

The Margin of the Cornell Glacier. By Ralph S. Tarr. [From the *American Geologist*, vol. xx. September, 1897.] Size 9½ × 6½, pp. 139–156. *Plates. Presented by the Author.*

A minute study of the end of a great glacier, with numerous fine illustrations.

Novaya Zemlya. *Zemlevedenie* 3, 1896 (1897): 158–163. ———

Novaya Zemlya and its latest Exploration. Anon. [In Russian.]

An account of the expedition of Engelhardt and Chernysheff in 1895, and references to the eclipse expeditions of 1896.

Spitsbergen. *Alpine J.* 18 (1897): 501–506. **Gatty.**

A Spitsbergen Glacier Expedition. By Victor H. Gatty.

An excursion from Recherche bay in 1897.

MATHEMATICAL GEOGRAPHY.

Geodesy. ———

Verhandlungen der österreichischen Gradmessungs-Commission. Protokoll über die am 21 April 1897 abgehaltene Sitzung. Wien, 1897. Size 9 × 6½, pp. 16.

Geodesy. *Math. u. Naturw. Berichte Ungarn* 13 (1897): 365–379. **Kövesligethy.**

Ueber eine neue Methode der Morphometrie der Erdoberfläche. Von Dr. R. von Kövesligethy.

The author introduces a method of mathematical treatment for the morphometry of the surface of the globe similar to that employed by Gauss for the discussion of terrestrial magnetism. As the geoid is treated in geodesy he treats the *oroid* in orometry.

Geodesy. **Schumann and Kühnen.**

Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Die Neumessung der Grundlinien bei Strehlen, Berlin und Bonn ausgeführt durch das Geodätische Institut. Unter Mitwirkung von R. Schumann bearbeitet von Fr. Kühnen. Berlin: P. Stankiewicz, 1897. Size 11½ × 9, pp. iv. and 122. *Plates. Presented by the Institute.*

On the re-measurement of three bases in the German system of triangulation.

Latitude Changes. *B.A. Imp. Sci. St.-Petersbourg* 5 (1896): 223–236. **Ivanof.**

A. Ivanof. Déclinaisons de 14 étoiles employées, pour les recherches sur la variation de la latitude de Kasan. [In Russian.]

Problems in Geography. **Aspiazu.**

Sociedad Geografica de La Paz. Bolivia. Conferencias y escritos cientificos del Dr. Don Agustin Aspiazu. 1897. Size 8½ × 5½, pp. 256. *Plates. Presented by the Author.*

The greater part of this little book is occupied with the discussion of various problems in mathematical geography and astronomy, including the determination of position, the measurement of gravity, etc.

Topography. **Corballis.**

Topography made easy. A complete course for officers preparing for the Staff, College, Promotion, and the Militia Military Competitive Examinations. Compiled by James Corballis. London: Gale and Polden, [1896]. Size 7½ × 5, pp. 124. *Illustrations. Price 4s.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Bog-bursts. **Früh.**

Ueber Moorausbrüche. Von Jakob Früh.—Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich. Sonderabdruck aus Jahrgang xlii., 1897. Size 9 × 6½, pp. 202–238. *Presented by the Author.*

A discussion of bog-bursts, with special reference to the great outburst of a bog in the Killarney district in 1896.

Climate Changes. *J. Geology* 5 (1897): 653–683. **Chamberlin.**

A group of hypotheses bearing on climatic changes. By T. C. Chamberlin.

Colour of Water. *Ann. Hydrographie* 25 (1897): 432–442. **Hasenkamp.**

Die Farbe der natürlichen Gewässer. Mit besonderer Berücksichtigung der Arbeiten von Spring, zusammenfassend dargestellt von Dr. H. von Hasenkamp.

Geology. **Selwyn.**

Presidential Address on the Origin and Evolution of Archæan Rocks, with Remarks and Opinions on other Geological subjects; being the result of personal work in both hemispheres from 1845 to 1895. By Alfred R. C. Selwyn, C.M.G., F.R.S., etc. [From the *Transactions of the Royal Society of Canada*, Second Series, 1896–97. Vol. ii. Proceedings.] Ottawa: J. Durie & Son, 1896. Size 10 × 6½, pp. 22.

Glacial Formations. *J. Geology* 5 (1897): 730–743. **Bannister.**

The Drift and Geologic Time. By H. M. Bannister, M.D.

Glaciers. **Lapparent.**

Une nouvelle Théorie des anciens Glaciers. Par A. de Lapparent. Extrait de la *Revue des Questions Scientifiques*, Octobre 1897. Louvain, 1897. Size 10 × 6½, pp. 24. *Presented by the Author.*

This will be specially noticed.

Ice. *Atti R. A. Lincei, Rendiconti* 6 (1897): 262–269. **Straneo.**

Sulla conducibilità termica del ghiaccio. Nota di Paolo Straneo.

On the thermal conductivity of ice, a matter of considerable importance in many departments of physical geography.

Land-forms—Valleys. *Mém. S.G. Genève* 36 (1897): 23–40. **Ritter.**

Origine de l'emplacement des cours d'eau. Par M. Étienne Ritter.

A study of the conditions which originally determined the position and direction of river-valleys.

Meteorite. *C. Rd.* 125 (1897): 894–897. **Meunier.**

Sur quelques circonstances particulières qui paraissent avoir accompagné la chute d'une météorite le 9 avril 1891 à Indarck, en Transcaucasie. Note de M. Stanislas Meunier.

Particulars of the fall of a meteorite weighing about 60 lbs. on April 9, 1891, in the Transcaucasus. Ten hours after the fall the mass was still so hot that it could not be touched with the hand, but cool enough to be carried wrapped up in a cloak.

Meteorology—Evaporation. *T.S. African Philosoph. S.* 9 (1897): 8–19. **Alston.**

Comparison of Evaporation Results in New South Wales and South Africa. By Garwood Alston. *With Diagrams.*

Mountains. *Knowledge* 20 (1897): 282–285. **Cole.**

The Heart of a Continent. By Grenville A. J. Cole. *With Illustrations.*

Oceanography. **Dickson.**

Report on Physical Investigations carried out on board H.M.S. *Research*, during August, 1896. By H. N. Dickson. From Part iii. Fifth Annual Report of the Fishery Board for Scotland, pp. 280–296. Size 10 × 6½. *Presented by the Author.*

Describes the continuation of Mr. Dickson's valuable researches for the Scottish Fishery Board in the North Atlantic. See note on p. 185.

Oceanography. *P. Linnean S.* (1896–97): 16–49. **Günther.**

The President's Anniversary Address.

Dr. Günther dealt in his address with the fauna of the deep sea, taking up each of the oceans or divisions of oceans in turn, and showing the dependence of their living forms upon the physical conditions.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. *Naturw. Wochenschrift* **12** (1897): 541–545. **Mewes.**
Ueber die Abhängigkeit der Nervenreizbarkeit der Völker von terrestrischen und kosmischen Erscheinungen. Von Rudolf Mewes.

On the influence of geographical and physical environment on the powers of human perception.

Anthropology. *T.R.S. Literature* **19** (1897): 1–58. **Phené.**
Dendrophoria. Researches for and Examination of Still Existing People, Languages, Customs, and Remains mentioned by Herodotus, Strabo, etc., in India, Thrace, Italy, and Western Europe. By Dr. J. S. Phené. *With Illustrations.*

Archæology. *T.R.S. Literature* **19** (1897): 59–78. **Petrie.**
The Relations of Egypt and Early Europe. By Prof. Flinders Petrie, D.C.L. *With Illustrations.*

Historical. **Maspero and Sayce.**
The Struggle of the Nations, Egypt, Syria, and Assyria. By G. Maspero. Edited by A. H. Sayce. Translated by M. L. McClure. London: Society for Promoting Christian Knowledge, 1896. Size 11 × 7½, pp. xii. and 794. *Map, Coloured Plates, and Illustrations. Price* 25s. *Presented by the Publishers.*

This is a handsome volume, in which the earliest history of the Eastern Mediterranean lands is told from the monuments, illustrated by a large number of reproductions of drawings and photographs of sites and figures. Beginning with the first Chaldæan empire, the history follows the growth of Nineveh and Phœnicia; details the Egyptian conquest of Syria and its organization as part of the Theban empire, the rise of the Hittites, and the eventual overthrow of the Theban empire; the growth of Assyrian power, and the familiar wars of the Hebrews and Philistines, which are here set in their true place with regard to the historic development of the ancient world. Numerous sketch-maps are used in illustration of the event.

Historical—da Gama. *B.S.G. Lisboa* **16** (1897): 191–202. **Levy.**
Les découvertes de Gama et la colonisation portugaise. Par Victor Levy.

Historical—Map. *Z. Ges. Erdk. Berlin* **32** (1897): 65–111, 191–218. **Kretschmer.**
Die Katalanische Weltkarte der Biblioteca Estense zu Modena. Von Dr. Konrad Kretschmer. *With Map.*

Historical—Noreia. *M. k.k. G. Ges. Wien* **40** (1897): 621–747. **Pichler.**
Die Noreia des Polybios und jene des Castorius. Von Fritz Pichler.
On the site of Noreia.

Historical—Verrazano. *Mem. S.G. Italiana* **7** (1897): 165–190. **Peragallo.**
Intorno alla supposta identità di Giovanni Verrazzano, col corsaro francese Giovanni Florin. Memoria del socio corrispondente don Prospero Peragallo.

Place-Names. *B.A.R. Belgique* **31** (1896): 307–313. **Wauters.**
Quelques mots sur les progrès de la toponymie en Belgique. Par Alphonse Wauters.

Toponymy, M. Wauters explains, is a new science which takes up the names of places and studies them with a view to elucidating history and geography. The paper deals in part with M. Wauters' priority in introducing this study to notice in Belgium.

Shamanism. *Zemlevedenie* **4** (1897): 29–48. **Stepanovsky.**
Shamanism and the Shamans. By J. Stepanovsky. *Illustrations.* [In Russian.]

BIOGRAPHY.

Biography. **Smith.**
Twelve Indian Statesmen. By George Smith, C.I.E., LL.D. London: John Murray, 1897. Size 8¾ × 5½, pp. x. and 324, *frontispiece. Presented by the Author.*

Dr. George Smith here gives well-proportioned biographies of twelve builders of the Indian empire, including Charles Grant (1746–1823), Sir Henry Lawrence (1806–1857), Lord Lawrence of the Punjab (1811–1879), Sir James Outram (1803–1863), Sir Donald M'Leod (1810–1872), Sir Henry Marion Durand (1812–1871), General Colin Mackenzie (1825–1881), Sir Herbert B. Edwardes (1819–1868), John Clark Marshman (1794–1877), Sir Henry Sumner Maine (1822–1888), Sir Henry Ramsay (1816–1893), Sir Charles U. Aitchison (1832–1896).

Elias. *Deutsche Rundschau G.* **20** (1897): 88. ——
Ney Elias. *With Portrait.*

Lambiardie. *Rev. G.* **41** (1897): 116–127, 172–185, 245–255. **Filon.**

L'ingénieur Lamblardie (1747–1797), successeur de Perronet à l'École des ponts et chaussées et fondateur, avec Monge, de l'École des travaux publics (École polytechnique). Par F. Filon.

Lander. *A travers le Monde, Tour du Monde* **3** (1897): 364. ——

La vie de l'Explorateur H. Savage Landor.

Owen. **Bovill and Askwith.**

'Roddy Owen' (Brevet-Major Lancashire Fusiliers, D.S.O.). A Memoir. By his sister Mrs. Bovill and G. R. Askwith. With Portraits and Maps. London: John Murray, 1897. Size 9 × 6, pp. viii. and 289. *Price* 12s. *Presented by the Publisher.*

The biography of a typical British officer, who, turning his attention from horse-racing to special service work, was engaged in military operations in West Africa, Uganda, Unyoro, Chitral, and the Egyptian Sudan. Particulars are given of 812 races in which he rode, and extracts from many of his letters while in remote regions on active service during the last four years of his life.

Richter. *Deutsche Rundschau G.* **20** (1897): 85–87. ——

Eduard Richter. *With Portrait.*

Prof. Richter of Graz, well known for his researches in physical geography.

Veth. *Jaarb. k. A. Wetens. Amsterdam*, 1896 (1897): 1–42. **V. d. Lith.**

Pieter Johannes Veth. Door P. A. v. d. Lith.

Vogel. *Petermanns M.* **43** (1897): 1–6. **Wagner.**

Carl Vogel. Nachruf von Prof. Dr. H. Wagner.

The late Herr Vogel, who died on July 16, 1897, was associated with Petermann, Behm, and Berghaus in securing to the geographical establishment of Justus Perthes the high reputation it has so long enjoyed for the production of the highest class of cartographical work.

GENERAL.

British Colonies. *J.S. Arts* **46** (1897): 7–16. **Burne.**

The Colonies: their Arts, Manufactures, and Commerce. By Major-General Sir Owen Tudor Burne, G.C.I.E., etc.

A general discussion of the growth of the British Colonies as a whole.

British Empire. *Fortnightly Rev.* **62** (1897): 803–816. **Coubertin.**

A French View of the British Empire. By Baron Pierre de Coubertin.

Discusses the colonies and their relation to the mother-country.

Educational—Methods. **Davis.**

University of the State of New York. The present trend of Geography. A Paper delivered at the thirty-fifth University Convocation, Senate Chamber, Albany, N.Y. June 29, 1897. By Prof. William Morris Davis. Albany, 1897. Size 10 × 7, pp. [12]. *Presented by the Author.*

An excellent summary of the present position of geographical education in the United States, and the advances that are being made.

French Geographical Congress. *B.S.G. Com. Havre* **14** (1897): 139–182. **Favier.**

Rapport sur le Congrès National des Sociétés Françaises de Géographie, xviii^e. Session, tenu à Saint-Nazaire du 1er au 8 août 1897. Par M. E. Favier.

Hunting-Maps. **Marcel.**

A propos de la Carte des Chasses. Par Gabriel Marcel. Extrait de la *Revue de Géographie* (vol. 41 (1897), pp. 344–358). Paris: Ch. Delagrave, 1897. Size 10 × 6½, pp. 16. *Presented by the Author.*

An interesting account of the old French maps of hunting-districts, drawn as a guide for the guests invited to a hunt.

Navigation. *National G. Mag.* **8** (1897): 266–272. **Littlehales.**

The Compass in Modern Navigation. By G. W. Littlehales.

Portuguese Colonies. **Vasconcellos.**

As Colonias Portuguezas. Geographia physica, politica e economica. Por Ernesto J. De C. E. Vasconcellos. Lisbon, 1896. Size 7½ × 5½, pp. 444. *Presented by the Author.*

A handbook of the Portuguese colonies in the Cape Verdes, East and West Africa, India, Macao, and Timor, forming a detailed description of all the colonial possessions of Portugal, very clearly arranged, and the descriptions fortified with official statistics,

Prisons. **Tallack.**
Penological and Preventive Principles, with special reference to Europe and America, etc., etc. By William Tallack. Second Edition. London: Wertheimer, Lea & Co., 1896. Size 9 × 6, pp. xii. and 480. *Price 8s.* *Presented by the Howard Association.*

Prospector's Handbook. **Anderson.**
The Prospector's Handbook. Seventh Edition. By J. W. Anderson. London: Crosby Lockwood & Son, 1897. Size 7 × 5, pp. xii. and 176. *Illustrations. Presented by the Author.*

Queensland Geographical Society. **Muir.**
The Royal Geographical Society of Australasia, Queensland: an Historical Review. By Alexander Muir, J.P., Vice-President. [Read at the Annual General Meeting of the Royal Geographical Society of Australasia, Brisbane, July 17, 1896.] Size 9 × 5½, pp. 20. *Presented by the Author.*

Rain-gauge. **Hellmann.**
Ein neuer registrirender Regenmesser. Von G. Hellmann. From *Meteorologische Zeitschrift*, Februar, 1897. Size 10½ × 7, pp. [4]. *Illustration and Diagram.*

Scurvy. **Wright.**
On the Pathology and Therapeutics of Scurvy. By A. E. Wright, M.D. [From 'Army Medical Report,' 1895.] Size 10 × 6½, pp. 12.

Smithsonian Tables. **Gray.**
Smithsonian Miscellaneous Collections. 1038. Smithsonian Physical Tables. Prepared by Thomas Gray. Washington: the Smithsonian Institution, 1896. Size 10 × 6½, pp. xxxiv. and 302. *Presented by the Smithsonian Institution.*

Sudan Almanac. ——
Sudan Almanac, 1897. Compiled at the Intelligence Division, War Office (London). Calculations made at the Nautical Almanac Office. Size 6 × 4½, pp. 24.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

Austria-Hungary. **Artaria.**
Artaria's Eisenbahn- und Post-Communications-Karte von Oesterreich-Ungarn, 1898. Scale 1 : 1,700,000 or 18·8 stat. miles to an inch. Mit Stationsverzeichnis. Verlag von Artaria & Co., Wein. *Price 1 fl.*

England and Wales. **Bartholomew.**
New Reduced Ordnance Survey of England and Wales. Sheet 25, Huntingdon, Cambridge, etc.; Sheet 19, Essex; Sheet 26, Bedford and Hertford, etc. Scale 1 : 126,720 or 2 stat. miles to an inch. J. Bartholomew & Co., Edinburgh. 1897. *Price 2s. each, mounted on cloth. Presented by the Publishers.*

England and Wales. **Ordnance Survey.**
Publications issued since December 8, 1897.

1-inch—General Maps:—

ENGLAND AND WALES:—92, 94, 261 and 262, 297, hills engraved in black and brown; 107, 121, hills photozincographed in brown; 9, 18, 29, 249, 256 (revised), engraved in outline. 1s. each.

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L. 1, 2, 5, 6, 7, 9, 11, 13; LIV. 1, 6, 11, 12; LV. 1, 2, 7, 8, 12, 13, 14, 15, 16; LVI. 1, 5, 9; LVII. 1, 2, 6, 7, 8, 16. **Hampshire**, LXXV. 1, 2, 4, 10; LXXVI. 7, 8, 14, 16; LXXVIII. 1; LXXXII. 3, 4; LXXXIV. 4, 8; LXXXVIII. 2, 6, 7, 9, 10, 13, 16; LXXXIX. 4, 7, 11; XC. 3, 5, 7, 12; XCI. 14, 15; XCVI. 2, 4, 8. **Essex**, II. 5, 8, 9, 10, 12, 13; III. 11, 12; IV. 7; V. 6, 7, 8, 9, 10; VI. 1, 5, 9, 10, 11, 13, 14; VIII. 2; XII. 2, 8, 12; XIII. 2; XVIII. 2, 4; XX. 7, 10; XXII. 6, 7, 8, 12, 15; XXVIII. 9; XXIX. 12; XXX. 1, 5, 6, 9, 10, 11, 13, 15; XXXIX. 1, 5, 6, 7, 13, 14; XLVIII. 7; LXV. 10; LXXXIV. 15; LXXXIX. 2, 3. **Hertfordshire**, XIV. 10; XXII. 12. **Kent**, II. 3, 7, 13; V. 9, 13; VII. 7, 11; IX. 1, 2, 5, 7, 9, 11, 12, 13, 14; X. 7; XI. 13, 15, 16; XVI. 1; XVIII. 16; XIX. 16; XXI. 9, 12; XXII. 13, 14, 15; XXXI. 1, 2, 3, 5; XXXIII. 1, 2; XXXIV. 2, 4, 6, 10, 11, 13; XLV. 3, 4, 6, 7, 8, 9, 10, 12, 14, 15; XLIX. 1, 5, 9; LV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 16; LXV. 4. **Northumberland**, XIV. 8, 9, 10, 11, 14, 15, 16; XV. 9, 10, 13, 14, 15; XIX. 3, 6, 7, 9, 10, 12, 13; XX. 1, 2, 5, 7, 13; XXII. 2, 3; XXXI. 8; XXXII. 4, 7, 8, 15, 16; XXXIX. 3; CII. 11; CVII. 1; CXI. 3; XVII. 14. **Surrey**, VI. 8; XXII. 8, 14, 16; XXX. 1, 2, 5, 6, 7, 10; XXXVI. 2, 10; XXXVII. 6, 7, 12, 15; XLIII. 6. **Sussex**, XXI. 2, 5, 9, 13; XXV. 6; XXVI. 7; XXXVIII. 1; XXXIX. 13; LI. 12; LXIII. 2, 6, 7, 10, 11.

(*E. Stanford, Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1897. Sheets: 481, Hildesheim; 482, Mayen. Scale 1 : 100,000 or 1·7 stat. miles to an inch. *Price* 1·50 *mark each sheet.*

ASIA.

Hong Kong. **Public Works Department.**

Plan of Victoria City, Hong Kong. Scale 60 ft. to an inch. Public Works Department, Hong Kong, 1897. 28 sheets. *Presented by H.M. Secretary of State for the Colonies.*

Sumatra. **Thomson.**

Kaart van het gebied Bezet in Groot-Atjeh met de nederzettingen Lepoeng en Lehoeng. Scale 1 : 40,000 or 2·1 stat. miles to an inch. By L. W. J. K. Thomson. J. Smulders & Co., The Hague, 1897. 2 sheets. *Presented by the Author.*

AFRICA.

South Africa. **Currie.**

The Castle Line Map of South Africa. Scale 1 : 2,217,600 or 35 stat. miles to an inch. Donald Currie & Co., London, 1897. On rollers. *Presented by the Publishers.*

This is a general map of South Africa, on which all means of communication by road and rail are laid down. In addition to this, several items of useful information are given, such as the localities where certain minerals are found, the depth below the surface at which water can be reached, the annual rainfall, and navigable inland waters for the whole year, or for the rainy season only; there is also a table of distances between ports, and a map of Central Africa is shown as an inset.

Sudan. **Intelligence Branch, Topography.**

Map of the Soudan and Neighbouring country. Scale 1 : 1,520,640 or 24 stat. miles to an inch. Intelligence Branch, Quarter-Master-General's Department, Simla, 1897. *Presented by Intelligence Branch of India.*

Transvaal. **Regan.**

Plan of the Witwatersrand Gold Fields. Scale 1 : 29,750 or 792 yards to an inch. By Wm. F. Regan, F.R.G.S. Issued by the London and Pretoria Corporation, 1897. London. *Price 2 guineas. Presented by the Publishers.*

On this plan are shown the positions and boundaries of the several mines on the Witwatersrand, and statistics are also given in tabular form of the Rand's gold yield from January, 1893, to August, 1897.

GENERAL.

Exploration. **Schrader.**

l'Année Cartographique. Supplément Annuel à toutes les publications de Géographie et de Cartographie, dressé et rédigé sous la direction de F. Schrader. Septième Supplément. Paris: Librairie Hachette et C^ie^, 1897. 3 sheets of maps and letterpress. *Price 3 francs.*

The first sheet of this useful atlas contains a map showing the route followed by MM. J. Chaffanjon, L. Gay, and H. Mangini across Mongolia; it also contains maps showing the route followed by Mr. C. E. Bonin in Eastern Tibet, Nansen's polar expedition, the correction of the arctic coast-line from observations of recent expeditions, and a population map of the Russian Empire for 1897. The second sheet contains maps showing the routes of M. de Foureau, 1894–95, in the Algerian Sahara; Prince D. Ghika's and Dr. D. Smith's explorations in Somaliland; Lieut. C. F. S. Vandeleur's surveys in Uganda and Unyoro; the course of the Niger from its mouth to Timbuktu, by Lieut. Hourst; and the Marotsi country from the sketch surveys of Captain Gibbons, Mr. B. C. Reid, and Captain Bertrand. The third sheet contains maps showing the mountain system of Venezuela, from the work of Dr. Seevers, 1896; a railway map of Mexico, 1896; a map of the Cordillera de los Andes showing the Puyehue pass; the course of the Rio Ronuro, Central Brazil, and the route followed by Hermann Meyer; and the southern portion of the territory of S^{ta} Cruz, in the Argentine Republic. The maps are accompanied by explanatory notes, which are printed on the back of them.

CHARTS.

Russian Charts. **Chief Hydrographic Department, Ministry of Marine, St. Petersburg.**

Charts and Plans published by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

EUROPE.

No.
197 Nukko Vorm channel, published in 1897.
467 Index sheet of Maps and Plans of the Baltic sea, published in 1896.
468 The rocks of Abö:—No. 1, from Hangö to Chukan island, published in 1897.
212 The roadstead of Libau and port Emperor Alexander III., published in 1897.

The White and Arctic Seas.

471 Plan of the Ekaterinovskaya (Catharine) harbour, published in 1896.
472 Plan of the bay of Podpakhota, published in 1897.
474 Plan of the creek Ozerko, published in 1897 (Novaya Zemlya).
477 Plans of the bays of Teriberka, Porchnikha, and Rynda, published in 1897.
476 Plans of the bays of Pala, Bazarnaya, Finmanskaya, and Pechenga, published in 1897.
478 Plans of the bays of Korabelnaya, Keyskaya, Tsyp-Novolok, and Vaida, published in 1897.
459 Plan of the Kandalaiski roadstead, published in 1896.
432 Chart of Novaya Zemlya and the western part of the Kara sea, published in 1897.
446 Plan of Malo-Karmakul cantonment, published in 1896.
482 Plan of the bay of Belush with the creek Samoyed on Novaya Zemlya, published in 1897.
484 Provisional chart of the southern part of the gulf of Ob, published in 1897.
483 Provisional chart of the gulf of Ob and the bay of Yenisei, published in 1897. In substitute of No. 368.
485 Plans of the river Yenisei, from its entrance to Cape Gostinyi and Lukovaya narrows, published in 1897.

The Black Sea and the Sea of Azov.

453, A and B The bay of Karkinitzki, published in 1896.
1770 The creek and roadstead of Theodosia, published in 1896.
1768 From the mouth of the Dniester to the mouth of the Danube, published in 1897.
463 General chart of the sea of Azov, published in 1896.

The Caspian Sea.

1569 The bay of Astrabad and the island Bolshoi (Great) Ashur, in the Caspian sea, published in 1897.

North Pacific Ocean.

464 Index sheet of Peter the Great bay, published in 1897.
465 Index sheet of the sea of Japan and the Yellow sea, published in 1897.
466 Index sheet of the seas of Okhotsk and Bering, published in 1897.
1752 Peter the Great bay, published in 1897.
481 The bay of Slavyanski, published in 1897.

448 The western shores of the sea of Japan from the bay of St. Vladimir to the bay of America, published in 1896, a complement to the Map No. 1599.
460 Plans of the mouths of rivers and of creeks on the western shore of the sea of Japan, published in 1896.
470 The southern part of the strait of Tartary, published in 1897.
486, A and B Provisional chart of Lake Baikal, on two sheets, published in 1897.
Presented by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for December, 1897. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Canada. **Topographical Surveys Branch, Department of the Interior.**

Twenty-one Photographs of the Rocky Mountains, Canada. *Presented by the Topographical Surveys Branch, Department of the Interior, Ottawa.*

This is a very fine series of photographs, and contains the following characteristic views of Rocky mountain scenery:—

(1) Looking north from the summit of Mount Stephen; (2) The upper end of the first Bow Lakes—Mount Balfour is in the clouds; (3) From North Fork Station, looking north-west; (4) Looking west from the summit of Mount Stephen; (5) Looking up the Bow valley from the first mountain to the north of Mount Hector; (6) Mount Hector, looking down the Bow valley; (7) Mount Hector from the first mountain to the north; (8) From Slate mountains, looking west through the Kicking Horse pass; (9) Looking north-east from the summit of Mount Stephen—the Continental divide. (10) From North Fork Station, looking east; (11) From North Fork Station, looking to the south-east; (12) From the ridge south of Mount Hector; (13) Looking east across the north fork of Kicking Horse river from the saddle east from Emerald lake; (14) From the summit of Mount Stephen, Cathedral mountains in the foreground; (15) Looking up the Bow valley from Mount Piran; Mount Hector in the centre; (16) Looking north-east through the Howse pass; (17) Assistant J. R. Allen on Mount Stephen, looking north-east; (18) J. J. McArthur on the summit of Mount Stephen; (19) Looking south-west from North Fork Station; (20) From the summit of Mount Stephen. Looking east through the Kicking Horse pass; (21) Mounts Hector and Molar from the east.

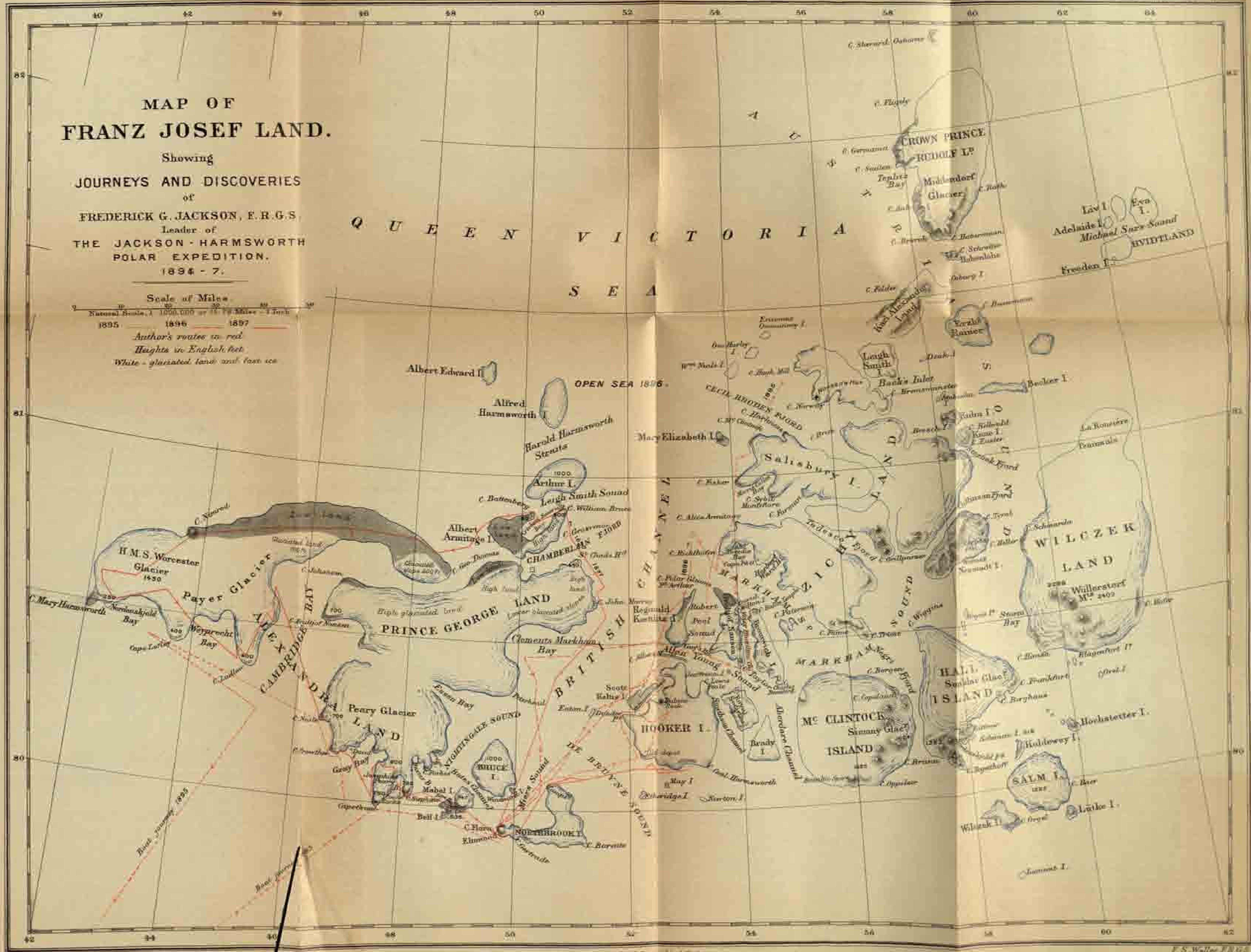
South Africa.

Twenty-seven Photographs of South Africa, including views of Pretoria, Johannesburg, Port Elizabeth, Natal, Kimberley, and Capetown. *Presented by F. Jeppe, Esq.*

As will be seen by the following list, this series contains views of many of the principal buildings and scenery of the Cape Colony, Natal, and the Transvaal:—

(1) Main street, Port Elizabeth; (2) Town Hall, Port Elizabeth; (3) Port Elizabeth from the bay; (4) Church square; (5) The Raadzaal, Pretoria; (6) Between the chains, Johannesburg; (7) Transvaal Mortgage Co.'s building; (8) Sylvan retreat; (9) West street, looking west; (10) Town hall, Durban; (11) Umgeni falls, Natal; (12) The Valley of a Thousand Hills; (13) Bird's-eye view of Durban; (14) Sorting the gravel for diamonds; (15) The morning market, Kimberley; (16) Pay-time in the compound; (17) The open kopje, Kimberley mine; (18) Open works, De Beer's mine; (19) Government House, Capetown; (20) Adderley street, Capetown; (21) The Garden's avenue, Capetown; (22) Parcel of diamonds classified for shipment; (23) Bird's-eye view of Capetown; (24) The Cape naval station, Simon's-town; (25) Commissioner street, from Eikstein's buildings; (26) Chamber of Mines offices; (27) Wynberg avenue, near Capetown.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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F. S. Weller, F.R.G.S.

The

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JOURNEYS IN NORTH GREENLAND.

By Lieut. R. E. PEARY, U.S.N.*

I assure you it was not because I did not wish to come that I have not been here before this. I did wish to get here and have the pleasure and the honour of addressing this the first Geographical Society in the world. But, as your President has just said, one thing or another prevented. I have that pleasure, that honour, to-night. I feel that my subject to-night is one that puts me in sympathy with you and you with me. It is a subject in which the British nation is interested, and in which it has felt the deepest interest for centuries. I feel that I stand here to-night in the focus of centuries-long efforts in the arctic regions, and I believe that I speak within bounds when I say there are no pages in England's history of which she is prouder than those on which are written the splendid efforts of her gallant sons in the region of midnight suns and noonday nights.

It is of course impossible, in the limits of one evening, to cover all the points of interest or meet all the interrogations which occur to a large assembly of intelligent minds in connection with such an attractive subject. I have more ground than is usual to cover, from the fact that I have several expeditions to speak of. What I shall attempt this evening is to give you very briefly, yet I trust clearly, a *résumé* of what I have done thus far in the arctic regions, and a synopsis of what I propose to do in the future; and then, with the assistance of the illustrations which I have, endeavour to give you absolutely accurate and

* Paper read at the Royal Geographical Society, December 6, 1897. Map, p. 235. See also map, *Geographical Journal*, vol. ii. p. 384.

definite ideas of the land, the people, and the real phases of life and work in the northern portions of Greenland.

My arctic work comprises—

1. A summer voyage and reconnaissance of the Greenland inland ice in 1886.

2. A thirteen months' sojourn in Northern Greenland, including a 1200-mile sledge journey across the ice-cap, and the determination of the insularity of Greenland—1891–92.

3. A twenty-five months' stay in North Greenland, including a second 1200-mile sledge journey across the ice-cap; the completion of the study of the Whale sound natives; a detailed survey of that region, and the discovery of the great Cape York meteorites—1893–95.

4. Summer voyages in 1896 and 1897, including the securing of the last and the largest of the great meteorites, the 90-ton mass.

Before taking up these expeditions in their order, I will attempt to bring home to you a realistic conception of what Greenland is actually like. Of course we all have a general idea of Greenland, and know that its interior is covered with snow and ice, yet the actual facts are so different from anything existing in lower latitudes, so entirely dissimilar from anything with which we are personally acquainted, and which we might use as a foundation from which to start our conception, that I doubt if one in ten even of the best-read has a true conception of the actuality of this great arctic island continent.

All that there is of land, as we understand the term, in Greenland is simply a ribbon 5 to 25 (and in one or two places 60 to 80) miles in width, made up of mountains and valleys and deep branching fjords; ribbon surrounded by the arctic sea, playground of the iceberg and the pack-ice, and itself in turn surrounding and supporting, like a Titan dam, the great white ice-cap beneath which the interior of the country is buried. When I say this, I am sure most of us immediately think of some particularly mountainous region with which we are familiar, as, for instance, the highlands of Scotland, the Alps or the Pyrenees, covered several hundred feet deep in snow and ice, yet still retaining the original irregularities of the region. Such a mental picture, however, would in no way represent the conditions of interior Greenland. There the accumulated snow-precipitation of centuries, in a latitude and altitude where it is practically correct to say that it never rains, and the snow does not melt even in the long summer day, has gradually filled all the valleys of the interior until it has levelled them even with the mountain summits, and, still piling higher through the centuries, has at last buried the highest of these mountain summits hundreds and even thousands of feet deep in snow and ice.

The interior of Greenland to-day is simply an elevated unbroken plateau of snow lifted from 5000 to 8000 and even 10,000 feet above the level of the sea; it is an arctic Sahara, in comparison with which the African Sahara is insignificant. For on this frozen Sahara of inner Greenland occurs no form of life, animal or vegetable; no fragment of rock, no grain of sand is visible. The traveller across its frozen wastes, travelling as I have week after week, sees outside of himself and his own party but three things in all the world, namely, the infinite expanse of the frozen plain, the infinite dome of the cold blue sky, and the cold white sun—nothing but these. The traveller, too, across this frozen desert knows that at no time during his journey are the highest rocks of the mountain-summits below him nearer than from 1000 to 5000 feet down through the mighty blanket of snow. Such is the interior of Northern Greenland; and it is upon the surface of this

BOWDOIN GLACIER.

uplifted desolation, in nearly straight lines at a constant elevation of from 5000 to 8000 feet above the level of the sea, that my sledge-journeys have been made, in widest contradistinction to the road of the usual arctic sledge-party—the frozen surface of the polar sea, at the sea-level, along and outside of the ragged periphery of an arctic coast-line.

The object of my work in 1886 was to satisfy myself by personal observation as to the actual character of the Greenland inland ice, in regard to which there were conflicting reports. The summer's work covered a voyage from Newfoundland to Disco bay, Greenland; a stay of three months in that country, in which time was effected a reconnaissance of the inland ice; and then two and a half months on a whaler along the west coast of Baffin's bay and Davis' strait. Lack of space compels me to note only the work which was the main object of the voyage—the reconnaissance of the inland ice—and that in the briefest manner.

This reconnaissance was made from the head of Pakitsok fjord, about the middle of Disco bay. Starting July 5 with one companion, Christian Maigaard, a young Danish officer resident in Greenland, ourselves dragging the sledges, on which were loaded our provisions and equipment, we reached, at the end of twelve days, a point 100 miles from the edge of the ice and 7525 feet above the level of the sea. Our course had been true east the entire distance. Here we were stormbound four days, and then consumed five days returning to the land. The details of this journey are to be found in the proceedings of the

GNOME GLACIER.

American Geographical Society. I shall note here only the significance of, and results flowing from, this journey.

The elevation reached was greater than that attained by any previous explorer on the inland ice. For the first time the deep, unchanging, incoherent snow of the central plateau was reached, and my upward and return journeys between the land and this interior *névé*, separated as they were by a period of some three weeks, enabled me to present for (to the best of my knowledge) the first time, a clear conception of the different zones and varying conditions existing between the edge of the "Great Ice" and the unchanging snow of the interior.

The characteristics of such portions of the "ice-blink" as came under my personal observation may be stated as follows: The coastline shows a great diversity of features dependent upon the altitude, the season, and the elevation and configuration of adjacent mountains.

Wherever the ice projects down a valley in a long tongue or stream, the edges contract and shrink away from the warmer rocks on each side, leaving a deep cañon between, usually occupied by a glacier stream; and the upper surface, disintegrated by the reflected heat of the mountains above, and shattered by the daily change of temperature—more, perhaps, than by the outward flow—presents a chaotic labyrinth of crevasses, gullies, and ragged pinnacles, increasing in magnitude in direct proportion to the length of the tongue and its approach to sea-level. Smaller tongues or teats, rounding down into shallow indentations in the crest of the mountain-dam, are apt to leave only their tips ragged, and their upper surfaces covered with a network of narrow

ESKIMO HOUSE-BUILDING.

crevasses. Higher up, along the unbroken portions of the dam, where the rocks have a southern exposure or rise much above the ice, there is apt to be a deep cañon between the ice and the rocks. The bottom of the cañon is almost invariably occupied by water. Where there are no adjacent rocks higher than the ice to push it back with their reflected heat, the ice will reach down upon the rocks in a dome-like slope. Frequently drifts of fine hard snow extend like causeways from ice to rock, through the bases of which the littoral glacier streams tunnel a passage. Still farther up, at the very crest of the dam, the ice lies smoothly against the rocks. As to the features of the interior within the coast-line, the surface of the "ice-blink" near the margin is a succession of rounded hummocks, steepest and highest on their landward sides, which are sometimes precipitous. Farther in, these hummocks merge into long flat swells, which in turn decrease in height towards the interior, until at last a flat gently rising plain is reached, which doubtless becomes ultimately level.

In passing from the margin of the "ice-blink" to the remote interior, from one to five distinct zones may be noted, the number and width varying with the season, the latitude, and the elevation. In winter the entire surface is undoubtedly covered with a deep unbroken layer of fine dry snow. Late in the spring, the warmth of the sun at mid-day softens the surface of the snow along the lower borders of the ice, and this freezes at night, forming a light crust. Gradually this crust extends up the interior, and with the advance of the season the snow along the borders of the "ice-blink" becomes saturated with water. A little later this zone of slush follows the zone of crust into the interior, the snow along the borders of the "ice-blink" melts entirely, forming pools in the depressions, and streams which cut deep gullies in the ice; water cavities form, old crevasses open, and new ones appear. This zone rapidly widens and extends into the interior in the footsteps of the others, and behind it the immediate border of the ice gets ragged and soiled; pebbles, boulders, and moraines crop out of its melting surface; and by the end of the arctic summer it is eaten and shattered by the heat, and eroded by the streams into impassable roughness.

This journey satisfied me as to the general characteristics of the "Great Ice;" showed me that ideas and theories which I had advanced, previous to undertaking the voyage, were in the main correct; impressed upon me that the inland ice presented an "imperial highway" by means of which to reach and determine the northern extension of Greenland, a problem which your distinguished President has characterized as second only to the attainment of the pole itself; gave me an invaluable fund of actual personal experience; enabled me to formulate a general plan for the complete exploration of Greenland; and laid the foundation for the persistent and systematic attacks which I have made and shall still make upon the unknown portions of Greenland and the adjacent lands to the north.

Returning from this voyage, I prepared three or four desirable routes for overland sledge journeys, which should complete our knowledge of Greenland:—

1. For the simple purpose of accomplishing the feat of crossing Greenland—the route from the south-east angle of Disco bay to Cape Daw (this route was attempted two years later by Nansen, but, deflected by hostile conditions, he effected a crossing much farther south on a shorter route).

2. For the purpose of obtaining a transverse profile of Greenland—

the route from the base of Nursoak peninsula to the head of Franz Joseph fjord.

3. For the purpose of determining the northern extension of Greenland and completing the gap in its northern and eastern coast-line—a route from Whale sound parallel with the north-west coast to the northern terminus (this journey was accomplished by me five years later).

Returning from the voyage of 1886, the demands of the service kept

ESKIMO WOMAN, WHALE SOUND.

me fully occupied for five years. At last, in 1891 I found the opportunity of carrying out my constantly cherished project of a march from Whale sound across the inland ice of Northern Greenland to the northern terminus of that country, and the result was the North Greenland Expedition of 1891 and 1892.

The main object of this expedition was the determination of the northern limit of Greenland, and its fundamental feature was the utilization of the surface of the interior ice-cap as my highway to the objective point. My party comprised seven persons: Dr. F. A.

Cook, Langdon Gibson, John M. Verhoeff, Eivind Astrup, Matthew Henson, Mrs. Peary, and myself. My programme was to proceed in my ship to Whale sound, winter there, start early the next spring, make my northern journey over the ice-cap, and return to my winter quarters the same season. This programme was carried out on schedule time, in spite of the serious handicap resulting from the breaking of both bones of my right leg on the upward voyage, my landing a helpless cripple strapped to a plank, and my consequent incapacitation for serious exertion during the remainder of the first season. Again lack of space compels me to note only the ice-cap journey, and that very briefly.

The start was made on the last day of April, 1892. Two weeks of hardest work were consumed in transporting my supplies across the succession of great ice-domes intervening between the coast-land ribbon at the head of McCormick bay and the true inland ice. I had with me three of my party, Mr. Cook, Astrup, and Gibson, and sixteen dogs. My course was north-east true, which, assuming the charts to be correct, should enable me to clear the heads of the Humboldt, Petermann, and Sherard Osborn indentations. Advancing on this course, much to my surprise, I found myself almost immediately over the divide, at an elevation of somewhat less than 5000 feet, and gradually descending toward the Humboldt glacier basin. Hardly had I lost sight of the Whale sound land before the distant peaks of the Rensselaer harbour coast rose into view. After a gradual descent to an elevation of about 3500 feet, the surface of the ice became nearly constant as to elevation across the Humboldt glacier plateau.

On May 24, at a distance of 130 miles from McCormick bay, all my boys having volunteered to accompany me, I selected Astrup as my companion for the long journey, and Gibson and Cook returned to Redcliffe. Two marches beyond this we began climbing again, and on the last day of June had passed out of the Humboldt depression, and from the plateau south-east of Petermann, at an elevation of 4200 feet, looked down upon the head of that fjord and the great glacier discharging into it. Still ascending, we reached the divide at an elevation of 5700 feet, June 5, and then began descending into the St. George's and Sherard Osborn depressions. Unfortunately, the next two marches were made in cloudy weather, and I got too deeply into the depression and too near the centre of ice-movement. As a result, about ten days were lost in getting out again and back on to the crevasse-free level heights farther inland.

Again setting my course to the north and north-east, everything went smoothly for several days. We climbed gradually and easily over the highest divide we had yet encountered—something over 6000 feet in elevation—and were descending slightly towards the north-east, when, on June 26, in lat. 82° 12′ N., I was discouraged to see the land which had been occasionally visible to the north-west rise into view north and north-east. Advancing a short distance farther, the entrance of a large fjord came into view in the north-west, and soon after the land rose into view north and north-east, with the depression of the fjord beyond it. I then deflected my course to the east, and soon found the land, and the fjord beyond it, again confronting me; deflecting still more, this time to the south-east, I advanced until July 1, when a broad break in the land beyond the fjord was visible

ESKIMO YOUNG MAN, WHALE SOUND.

opening out to the north-east, and I immediately made for the land, with the intention of reaching this opening. After reaching the inner edge of the land-ribbon, where the inland ice came down against the slope of the mountains at an elevation of about 4000 feet, we were obliged to travel some 25 miles over the mountain crests and ridges before reaching a summit which gave us an unobstructed outlook over the great bay stretching out to the north-eastward. These 25 miles, over a surface consisting of sharp rocks of all sizes, were extremely trying to Astrup and myself. The fatigue of climbing with our heavy packs and hampered by the dogs, which we were obliged to take with us, was greatly increased by the enervating effect of what was to us an almost tropical temperature, accustomed as we had been to the clear, cold, searching atmosphere of the inland ice. When, however, we reached at last the summit of the great bronzed cliff, some 3500 feet in height, guarding the head of the great bay, we forgot all our fatigue in the grandeur of the view before us. To our right, across a great glacier, rose other vertical bronze cliffs 4000 feet or more in sheer height, and ending in a wild promontory. Northward and north-eastward stretched a bold, bluff, red-brown line of shore, the nearest portion of it surmounted by an ice-cap of limited extent, but the more distant portions free of all cresting ice-cap and of snow. To our left lay the depression of the fjord which had barred our passage, and still further to the northward we could make out the entrance of a second fjord, reaching apparently to the north-westward. At our feet, beyond the great fan-shaped face of the glacier, which I estimated to be 20 miles in periphery, were scattered numerous icebergs, prisoned in the still unbroken surface of the bay ice. Beyond this the bay ice seemed perfectly smooth and unbroken, and stretched away uninterrupted to the distant white horizon of the north-eastern arctic ocean. Far out in the centre of the bay I could make out a clouded appearance, undoubtedly due to the formation of water-pools upon the surface of the ice, the first signs of approaching disintegration. Our position was 81° 37' N. lat., 34° 5' W. long.

The bay itself I named, in honour of the day on which we first looked down upon it, Independence bay. The great glacier at my right I called Academy glacier; the giant cliff on which we stood, and upon which I afterwards erected my cairn, I named Navy cliff; and the detached land-masses to the north, Heilprin and Melville lands respectively. My equipment was adapted to inland-ice work only, and was too light for the stress of sea-ice work. If I were to proceed further I must descend to the sea-level, with a practical certainty that in a few miles my sledges would be destroyed by the roughness of the sea-ice. Consequently, from that point I turned back.

July 7 we were back at the edge of the inland ice, and on the 8th began our uneventful return journey.

As to the character of the northern land-ribbon in the vicinity of Independence bay, paradoxical as it may sound, its appearance, as seen from the heights of the ice-cap, was much less forbidding than that of the Whale sound ribbon seen under the same circumstances. This I judge to be principally the result of local orographical features, but partly also due to the reversion of the point of view.

The northern shores of Whale sound are almost continuously bold, and the plateau above the cliffs is almost completely covered either by tongues of the main inland ice, as in the peninsula between Bowdoin bay and Inglefield gulf, or by detached ice-caps, as on Redcliffe peninsula, Herbert island, etc., the edges of which in many places are less than a mile from the shore-line. As a result, the traveller, descending from the heights of the "Great Ice," sees only the rolling snow-domes of these tongues and isolated caps, with the crests of the black cliffs intersecting them in irregular lines, until he has almost reached the edge of the ice, and is able to look down into the bays and see the warm and contracted slopes along their shores and the little valleys at their heads.

The Independence bay land, on the contrary, is, though elevated,

FŒTAL GLACIER, M'CORMICK BAY.

rolling and devoid of ice-cap, and broad areas of the red and dark brown land surface meet the eye. Another thing in favour of this region is that it is approached from the front, as it were—*i.e.* from the south—while the other is approached from the back, or the north.

The geological features of the country are practically the same as those of Whale sound, and nearly, if not every, feature of the one region could be duplicated in the other. The lateral moraine of the "Great Ice" in Independence bay contains the same rocks and has the same appearance as that at Bowdoin bay; the level tops of the high mountains and ridges show the same hard, compacted gravel surface (as if formed by a heavy road-roller) that can be seen on the Redcliffe pleateau back of Cape Cleveland. The eastern slopes of Heilprin Land remind me very strongly of the south-eastern shore of McCormick bay; and the giant cliffs which tower over the Academy glacier, though much higher, resemble strongly those of Academy bay. Dark granite and gneissose cliffs and trap-dykes, running in various directions, may be seen here as about Whale sound. Wave-marked slabs of red sandstone, identical in colour and size of markings to those I have picked up on the shore of Bowdoin bay, I saw over 3000 feet above the sea on the Independence bay land.

The country east of the Academy glacier, with the dark cliffs surcharged with a continuous ice-dome, would, but for the absence of exuding glaciers, be strikingly similar to the shore of Whale sound, between Ittibloo and Netiulumi, while the Independence bay peninsula proper resembled the country between Inglefield gulf and Olriks bay. In fact, the whole country seemed familiar, but with an increased barrenness, savageness, and sombreness, as might be expected from four additional degrees of latitude. Yet again, paradoxical as it may seem, I was struck by the greater abundance of flowing water, not only on the land, but along the edge of the ice-cap in this latitude as compared with Whale sound. The zone of wastage along the northern edge of the ice-cap was as wide as it was at McCormick bay.

The Academy glacier, while showing in its upper portion and around the circumference of its great *névé* basin features similar to those of the glaciers of Jacobshavn and Tossukatak in Disco bay, and the Heilprin and Tracy glaciers in Inglefield gulf, in its lower portion showed peculiar features like those noted by Dr. Coppinger in the Petermann glacier. For several miles from the extremity of the glacier the ice-stream is intersected by great vertical-walled canals, in which the water has frozen many feet below the glacier surface. As may be imagined, the discharge of the glacier is controlled by these canals, and instead of fragments of ice and icebergs, as we understand them, great fields of the glacier, miles in extent, are detached and gradually move out into the bay.

The uniformly smooth surface of the bay ice might be accounted for in two ways: either on assumption that the ice did not break up every year, and that the combined effects of partial surface melting in summer and the drifting snow of spring and fall would smooth all irregularities; or that it does break up, and the moment it is loosened is driven out to sea by the wind, which is always blowing out of the bay. The absence of icebergs in the bay, except near the end of the glacier, inclines me to the latter idea. Small lakes and ponds are numerous over the land, and rushing brooks in summer-time are everywhere. The presence of nearly continuous sharply marked tumuli and embankments of moraine material, miles in advance of the present edge of the "Great Ice," indicate more clearly than I have noticed anywhere to the south, the undoubted retreat of the ice from a considerable area of terrene.

During our traverse of this northern land I found flowers of numerous varieties blooming in abundance, conspicuous among them the ever-present arctic poppy. Snow-buntings, two or three sandpipers, a single gerfalcon, and a pair of ravens were observed. Two bumble-bees, several butterflies, and innumerable flies were also noted. As for musk-oxen, their traces are to be found on every mountain and in every valley; without making any search whatever for them, we saw about twenty, and all these could have been obtained without the least difficulty.

SASTRUGI OF THE INLAND ICE.

Bearing more to the south into the interior, in order to avoid the obstacles near the coast, the crevasses and steep slopes of the glacier basins, in four marches we were on the great central plateau, cloud-capped and deep with snow. Here, at an average elevation of about 8000 feet, we travelled for two weeks; then, bearing to the westward, came down to the 5000-feet level east of the Humboldt glacier, and thence parallel to the outward route to the head of McCormick bay. Just before midnight of August 5 we met Prof. Heilprin and his party some ten miles from the edge of the ice, and early in the morning of Saturday the 6th we touched the shore of McCormick bay. I had five dogs remaining.

A carefully studied feature of my project was the entire dependence upon the game of the Whale sound region for my meat-supply; and though I took an abundance of tea, coffee, sugar, milk, corn-meal, and evaporated fruits and vegetables, my canned meats were only sufficient to carry us over the period of installation, with a small supply for short-sledge journeys. In this respect, as in others, my plans were fortunate of fulfilment, and we were always well supplied with venison. With fresh meat and fresh bread every day, we could smile defiance at scurvy.

The accident to myself on the upward voyage, and my consequent incapacity for work during the season of 1891, was a serious blow to me, destroying, as it did, my opportunities for geographical work in the neighbourhood of Redcliffe House, and, what I regretted most keenly, rendering it impossible to make velocity measurements of the extremely interesting glaciers of that region. Fortunately, the accident did not affect the long sledge journey, which was the main object of the expedition.

The principal geographical results of the expedition may be briefly summarized as follows:—

The determination of the insularity of Greenland, and the delineation of the northern extension of the great interior ice-cap.

The determination of the existence of detached land-masses of less extent to the northward.

The determination of the relief of an exceptionally large area of the inland ice.

The delineation of the unknown shore of Inglefield gulf, and the imperfectly known shores of Whale and Murchison sounds. The variance of existing charts from the real configuration of this region is so great, that I found it difficult to locate satisfactorily the names appearing upon the charts. I have, however, retained all these names, and I think that in future there will be no difficulty in distinguishing them.

The discovery of a large number of glaciers of the first magnitude.

In the field of ethnology, the expedition can claim to be the first that obtained complete and accurate information of the peculiar and isolated tribe of arctic highlanders. Dr. Cook made a complete census of the little community of Smith sound Eskimo, showing the relationship and approximate age of every man, woman, and child in the tribe. The total, according to this census, is 233. He also made anthropometrical measurements of seventy-five individuals, and with his assistance I took a complete series of photographs of the same individuals, comprising portrait, and front, side, and rear elevations in the nude of each subject.

The meteorological and tidal observations by Mr. Verhoeff are among the most complete and painstaking ever made in the arctic regions. An independent set of four hourly tidal and weather observations, kept by each officer of the watch, will prove of value in connection with the above.

As regards geographical methods during the traverse of the inland ice, my daily reckoning was kept by the compass, and an odometer wheel attached to the rear of the sledge. The circumference of this wheel being a trifle less than 6 feet 1 inch, one thousand revolutions of it made one nautical mile, and the revolutions were registered by the ordinary odometer mechanism.

At four camps on the upward journey and three on the return, not including the observations at Navy cliff overlooking Independence bay,

LITTLETON ISLAND.

this daily reckoning was checked by a complete series of solar sights, taken with a small traveller's theodolite with a special vertical arc of large radius.

The time was obtained from two pocket-chronometers and a high-grade watch, all of which were carefully rated before my departure and after my return, and were compared with each other almost daily during the journey.

That these observations were not taken more frequently was due to the fact that, travelling as we did when the sun was north and sleeping when it was south, the taking of a set of observations meant for me either no sleep at all, or at best but two or three hours of it. That even the field working of my sights was, however, not very far out of the way may be inferred from the fact that, running on a compass course from my last observation camp, 150 miles north-east of McCormick bay, and supposing myself to be 10 miles to the eastward of my outward course, I found myself, on reaching the head of McCormick bay, but 5 miles to the eastward; in other words, I was 5 miles out in my reckoning.

The freedom of the inland ice from all local attraction, and the consequent reliability of the compass, if its constantly changing declination be carefully watched, is of great assistance to the traveller.

Elevations were determined by aneroids only, a special boiling-point apparatus, which I had ordered for the purpose of checking the aneroid readings, having proved on trial to be perfectly worthless.

This expedition was fortunate in most respects, and the long sledge journey over the inland ice may claim to be called unique in respect to the distance covered by two men without a cache from beginning to end, and in the effectiveness with which those men were able to handle a large team of Eskimo dogs. It is to be borne in mind that this was the first time that dogs had been used upon the inland ice, and that many of the methods and articles of equipment had to be devised especially for the novel conditions of the work. In fact, the art of travelling upon the inland ice was in its infancy, compared with travel over the sea-ice along an arctic shore-line.

Before leaving Greenland in 1892, I had formulated ideas for carrying my work further, and, returning to the States, succeeded in raising funds for a second expedition, my object being to go again to Whale sound, winter there, and start in the spring of 1894 across the ice-cap to Independence bay with enough men to form two parties, and an equipment suited for travel over the sea-ice, and prosecute my work further north and east of Independence bay. Early in March, 1894, I encountered on the ice-cap a series of blizzards unprecedented in arctic work. A climax came in a three days' storm. During a period of thirty-four hours we had an average wind velocity of 48 miles an hour, as recorded by my anemometer, and an average temperature of $-50°$ Fahr., and a minimum of $-66°$ Fahr., as shown by thermograph. The effect of that weather was to freeze several of my dogs as they slept in the snow. My party, well protected with fur clothing, suffered not seriously, beyond frost-bitten toes and fingers. I pushed on until the "piblockto," or Greenland dog madness, induced by the continued exposure, got such a hold of my dogs as to make it absolutely impracticable for me to go further, and I cached most of my provisions and turned back. I was obliged to cache other supplies on the way back, and finally reached the lodge with my remaining dogs in sad condition, and with my party practically used up.

As a result of this mishap, and the discovery by most of the members of my party that arctic work is not quite a picnic, all of the party, except Lee and my coloured man Henson, returned in 1894 on the ship which had come up for me. With them returned Mrs. Peary and the little girl who first saw the light in the white north. I with my two companions remained another year. I was seriously handicapped, for the greater part of my material had gone to the first year's work, but I felt, as long as I had the time, that I must make the attempt again. There was a chance that I might succeed. Wintering again, I started once more in the spring of 1895. All my pemmican and alcohol were locked up in the cache, 124 miles from the edge of the ice-cap, so I had to start with ships' biscuit and tea, frozen venison for myself and party, frozen walrus meat for my dogs. Those of you who have had experience in arctic work know what a handicap it is to be obliged to carry

JOSEPHINE HEADLAND.

rations in that shape for your party, 4 lbs. of fresh meat being equivalent to 1 lb. of pemmican. I started on this trip on April 1, and with me, as a result of the confidence I had been able to inspire among the Eskimo, I was enabled to take a supporting party of three of them to accompany me to the cache and return from there alone, while we kept on in the effort to reach Independence bay. I felt I stood an even chance of reaching the bay, and if we did reach it, and musk oxen were in sufficient abundance, we could recuperate, rest awhile, then push on to accomplish something beyond my previous work. The chance was worth taking.

The details of the march to Independence bay it is not necessary to repeat here. When we started on this journey, we knew that we were relying solely upon our own exertions and the Almighty. Whatever fortune, ill or good, awaited us in or beyond the heart of the "Great Ice," whatever accident or mishap befell, there would, there could, be no rescuing party.

During my journey in 1891, in my effort not to make any more easting than was absolutely necessary, I was repeatedly turned from my course by the unexpected penetration of the glacier basins of the great fjords of the north-west coast of Greenland into the interior, and in this way experienced much delay and annoyance. On my return the same year, I went well into the interior to avoid these obstacles. In this I succeeded. With two routes having the same starting and objective points, and enclosing between them an elongated elliptical area, it was evident that an intermediate route on my next journey would not only be somewhat shorter, but would avoid the crevasses and steep slopes of the one route and the deep soft snow of the other. This I found to be the fact, and, after the experience of the upward journey, I was able to modify the return route still more, with the saving of a few miles and improvement of the travelling.

GLACIER OF THE SCARLET HEART.

The land clouds of the Independence bay region were visible at least 100 miles in upon the ice-cap, gradually rising above the snow horizon as we approached. When we reached what might be called the actual crest of the ice-cap, a point about 15 miles from the edge, where it begins to slope down rapidly to the land, and I could make out the familiar landmarks, I found that we were approaching the land on a course about 5 miles east of that on which I had descended to it in 1892. This difference of position resulted in a higher elevation, enabling me to look over the eastern edge of the Academy glacier basin, and make out the summits of the east coast land-ribbon considerably further to the south than I had seen them in 1892.

At this time it was entirely clear on the ice-cap and along the inner edge of the Independence bay land. Further out was a heavy, hazy stratum, hanging at a considerable elevation over the land, beneath which I saw due north of us, and distant apparently 75 or 100 miles, what had escaped observation owing to the heavy clouds on my previous trip, a magnificent mountain, massive in form and heavily buttressed, towering in savage grandeur far above the intervening cliffs and ice-caps. Apparently it was twice their height; as, however, its shape was changing under the mirage effects of these high latitudes, it is very likely that its elevation was exaggerated by the same cause. Increasing haziness soon hid it from our view; a few hours later a dull veil formed, entirely blotting out the sky, clouds sank in great leaden masses on to the land; the ice-cap took on a ghastly hue, and short, sharp gusts of wind followed each other in rapid succession down the slopes of the "Great Ice," and the land was reached in the midst of a roaring blizzard from the ice-cap, which confined us upon the moraine for two days.

In 1892 my route from the moraine to Navy cliff had been selected

ON THE GREAT ICE.

with a view to giving me as good an outlook as possible, and I had travelled intentionally along the crest of the mountains which bound the Academy glacier on the west. Now my chief object was to get the sledges to the bay-ice by the easiest practicable route, and this meant following the valleys of the streams, where the greatest amount of snow was to be found, and the grade certain to be more regular and gradual. For this reason, during our work upon the Independence bay land, hunting the musk ox and transporting the sledges and equipment to a point about 10 miles north of Navy cliff, we saw only the slopes of the valleys which formed our road.

The details of our return journey from Independence bay it is not necessary to repeat here. Somewhat recuperated by the liberal rations of musk-ox meat, men and dogs fortunately started on the return journey in fairly good condition, and were thus enabled to make the ascent of nearly 8000 feet to the crest of the "Great Ice."

From this point on, a practically level surface, the absence of storms, the perfection of our equipment, and the use of every expedient known to the Eskimo, or which our own ingenuity could devise, to decrease the friction of our sledges and increase the tractive force of ourselves and dogs, enabled us to travel at speed from 1½ to 2 miles per hour, and to continue these speeds from ten to twelve hours at a time, depending upon the character of the snow. Any sudden or increased exertion, however, would invariably be followed by bleeding at the nose, and a weakness would compel us to stop and rest. Fortunately for us, no ice-cap blizzard occurred during the return march, and we eventually reached the lodge with all our provisions consumed, and one dog out of the forty-one with which we started at the beginning.

While this journey cannot be said to have added much to the information gained during the previous trip of 1892, it has completed the conquest of the inland ice, and has shown that, with the proper supplies and the right kind of men, Greenland can be crossed with safety at any point in a single summer.

Had the discoveries of the first journey across the ice-cap from Whale sound to Independence bay been combined with the perseverance and the determination under the most serious handicaps of the second journey, the combination would, I believe, have been *facile princeps* among all arctic journeys.

There are numerous points of the utmost interest in connection with the inland ice of Greenland, which the limits of the evening will not permit me to touch upon. A comparison of the four profiles between Whale sound and Independence bay is very interesting, and brings out the relief of the "Great Ice" in a very clear manner, showing it is really a very much flattened mountain system in ice, with its main backbone, its radiant spurs, and its intermediate valleys. The first journey was near enough to the ice to cross the great basins of exudation, if I may use the term, and their intermediate devise, and the profile shows a succession of ups and downs, like those of a railroad located along the foothills of a mountain system. The profile of the return journey of the same year shows but one depression, and that in the Humboldt basin. The profiles of the two journeys of 1895 are ideal in that they show a rapid ascent from Bowdoin bay to the surface of the central ice-mass, and then a gradual radiant along the western slope of the continental divide till the summit is reached about 180 miles from Independence bay, when the descent is rapid to the edge of the ice. That the crest of the Greenland continental ice divide is east of the country's median line there can be no doubt. Where it is crossed on the way to Independence bay, it is trending away to the north-west and rapidly decreasing in altitude, to lose itself in the landward slopes of the

"Great Ice" near the convergence of Victoria inlet and the north-west coast. From this continental divide extend spurs into the Cape York peninsula, Prudhoe Land, Washington Land, Hall Land, etc., and between these divides are the enormous basins which feed the glaciers of Melville bay, Inglefield gulf, Kane basin, Petermann and Sherard Osborn fjords.

There is one thing of special interest to the glacialist—the transportation of snow on the ice-cap by the wind. No one who has not been there can have any conception of its magnitude. The wind is always blowing,

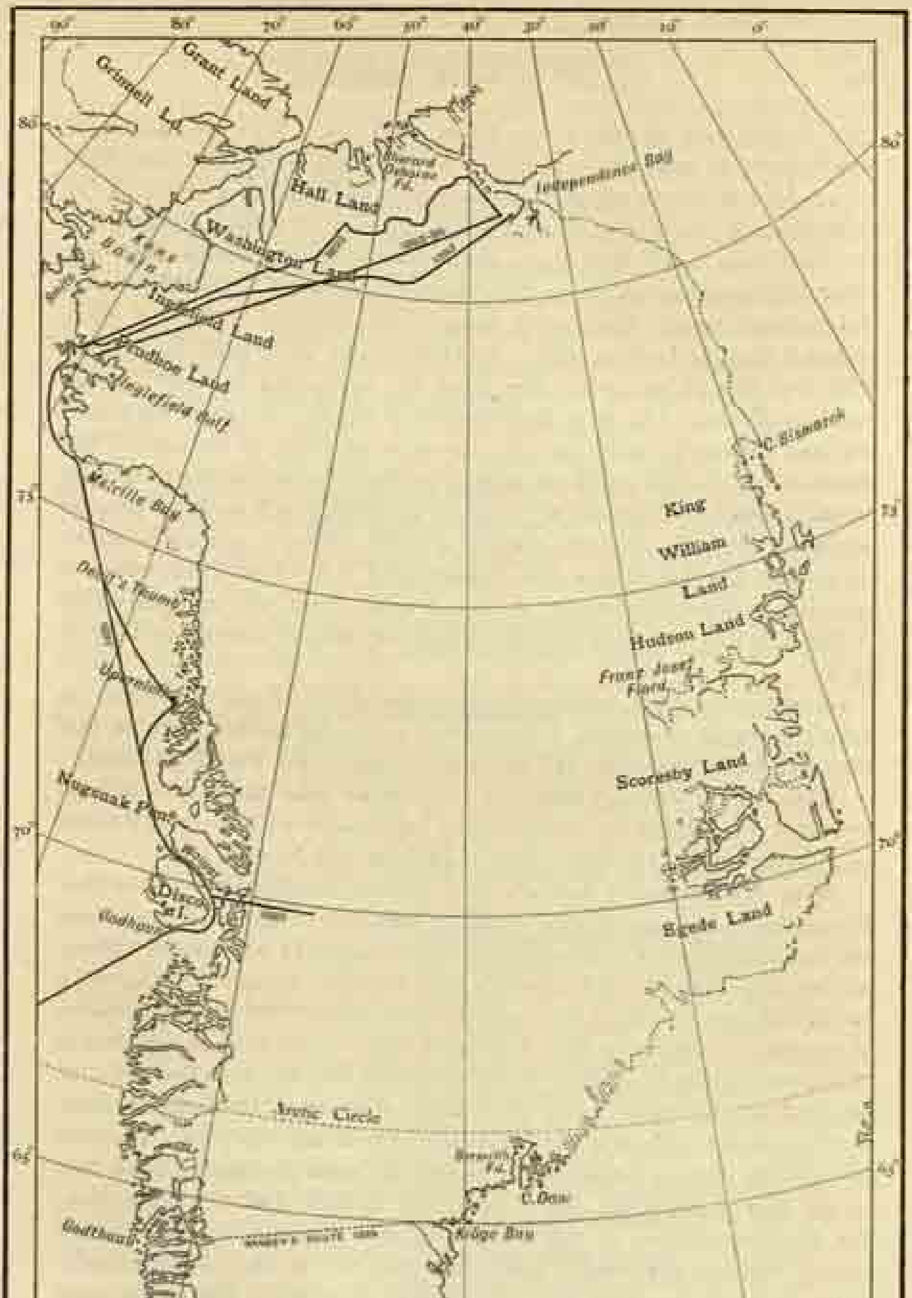
MOVING THE BIG METEORITE.

and blowing almost always on lines which would be gravity lines from the interior. The regularity of the winds of the "Great Ice" of Greenland, as I have found them during an actual sojourn of over seven months upon the ice-cap and visits to it of greater or less duration in every month of the year, is phenomenal. Except during atmospheric disturbances of exceptional magnitude, which cause storms to sweep across the country against all ordinary rules, the direction of the wind of the "Great Ice" of Greenland is invariably radial from the centre outward, normal to the nearest part of the coast-land ribbon. So steady is this wind, and so closely does it adhere to this normal course, that I can liken it only to the flow of a sheet of water descending the slopes from the central interior to the coast. The direction of the nearest land is always easily determinable in this way. The neighbourhood of great fjords is always indicated by a change in the wind's direction; and the crossing of a divide, by an area of calm or variable winds, followed by winds in the opposite direction, independent of any indications of the barometer.

The opinion has been forced upon me that the wind, with its transporting effect upon the loose snow of the ice-cap, must be counted as one of the most potent factors in preventing the increase in height of the ice-cap—a factor equal perhaps to the combined effects of evaporation, littoral and subglacial melting, and glacial discharge. I have walked for days in an incessant sibilant drift of flying snow, rising to the height of the knees, sometimes to the height of the head. If the wind becomes a gale, the air will be thick with the blinding drift to a height of 100 feet or more. I have seen in the autumn storms in this region, round an amphitheatre of some 15 miles, snow pouring down in a way that reminds one of Niagara. When it is remembered that this flow of the atmosphere from the cold heights of the interior ice-cap to the lower land of the coast is going on throughout the year with greater or less intensity, and that a fine sheet of snow is being thus carried beyond the ice-cap to the ice-free land at every foot of the periphery of the ice-cap, it will perhaps be seen that the above assumption is not excessive. I feel confident that an investigation of the actual amount of this transfer of snow by the wind is well worth the attention of all glacialists.

One of the results of the 1893–95 expedition was the location of the mysterious "Iron mountain" of Melville bay. When in 1818 Sir John Ross discovered the existence of the Cape York Eskimo, he found in their possession native iron. That iron, when brought home, was found to contain nickel, and it was supposed to be of meteoric origin, until later the so-called Nordenskjöld irons were found to be telluric, not meteoric, and it was then assumed that this northern iron must also be telluric. Various efforts were made to discover this "Iron mountain," but I was fortunate in being the first white man to locate it, which I did in 1894. Starting from my headquarters on the north side of Inglefield gulf with an Eskimo guide, and following into Melville bay for some 34 miles, I found the Iron mountain to be, not a mountain, but three great ingots of meteoric iron, one weighing about 1000 lbs., another 6000 lbs., the weight of the other indeterminable.

The Eskimo legend in regard to these masses is that they were originally an Innuit or Eskimo woman, who for some impropriety had been thrown out of high heaven, and, with her dog and tent, had landed in that inhospitable region. The 6000-lb. mass was the woman. This was the one from which the Eskimos have obtained their iron supplies for generations. Heaven seems to have taken pity on these isolated people, and sent them these masses of pure soft iron to enable the entire



Grant Land
Grinnell Ld.
Hall Land
Independence Bay
Washington Land
Kane Basin
Inglefield Land
Prudhoe Land
Inglefield Gulf
Melville Bay
Devil's Thumb
Upernivik
Nugsuak Pen.
Disco Isl.
Godhavn
C. Bismarck
King William Land
Hudson Land
Franz Josef Fiord
Scoresby Land
Egede Land
Arctic Circle
C. Dan
Godthaab
C. Farewell
Sketch Map
of
GREENLAND
showing the journeys of
LIEUT. R. E. PEARY U.S.N.
1886-97

tribe to pass from the stone age to the iron age. Without that there was no possible means by which they could obtain metal, any more than you or I could obtain something from the planet Mars; and one of the most striking points in proving the intelligence of these people is the fact that they noted that these great masses were different from any other substance round them, discovered their valuable characteristics, and devised means of utilizing those characteristics. Two of these masses I brought back in 1895. In 1896 I went back with my steamer with the idea of removing the third, my appliances in 1895 having been insufficient; but, though successful in ripping it out of its frozen bed, and moving it something like a quarter of a mile to the edge of the shore, before I could get it embarked, the Melville bay ice began driving in, and I was forced to take my ship out as quickly as I could to prevent her being crushed. In 1897 I made another attempt, and succeeded in embarking the huge mass and transporting it to New York, where it now lies. The dimensions of the largest mass are approximately 12 feet × 8 feet × 6 feet, and the estimated weight something like 90 tons.

Returning in 1895, feeling that the capabilities of the Greenland ice were practically exhausted, I formulated a plan for further work, in case the problems of the north had not been solved by the time I returned.

Immediately after my return it would have been premature to have presented any project for further arctic exploration with two magnificent expeditions still in the field, those of Jackson and Nansen.

With the return of Jackson and Nansen, bringing the news that Franz Josef Land was not the southern terminus of an arctic continent, but an archipelago of comparatively limited extent; and that the *Fram*, in her three years' drift through the Siberian segment of the polar basin, had seen no land, I felt that the time was ripe for the presentation of my plan for further work. I believed that the practical demonstration of the non-existence of land of any considerable extent in the Siberian segment of the polar basin practically eliminated that region from further consideration as a possible means of reaching the pole. The land lying north of main Greenland remained the most northerly known land on the face of the globe, and it could now be said that the route along the north-west coast of this land, with *terra firma* for a base, was not merely the *most* practicable route, but that it was the *only* practicable route by which to reach the yet unscaled apex of the Earth, the north pole. Acting upon this belief, my theory was to proceed with my ship to Whale sound, take on board eight or ten of the most effective young men of my Eskimo (I know every man, woman, and child in the tribe and their peculiarities), the most loyal and energetic, with their wives, their dogs, their tents and sledges, their canoes, weapons, and implements—all their belongings, in fact—transport them to the farthest possible point to which I could take my ship, making Sherard Osborn fjord my objective point. There I would land with my people and supplies and establish a colony, a settlement which would be normal, just like any other Eskimo settlement, except that it would be 200 or 300 miles further north. The environments and conditions of life would be practically the same, and my Eskimo would feel at home. Establishing my settlement there, I shall send my ship back.

As soon as she has left, and the ice has frozen sufficiently for my purpose, I shall, with the assistance of the Eskimo, begin transporting my supplies by comfortable stages north-east along the coast, shifting my village ahead from time to time, until with the return of the sun in the spring I should hope to be, with my people and a large depôt of supplies, at the most northerly point of the land, wherever that may be. We know the land here extends beyond 83° 24'; it is very likely it reaches to 85° N. In February, or perhaps in March, I shall start with two or three still further selected people, the best of those I have taken, with me, my best teams of dogs, with specially constructed sledges, everything in the way of supplies and equipment refined to the minimum limit, and shall endeavour to make the distance from there to the pole and back again. By some it is called a dash; I do not believe in the term myself, and yet, if it is unbroken ice, it must be accomplished, if it is accomplished at all, in a continuous journey. It may take three or four months, and the magnificent experience of Nansen, as well as my own, shows that there are no insuperable difficulties in keeping a party in the field for that length of time. In other words, the programme is to secure every mile of advance just as far as there is land, and then attempt to accomplish the remaining distance in one effort. In case the conditions are unfavourable or impracticable the first season, I shall return to my Eskimo village, winter there, and start again the next spring; and if the conditions are not favourable the second year, come back for the winter and start again, and again. I believe that at any point in the arctic regions, at one time or another, at one season or another, the door is open or can be opened, and the man who is in readiness and waiting for the favourable opportunity can get where he wants to. When an expedition goes north for one or two years only it may not find the favourable opportunity; but if it can stay the four or five years which I am prepared to stay if necessary, some time in that period the favourable occasion is sure to come, and the door will be open or can be pushed open. On my return from the northern trip, or in the interim between successive attempts, I should endeavour to complete the geographical features and characteristics of the northern land and the north-west coast of Greenland, and endeavour also to fill in the outline of the east coast down to Cape Bismarck; in other words, to complete the delineation of the land-masses of this section of the arctic basin. Then I shall retrace my steps along the north-west coast to my original base at Sherard Osborne fjord. From here I shall return in my ship, if she succeeds in effecting the connection; otherwise I shall ascend to the ice-cap from the head of Sherard Osborne or Petermann fjord, and take the route with which I am so familiar, across the inland ice to Whale sound, where my ship can reach me without difficulty.

Such, in brief, is my project for the proposed work, and I must say, though perhaps I am egotistical, that it does seem to me as if the conditions were favourable. Experience counts for a great deal in arctic work. Success in arctic navigation is the result of that definite, detailed knowledge of coasts, winds, tides, and ice, the same kind of knowledge for each step of the voyage that a harbour pilot has. You must know what the effect of a given wind is upon the ice at any point along the coast, the effect of the ebb and flood tide, as, knowing these things, you can put your ship through with safety, or keep her out until a favourable time comes. I feel that I have, in the last five or six years of my life, obtained a knowledge of some of these details of arctic work, and outside of all that is the fact of my utilization of the Eskimo. You will agree with me that there can be no human beings on the face of the globe better adapted to form the rank and file of an arctic party than members of their little tribe, the most northerly people in the world, whose fathers and grandfathers and great-grandfathers before them have lived in that very region. They know all the possibilities and all the hostilities of their frozen home, and know how to take care of themselves. Further, they have confidence in me and regard me as a friend, and would travel with me, and starve with me should it be necessary. I feel that, with an experienced surgeon and perhaps one other white man, and that material from which to recruit the rank and file of my party, it would come near being an ideal party for arctic work.

The question has frequently been asked me, What do I expect to find north of Greenland? I don't expect. My object is to try and find out. The matter of possible opposing current comes up. I can touch only briefly on that. We know the strong southerly setting current along the east coast of Greenland. That current must have been diverted by something, and it must be land more or less dense to the north of main Greenland. Then the query arises, Why should I not find just the same ice as other explorers have found? Undoubtedly I shall; yet, from what I have seen of arctic ice, I am convinced that particularly rough ice is apt to occur in areas. These areas may be of considerable extent, 50 or 100 miles across, but, with an opportunity for reconnaissance, a way can be found around them on comparatively smooth ice, and the area of rough ice avoided by a *détour*.

Such is the brief outline of my past work and future plans. In regard to the latter, it gives me pleasure to say that already the preliminaries are effected. While north last summer I selected the

Eskimo for my colony, gave them their instructions, and they are preparing for my return, the funds and time for my work are assured, and I shall start late next July.

I thank you for your cordial interest and attention.

Before the reading of the paper, the PRESIDENT said: At last we have Lieut. Peary amongst us. He has been promising to come over here for the last five years, I think, but he has always been prevented by the exigencies of work in the arctic regions. He has given us very good excuses indeed for not coming. However, now that we have him here, I feel quite sure that this meeting will give him a hearty and cordial welcome. I will now call upon Lieut. Peary.

After the reading of the paper, the PRESIDENT said: I think I must first congratulate Lieut. Peary on having been listened to by the audience with greater interest than I have ever seen in this hall. You have Sir Leopold M'Clintock before you, who could tell you something about the route you are about to take; Sir Erasmus Ommanney, Sir Allen Young, Dr. Neale, Mr. Jackson, and at least half a dozen other arctic explorers. I see also very eminent naturalists, Prof. Bonney, Mr. Blanford, Mr. Sclater, and others. They would all have liked to have joined in the discussion of this subject, but I am afraid it is too late to expect a long discussion. We shall, however, be pleased to hear a few words from Sir Leopold M'Clintock.

Admiral Sir LEOPOLD M'CLINTOCK: My first duty is to thank our President for allowing me this opportunity of expressing my admiration of the good work performed by Lieut. Peary, his wonderful endurance, and his wonderful perseverance in carrying out the exploration he has brought so far to complete success. I have only to express at this late hour my hope, in which I am sure every one will join, that he may be thoroughly successful in his next arctic expedition.

The PRESIDENT: Lieut. Peary is, without exception, the greatest glacial traveller in the world. He is also far and away the greatest dog-sledge traveller in the world, as regards rapidity and distance. The important work he has done, the discoveries he has made, are patent to you all. He has found out a mystery of centuries—a mystery even alluded to by the great Lord Burleigh: he has found out the termination of the Greenland glaciers. By what means he has done this you have heard, and he has illustrated what he has done by the most beautiful pictures that we have ever seen on that sheet. Great though that work has been, I cannot help alluding to another piece of work which I look upon as almost as great—that is, the salvation of the Arctic Highlanders. When I went with Sir Erasmus Ommanney in the *Assistance* amongst these people, we found them with sledges, but without any means of catching the walrus, except their arms, to fight with them on the edge of the ice. They had no canoes, no guns, but most remarkable-looking knives, which they cut from these marvellous aerolite boulders, which Lieut. Peary has discovered. The Arctic Highlanders would probably have died out if they had been left alone. Lieut. Peary has provided them with the means of catching their food by going out to sea in canoes. He has provided them with the means, which they never had before, of catching the reindeer; and they are now, as he has told you, certainly since 1850, increasing in population. I concur with him that one of the most interesting points in his projected journey is the company of this most interesting people—the only people in the world who are completely pure in blood and completely isolated. Lieut. Peary tells us that he has made a census of them. He knows every man and woman and child, and all their names and relationships to each other, and their fathers back to their great-grandfathers and grandmothers. I think that the salvation of that people is a great feather in the cap of Lieut.

Peary, and I think he well deserves the devotion and loyalty that he has secured from them.

You will wish, I am certain, to pass by acclamation a vote of thanks to Lieut. Peary for this most interesting account of his journeys, and for the extremely beautiful illustrations he has provided to-night. You will also wish to pass an expression of your earnest wish that he may be successful in the grand undertaking before him, and which he has sketched out to you. I have to express to you, Lieut. Peary, the thanks of the meeting for your paper and illustrations.

Lieut. PEARY: I can only say I thank you sincerely for your appreciative interest. I felt from the first we were in sympathy; I know it now. I thank you for your vote of thanks.

FOUR YEARS' TRAVEL IN CENTRAL ASIA.*

By Dr. SVEN HEDIN.

In such a short lecture as this, it is no easy task to give even the outlines of a journey of research which, during three and a half years, led us in innumerable bends and turns from the one end to the other of the greatest continent of the world, to give an account of the results gained and the observations made in different branches of science, or to describe the varying adventures to which a traveller cannot help being exposed on such a journey. I therefore beg you kindly to make allowance for the brevity to which I am compelled, and for the gaps which must necessarily occur on account of my dwelling on points of general interest. Thus I pass over the journey through the Kirghiz steppes and across Tashkend to Margilan.

After having crossed the Pamirs in the winter and spring of 1894, I undertook, in the summer and autumn of the same year, my first excursion to Eastern and Central Pamir, taking Kashgar as starting-point; in the spring and summer of 1895, a journey through the Takla-Makan desert and the north of Eastern Turkistan; and in the summer and autumn of the same year, finally a third excursion to the Eastern and Southern Pamirs. In the same way, I afterwards made Khotan my basis of operation, starting from this place in the beginning of 1896 on my long journey around Eastern Turkistan and to Lob-nor, and when I left Khotan at the end of June, 1896, I had "burnt my ships" in earnest, cut off all possible connections with the occident, and given up all hopes of renewing this connection before I had reached Peking in the far East.

It was a hard campaign which was begun on February 23, 1894, when, with a caravan of twelve horses and four men, I left Margilan to cross the snow-covered Pamirs by the tortuous mountain-path leading

* Read at the Royal Geographical Society, November 22, 1897. Map, p. 332.

across steep rocks, across rivers and gravel-pyramids, up through the Isfairam transverse valley to the crest of the Alai range. The first stages were easy, but higher up we cross the river time after time on trembling wooden bridges. The valley is narrow and picturesque; the silence is only disturbed by the shrill commands of the men, which give a ringing echo against the perpendicular rocky walls, and by the roar of the river below us. The caravan proceeds slowly up the dangerous path, which, scarcely a foot wide, runs along the very verge of the precipice. Still higher up, the path was covered with a smooth sheet of ice, and sloped towards the brink of the yawning gulf. The first horse was led by a Kirghiz, who was well acquainted with the way; but it slipped, slid down the sloping path, passed over the verge, turned several somersaults in mid-air, and was crushed on the slate in the bottom of the valley. Such smooth ice-coverings became quite usual higher up, and we were obliged to cut steps in the ice with spades and picks, and then strew sand on the steps. This took time. It got dark, and only the stars lit up the wild landscape with their pale light. The horses were led in single file. We slid, crept, and dragged ourselves along the edge of the precipices. After enormous exertions, we reached, a few days later, the crest of the Alai chain, in the Tengis-bai pass, 12,600 feet high, where the snow lay deep. The view from this point is delightful; we are surrounded by snow-covered ridges in all directions, but in the south-east we see in the distance the Trans-Alai range, with peaks which disappear in the clouds, and snow-fields of dazzling whiteness.

The Tengis-bai is one of the boundary-marks between the river districts of Sir-daria and Amu-daria. The southern slope is also steep, and we rode across one fresh avalanche after another. One of the largest, which was over 400 yards wide, had fallen the day before, and the Kirghiz congratulated us on having escaped its fury. The day after we had passed Tengis-bai, there was a violent snow-buran, and if we had been belated one day, we should doubtless have all been lost in the pass. Tengis-bai has given many a Kirghiz a nameless grave.

During the whole march through the Alai valley we had deep snow, and were obliged to have four camels led in front of us to tramp down a path through the snowdrifts for the horses. Once we were stopped by a gulley about 150 yards wide, in which the snow had drifted to a depth of 10 feet. We could not cross except by having the Kirghiz spread felt mats on the snow and letting the horses walk on the mats, which were moved forwards, the one after the other, until we at last reached the other side after many difficulties. The cold was severe, and the temperature sank on March 6, at Urtak, to 30° below zero Fahrenheit, while we were not able to get up the temperature in the tent higher than 24·8° below zero, although the tent was full of Kirghiz.

In the Alai valley, about 250 yards from Kipchak, Kirghiz pass the winter. Near the end of May, when a rich growth of grass succeeds the snow, there is life in the valley. All the rich Kirghiz of Ferghana then come here with their herds, and make their "yeilaus," or summer camps, on the banks of the Kisil-su. They then perform their "baygas," or games on horseback, invite each other to feasts, celebrate marriages, and enjoy their summer in every possible way.

The climate has also its peculiarities—the sun burns one in the face on one side, while on the other one is near freezing. At midday on March 5 the thermometer showed in the shade 14° Fahr., but the insulated thermometer showed 125°. A range of 100° in six hours are very usual during the winter. The lowest temperature which I observed was on the night of March 10 at Koksai, namely, −36·5° Fahr. After the skin has changed a few times, the face becomes copper-coloured, and as tough and dry as parchment. Moist food dries up to stone, preserves freeze to chunks of ice. The greatest danger in crossing the Pamirs during winter is the snow-burans. If the caravan is overtaken by one of these burans, it is necessary to keep close together, for if any are separated from the main body, it is impossible for them to make themselves heard above the howling of the storm either by shouting or firing off rifles, and they are lost and freeze to death. Thus we always camp when the storm comes on.

Crossing the Kisil-art pass in the Trans-Alai mountains, we reached the Great Kara Kul on March 10. For two days we marched across its ice-covered surface, and I sounded its depth in seven places, and found it to be at the most 756 feet deep in the western basin. In the Mus-kol valley we found two very peculiar ice-volcanoes, which were formed by spring water oozing out of the ground and freezing in layers, one of these being 16 feet, and the other 26 feet high.

On March 16 we rode in a blinding snowstorm across the Ak Baital pass, and, two days later, down through the Murgab valley to the little Russian fort, Pamirski post, where the Russian flag waves over the roof of the world. Here I was very politely received by six officers and 160 Cossacks, and had a pleasant rest after all my hardships.

On April 7 we broke up again, and rode across Rang Kul to the Chugatai pass, where we cross the Chinese frontier. We had five days' marches to the frontier fort, Bulun Kul, where Yan-darin was the commander. Wild reports in regard to my approach were already circulating here. It was said that I was escorted by sixty Cossacks armed to the teeth; my tent was surrounded at night by Chinese guards; they even insisted upon opening the chests containing my luggage and provisions, in order to be sure that I was not smuggling Russian soldiers across the frontier in them; and the Kirghiz were forbidden to supply me with mutton and other necessary articles. After many "ifs" and "ands," I was given permission to visit Mustagh-ata. I had only time, however, to do some preliminary work, when, after an attempt to ascend the mountain which was frustrated by a snowstorm, I was attacked by inflammation of the eyes, which compelled me to hurry back to Kashgar. During the summer and autumn of 1894 I continued my researches in Eastern Pamir; but I will pass by them in silence, in order to say a few words about the magnificent mountain which so captivated my interest.

As Mount Demavend plays an important part in the popular fancy of the Persians, so in the eyes of the Kirghiz does Mustagh-ata, as it is enveloped in a mysterious shimmer, and is clad in a variegated mantle of

MY TARANTASS IN THE KIRGHIZ STEPPE NEAR LAKE ARAL.

fantastic traditions and legends. They look upon Mustagh-ata as a holy mountain—a *masar*, or grave of saints—where seventy-two saints are buried, and among them Moses and Ali. They tell that only an old *ischan*, or holy man, had, in ancient times, ascended to the top of this mountain, where he found in a garden a white camel and old men in white garments and with long white beards; and they believe firmly that there is a city, which they call Yanaidar, whose inhabitants are absolutely happy and possess all the enjoyments of life; where a perpetual spring prevails, where the gardens always bear fruit, and where the women are beautiful and never grow aged. They declared that the mountain could not be ascended, abysses and acclivitous slopes preventing any progress, the cliffs being covered by ice as bright as steel; and the wind—the sole master of the region—would sweep us away like grains of sand, we were to attempt to set the giant at defiance.

Like a mighty outpost against the Central Asian deserts, the Mus-tagh-ata, one of the highest mountains of the world, and surely the highest of the Pamir, rises 25,590 feet, and is at the same time a worthy continuation of the tremendous ranges—the Himalaya, Kuen-lun, Kara-Koram, Hindu-Kush, which meet here on the roof of the world. It constitutes the culminating point of the meridional chain which brings the Pamirs to an end in the east, and is called Mus-tagh, or the ice mountains, and the name Mus-tagh-ata, or the Father of the ice mountains, points at once to its superiority.

If Mustagh-ata formed a regular cupola, it would even then, according to the laws of nature, be encased in ice-armour covered with snow and *névé*, and this ice-armour should, in zones, have the same thickness if we disregard the climatic factors. In reality, however, the irregular form of the mountain enjoins quite a different distribution of the masses of ice. Generally speaking, the higher regions of the mountain are, to be sure, covered with an enormously thick mantle of ice, which stretches out its apophyses-like tentacles to the depressions of the *névé* basins and the glacier passages, but its thickness and extent are very uneven on the different slopes. The north top, which I ascended 19,653 feet (about the height of the summit of Kilimanjaro), on August 6 and 16, was at this altitude covered with a layer of *névé* and newly fallen snow 1½ foot thick, which lay immediately on weathered rock bottom. The case is quite different further to the south, as I found in attempting an ascent on August 11 with six Kirghiz and nine yaks. Here we ascended on the western rocky crest of the Chak-tumak glacier to a height of 15,584 feet, where the rock disappears under the ice. At this height we can see two of the prominences of the armour-ice, the nearest of which possesses most of the qualities of an ordinary glacier. Its front wall is 20 metres (66 feet) high, and perpendicular, and at its base lie blocks of ice which have fallen from above: but there are no moraines. The snow-covered surface is cut up by transverse and convex crevasses, a brook formed by the melting ice runs down from the front. We afterwards continued our ascent on the ice, whose snow-covering kept the yaks from slipping, although the slope is 24° steep. Gradually we came into a system of parallel transverse crevasses at least 1 foot wide and 33 feet deep, but they were usually covered with snow, so that the yaks turned one somersault after the other. Higher up they became more scarce, but the snow increased. At a height of 18,537 feet, the first yak disappeared suddenly in a crevass, but fortunately fastened by the horns and one hind leg, so that by passing ropes around him and hitching them to the other yaks, we were able to haul him up. The crevass was 4½ feet wide and 26 feet deep, and its walls consisted of dull blue ice. A little higher up all progress was barred by a crevass 20 feet wide. The snow lay here nearly 2 feet deep; 650 feet above us rose mighty ice protuberances, with wild jagged forms, resembling walls, pyramids, and towers, frequently with vertical sides of clearest ice, otherwise covered with snow.

My limited time prevents me from describing our many glacier journeys. They were performed under very difficult conditions, for we had to work at a height which by 6560 feet exceeds that with which one is accustomed on the glaciers of the Alps. It would also have been difficult to stand all the hardships to which we were

KIRGHIZ WOMEN ON THE MURJAB.

exposed if it had not been for the tough and hardy yaks, which mounted to a height of 19,750 feet without complaining. I camped at several points at a height of about 14,000 feet, a height equal to that of the summit of the Finsteraarhorn, and from that made excursions. The glaciers which were specially surveyed were Gorumdeh, Sarimek, Kamper-kishlak, Jam-bulak, Chak-tumak, Tergen-bulak, and Chum-kar-kashka, while the two Kok-sel glaciers, Sar-agil, Shwer-agil, Aftab-urui, and Gerdumbeh were only mapped from a distance. Jam-bulak is the largest, and has a breadth of half a mile and a length of 5½ miles. I will not leave them, however, without mentioning some of the laws which govern them all. The glaciers of Mustagh-ata are all retreating. Old moraines, glacier clay, and erratic blocks extend in the north all the way to Basik-kul, and in the south to Kara-su. The position of the glacier-fronts vary somewhat, however, with the seasons of the year, advancing a few yards in the summer, when the glacier movement is strongest, but retreating again in the winter, when the glacier movement almost ceases, and the fronts are constantly worn by ablation. In a couple of places I planted a chain of measuring-poles straight across the glacier, in order to ascertain the rate of its movement. I discovered the greatest speed at a point in the middle of the Jam-bulak glacier, which, from August 3 to 18, advanced 14¾ feet, or hardly 1 foot per day.

From north to south the glaciers become gradually smaller, but the old moraines become slowly larger, which depends upon the fact that the glaciers which have been most exposed to the sun have developed a higher speed. In the glaciers which run west, the left half is always higher and larger than the right half, since the shade afforded by the rocky walls on the south in some degree prevents the glacier from melting on this side; but after the glacier emerges from the rocky passage, its left side melts faster, on account of its being exposed to the sun on the south. The left and lateral moraines are always larger than those on the right. The central and front moraines are generally rudimentary. Nearly all the glaciers form at a certain height falls, which cause transverse crevasses; longitudinal and circular crevasses also occur. The angle of fall is always very sharp. On the rocky wall on the right of Chaktumak, I saw a very fine example of a falling glacier. The rocky wall is perpendicular, and rises 656 feet above the surface of the glacier, bearing on its top a spur of the ice, which gradually extends over the edge of the precipice, and occasionally breaks off in great blocks. These blocks of ice are crushed against the protruding rocks below to a fine white powder, which, like a waterfall, rushes down on to the surface of the main glacier, there to form a regenerated parasite glacier.

Mustagh-ata consists almost exclusively of gneiss and crystalline schists. The gneiss occurs in many and very beautiful varieties.

The melting brooks of the glaciers running west are accumulated by the Su-bashi river, which discharges itself into the Little Kara-kul, a pretty alpine lake which has been formed by a dam consisting of an ancient moraine. The northern brooks flow into the Ike-bel-su, a mighty rushing river in the summer, which, under the name of Gez-daria, cuts a passage through the Mustagh-ata chain in a deep cross-valley. The southern brooks join the Kara-su, one of the tributaries of Yarkand-daria. The great fall of hail and snow on Mustagh-ata, especially during the summer, when we had hail or snow nearly every day, has always one destination, namely, Lob-nor, no matter whether, during its metamorphosis, it is carried to the north or the south.

After having spent the winter in Kashgar, I again broke up camp in February, 1895, and started on my journey across Maral-bashi to

Merket on Yarkand-daria with two great *arbas*, or high-wheeled carts, which creaked and groaned under their heavy burdens. We had to cross the Takla-makan desert to Khotan-daria, a distance of about 200 miles, and I thought that I should find vegetation, springs, and perhaps traces of ancient civilization at the foot of Mazar-tagh, the mountain-range seen by Prjevalsky and Carey, which was supposed to extend straight across the desert. It was my intention afterwards to continue to Tibet, and we therefore had a very great amount of luggage —provisions, winter clothes, tents, weapons, ammunition, etc., and since we also took with us a supply of water for twenty-five days, our eight fine camels were heavily loaded when we left Merket on April 10, and

VIEW FROM THE MOHAMMEDAN TASHKENT.

started off for the unknown East. We had in our caravan, besides the camels, dogs, sheep, and hens, with a cock that woke us in time every morning. The first few days we found one or two eggs every morning in the nest basket, which was placed on the back of one of the camels; but when the water-supply began to run low, the hens left off laying eggs. At last I had four men—my faithful body-servant, Islam-bay, who accompanied me throughout the whole journey, all the way to Urga in Mongolia; Kasim, from Yarkand; Muhammed Shah, from the same town; and the desert-man, Kasim, who had frequently travelled in the desert in search of gold, like the rest of a whole tribe of good-for-nothing people living on the edge of the desert, firmly believing that they will sooner or later find great treasures hidden in the desert sands. In some places the desert is called Dekken-dekka, because it is believed that 1001 cities have been buried in the sands. I heard of a man who had found a city, in whose houses Chinese silver yambans were lying in great heaps. He had taken with him as many as he could carry; but just as he was about to return with his plunder, a great flock of wild cats rushed out at him, and scared him so that he dropped his precious burden and fled for dear life, but he could never find the place again. In another city corpses had been found in a posture indicating that they had been suddenly struck dead while engaged in their daily occupations. I had an opportunity of hearing many just as comical and adventurous legends, which only increased the attractions of this dangerous journey. During the first thirteen days everything went off well, and we could get water every day by digging. It was brackish, to be sure, but it was good enough for the camels to drink. At last we really reached a mountain-range, which we took for granted to be the continuation of Mazar-tagh, at the foot of which there are two beautiful small lakes, which are plainly formed by some branch of the Yarkand-daria. In the reeds there were ducks and geese, and on the shores grew poplar, tamarisk, and kamish (*Populus diversifolia*, *Tamarix elongata*, and *Lasiagrostis splendens*). We rested here two days, and for a couple of weeks after we looked back to this place as a paradise.

On the 23rd we resumed our march. After two hours the mountain disappeared in the dust-filled air, and we never afterwards saw any traces of any Mazar-tagh, therefore the two mountains are isolated. Before us stretched the dreary but agitated desert sea, with dunes from 80 to 100 feet high. We rested at the last tamarisk, which the camels stripped of both bark and leaf. A well was dug, but we got no water. I had ordered a water-supply for ten days to be taken with us from the lake, but I found, after it was too late, that only a four days' supply had been taken. The desert man, Kasim, said that after four days we should reach a place where water could be had, and since his statement agreed with the maps which I had, I relied upon him.

The next day a violent west wind blew the sand in great clouds from the tops of the dunes, so that the whole horizon was quite dark. We had left the last stretches of clay ground behind us, and now everything was sand. The dunes lay north and south to a height of 150 feet. Islam-bay went at the head of the caravan with the compass in his hand, and had orders to keep due east, where Khotan-daria should be nearest to us. We went in crooks and roundabout ways, in order to avoid the worst sand. The desert resembles a petrified sea with giant waves. Every morning the same desolate landscape spread out before us. Every trace of life was lacking. Not even a fly was to be heard in the air, not even a yellow leaf broke the monotony.

On April 26 we left two dying camels, with their empty water-tanks, to their fate. If we were saving, our water-supply would last two days more, and we expected at any moment to find well-water; but this was a vain hope, and if we had had the least idea of what was to come, we should have returned to the little lakes. That evening we came to a small piece of clay ground between two dunes, and the men stripped off their clothes and took turns at digging a well with the courage of desperation. At the depth of one yard, the ground became damp, and our spirits rose. All the animals, even the hens, waited impatiently around the well, which was becoming deeper and deeper; but at the depth of 10 feet the sand again became dry, and the well was deserted in disappointment. The camels now had to eat up their

CROSSING THE ARIS RIVER.

saddles, which were stuffed with hay and straw, and then the whole supply of bread.

On the 27th we saw two geese flying towards north-west, and they fired our hope. I now went on foot all the time, in order to keep as straight a course to the east as possible. The sand did not decrease. Wherever the eye turned there were whole chains of dunes, in which one sinks and feels one's self held fast. We were as saving as possible with the water, and the animals did not get a single drop more, but in the evening thick clouds rose from the western horizon, and the tent was spread out on the ground. All the men stood in readiness to take hold of its corners if the rain should come, but this was also a vain hope, for the clouds blew over to the south-east without a drop of rain touching us. We did not pitch the tent any more, although the night air was cold, frequently being only a couple of degrees above freezing-point, while on clear days the glass showed about 85° to 100° Fahr. When, on the 28th, we were awaked by a sandstorm, the whole camp was buried, and many objects had to be fished out with staffs.

During the march we were enveloped in a sandcloud so thick that it was as dark as night, and a dark, fire-yellow light filled the air. We were obliged to keep close together, for our tracks were instantly covered by the drifting sand, and if one of us had lost the others, he would have been lost beyond recovery. Only the nearest camel could be seen through the clouds of sand; no cry could be heard, nothing but a loud whistling and hissing sound reached the ears, as billions of grains of sand shot past. Perhaps it was that these sounds led Marco Polo to fancy he heard drums and squadrons of cavalry, of which he speaks in describing the horrors of the Lob desert. One of the camels stopped on a dune, and was immediately lost out of sight for ever. In the evening we left all the provisions, clothes, chests, etc., which we could possibly get along without. On the 29th we still had two quarts of water, but it was stolen the following morning. The camels were fed for the last time with the whole of our butter-supply. The end then began to draw near. On May 1 we were tormented still more with thirst; the men drank the camels' rancid oil, and I drank some Chinese brandy, which otherwise was used for a lamp-stove. This paralyzed my muscles, and I dragged myself laboriously along, far behind the caravan, ready to drop at any moment, in the burning rays of the sun. The bells of the camels could no longer be heard, but I followed the tracks, and after walking on about 3 miles, I found the others lying flat in the sand. A couple of them were weeping and calling upon Allah. Even the camels had lain down, tired to death and with outstretched heads. We had hardly enough strength to pitch the tent. We undressed, crept into the shade of the tent, and lay there all day. Not a sound was to be heard except the breathing of the camels, which broke heavily upon the silence. We slaughtered the last sheep, in order to drink its blood, but it was so thick and sickening that no one would taste it. The men put up with a drink of a still worse character, which was provided by the camels. It was mixed with vinegar and sugar, and doubtless hurried on the death of the desert man and Muhammed Shah. They got lost the same evening, and we never heard of them again. Even Islam wasted his strength in this way.

As the sun began to set, I felt myself entirely restored, and with Islam, Kasim, and the five camels, I left the miserable camp, where everything except my notes, instruments, money, and some other necessary things were left in the tent. In order to save my strength, I rode on a camel, but it soon became pitch-dark, and we could not see where we were going, but were constantly stopped by the dunes. I therefore lit a lantern, and went on foot to find out the best passage.

At midnight we had only gone $2\frac{1}{2}$ miles; one of the camels had been deserted and Islam was done for. Now that I saw the end was near, I decided to leave everything, took Kasim with me, and hurried to the east, after having encouraged Islam and told him to follow our tracks as soon as he was able to walk again. Thus we left the last fragments of our caravan in an Egyptian darkness. The lantern was left burning beside Islam, but its weak rays were soon hidden by the dunes.

I only carried the two chronometers, a watch, a compass, paper and pencil, a tin of lobster, and some cacao. Kasim carried a spade for well-digging, a couple of pieces of bread, the fat tail of the slaughtered sheep,

READY TO ASCEND THE MUSTAGH-ATA FROM YAM-BULAK, 14,500 FEET.

and a piece of coagulated blood. We did not derive much pleasure from these poor provisions, however, for the throat and all its mucous membranes soon get as hard and dry as the skin on the outside of the body, and it is impossible to swallow. The feeling of hunger disappears entirely on account of extreme thirst, which, especially during the first days, is so torturing that one is ready to go mad; but after the body has left off transpiring, a progressive debilitation sets in, which gradually leads to a crisis.

Meanwhile I hurried eastward with Kasim. We walked, with innumerable interruptions, all night. At 11 o'clock on May 2 it was so hot that it became black before our eyes, and we rested all the rest of the day. We undressed stark naked and buried ourselves in the sand, with our clothes hung above our heads on the spade by way of protection from the unmerciful sun.

From six till one o'clock at night, we walked in the moonlight. After a short rest, we crept on over this ocean of fine yellow sand, which appeared to be endless. Suddenly Kasim stopped short on the morning of May 3, caught hold of my shoulder, and, with a blank stare, pointed to the east. I looked and looked, but could not discover anything unusual; but, with his falcon eyes, he had descried a green tamarisk, on which our hope of rescue was now concentrated, for its roots must reach down to water. When we at last reached the bush, we thanked God for his mercy, and I have never before so forcibly realized that the Mohammedans have the same God as the Christians. We rested a while, and chewed the juicy needles of the tamarisk like animals. It was the olive-branch which showed there was a shore to the desert ocean, an outlying rock which causes the shipwrecked seaman to hope that the coast is near. In the shade of another tamarisk, we rested all day, from ten till seven o'clock. In the evening we reached three fresh poplars, where we tried to dig a well, but were not strong enough; so we kindled a fire instead, in order to let Islam know where we were, if he should still be alive.

On May 4 we were discouraged again by the appearance of a high belt of sterile sand. During the hottest hours we rested again under the shadow of a tamarisk. When I dressed myself again at seven o'clock and encouraged Kasim to come on, he hissed out that he was not strong enough. I then continued alone until one o'clock at night, when I sank down in utter fatigue under a tamarisk. Some hours later Kasim came staggering up, and we continued together. After a short rest, we dragged ourselves along on May 5 with the waning strength of dying men; Kasim looked dreadfully giddy and confused. But at last our hope grew lighter—we saw a dark line along the horizon; it was the wooded banks of Khotan-daria! We walked into its leafy arbours, and realized that the river was near at hand, but were not able to walk any farther in the heat of the day, so we sank down under a shady poplar. At seven o'clock in the evening, taking the spade-handle as a staff, I crossed the wood, creeping long distances on all fours. Kasim remained where he was, lying on his back, motionless, with eyes wide open and mouth gaping, and he did not answer when I asked him to go with me.

Then the wood suddenly ended, and a plain, lit up by the pale rays of the moon, spread out before me. I at once understood that it was the bed of the Khotan-daria, but I found it dry, and waiting for the summer freshets from the mountain; but I did not think that I was doomed to succumb in the very bed of the river. I therefore crossed it, and with great difficulty reached the opposite bank, whose woods and reed thickets could be dimly seen in the darkness. It had taken me five hours to go scarcely 2 miles. All of a sudden a duck flew into the air, water splashed, and I stood on the edge of a little pool of fresh, clear water, which was still left in the deepest part of the bed of the river, where the stream had last flowed.

I will not take up your time by describing my feelings, or what then happened. Let it suffice to say that, after I had drank, I filled my boots to the very tops, passed the spade-handle through the straps, and returned to Kasim, who was thus rescued in the very last moment; but he was not strong enough to walk, and so I walked alone three days and two nights southward in the bed of the river, living on grass and tadpoles, until on May 8 I found shepherds, and was beyond all danger.

ON THE SLOPE OF MUSTAGH-ATA, 18,000 FEET.

Encouraged by our fires, Islam Bay dragged himself along to the river, leading the last camel, that carried my notes, some instruments, and our Chinese silver.

In order to repair the losses which I had suffered, I returned across Aksu and Ush-Turfan to Kashgar, and while I was waiting for the new outfit, I undertook, during the summer and autumn of 1895, a new journey to the Pamir plateau and Hindu Kush, and had a pleasant stay with the officers on the Anglo-Russian boundary commission. I never shall forget the hospitable manner in which General Gerard, Colonel Holdich, and others received me.

On December 14, 1895, I left Kashgar for the last time. In twenty-three days we marched across Ordum Padskah, Yarkand, Kargalik, and Guma to Khotan—the same way taken by Marco Polo six hundred years ago. Between the last-mentioned towns, we passed a couple of spurs of the desert where the road is swept away by every storm. Poles have therefore been placed along the road to mark the way. It is the same custom referred to by Marco Polo, when he says that travellers erected a pole every night, in order that they might know the next morning which way they were to go.

On January 14 I again broke up camp, and left Khotan with the smallest caravan I have ever had—four men and three camels. We were to cross the great desert in its broadest place. We had gone through sad experiences, and knew full well the many dangers to be run, and we therefore made our outfit as light as possible, for fear that we should again be compelled to leave everything in the desert sands. The larger portion of our baggage was left in Khotan, to which place we must consequently return. We took provisions with us for only fifty days, but were four and a half months on the way. The worst of it was that I did not take my Chinese passport with me, and therefore got into trouble with a couple of mandarins. Such things as tent and bed were reckoned among luxuries. During this whole journey, I slept, like the men, on the ground, wrapped in furs. The temperature fell to $-7\frac{1}{2}^{\circ}$ Fahr., but we almost always had fuel, and the spring was approaching. From Tavek-kel we directed our course for some days eastward, taking with us a couple of gold-hunters, who, for a high remuneration, promised to show me the way to an old city. On January 24, when the dunes rose to a height of 45 feet, we reached the place. In the valleys between the dunes, we could see, as far as the eye could reach, ruins of houses built of poplar. As a rule, the timbers of which the framework had been built were only standing about 2 feet high. They were very much worn by drift-sand, chalk-white, hard, but so brittle that they broke like glass when struck. The walls consisted of interwoven reeds covered with plaster, on which we found some artistic mural paintings—praying women of the Arian type, Buddha sitting on the cup of the lotus, tasteful ornaments, etc. An excavation led to the discovery of a manuscript and some plaster casts. There is no doubt that this city is of Buddhist origin, and we may thus *à priori* with perfect certainty assert that it is older than the Arabic invasion led by Kuteybe-ibn-Muslim in the beginning of the eighth century. Comparative researches in regard to Buddhist art in India, in connection with the calculations I have made as to the travelling speed of the dunes, will doubtless lead to a more definite determination of the age of the city. On January 26 we reached the Keria-daria forest-belt, and camped beside the thickly-frozen river. On our continued march to the north, we made several important discoveries. It had been believed that the river soon ended in the desert, but I found that it extended as far as $39\frac{1}{2}^{\circ}$ N. lat. At Tonkus-baste it divides into two beds, which periodically alternate with each other. In its forests there lives an almost entirely isolated tribe of nomads, of whose existence not even the Chinese have the least idea. West of Tonkus-baste, in the sands, there are the ruins of another ancient city, showing the same peculiarities as the one above described. The timber foundation of one of the houses was very well preserved. Now, since the two cities lie on a line parallel with the present course of Keria-daria, I suppose that the river has moved to the east since the flourishing time of these cities, the same as is the case with Yarkand-

IN THE TAKLA MAKAN DESERT.

daria and Khotan-daria, for whose moving eastward I have found several proofs. In the region where Keria-daria dwindles down to a little brook winding between the dunes, and finally disappears in the drift-sands, the wild camel lives in great herds in undisturbed peace and quiet. We shot three. The meat was by no means bad, and the fat in the humps was a splendid shortening for our rice-puddings. They live in the desert on sporadical tamarisks, and very seldom come to the river to drink. The herdsmen at lower Keria-daria asserted that the camels do not drink at all in the winter, and that nothing will frighten them so much as the smoke from the camp fires. If they smelt burnt wood they would run off like the wind, and not stop for two or three days. This may be a characteristic due to atavism. I might prove this by details, but I have not time this evening.

For eight days more we had sterile desert before we saw any signs of the river Tarim, and when we marched into Shah-yar, we had crossed the Takla-makan desert in forty-one days—a journey which I would not have undone, but which I hope to be able to do again, for this desert-ocean conceals the traces of an ancient and high civilization, and the saga-like legends are not to be despised. In the primeval forests of Tarim, I classified the complicated river-system, and on March 10 we reached Koria, from which place I made an excursion to the Mongolian city Kara-shar, which led to important discoveries in regard to the relation of Bagrash-kul to Kontje-daria.

Prjevalsky was the first European who travelled to Lob-nor, and when he found this lake a whole degree further south than the Chinese maps place it, and, besides, declared the water to be fresh, a difference of opinion arose between him and Baron von Richthofen, which, ever since the death of Prjevalsky in 1888, has been waiting for a final decision. Richthofen showed in a clever manner that a desert lake which has no outlet to the sea must necessarily contain salt water, but since the basin of water found by Prjevalsky was fresh, and since the Chinese topographers, who are not used to putting things on their maps which do not exist, had placed Lob-nor a whole degree north of the lake discovered by Prjevalsky, Richthofen maintained that this body of water must be of modern formation not existing when the Chinese topographers mapped the old Lob-nor. Prjevalsky went by the main route between Tarim and Koncheh-daria, and later travellers have followed in his footsteps. If I were to be able to contribute to the solving of the problem, I must necessarily go through the desert east of the last-named river, from which an arm should branch off to an eventual lake in the east.

On March 31 I left Chikenlik. We found that Koncheh-daria divides, so that a part of its water goes to Chivilik-kol; but the larger portion, under the name of Ilek, runs south-east, and my satisfaction was great when, on April 4, after following the left bank of the river for three days, I found that, just as the Chinese and Richthofen claimed, it empties in a long lake, whose eastern shore-line we followed for three days. The people living in the neighbourhood of Lob-nor call its four basins Avullu-kul, Kara-kul, Tayek-kul, and Arka-kul, but the Chinese call the whole region Lob-nor, a name which, in the tract around the south lake, is absolutely unknown. I found the lake to run north to south, while the Chinese Lob-nor is mapped as running east to west. But even this circumstance has a natural explanation. Since the whole Lob-nor district lies nearly in the same horizontal plane, the hydrographical distribution must be extremely sensitive to any change in level. There are two constant factors effecting such changes, namely, the easterly sandstorms, which are especially violent in the spring, filling the basin and pressing the lake westward, and the sediment carried down by the river. That the lake formerly really extended eastward is shown by the fact that the eastern shore is skirted by a series of already isolated salty pools and marshes, as well as deep bays which will soon be isolated, and by a narrow belt of forest in which three separate growths may be distinguished—in the east, dried-up dead forest; in the centre, fresh forest with tall trees; and nearest to the present shore, young forest. Thus we see that the forest travels with the lake westward. The superfluous water continues through Sadak-kul and Nias-kul to the river Tarim. There are still other proofs that the southern lake must be of modern formation. It lacks every trace of forest, while the whole Tarim system, all the way down to the ancient Lob-nor, is very rich in poplar. The forest has not yet had time to extend to the new lake. Furthermore, the eighty-year-old Lob chief, Kunchikan-bek, told me that his grandfather, Numet-bek, had lived in his youth on the shores of a lake in the north, and that then there was only deserts to be found in the region of Abdal. Finally, I might mention that Marco Polo, who travelled through the city Lob, does not say a word about any lake.

Our journey along the shores of the ancient Lob-nor was rather troublesome, for the infringing sand here lies high and soft, and the temperature at noon rose, as early as April 6, to 91° Fahr. in the shade. Our greatest torment was the gnats, which on calm days formed perfect pillars of cloud. One evening, while camping on the shore, we were so violently attacked by them that we had to resort to a rather unusual weapon—setting fire to the dry last year's reeds, which formed a dense thicket covering a larger portion of Kara-kul, and the fire spread like a prairie conflagration, spreading a lurid glare over the whole lake. A sea of fire is, at all events, something unique.

From Kum-tyeke, in whose neighbourhood we visited the ruins of an old Chinese fortress, Merdek-shahr, I sent the caravan in advance to Abdal, while, with two Lob-men, I took a very enjoyable journey by boat on lower Ilek, Tarim, and southern Lob-nor. The Lob-dwellers spend half of their life in their long narrow canoes, which are dug out of poplar trunks, and rowed by broad oars held vertically. Noiseless and swift as fishes, the light canoes glide over the dark blue bosom of the lake, with its reed-hidden shores and its playfully curling eddies. On Sadak-kul we were overtaken by a violent easterly storm; the waves foamed and hissed, and we came near capsizing before we reached the protecting narrower water-ways.

On the farthest Lob-nor, the reeds grow very thick. They are frequently 2½ inches in circumference, and reach a height of 27 feet.

The greatest depth of water which I sounded was 15 feet. The reeds are intersected in all directions by "chappgans," or passages about a foot wide, which are kept open by the Lob-dwellers for fishing-nets. These passages are made by pulling up the new shoots from the bottom every spring. When we enter such a passage it becomes dark and close, and it seems as if we were disappearing in a tunnel of reeds. We lived here on wild ducks and geese and their eggs, as well as on fish, and lived an idyllic life. My stay on Lob-nor is one of my most pleasant recollections from my journey through Asia.

From Chargalik we set out with our caravan of horses on our journey of 600 miles to Khotan, partly the same way taken by Marco Polo, and which took us through Cherchen, the gold districts of Kopa and Surgak, Nia and Keria. In Khotan, which place I reached on May 28, the obliging *amban* of this city, Liu-darin, gave me back a large portion of the things which I had lost when shipwrecked in the desert. Herdsmen and hunters from Khotan-daria had found them by following the tracks of foxes who had scented our provision-chests during the winter; but I did not find much joy in getting back my fine photographic apparatus, for the natives had taken all the negatives and put them to use as window-panes.

In Khotan we prepared for a hard campaign in North Tibet, marched back to Kopa, and from there to Dalai-kurgan, near the north foot of the Kuen-lun mountain, the last place where we found human beings. They were Tagliks, and Jaggatai-Turks, and live a half-nomad, half-domiciled life, subsisting mostly on sheep-breeding, but sometimes raising barley. They live in dens in the ground, dug in the yellow, loose layers of loess, which form a transition from the mountains to the desert.

On August 6 we left Dalai-kurgan, and marched through the secondary pass Sarik-kol to the upper course of the Mitt river, where the country is called Lama-chimin. The names Dalai and Lama, as well as Kalmak-chapp and Kalmak-uturgan, and others, remind us that Mongolians have once lived here.

(To be continued.)

EXPLORATIONS IN THE INTERIOR OF WESTERN AUSTRALIA.*

By the Hon. DAVID W. CARNEGIE.

The Expedition consisted, besides myself, of Joseph A. Breaden as second in command, Godfrey F. Massie, Charles W. Stansmore, and Warri (an aboriginal boy from the McDonnell ranges, South Australia); nine

* Paper read at the Royal Geographical Society, February 14, 1898. Map, p. 332.

camels (eight packs and one riding), equipment, etc.; and provisions for five months.

July 9, 1896.—A start was made from Coolgardie, heavy rain falling at the time, but unfortunately not extending any great distance towards the interior, and, passing through Goongarrie (Ninety Mile) and Menzies, we left civilization at Cudmore's (or Doyle's) well, some 50 miles south of Lake Darlot; the country between Coolgardie and Cudmore's looking well after the winter rain, grass (a short spear-grass of no great value for fodder for stock) and everlastings, pink and white, having sprung into life, giving a very pleasing appearance to an otherwise dreary belt of country. A mob of some three hundred bullocks were camped near the well, the first lot to be brought from the Gascoigne to the Coolgardie fields by a direct route. The stockman told me that they had had no difficulty, either on account of water or feed, and had travelled in an almost direct line *viâ* Lake Way and Lawlers. These were the last white-faces we saw until reaching Hall's Creek (Kimberley goldfields) in the middle of December. Taking a general north-east by east course, so as to leave Lake Wells on our north, and strike Mounts Allott and Worsnop (two very noticeable table-topped hills) on Forrest's route of 1874, we crossed an auriferous belt near the southern end of the Neckersgat range (Wells). Here we found good green herbage and bushes, and pools of rain-water in small creeks. Numerous prospectors have visited this locality, but so far, I think, no payable gold has been found. This was the last gold-bearing country we saw until well within the Kimberley district.

In approximate long. 122° 30′ we entered the desert proper, which continued in unbroken monotony to Mount Worsnop. Vast sand-flats timbered with desert gums and a few quondongs and acacia bushes, interchanging with long stretches of rolling sand-ridges, high and steep in places, but of a far less formidable character than those met with later on; the one characteristic vegetation being spinifex.*

Throughout this part of the country cliffs, terraces, and little low tablelands of sandstone are met with. In these rock-holes may be found, and from them small watercourses run out, only to be swallowed in a mile or so by the sand. Though in no case did we find water in these creeks, yet the rains of the early winter had caused splendid herbage and green grass to grow on the banks—both excellent feed for our camels. But few natives inhabit these parts, animal life being very scarce and the water-supply precarious. During this part of the journey we had our longest dry stage, viz. thirteen and a half days, during which time the camels were without any water, and we

* Spinifex (*Triodia*) grows in round isolated stools from 1 to 3 feet high, from which wave a few straggling blades of grass. The needle-like spikes which form the stool make walking unpleasant, cause sores on the feet and legs of the camels, and before long rub all the hair off their shins.

ourselves were very hard pressed. By following natives' tracks, even those of quite recent date, we would only be rewarded with a *dry* rock-hole, or one from which it was plain the natives had just taken the last drop. Doubtless had we continued to follow tracks from hole to hole, regardless of the direction in which we travelled, we should have at length got water. But having a definite object in view, I pushed on, only using such footprints as led us on the course I wished to follow, or as near as might be. On leaving the comparatively well-watered country, we had come so suddenly into a dry and desert belt that we were hardly prepared to stand a long drought. I had carelessly omitted to have every available can or canteen filled at our last watering-place, and in consequence we suffered more discomfort than would otherwise have been the case. On leaving camp in the morning, we would travel from seven to nine hours straight on end, with a halt of no more than a minute or two to readjust nose-lines or packs, and would have neither water nor food until camp had been made at night.

Having but one riding-camel between five of us, we were on foot the greater part of the day. This training, though rather severe at first, stood us in good stead later on in the year, when the weather was hotter and water harder to obtain; and, indeed, without it I do not doubt but that some of us would have succumbed to the hardships of the great sandy desert. Besides the benefit we obtained, the practice of walking saved the camels an extra load and many a mile of travel, for when on water-hunting excursions, away from the main party, we always worked on foot, and so gave the camels all possible rest. On the thirteenth day, shortly after noon, I, leading with the compass, was rejoiced by the sight of a fresh track, and only some 60 yards ahead of us we saw a "buck" (male native) engaged in unearthing an iguana. At once we set out, and, he running, we gave chase, and, weak as we were from want of water and consequently of food also, would have had a poor chance of securing him had not Stansmore on the riding-camel cut him off in front. No doubt he had at least heard of the white man, for, after the first surprise of capture, he showed more confidence, and, quickly understanding our wants, led the way, with a guard on either hand, at a swinging pace—too fast for our camels or ourselves. Soon after sundown we arrived at the promised water; a low outcrop of conglomerate surrounded by mulga and enclosed between two sand-ridges, seen in the uncertain light, gave us high hopes, which, alas! were doomed to disappointment, for the rock-hole was dry. I was doubtful at first whether the native had led us wrong intentionally or no, but I was soon satisfied that his idea had been to bring us to a dry hole and give us the slip during the night. In this he was not successful, being too closely guarded, and thus frustrated in his design to burn through or bite the rope with which he was secured. Partly from necessity and partly to ensure his going to water in the morning, I allowed him no water to drink. This had the desired effect, for within 5 miles he took us to a water-hole, at which we were able to obtain a splendid supply. This I named the "Empress Spring"—a name appropriate to the year of rejoicing over Her Gracious Majesty's long reign.

A very curious water this—between two sand-ridges some 1¼ mile apart, a low outcrop of white limestone, in which could be seen what appeared at first sight to be a series of three rock-holes, which one might easily pass within 60 yards and not notice. On further inspection, two of the three holes turned out to be circular entrances, 2 and 3 feet in diameter, leading vertically into a cave beneath, the floor of this chamber, which is 28 feet across, being some 20 feet from the surface, and covered to a depth of 2 feet with sand. From the cave two passages run, one west and upwards, the other east and downwards. Along this latter passage one can just crawl, and at the end of it, some 50 feet from the surface, is a small pool of water, evidently a soakage from the surrounding country, and possibly a spring. Though only a small supply was visible, yet continual bailing did not appreciably lower the level of the water. Considerable work had to be done before we could get the water to the surface; the native bailed the water into a bucket, which was passed from hand to hand along the passage to the floor of the cave, and finally hauled from above to the surface.

A rough ladder formed of mulga poles and branches had served the aboriginals to come and go, and all along the passage the remains of old fires could be seen.

Surrounding the outcrop, a small patch of buckbush (or roly-poly grass) and good camel bushes exist. From the man who guided us to this water I made out the following words, which I look upon as pretty reliable, though it is very hard to be certain whether or no one is getting the correct word:—

Fire or smoke	Warroo or walloo.
Wood	Taalpa.
Dog	Puppa.
Water	Gabbi.
Nose	Woola or 'oola.
Arm	Menia.
Hand	Murra.
Hair	Kuttya.

Here we found, too, a curiously carved flat board, rounded on the back, some 10 feet long by 6 inches broad, similar to one shown in sketch, bidden away in some bushes. I do not know the use to which these boards are put, but fancy they have some mysterious significance, and are produced at "coroborrees." From the unusually careful way in which they are hidden, I should judge they were of some value.

Around Mounts Allott and Worsnop we found an oasis of some 5 or

6 square miles of fair stock country. Alexander spring we found dry, and in appearance more like a soakage in the shallow bed of a small watercourse than a spring; at the same time, not 5 miles south of the spring, and visible from the top of Mount Worsnop, the welcome sight of a fine deep clay pan met our eyes. This clay pan (Woodhouse lagoon), some 400 yards in diameter, is surrounded by sandhills, and is evidently formed from the drainage off Mounts Allott and Worsnop, and the neighbouring cliffs and hills, and into it the creek in which is Alexander spring, after spreading out on to a blood-wood flat, eventually finds its way. Teal and water-hen were fairly numerous, and one camp of natives, who retired on our appearance.

Striking north now, we shortly got into spinifex country of a new character: undulations of sand covered with a light gravel of ironstone—most barren and wretched country, only relieved by the occurrence of belts of blood-woods in the valleys between the undulations. In these belts of timber good feed might sometimes be found. Besides the blood-woods and a species of beef-wood, no timber grows, though occasional thickets of mulga are met with. This gravelly desert extends as far north as lat. 22° 40'. Between Alexander spring and the Alfred and Marie range, a few hills and low ranges of sandstone occur, but north of the latter no hard country or hills were seen for a great distance. A few small and scattered families of blacks inhabit this desert, subsisting on spinifex rats, boodies (a smaller rat), snakes, lizards, iguanas, grubs, seeds, and occasionally doves or pigeons, an emu or kangaroo (of which a few exist in the Young range) very rarely falling to their lot. For water they depend almost entirely on native wells, which yield a scanty and unreliable supply. Forced from the nature of the country, scarcity of water, and their peculiar method of hunting, viz. by burning large tracts of spinifex, to be always wandering, they seldom camp for more than a week or two in one place, and do not trouble to build any sort of houses or shelters.

Having set alight to a patch of spinifex, the natives surround the blaze as far as their small numbers will admit, and with throwing-sticks and spears knock over any rats or other animals or reptiles which are trying to escape from the burning spinifex. So soon as a patch of country has been burnt, the "gins" and "picaninnies" go carefully over the ground with a pointed stick in one hand and a wooden "cooliman"* in the other, gathering up any lizard, snake, or grub which has perished in the flames.

When the country immediately surrounding the well at which the tribe is camped has burnt out to a radius of some 4 or 5 miles, they wander on to another well. The Australian aboriginal is not noted, as a

* A small trough of wood or bark, used for either carrying food or water, or for scooping out the sand from native wells.

rule, for his provident customs, but their unwillingness to camp near a good water shows that these desert natives are not without some thought for the future. The small native wells are used first, and when these and the rock-holes are exhausted, then the more dependable waters are made use of. As well as the rats and reptiles, on which they chiefly live, they use an edible bean not unlike the bean of our English broom; this they heat on the wood coals and eat with evident relish, though to us the taste of the beans was most unpleasant, being very bitter. A small yellow seed they grind on a flat stone with a small round boulder of granite (evidently traded for from a distance), and by mixing a little water make a paste, sometimes baked into a very black and unpalatable-

IN THE QUEEN VICTORIA DESERT.

looking cake. Though feeding, as a rule, only night and morning, they sometimes sit down and cook and eat a rat as soon as killed. Everything is eaten in a half-cooked state. The process of preparing a meal is simple in the extreme; the rats are plucked and thrown on to the hot ashes with no further preparation, and are greedily devoured red and bloody, and but barely warm. A lizard or iguana calls for a further exercise of culinary knowledge: first, a crooked twig is forced down the throat, and the inside pulled out, which dainty is thrown to any dog or child that happens to be near; the reptile is then placed on hot coals until distended to the utmost limit that the skin will bear without bursting; then it is put on ashes less hot and covered with the same, and after a few minutes is pronounced cooked and ready for the table. The old gins usually do the cooking, and keep up an incessant chattering and swearing the while.* They drink twice a day, on going out and on returning from hunting, and swallow an enormous quantity of water, blowing themselves out to a noticeable degree. Using no shelter or "mia" of any kind, they sleep two or three together in a hollow scraped out in the sand; between each hollow a little fire is kept burning all night (in the cold weather), replenished from a bundle of sticks and roots kept handy for the purpose. To break the force of the wind, a fence is made of uprooted tussocks of spinifex some 2 feet high, and behind this they lie coiled up higgledy-piggledy like a litter of pups. Poor as is the supply from the native wells, they last the blacks a considerable time, as, except for drinking, they make no use of water. From what I have seen of these wells, I judge them to be simply rock-holes which have been filled in and covered by the general deposit of sand. In some few there seems to be a very slight soakage, but as a rule, when we had finished with a well, it presented the appearance of an empty rock-hole from 12 feet to as much as 30 feet in depth.

There being no soakage into the well, the sand immediately round it is just as dry as that elsewhere, and in consequence one sees no grass or herbage growing near the mouth, as would be the case were the ground damp. Except for native camps or tracks, one has no guide whatever to these holes, and might easily pass within a few yards without seeing them. The plan on which we worked was as follows: Every day or so we would see smokes arising in various directions (usually at about 9 a.m.). Choosing a smoke in the direction nearest to that in which I wished to travel, I would take a bearing with prismatic compass, and travel on that bearing until the fire or the burnt patch of country was reached. Sometimes these fires, though appearing quite close, would prove to be 30 miles off, and pretty accurate steering was required to hit off the exact spot where the fire had been. Having reached the spot, we would, if possible, surprise natives whilst they were hunting, and secure one or more; or, failing that, we would pick up the tracks of the lighters of the fire, and follow them until their camp was found. This often entailed hours and hours of patient search, for so many footprints surround the burnt country that it is hard to single out the tracks leading campwards. On our approaching a tribe, astonishment and awe would keep them spellbound for a few minutes, and then up and away they would run helter-skelter, leaving everything behind them—some hiding behind bushes, others climbing into trees, and a few of the bolder spirits awaiting our arrival, with but ill-assumed confidence, after the first retreat. It would often happen that they had only one or two of us to deal with, the main party being behind, and on such occasions they were bold and insolent, and sometimes ready to dispute our unceremonious arrival into their country. A young "gin" (girl) or small boy would always show us their camp and well without much hesitation, a "buck" sometimes, but an old lady never; they are the hardest to manage, and are quite untamable, yelling and screaming, kicking, scratching and biting, spitting, and presumably cursing, until one is by no means sorry to be quit of them. Having secured a native, or two if possible, for they fret less in company and sooner get over their fear, should he take us to water at once, well and good; if not, we would continue on our course for the rest of the day, taking the captive with us. A single night without water would soon bring him to reason, and one could be pretty sure that in the morning he would be only too anxious to get started. When thirsty they travel very straight and at a great rate, with long swinging strides, often carrying a short stick behind the shoulders like a "backboard." Though apparently there is little advantage in this, it will be found that the position one's arms take expands the chest and opens the lungs, and certainly makes rapid walking easier.

On starting, I would make the native point out the direction of the water, and take a bearing; as a rule they deviate but little from the direction pointed out. Sending the captive on ahead with one of us to prevent his escape, I would walk behind the line, and so watch our course.

These captures were a necessity—matter of life or death for us,—our guides were never cruelly dealt with, but, as a rule, dismissed with presents, and well enough contented.

Arrived at a well, our troubles, so far from being over, were only just beginning, and long hours (often days and nights without rest) of hard work lay before us before we could have any water for our camels or ourselves, though we might be able to get sufficient to keep us going whilst we worked.

On first acquaintance with these wells, a novice's impulse would be to dig out the sand until the bottom was reached, and wait for the water to soak in, in which case he would be woefully disappointed, for the water is held a long time in the sand, and, there being no soakage from the surrounding country, every shovelful of sand would contain an appreciable amount of water, and finally he would be left with a rock-hole cleaned out certainly, but cleaned not only of sand, but of water also. To sink by degrees and bail the water as it oozes from the sand above is equally out of the question, for every shovelful taken out only leaves room for the surrounding sand to fall in. Therefore, without some means of holding back the sand, one is placed in the wretched position of finding and seeing the water without the power of getting it. The natives use so little water at a time that, as the water becomes less, they are able to scoop out the sand very gradually, and plaster it round the sides of the well, and so prevent the inrush of sand. As often as not, they do not bail the water at all, but suck it up from the sand through a bunch of grass.

Luckily, amongst our gear we had two galvanized iron boxes made with deep lids, on the same pattern as those of a commercial traveller; by cutting the top of the lids off, we were able to make a sort of "caisson" without damaging the rest of the box. By sinking these in the sand in the well, by digging out the sand contained in them, and by patiently waiting with a pannikin for the small trickle of water soaking in from the sand contained between the outside of the boxes and the sides of the rock-hole; and then again forcing the boxes lower and continuing the bailing process, we were able to drain the native well of all the water it contained, and by the time we had finished, an empty rock-hole surrounded by sand would remain, with only a few traces of moisture at the bottom.

The water from these wells always had a nasty taste, and on boiling a thick scum would come to the surface. Tea made with it turned quite black. Iron the water certainly contained, but, besides that, the remains of birds, lizards, sticks, and other rotting vegetation, and the flavour left by countless aboriginals go to make a very remarkable beverage.

So wretched a supply do these wells yield that, after sometimes as much as four days' and nights' constant work, we would be only rewarded by 100 to 180 gallons; we were seldom able to fill the camels and the water-cans at the same well, and week after week for nearly five months it was one continual battle for water.

The weather was now very hot for the time of year, and the temperature increasing daily, though in the early morning a cold east wind blew that freshened us for the coming heat of the day. We passed over large tracts of burnt country, from which the strong winds were continually blowing clouds of black dust and ashes—little spiral winds, small "willy-willies," being of common occurrence, when a black cloud would suddenly rush up into the air, and many feet overhead bunches of spinifex, small branches, and grass would be whirled round in rapid confusion.

On September 19, after leaving Family well in lat. 22° 40', we entered the most miserable and barren desert of sand-ridges it is possible to picture, and from this date until November 16 we were never out of sight of a sand-ridge. From lat. 22° 40' up to lat. 20° 45' there stretches a vast howling wilderness of high spinifex-clad ridges of red sand, so close together that in an average day's travelling of seven hours we would cross some sixty ridges, so steep that as often as not the camels would crest them on their knees, and so barren and destitute of vegetation (saving spinifex) that even camels are hard put to pick up a living. The average height of these ridges from trough to crest I should judge to be at least 50 to 60 feet vertical.* With almost heart-breaking regularity, they keep their general trend of north by east and south

* Colonel Warburton estimated the average height of sand-ridges seen by him to be over 80 feet. Gregory gave from 30 to 60 feet as the average height of those seen by him east of the Oakover river.

by west, which made our travelling the more difficult and tedious as, from our northerly course, we were always crossing the grain of the country. As well as the troughs and waves, so to speak, the ridges seem to run in great undulations, so that for half a day, or a day perhaps, we would reach the top of one ridge only to find a higher one in front, and, similarly, the next part of our journey would be over ridges gradually sinking before us. Words can give no conception of the ghastly desolation and awful, hopeless dreariness of the scene which meets one's eyes from the crest of a high ridge. The barrenness of the sand is only intensified by the few sickly and shrunken gums that are dotted over it, and everywhere spreads spinifex; true it is, though, that even this poverty-stricken plant has its uses, for it serves

CONICAL HILL AT ENTRANCE TO BREADEN VALLEY.

to bind the sand and keep the ridges for the most part compact. Where the spinifex does not grow—that is, on the crest of the ridges, probably kept back by the wind—one realizes how impossible it would be to travel for long over dunes of loose sand.

In such country as this one can appreciate the many good qualities of the camel. Poor kind and noble-hearted beasts, with what patience and undaunted courage do they struggle on with their loads, never complaining, and never giving in until they drop from sheer exhaustion! Night after night we searched in vain for any feed; after vainly wandering in their hobbles, picking up a few scattered mouthfuls from a dry and shrivelled thistle-like plant (good feed when green, and full of sticky white juice), tired nature would at last give in, and empty-stomached and well-nigh worn to death, they would lie till morning, until again dragged relentlessly across several dozen more of ridges.

All through this wretched country small families of natives (eight or nine together) exist. Contrary to what one would suppose, they are by no means small or ill made; rather the opposite, some "bucks" being upwards of 6 feet high, and on the whole a better race than those seen farther south about the Eastern Coolgardie fields. And the reason is not far to seek, for with the southern black it is either a feast or a famine—that is to say, that once in a while he kills an emu or kangaroo, and in the mean time lives upon "bardies" (large white grubs found in the roots of a shrub), and so forth; whereas the desert nigger never knows want, and has always a full larder, though it may contain nothing better than rats and lizards. On their return from hunting, one sees the bucks marching home with the spoils of the chase strung by the tail in the hair girdle that they wear round their waists, and the ladies following behind with "coolimans" brimful of bob-tailed lizards, sleeping-lizards, rats, and other choice delicacies. These rats live upon the roots and the young plants of spinifex, and, so far as I can see, do not require water; supposing that they were able to go down to the bottom of a native well, and climb up again, which it would not be possible for them to do, they would certainly leave well-beaten paths leading to the water, and these one does not ever see. Spinifex contains a considerable amount of turpentine, and from the roots the natives make a kind of gum, so that perhaps sufficient moisture is obtainable from it to keep the rats alive.

Whilst hunting or travelling, the natives get some satisfaction, and I suppose a certain amount of nourishment as well, from the pulp of a certain plant which they chew, something of the nature of "pitcheri" used by the Queensland blacks.

The natives are by no means free from disease, and both at Family well (lat. 22° 40′) and at the Jew's well (lat. 19° 40′) we found natives, one a woman, the other a man, suffering from some horrible outbreak of running sores, covering the arms, legs, chest, and back, accompanied by a swelling of the joints. We doctored them with Stockholm tar and linseed oil (a mixture used for mange in camels), which seemed to relieve them somewhat. Disease of the eye is not uncommon, one poor little boy having the inner corner of either eye completely eaten away, leaving a cavity into which one could easily put the point of one's thumb. At a native well (lat. 21° 40′) was a stone-blind native, and from what we could gather he had been always so.

Wounds and scars from burning are of common occurrence, from the fact that they sleep so close to their small fires, and owing to the careless manner in which the babies and children are thrown down and left close to a fire, to roll in and have an arm half-charred or to be merely blistered and roasted, as chance may direct. The mothers care very little for their children, and the elderly ladies especially will show far more affection for a litter of domesticated dingo pups. When a tribe has been in full retreat on our approach, I have seen an old gin stop and turn back to their camp to pick up some small puppies; yet when, as sometimes happened, we had a small boy in captivity, no attempt at rescue was made.

Amongst the weapons and treasures in a camp are nearly always found several bundles rolled in a covering of bark and tied round with hair string. In these bundles they carry all sorts of finery (in the shape of plaited bands of string for the arm or wrist, "sporrans" or tufts of dingo hair, or the tips of rats' tails, necklaces of beans, and so forth), and valuables—carved sticks, flat or round, as shown in sketch; pieces of quartz or opaline for making tools for carving; a sort of red ochre and another white substance, from which they make paint for decorating themselves; bunches of emu's, crow's, or hawk's feathers; a few bones of birds or rats for putting through the nose; and numerous other odds and ends. As evidencing the extent to which they trade from one to the other, I mention you that in camps as far in the interior as Helena spring and Family well we found such things as pearl-oyster shells (used slung round the waist for a "sporran"), lids of tin match-boxes, an iron tent-peg, a piece of a saddle-tree, piece of glass (carefully packed in a case of feathers and grass), and tomahawks made from old iron, apparently part of the tyre of a dray-wheel. This trading is all the more curious when one considers the small extent of country to which one family is confined, and also the very rapid changes in language. I should say that about 70 or 80 miles would be the very longest distance that any native could travel without leaving his own particular district. On our return journey, two men caught near Mount Elphinstone knew no waters beyond Stansmore range, where we liberated them. I think it probable that there are no natives who are entirely ignorant of the existence of the white man, though doubtless to many we are as little known as the pigmies of Africa were to the ancients.

The blacks nearer settlements add the word "womany" to their English vocabulary. Again, at Helena spring the native that we had with us would look on quite unmoved at us as we shot the small tufted pigeons, which came to water in fair quantities; whilst further north, at Jew well, on my picking up a rifle there was a general stampede of the natives, who surrounded us as we worked at the well, and who were somewhat impeding us by their inquisitiveness.

Helena spring, a small basin in a surface outcrop of limestone formation, fed from some subterranean source, is surrounded by a little oasis, not more than 400 yards wide, of splendid herbage of thistle-like appearance, and numerous good camel bushes; outside this welcome spot, away to the horizon on all sides stretches the desolate sea of sand-ridges, at the time of our journey looking all the more inhospitable and dreary from having been recently burnt. The basin, through the bottom of which the water rises, contains no more than 70 gallons; on exhausting this supply the water will be found to rise again, and before long attains its former level nearly flush with the surface. Here we camped some few days, allowing the camels to enjoy to the full the good feed and unlimited supply of water; not sorry ourselves for a few days' rest, occupied in washing, mending clothes and saddles, diary-writing, and the numerous little duties which had necessarily been somewhat neglected. Who can picture the satisfaction and relief of finding one's self at a good water, easy of access and unfailing of supply, after weary days and nights of toil in the wretched native wells? What a Godsend this spring was to us and our tired camels! Without it 'tis hard to say how we would have fared, for the camels were well-nigh exhausted from the heat and want of feed, and had been coaxed along with the greatest difficulty. The sand during the day became so overpoweringly hot that the camels would not stand still, and on a necessary halt to adjust a pack or nose-line, some would break away and drop down in the wee patch of shade afforded by some small bush or shrub, some would lie down, and those that stood would be continually lifting their feet. The aboriginal we had with us suffered more from the heat than we did, and would hurry forward when a tree came in sight, straining at the rope or chain like a dog at his leash, throw himself in the shade of the trunk (for the few ill-leaved branches afforded no shade), and with a stick dig a small hole in the sand, then from a foot or so below the surface he would bring up handfuls of cool sand, with which he would anoint his legs and arms. Sometimes he mixed with the sand his own urine, plastering the mud so formed over his head and body. To two dry wells he took us, until our patience was nearly exhausted, and we resorted to the unfailing argument of allowing him no water until he guided us aright. The outcome of this was the finding of Helena spring, on arrival at which our friend was most anxious to plunge into the basin of water, so eager was he to alleviate his thirst.

Words got from Natives near Helena Spring.

Native.	English.
Goondooroo	Eagle-hawk.
Waaldi	Gum tree.
Godadjudah	Spinifex.
Nooah	Sand.
Warroo	Smoke, fire, or firewood.
Gabbi	Water.
Puppa	Dog.

Native Words near "Point Massie."

Native.	English.
Yowie	Water.
Yurrie	Water.

It may sound cruel to keep a man thirsty for so long, but it must be remembered that our lives depended on the natives showing us water, and if unwilling to do so they had to take the consequences; and for that matter, though in such a case they had no water for perhaps thirty hours, yet we, working and walking, had no more day after day than would just suffice to keep body and soul together.

From latitude 20° 50′ to latitude 19° 20′, the monotony of the desert was somewhat broken by the occurrence of detached blocks and tablelands of sandstone (the Southesk tablelands) which, in the distance, had the appearance of bold headlands, cliffs, and points such as one

VALLEY AT HEAD OF WHICH IS GODFREY'S TANK, A LARGE POOL IN A DEEP ROCKY GORGE.

sees on the sea-coast. These are in some cases some 200 feet above the surrounding country, with sheer rocky faces and more or less flat tops, from which there stand out conical peaks, and hills like so many gigantic mole-hills. The flat top gradually slopes away from the highest cliffs, until at a distance of some 3 to 6 miles the sandhills and the summit of the tablelands are one. Barren of all trees—except here and there a fig which somehow manages to live with its roots, some finding a foothold in clefts in the face of the rock, and some hanging into space—and innocent of all vegetation but spinifex, these hills present a most forbidding and desolate appearance. In the valleys between the headlands and around the foot of the cliffs a narrow belt of fair grass grows, and, torn away by occasional thunderstorms, rough and steep little gorges and glens give rise to narrow though deeply scored watercourses, which with their fringes of bushes and shrubs are soon swallowed by the all-devouring sand. From the appearance of these little creeks, I should judge that very occasional, but very violent thunderstorms must visit this region. The beds overgrown with spinifex go to show that running water is of infrequent occurrence, whilst the upturned roots of trees and large boulders and broken fragments of rock strewn about in wild confusion, and the way in which a channel has been torn out through the sand until the bed-rock is exposed beneath, give one the impression that some powerful storm-agency must sometimes be at work. Whilst we were amongst these tablelands the weather was broiling hot, and night after night we experienced terrific thunderstorms, but, alas! unaccompanied by rain. Every evening the clouds would bank up black and threatening, the heat would be suffocating, making sleep impossible, lightning tearing across the sky; and then, after all this hope-inspiring prelude, several large drops of rain would fall—no more—the sky would clear, and the performance be over, only to be repeated the coming evening.

At the head of one or two gorges we found some large rocky pools, usually situated underneath an overhanging ledge of rock. The largest of these (Godfrey's tank), situated in a position almost inaccessible to camels, I estimated to contain, when full, about 40,000 gallons. As we found the hole, it held sufficient water to enable us to have a good bathe before leaving it.

From Godfrey's tank to Mount Bannerman there was another uninterrupted stretch of sand-ridges, and one well with a good supply (lat. 19° 40′). To this we had tracked a tribe of some twenty blacks, about which the most noticeable thing was their pronounced Jewish cast of features—fine, big men most of them, very inquisitive and bold. To the east of this well a belt of black desert oak stretches, the first we had seen.

Near Mount Bannerman we had our first mishap, losing three camels from poison-plant. I could not discover which bush it was that had such fatal properties, and could only be thankful that we lost so few. One day past Mount Bannerman, and the desert of sand-ridges was behind us. Here, in the shape of horse-tracks, we saw the first signs of white man since sighting Forrest's pile of stones on Mount Allott. Our journey through unknown country was now at an end, and along the banks of the creeks and rivers in the Kimberley country, into which we shortly entered, our path was through pleasant places—shady trees, long grass, and frequent pools of water in the shingly beds of the creeks (alive with fish and ducks), made a welcome change after the awful desolation of the desert. This Kimberley country is too well known to need any further description here. Let it suffice that we followed up the Margaret river to the crossing of the Derby—Hall's

Creek telegraph-line, and along the latter to Hall's Creek, the official centre of the Kimberley goldfield. Our joy and self-congratulations at having overcome the dangers and difficulties of the desert were doomed to a short existence, for a most deplorable accident, resulting in the death of poor Charles Stansmore, took half the pleasure from our hard-earned victory. For some time past, having exhausted our supply of meat, it had become customary for one of us to carry a shot-gun and follow up the opposite bank of the river, or walk wide of the line of march, on the chance of shooting a kangaroo, of which we saw a fair quantity when once out of the desert. On November 30, Stansmore was carrying the gun, and on descending a steep face of rock his heels slipped, the gun fell forward, striking the hammers on the rock at his feet, the cartridge exploded, and the charge entered his body just below the heart, death being instantaneous. I cannot describe our sorrow at the side of poor Charlie's lonely grave. So good and true, and a man in every sense of the word. 'Twas better thus than a lingering death from thirst in the desert, and yet how hard it seemed—to die on the edge of the promised land, with the bad country passed and left behind!

We reached Hall's Creek on December 4, having travelled some 1400 miles, and here we remained until March 20, the guests of Mr. Cummins, the extremely hospitable warden.

Hall's Creek is the official centre of the once populous Kimberley goldfield. This goldfield was discovered in 1882 by Mr. Hardman, government geologist attached to a survey expedition under Mr. Johnston (now Surveyor-General), who found "colours" in numerous localities; but it was left for prospectors to find payable gold; and early in 1886 one of the largest and most unprofitable "rushes" known in Australia set in for the newly-discovered alluvial field. The sinking being shallow, what ground there was was soon worked out, and before long the "rush" set back again as rapidly as it had come, and the goldfield was condemned as a "duffer," and left to the few faithful "fossickers," who have made a living there to this day. The alluvial gold was the great bait, and of this but little was found, and to reefing no attention was given, and so, at the present time, we see miles upon miles of quartz reefs, leaders, and blows untouched and untested as they were before the "rush" in 1886. No one can say what systematic prospecting might disclose in this neglected corner of the colony. There are many countries less well favoured for cheap mining; for one thing, Kimberley is blessed with an abundant rainfall, and the district contains some of the finest pasture-lands for cattle in the continent of Australia. The roads, except during the rainy season, are good, and cartage from the port of Wyndham (200 miles) should not be a very costly item. A scarcity of suitable mining timber, the remoteness of the district from settled parts, and the bad name with which it is loaded, are the disadvantages under which the goldfield labours. For all that, two batteries are working at the present time, and a rich find by some old "fossicker" is not so rare.

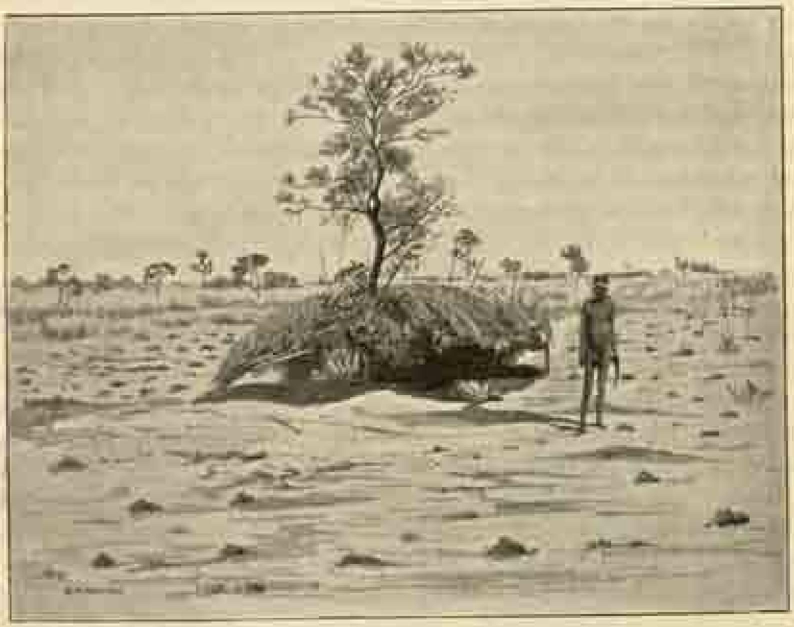
The present mining population of Hall's Creek is about twenty. This is augmented occasionally by the influx of "overlanders" from the Northern Territory and Queensland.

The gold-bearing country is cut off to the south-east by what is locally known as the "Sandstone," a bluff wall-like range named the "Albert Edward" range. In the same direction, between the Sturt and the border, "colours" of gold have been found, and the existence of this narrow auriferous belt, well known to the present prospectors on Kimberley, to the eastward of Messrs. Stretch and Week's station on the Sturt, gave us faint hopes that the same belt might be met with to the southwards. But to this, I may say, we pinned little faith, and beyond the feeling that we were to some extent benefitting the community in general by coming back through unknown country in the place of an uninteresting and useless return by the coastal stock track, we had little thought of any practical advantage resulting from our work, unless it were the opening up of a stock route between the cattle country of Kimberley and the southern goldfields; of this I had but little hope after our former experiences. It needs no expert to say in most decided terms that such a route is utterly impracticable; seeing that, when in the best of seasons it would be a matter of extreme risk to bring over a mob of, say, one hundred camels, what chance could a herd of cattle have of getting even a quarter of the distance? Any one reading the briefest account of the style of country encountered by us will, I think, be of the same opinion as myself.

We left Hall's Creek on March 22, on our return journey. There is no place that I shall so long remember for its kindness and hospitality as that out-of-the-way settlement.

Our party consisted of Messrs. Breaden and Massie (companions of my former journey), two black boys (one our faithful "Warri" and the other a Sturt creek native, "Tiger" by name, an excellent boy, but one so devoted to his own comfort that he left us on the first signs of the desert), eight camels, and three horses. By using canvas bags as well as our iron casks, we were enabled to carry a large quantity of water (about 100 gallons), and by allowing the horses one bucket (3 gallons) apiece nightly, we managed to keep them alive for the extraordinary periods of eight, nine, and ten and a half days; extraordinary, not so much because of the short allowance of water (for of course horses, when on good feed, have been known to live an almost equal length of time without any water), as on account of the almost total want of feed and the extremely trying nature of the country they had to cross. In many places the utter sterility of the country would not allow even the spinifex to grow its accustomed tops of coarse grass, and on more than a few occasions both camels and horses were forced to content their hungry stomachs with the prickly stool of that everlasting and useless plant.

Crossing these splendid grass plains (the Denison) discovered by Gregory, we reached Sturt creek, which that famous traveller has so well described, that little need be said about it here. Following the track down the creek, we arrived at Mr. Stretch's homestead on April 1. This is the most southerly settlement in the East Kimberley district. The Sturt, which up to this point had had the appearance of a broad line of blue-bush * swamps and flats, with hardly a defined channel to mark its course, here becomes confined between two rocky ridges of sandstone, the result being a fine water-hole some 5 or 6



NATIVE CAMP.

miles long, and, so far as I remember, about 300 yards across. Mr. Stretch accompanied us down the creek as far as the junction of it and the "Wolfe" (named by Mr. Stretch), which occurs some few miles north of the border of the Kimberley district. Above the junction the same swamps and flats, alternating with large rock-bound pools wherever a sandstone ridge runs across the course of the creek, exist. Below the junction the combined channels take on themselves the character of the Wolfe, which, in common with all the Kimberley creeks seen by us, is fringed with large gums, Leichardt pines, and Bauhinia trees. At the junction of the two creeks, the Wolfe is

* Atriplex.

of the greater volume, though the Sturt is certainly deeper; and, seeing that the Wolfe (which rises somewhat on the opposite fall to Christmas creek and the Mary river) floods twice or thrice a year, whereas the Sturt runs its entire length but once in every three or four, it must, I think, be to the former that the lakes (Gregory's "Salt sea") owe their existence. In any case, the combined waters of the Wolfe and Sturt have made but an insignificant channel between them, and one can hardly credit that this creek has a length of nearly 300 miles. From the junction downwards a war between the desert and the grass lands is waged for the supremacy of the river-banks. For miles the sandy channel, not one chain wide in places, is hemmed in on either side by desert gums and spinifex, and once out of sight of the creek, one might be in the midst of the wilderness for all the benefit the surrounding country receives from the water. But again lower, noticeably about the latitude of Mount Müller, the grass plains gain the day—and a very pretty bit of country it is, too, especially so under the conditions in which we saw it, when the creek was still running, and wherever, as in many places, it had overflowed its banks, clay pans and lagoons of beautiful clear water appeared, and on all of them teal and whistling duck in profusion. On nearing the lakes, the creek assumes so dismal an appearance, and so funereal is the aspect of the dead scrub and dark tops of the "boree," that one wonders that Gregory did not choose the name of "Dead" instead of "Salt" sea for the lakes he found. A curious point about this part of the creek is that stretches of salt and fresh water alternate. On unsuspectingly camping one night on its banks, we were forced, on tasting the water, to turn back several miles before we could get any fit to drink. The lake itself is a fine sight. To see so large an expanse of water (even though salt) is a rest for the eyes after so many miles of the unending sand and spinifex. The water of the lake, though used by the natives in certain parts, was too salt for our liking, so we camped on a high bank overlooking an estuary opening out into the large lake some 5 miles further south. There one can easily understand the reasons which caused Gregory to call it a sea rather than a lake, the more usual term, for anything more like the low-lying arms of the sea, such as those in Southampton Water at home when the tide is out, it would be hard to imagine. Even the smell of the seaweed and muddy ooze is not wanting, and, to complete the picture, myriads of wild-fowl cover the sandbanks and the surface of the water. In the early morning so dense is the crowd of shags, ducks, pelicans, snipe, and other birds, that to say that there was acre upon acre of wild-fowl would not be wide of the mark; but in spite of their abundance they are not easily shot, their very numbers ensuring the watchfulness of some of the various flocks. Large camps (perhaps two hundred in all) of natives were dotted round the lake, and on our first arrival we had an escort of nearly a hundred yelling and excited blacks—mostly men and boys, for, though very ready to talk of their "womany," they were careful to keep them in the background. They were peaceable enough, anyway, and I made them take one side of the water, while we camped on the other, and won their hearts by shooting pelicans for them, though the ungrateful fellows took our boy "Tiger" from us, and would have actually murdered poor "Warri" had he not been too clever for them. Here we saw some of our former Jew acquaintances, who recognized us at once; one old man, whose son's eyes I had doctored with lotion, was greatly pleased, and told us through Tiger that the boy's eyes were all right again. We questioned them about Wells and party, but of this they seemed to know little, though they knew of the murder of a white man by a native down the Fitzroy, an occurrence of recent date. They also told me of some white men who were speared in a cave a long while ago, somewhere about Christmas creek. Hoping to find some interesting facts for students of ethnology, I asked the old man his name. He said he hadn't got one, which seems strange, but he should know best, so I christened him "Jacob," for the benefit of the next person who recognizes in him the characteristic features of the Jewish people.

These Sturt natives are fine, well-set-up men for the most part. The abundance of game and fish no doubt accounts for their good appearance. Fish, from what I could gather, is not a common article of diet amongst them, for, having nothing in the shape of hooks or nets, they are unable to negotiate the deep water, and only catch fish on the rare occasions on which they find them up the creek in the shallows. Out of these they sweep them with a sort of fence of branches, which they drag through the pools on to the banks, the water running back through the sticks, and the fish being left high and dry on the sand. They find also quantities of mussels, which we thought disgusting in taste, but they greedily devour them when baked in a heap of ashes.

Using "Tiger" as interpreter, I got the following words from the natives, which I look upon as reliable. Without much trouble one could make up a lengthy vocabulary, as the blacks are only too fond of talking, but in most cases their information is untrustworthy, and it was only after testing several natives with the following words that I satisfied myself that they were pretty correct:—

English.	Native word.
Gregory's Salt sea ...	Burrow.
Fresh water	Nappa, or yowie.
Salt water	Moorabba (compare Hunt's Slate well, near Lake Lefroy, which is sometimes salt, called by the natives "Moorabbi").
Creek	Gilli.
Fire	Walloo, or warroo.
Fish	Yagoo.
Mussel	Bambirri.
Whistling duck	Tchibilla, in imitation of the cry of the bird.

English.	Native word.
Pelican	Coya.
Moon	Young'un.
Star	Gigi.
Sun	Brung.
Southern Cross	Wun-num.
Dog	Puppa.

We left the lakes on April 20, shaping a course to take us generally through the country mapped by Warburton, though I did not actually steer for any of his points or waters, knowing that doubts as to the accuracy of their position existed: and I may say here, though it is rather ahead of our journey so far, that our course should have taken us right through the salt lakes marked by him close to the border, yet no such lakes crossed our path. But in the same latitude as Lake White, and some 17 miles to the east of the position given to that lake by Warburton, we passed close to a lake the general description of which would agree with that of the first-mentioned lake: sandhills and spinifex right up to the edge of the lake (salt and dry, of course), and fringing the eastern shore a high tableland of sandstone. After striking this lake we turned west to the Stansmore range, and so, had another lake existed in that latitude, we must have seen it, which we did not. Now, if I am right in saying that Warburton thought he was 17 or 18 miles further west than he was in reality, this would account for his failure to connect with Gregory's traverse in 1856 at the Sturt lakes, and also for the failure of two parties to locate certain of his positions. The one was Mr. Buchanan's, who travelled a few days into the desert beyond the Salt sea, and returned quite satisfied that his idea of a stock route between the Sturt and the Oakover was impracticable. Mr. Buchanan looked in vain for Lady Edith's lagoon, which is marked as only 50 miles from the lakes. The other party was that of Mr. Smith, who attempted to cross the desert to the Oakover, but returned after penetrating it only a short distance. Mr. Smith told me that he thought he had located "Bishop's dell," and this he placed due south of the larger lake instead of south-south-west, as shown on Warburton's route.

Mr. Wells (the leader of the Calvert expedition), too, eventually found Joanna springs some 20 miles east of Warburton's position, therefore I am inclined to think that Warburton's work wants shifting bodily on the map some 17 or 20 miles to the east. Considering the sufferings that he and his party went through, one can only marvel that Colonel Warburton was able to keep any sort of reckoning.*

On leaving the lakes we got almost at once into desert country, a belt of "boree" scrub intervening; but not into the sand-ridges until

* Out of seventeen camels with which Colonel Warburton started, sixteen died. Some succumbed to hardship, and the rest were killed for food. Colonel Warburton lost the sight of his right eye. Neither he nor his son, nor, indeed, any member of the expedition, would have reached civilization but for the faithful courage of Samuel Lewis.

about lat. 20° 35', when we took a turn to the south, leaving a prominent single hill to the north of us. Beyond the lake we got water in a small gully running down a tableland, but after that our old method of steering for smokes, surprising camps, and running down the natives had to be resorted to. To the westward of the big hill (Mount Elphinstone) we surprised two natives as they hunted, after steering for their fire for no less than two days—for, of course, the actual smoke only lasts a few hours. One was an exceptionally fine man, and would be reckoned large in any community, the other older and smaller. We

FISH-POOL IN JANET CREEK.

kept these men for some days, and they took us to three good waters: a splendid soak not far from Mount Elphinstone, and some pools in rocky, desolate glens in the Stansmore range. Except that they did not seem to value each other's society—for we never saw them conversing—they appeared fairly contented so long as our course coincided with their wishes. No doubt they took us to one dry well, but that was my fault, for, on the old man pointing one direction and the younger one another, I chose the one that suited us best, and, in consequence, arrived at a dry hole. When I unloosed them they were unwilling to go, until I pointed out our proposed course—then about south. This at once decided them—off they went. Seeing their indisposition to accompany us, we were prepared for a stretch of bad country—nor were we disappointed. Till now the sand-ridges had been bad enough—high, red, barren, running right up to the ranges—where, by the way, several good creeks take their rise, only to be engulfed in the greedy sand, though, judging from a line of large gums which I could follow with field-glasses for a great distance, I fancy that one at least must reach the lake, which I take to be Lake White. Between the Stansmore range and Lake MacDonald (and beyond that too), the sand-ridges beat anything we had yet seen for sterility, frequency, and height; and Warburton showed discretion when he turned back in 1873, and made up further north before attempting to cross. As usual, the difficulties of travel were intensified by the obstinacy with which these ridges hold to their east and west direction, causing us infinite labour in having to cross the country "dead against the grain." Mr. Breaden counted the ridges as we crossed, and in one day's march we passed over no less than eighty-six ridges. I do not remember this as a particularly bad day; in fact, we got a good many flats between the ridges that afternoon, so that we may take it as an average experience. As to the distance in an ordinary day's march of eight hours—uninterrupted, except when mounting and dismounting to tie together broken nose-lines, or to give each other a spell at steering—(reckoned, when travelling due south, as the difference in latitude), we did not cover more than 12½ to 13 miles, though probably our actual mileage, reckoned up and down the switchback ridges, would be more than half as much again. In lat. 22° 19' we got a change: black desert oaks in place of the more usual stunted gums, and one day's flat travelling. Here, too, we made more captures; amongst them a very small man, almost a dwarf, with most peculiar wall-eyes like a Skye terrier. They were camped on the usual wretched well, and amongst their spoils of the chase we were surprised to see a domestic cat—a black one. Continuing on a southerly course, past a prominent bare hill capped with quartzite (Mount Webb), standing up like an island from a surrounding sea of sand and scrubs—crossing the Winnecke hills of Tietkens (1889), we struck the north-east corner of Lake MacDonald; this, in common with all the so-called lakes of the interior, is merely a vast expanse of mud and salt. The sand-ridges hereabouts are comparatively low, and have some feed on them, but high enough to so limit one's view that we only once got a sight of the lake. From this point we marched over samphire and salt-bush flats, and finally across the Davenport hills until again into the sand, when, just on the edge of the ridges on the east slope of the hills, we came on a native camp, and Godfrey on Monk, the only horse able to go out of a walk, succeeded in stopping one of the men—a fierce, well-made native, with an enormous length of hair and beard. After lengthy consideration he guided us to their water-supply—an enormous cavity in the sandstone rock, some 30 feet deep, and filled, to three-quarters of its depth, with sand. I estimate the capacity of the hole at 4000 gallons, yet our unremitting labours of nineteen hours' duration were rewarded with less than 90 gallons.

The next day, with the help of the native, who pointed out our course, we found a splendid rock-hole brimful, with more water in it than we could use in four days. How that black man must have laughed to himself as he watched us slaving away the previous day! This

AMONG THE SOUTHERN TABLELANDS.

was one of the many occasions on which a fourth man would have greatly assisted us. For on our first journey, before poor Charles Stansmore died, whilst three worked on the well, the remaining one and the boy could be hunting for more water.

In the native camps here we found barbed spears and a generally better class of implements. These people, I fancy, only make occasional desert trips away from the well-watered country over the border. Amongst other treasures we found a piece of glass bottle (evidently used for fining down and smoothing spears, etc.) most carefully tied up in a grass-woven case, opening like an oyster, and lined inside with feathers. In the same camp (this was near Mount Webb) we got a "sporran" consisting of a pearl oyster-shell or large conch shell, also one formed from the top portion of a human skull, whether that of a white or black I cannot say; a piece of the covering of a camel-saddle was also in use as a sort of sack for carrying their belongings in.

From this last rock-hole we kept a southerly course until about the centre of what was formerly marked as the probable outline of Lake Amadeus, this side of the border; no lake, however, was to be seen, only sand-ridges. We now turned westwards, running parallel with the Rawlinson and neighbouring ranges, though too far off to see them, except from one point, where we got sight of a large and prominent block of apparently bare red sandstone standing up alone on the horizon. This should be Mount Skene from its bearing, and distant some 40 miles from where we saw it. Soon we were to see our last smoke and make our last capture, for from the day of reaching the "Deep rock-holes," lat. 24° 20', long. 127° 20', we saw no more smokes, and but few natives or tracks. From a point three days east of these rock-holes to a point about an equal distance beyond them in a south-westerly direction, we encountered the most utterly barren and miserable country it has been our lot to see. Camp after camp and never a bite for camel or horse; no animal life, not even the usual spinifex rat (and here I may mention that the rats went out with the smokes, and south of latitude 24° 20' we saw hardly any), no birds, no natives, no tracks, no vegetation save the everlasting spinifex, and that in its most decrepit state; a few stunted gums or desert oaks stand in their solitude on the crests of the sand-ridges. Luckily, this wretched wilderness was near an end, for, a little south of the end of the Rawlinson range, to our delight we came once more into open country—the undulating gravelly desert * first crossed from west to east by Giles, and found by us in 1896 to extend northwards to lat. 22° 40'. Steering a due south-west course, with Woodhouse lagoon as our ultimate destination, we had splendid country for rapid travelling—undulating desert of gravel and spinifex, with occasional thick mulga scrubs. Here we saw but very few natives' tracks, and those which we followed took us constantly to dry rock-holes. Even fresh tracks merely led us to recently exhausted reservoirs. At length we found a serviceable hole, from which we got between 20 and 30 gallons.

About lat. 25° 30' we sighted what I took to be a long, low range of hills, and by my reckoning the Sutherland range; but on nearer approach we found that the supposed ranges were only high sand-ridges—cut off suddenly by a line of salt lakes and samphire flats, which, running in a southerly direction, and consequently at right angles to the sand-ridges, leave the butt ends, as it were, of the latter standing out above the flats, in such manner that these extremities and the ridges beyond them offer in the distance the appearance of a line

* "Gibson's desert"—named by Giles, after one of his party who perished in this region.

of broken hills, and were at first mistaken by us for a range. On the margin of these small lakes we got most excellent green feed, the first really good feed for either camels or horses since leaving the Sturt creek. We kept on our south-west course until lat. 26°, where by following some fresh tracks we came on a nice little soakage in the sandy bed of a fair-sized gum creek. This I took to be the Blyth, both from its position, course, and size. Forrest in 1874 marked a tree on this creek, but this I was unable to find—it is possible that it has fallen or been burnt. But a sketch that I made of a remarkable chimney-like peak seen from the head of the creek was at once recognized by Sir John Forrest, so there can be no doubt that we were on the Blyth creek.

Forrest buried numerous articles at his camp on the creek, including a bottle containing letters: I much regret that we were unable to recover such interesting relics. From these cliffs, in which the Blyth and other creeks originate, I saw the sand-ridges which we had just been skirting.

On leaving the creek, we steered for Woodhouse lagoon (a mile or so south-south-east of Mount Worsnop), and that day we had the first rain that we had experienced on either trip. This enabled us to get on without carrying water for the horses, of which we had now lost one—from internal complaints brought on by hardship. The lagoon we found to have but a few inches of water, whereas last August it had as many feet; and, again, last August, Alexander spring was as dry as a bone, and resembled a common rock-hole in the bed of the gully, whereas this time I found it brimful of the most crystal clear water. Small pools of water were lying about all over the rocks, so evidently the rain had been fairly heavy, but not heavy enough to run the creek below Alexander spring, which is the main supply for the lagoon.

A fairly large camp of blacks must have been camped here shortly after our first visit, evidently holding a corroboree, for between the Mount and Alexander spring I found a cleared place in the scrub, stones stuck up in the forks of the enclosing mulga trees, and a sort of altar of bushes, before which numerous tracks had passed to and fro. Hidden in these bushes I found one of these peculiar long, flat mulga boards, similar to those already described.

From the lagoon we steered a course a little south of west, intending to pass Lake Wells on the north and cut the Bonython creek, but on nearing the lake we found our progress barred by an unmarked arm, which runs away in a chain of small lakes, swamps, and samphire flats, broken by sandhills and ridges, in a northerly direction as far as the eye can see. This arm joins Lake Wells about the centre of what is marked as Von Treuer plateau. This tableland does not extend nearly as far east as was originally thought, and from the north side has not at all an imposing appearance. After several unsuccessful attempts at crossing, all ending in the hopeless bogging of horses and camels alike, we made down to Mr. Wells's crossing, which we knew to be narrow and good, and here we got over with great ease, not having to carry a single pack—a piece of good fortune. The lake here has a hard bottom within a few inches of the surface, consequently the camels could not sink to any appreciable degree. Mr. Wells's tracks (though made as far back as 1893) are still visible at the crossing. We now followed the same route as Mr. Wells to the Bonython, which, though only a flat shallow watercourse, as described by that traveller, has several good pools in it. Now prospectors' tracks became more numerous, four or five parties having apparently been here. Tracks recently made by cattle—probably stragglers from the Gascoigne district—were also to be seen, but we were not lucky enough to come upon the animals. From the Bonython we steered for the Erliston creek, cutting it just below Mr. Wells's marked tree. The country between the two creeks is for the most part flat desert country and mulga thickets, with a coarse undergrowth of grass. Before cutting the Erliston, we passed through the only auriferous country we had met with since leaving the vicinity of Hall's Creek, but, having been some days without provisions, we made all speed towards Lake Darlot township, and at last reached that place, after an absence from the southern goldfields of almost exactly one year. Thence we went on by easy stages to Coolgardie, having travelled upwards of 3000 miles, for nearly half that distance through country hitherto unexplored.

On looking at the large expanse of "Blank" on the map of West Australia before starting last year, I had argued myself into half expecting to find at least a small belt of mixed country similar to that which includes Lake Darlot and the outlying "finds" in the Mount Margaret district—mixed country in the sense that all round and between many of these far-out fields one finds patches of desert, so that one might probably make the complete circuit of the Lake Darlot field, within a radius of, say, 20 miles, and be all the time in sand and spinifex. But now, after the best part of a twelvemonth spent in travelling, it seems to me fairly certain that if any such mixed country exists, we must have dropped across some of it. Once past the longitude (roughly) of 122° 30′, the character of the country, as well as of the rocks, undergoes an entire change; and from there right away up to the old-established diggings of Kimberley, it is the same dreary monotony of sand and sandstone. Coming back we fared no better, and I am forced to the melancholy conclusion that the greater part of the vast West Australian interior, as seen by us, is useless to man or beast; that a direct stock route between the Kimberley district in the north and the Murchison-Coolgardie fields in the south can by no possibility be found; that there can be little or no hopes of the goldfields extending to any appreciable distance in a north-east direction (that they are most unlikely to extend further east I am satisfied, from what I saw of the country traversed by me in 1894); and that all idea of any auriferous connection between Kimberley and Coolgardie must be banished from our minds, though I consider it most likely that gold will be traced from Lake Way by the Opthalmia range to the Nor'-west goldfields. It is no pleasant task to have to condemn as useless so large a portion of a prosperous colony; yet I must speak of the country as I have seen it, and would remind you that Western Australia contains many hundreds of square miles of valuable land, of which only an insignificant part has as yet been occupied.

Judging from what Sir John Forrest tells me, I should say, also, that gold may be found near Mount Moore, in the vicinity of Lake Augusta, and it may be added that a small patch of auriferous country (in which no more than "colours" have been obtained) is known to exist in the Warburton ranges, already visited by one or two prospectors. Of the various sources of water-supply found by us, only two can be claimed as permanent, viz. Helena spring and Empress spring.

I may mention that ours was one of the few expeditions through the interior which was unaccompanied by Afghan camel-drivers, and that throughout both journeys we had only one sore back amongst the camels, in spite of the heavy loads they carried across country, well calculated to knock both packs and backs to pieces.

In conclusion, I take this opportunity of putting on record my most deep feelings of gratitude to my companions for their untiring, energetic help through all our journeyings. I verily believe that worse country (or better country either, for that matter) has never been travelled through by a more cheerful party, or by one in which the members of it were more fully in accord; and to the unanimity and ready co-operation that prevailed throughout the camp the successful issue of the expedition must in a large degree be ascribed.

OUTGOING JOURNEY.

	Latitude.	Longitude.
	° ′	° ′
Clay pans south of Doyle's or Cutmore's well (July 21) ...	28 35	120 57
Native well on small creek (August 1)	27 40	122 54
Small creek (August 6)	27 9	123 59
Empress spring (August 10)	26 47	124 25
Woodhouse lagoon (August 19)	26 10	124 48
Native well, dry (August 25)	25 15	124 48
Warri well (August 29)	24 57	125 9
Family well (September 17)	22 40	125 54
Native well (September 29)	21 49	126 33
Helena spring (October 5)	21 20	126 20
Soak east of Point Massie (October 14)	20 45	126 23
Godfrey's tank (October 19)	20 15	126 25*
Jew's well (October 27)	19 41	127 17
Mount Bannerman (November 1)	19 27	127 11*
Mount Hawick (November 29)	18 53	127 3
Hall's Creek (December 4)	18 16	127 47

Latitude by observation; longitude by account.

* Latitude by account.

RETURN JOURNEY.

	Latitude.	Longitude.
	° ′	° ′
Hall's Creek (December 4 to March 22)	18 16	127 47
Denison Downs homestead (April 1 to April 6)	19 9	128 13
Lagoon on Sturt creek (April 11)	19 45	127 20
Camp on estuary, above Salt sea (April 15)	20 11	127 31
Camp (April 23)	20 32	128 10
Camp (April 28)	21 4	128 33
Camp near mouth of Glen Wilson (May 2), Stransmore ranges	21 25	128 20
Dwarf well (May 7)	22 19	128 16
Native well, 1 mile west of Mount Webb (May 12) ...	22 57	128 20
Native well (May 16)	23 26	128 42
Large rock-hole (May 20)	23 44	128 52
Deep rock-holes (May 29)	24 20	127 20
Tree (?) on Blyth creek (June 17)	26 0	125 22
Woodhouse lagoon (June 17)	26 10	124 48
Camp (June 25)	26 20	123 22
Camp 2 miles south-west of tree marked L. A. W., on Erlistoun creek (July 12)...	27 36	121 46

Before the reading of the paper, the President said: This evening we shall be engaged in listening to the narrative of the very remarkable and, I think, important journey which has been made by Mr. Carnegie from south to north, and again from north to south, over the desert of Western Australia. It is, I think, almost a quarter of a century since I listened to the terrible account which was given to us by Colonel Egerton Warburton, who crossed that desert from east to west; but I look upon it as a still greater feat to have crossed it from south to north, passing over the tracts of previous explorers, and I feel sure that we shall listen to a most interesting and instructive paper. I will now ask Mr. Carnegie to be kind enough to read his paper to us.

After the reading of the paper, the following discussion took place:—

Sir HENRY NORMAN: I must express my great admiration at the energy and perseverance which Mr. Carnegie has displayed. Unfortunately, I have no personal knowledge of Western Australia, but I believe there are several gentlemen here who have a good deal of knowledge of that portion of the continent.

Sir MALCOLM FRASER (Agent-General for West Australia): I am sure you will agree that Mr. Carnegie has made a most interesting statement out of an apparently uninteresting subject. I have been personally acquainted with all those of whom he has spoken, Mr. A. Gregory, Mr. Forrest, Major Warburton, and Mr. Giles, and his statement is a full corroboration of what they have said. But pray do not go away imagining that Western Australia does not possess a great deal that is interesting. It has been rather unfortunate with our explorers that they have passed within a short distance of excellent country. The Messrs. Forrest passed over or by both Coolgardie and Kalgoorlie, and where Burke and Wills perished years ago is now covered with a flourishing settlement. Therefore let me say, that whilst Mr. Carnegie has only spoken of what he saw, let me hope that there may yet be outside and beyond the range of his horizon, as fine a country as any in the world. The goldfields extend from south to north almost continuously. We undoubtedly owe a great debt to Mr. Carnegie for his explanation of the desert part of the country. But, as I have said, I hope and trust that the present limit of our discoveries may be extended, and that we may find oases in this great wilderness which may serve for settlement in future in some way or other. With regard to the country travelled over by Mr. Carnegie, although we have in former years covered some of it with horses—for we had no camels in those days—we could not get beyond two or three days' march without a water supply. I have listened to Mr. Carnegie with admiration, and I cannot speak too eulogistically of the pluck and enterprise and the magnificent courage of my young friend; we must remember that his life was in his hands all the time. He has told us that at one point of his journey they lost several of their camels; he might have lost the whole of them, and if that had been so, I am afraid that we should not have seen him or any of his companions again. I hope he will accept from me my sincere tribute of admiration for the pluck he has shown throughout.

The PRESIDENT: If no one else wishes to address the meeting, it only remains for me to thank Mr. Carnegie in your name. The conception of his journey was excellent. He had noticed that his predecessors had crossed from east to west, and he resolved to attempt the journey from south to north and back again across the same desert, so as to explore it thoroughly. It is remarkable that all the great explorers who were his predecessors—Colonel Egerton Warburton, Sir John Forrest, and Mr. Giles—received the highest honour that we have it in our power to bestow,—our Royal Gold Medal. I think that in some respects Mr. Carnegie's journey is quite comparable to them. It certainly is so from the purely geographical point of view, and I have looked upon it, especially in reference to his description of those long sand-ridges, as extremely interesting. I should like to ask him the character of the troughs between the ridges—whether it was soft sand or hard desert ground?

Mr. CARNEGIE: As a rule the ridges themselves were hard and compact at the bottom of the slopes, but at the top, where none of this spinifex grew, the ridges were quite loose, and you could see where it had been blown into little hills, and so forth, by the strong winds. There seemed to be a very strong easterly wind blowing every morning for about two months. Between the ridge there would occasionally be a flat a few hundred yards in width, but as a rule it was simply up and down, like the waves of the sea.

The PRESIDENT: An investigation of the origin of this remarkable formation—which is unlike anything connected with sand-dunes that I have ever heard described in any other part of the world—would be, I think, from a geographical point of view, extremely interesting. Mr. Carnegie has shown all the qualities of a good explorer—remarkable pluck and energy, and determination to carry out the plan which he had originally conceived. He is also a practised observer. In offering him the thanks of this meeting, I think we may look forward (I certainly do) to such an explorer as Mr. Carnegie has shown himself to be—and he is still very young—being able in the future to do still more important work, and to his being of still greater service to geographical science.

MR. CARNEGIE'S MAP.—The map is a reduction of the Hon. D. Carnegie's map on the scale of 1 : 100,000. The survey was plotted by dead reckoning, and checked by frequent observations of south circumpolar stars with the theodolite. The distances were obtained from the rate of travel, and the prismatic compass was used for fixing the position of distant hills by intersections.

MRS. BISHOP ON KOREA AND THE KOREANS.*

By GEO. G. CHISHOLM, M.A., B.Sc.

A work by Mrs. Bishop is sure to be full of interest, of novelties, of instruction, and food for reflection. The present volumes, the result of four visits to Korea between January, 1894, and March, 1897, and visits to Manchuria and the Coast Province of Siberia made after her first visit to Korea during the Japo-Chinese war, are no exception. The first of the visits was, in some respects, the most interesting and important. It embraced the ascent of both branches of the Han, a visit to the Buddhist monasteries of the Diamond mountains, and the descent from these mountains to the eastern port of Wensan. From the account given in the *Journal*, vol. i. pp. 546–547, it seems evident that the Rev. Mr. Warner ascended both branches of the river, and not merely the northern one, as she states.† Mrs. Bishop, however, adds some important information about the river-bed and its valley. The waters of the upper Han in both branches are, like those of the upper Senegal and its tributaries, ponded back in many places by transverse barriers of rock, so as to form between these barriers a succession of deep, quiet reaches. It is these barriers that cause many of the rapids that hinder navigation of both branches, though in other places the hindrance is due to the occurrence of pebbly shallows. This structure of the river-bed is no doubt due to the same cause as in the Senegal, the succession of hard and soft rocks, together with the alternation of rainy and dry seasons. During the rainy season the river descends with sufficient violence to scoop out the soft material behind each rocky barrier. One may fairly conjecture that the phenomenon is connected with that which Mrs. Bishop mentions (vol. i. p. 117) as the most striking geological feature of the Han valley, cliffs of laminated limestone "continually presenting the appearance of the leaves of a colossal book."

Mrs. Bishop found Korean cultivation much better on the whole than she had been led to anticipate from the accounts of previous travellers; and from the prosperity and improved bearing of the Korean colonists she saw under Russian rule, she augurs well of the prospects of the people in their own land, if better government could be established there.

Mrs. Bishop is inclined to think that Europeans habitually underestimate the population of Korea. Taking seventy houses at random, she obtained an average of eight to a house, an average confirmed by the

* 'Korea and her Neighbours.' By Mrs. Bishop (Isabella L. Bird), with a preface by Sir Walter C. Hillier, K.C.M.G., late H.B.M.'s Consul-General for Korea. 2 vols. London: John Murray. 1898.

† Both in the note referred to in the *Journal*, and in the source from which the particulars are taken (The *Mission Field*, April, 1893), some confusion is caused by the words "Tanyang, about 25 miles north of Yeng-choun, the most southern point reached." Reference to Mrs. Bishop's map shows that "north" is a manifest mistake for south, and the words "the most southern point reached" relate to Tanyang, not Yeng-choun (Mrs. Bishop's Yeng-chhön).

estimates of others whom she quotes (vol. i. p. 82). The total population is generally taken by her at 12,000,000, and in one place she puts it down as 12,000,000 to 14,000,000. The following are census returns or estimates of town populations: Seul, "by a careful census taken in February, 1897," intra-mural, 144,636; extra-mural, 75,189; total, 219,825—males predominating to the extent of 11,079; Pyeng-yang (the Phyŏng-yang of Mrs. Bishop and of Mr. Carles in *Proceedings*, 1886, p. 300, the Ping-yang of the newspapers at the time of the war) before the war, 60,000 (Mr. Carles, above 20,000; Mr. Campbell in the *Proceedings*, 1892, p. 157, probably 100,000), at the time of Mrs. Bishop's visit, one year after the battle fought close by, 15,000;* Hwang-ju before the war, 30,000, now 5000–6000; Song-do or Kai-seng, 60,000; Chemulpo, a foreign population in January, 1897, of 4357 (3904 Japanese, 404 Chinese), estimated Korean population, 6756; Fusan, foreign, January, 1897, 5564 (nearly all Japanese), estimated Korean population of city and prefecture of Tung-nai, 33,000; Wensan, foreign (mainly Japanese) in January, 1897, 1357, estimated Korean, 15,000.

With regard to the other contents of the volumes, there is only space to mention that there are chapters on Korean customs, history, government, education, finance, and superstition; on Christian missions; some pages on trade well worth the attention both of British statesmen and British merchants; and four chapters on Manchuria at the time of the outbreak of the Japo-Chinese war, besides appendices.

Mrs. Bishop has evidently taken pains with the spelling of proper names. Her Korean spellings are mainly in agreement with those of Mr. Carles in the paper in the *Proceedings* above cited, though her Whang-ju is hardly an improvement on his Hwang-ju. These I have not been able to follow, as not being in agreement with the present rules of the Society, and I have altered them in accordance with the map or text of Mr. Campbell's paper in the *Proceedings* for 1892. The Russian names are unfortunately rendered in German forms, and Vladivostok appears under the curious hybrid form of Wladivostok.

THE GEOGRAPHICAL WORK OF THE UNITED STATES COAST AND GEODETIC SURVEY.†

By T. C. MENDENHALL, formerly Superintendent of the Coast and Geodetic Survey; and OTTO H. TITTMANN, Assistant in Charge of the Office of the Survey.

While a relatively small part of the energies of the United States Coast and Geodetic Survey has been devoted, since the creation of the Bureau in 1807, to geographical exploration, it is, perhaps, only just to say that in the character and

* "Four-fifths of its houses destroyed, streets and alleys choked with ruins, hill-slopes and vales, once thick with Korean crowded homesteads, covered with gaunt hideous remains" (vol. ii. p. 114).

† Read before Section E (Geography) at the Toronto Meeting of the British Association, August, 1897.

amount of its precision work it is second to no similar organization in the world. From the very start the standard of work has been the highest attainable in the existing condition of the arts and sciences on which such work must depend, and often, not content with that condition, the Survey has made it its business to better it by original investigations of the first class, leading to improvements in the instruments and methods of the highest importance. It thus became the principal, and for many years almost the only, bureau of the government in which exact science was cultivated. In its outward activities it was essentially an organization for the practical application of science to the solution of certain problems and the issue of certain publications which were of the utmost value to commerce.

The duties to be performed by it were to sound the depths of the ocean along the coasts of the United States, to define the shallows which barred the ways of commerce, to delineate with great accuracy the shores and physical condition of the thousand harbours and estuaries with which a benign Providence has blessed our coasts, to investigate the tides and currents of the waters which bear their precious burden of human lives and property to and fro, and to study the mysterious variations and uncertainties of the magnetic needle by which the course of the navigator was largely directed.

To these immediate problems the Survey addressed itself with vigour and foresight under the guiding hands of Hassler and his eminent successors. Hassler, the friend of Jefferson and Gallatin, enjoyed the confidence and support of these eminent statesmen, but he had before him difficulties as great as his field was wide. Inert public opinion as to the utility of the proposed survey had to be vitalized and moulded, men had to be trained to carry out the technical parts of the work, instruments had to be constructed, and correct methods had to be prescribed. How these difficulties presented themselves, and how they were overcome, will form a proper chapter, not only in the history of the great Survey which yet remains to be written, but also a chapter in the history of the progress of science in this country. It may be said that Hassler, in 1844, saw the fruition of his hopes when a general plan of operations prescribed by him was adopted by a scientific commission composed of army and navy officers and civilians. Its adoption marks the official recognition of the necessity for precise and systematic work in the mapping of our domain; its simple and correct outline of the operations to be followed in making a survey of great extent, has permitted the extension of the work in a manner commensurate with the enlargement of our national domain by acquisitions of territory from France, Spain, and Mexico. With the expansion of territory came the extension of the scope of the Survey, and finally, when the advantages of a transcontinental triangulation became apparent, its geodetic function was recognized by law. In accordance with its primary duties, the Survey has developed and charted the depth of the waters along our coasts with extreme minuteness and accuracy, not only in the rivers, bays, and harbours, but off shore as far as the needs of commerce demanded it. Going beyond the immediate requirements of the mariner, it devoted itself to discovering the depths of the sea over large areas, as is shown by the complete survey of the Gulf of Mexico. Its depths were sounded and charted, its salinity tested, and the temperatures of its waters were recorded. Much earlier than these successful surveys of the gulf were the explorations of the Gulf Stream, important not alone in their geographical results, but in developing methods, often by failures, which rendered subsequent success possible. The hydrographical results achieved are shown on between five hundred and six hundred charts, many of them of such exquisite perfection as to form a standard of excellence for all cartographers.

Its researches in physical hydrography include not only the study of the tides and currents, and incidentally the establishment of planes of reference from which the constancy of the relation between the ocean-level and the land is to be inferred, but it has studied for future comparison the movements of sandy shores, as, for instance, those of Cape Cod and of the exposed islands of Nantucket and Martha's Vineyard, to discover the relationship between the outlying shoals and the changes of the shores. Here again precision of work alone is of any avail, for correct conclusions can only be drawn after the lapse of time and after a standard of comparison has been created by an accurate survey. Want of space forbids the enumeration of many special results, but the discovery of the value of the tidal circulation through the East river as a factor in maintaining the depth of the bar at Sandy Hook, and the discovery of the underrun of the Hudson and its bearing on the feasibility of obtaining a water-supply for the towns along that river, may be mentioned as contributions in a special field of geography.

As properly belonging to the subject of the hydrographical surveys, the literature of the several and successive volumes of the 'Coast Pilots,' published by the Survey, must be mentioned. The 'Coast Pilots' of Alaska, compiled by Davidson, and later by Dall, are invaluable historical records of the geography of that coast, and the same may be said of the volumes covering the remainder of the Pacific coast, and those which describe in detail our Atlantic shores. They are not intended to deal in generalities, but they describe with rigid particularity geographical landmarks which are to guide ships by day and by night.

The maps of the Survey are embellished by accurate representation of the topography which borders our shores. For thousands of miles a narrow fringe of topography has been mapped with minute and necessary accuracy. It is based on local and detailed triangulation, which in turn rests on a larger network of triangles, which co-ordinates all the surveys along the coasts.

The introduction of precise methods for the determination of latitudes and longitudes went hand-in-hand with all the other operations of the Survey. Thus the success of Morse in the spring of 1844 was followed in the autumn of the next year by formal instructions given by Bache to Walker to prepare for telegraphic longitude determinations, but it was not until October 10, 1846, that the method was successfully put into practice by the exchange of signals between Philadelphia and Washington, and thereafter the precise determination of longitudes had merely to await the extension of the telegraph system from point to point within our own borders and throughout the world. As soon as the Atlantic cable had been laid in 1866, the Survey successfully undertook to determine our longitude from Greenwich by the telegraphic method. Up to that time the longitude adopted for Cambridge, Massachusetts, in 1851, was used. The adopted value, $4^h\ 44^m\ 29{\cdot}5^s$, had been derived from many years of laborious observations of moon culminations, eclipses, occultations, and chronometer determinations; but this value was increased (in 1869) by $1{\cdot}35^s$, as the result of comparatively brief cable determinations. Similarly, the longitude adopted for San Francisco, in 1855, as the result of 206 moon culminations, was increased in 1869 by $3{\cdot}1^s$—in linear measure, about three-quarters of a mile—by the telegraphic determination. Within the last year, the Survey has completed and adjusted its primary longitude-net, covering the whole United States, and fixing for all time the astronomical longitudes of the points included in it, not only in their relation to each other, but in all probability their final relation to the initial meridian of Greenwich, since in this adjustment three transatlantic determinations by the Coast Survey, and one by the Canadians, have been used. Less need be said of the many latitude determinations, since the methods adopted, though admirable in their precision, involved no such radical improvement as that which the telegraph brought about in the determination of longitudes. On the other hand, however, the zenith telescope, as developed by the Survey, has, in the hands of its observers, contributed materially to our knowledge of the variation of latitude.

Reference has been made to the geodetic function of the Survey. It has measured an oblique arc, the last triangles in which have but just now been observed, extending from the north-eastern boundary to the Gulf of Mexico. To join this with the primary chain, as yet incomplete, of triangles along the Pacific coast, a great arc has been measured along the 39th parallel of latitude, the completion of which has been but recently announced.

The adjustment of the triangulation along this great arc, and the adoption of a homogeneous system of geographical co-ordinates, will furnish the fundamental data for the co-ordination of all government or state surveys for all time to come, if it be permitted to fallible human wisdom to make such an assertion. Grand in its inception, splendid in its execution, this monumental work may be reckoned as the most important contribution to the geography of our country, on account of its present and prospective value. The measurement of a great meridional arc along the 98th meridian is in contemplation, and our sister Republic of Mexico, which has just established a Geodetic Survey, it is hoped will take a hand in its extension southward, while to our cousins across the northern border a similar opportunity for its prolongation northward may be offered in the course of time.

The Survey has been especially called upon for assistance in defining the boundaries of eleven states, and aid has been extended to fifteen more by the determination of geographical positions within their borders. In the determination of the national boundaries, it has co-operated in retracing the line between Mexico and the United States, has made topographical surveys along the north-eastern boundary, and in the far north it has determined the crossing of the 141st meridian on the Porcupine and Yukon rivers, in regions to which all adventurous eyes are now turned, and in South-East Alaska it has made exploratory surveys as well as precise geographical determinations for the ultimate delineation of the boundary between Alaska and the British possessions.

The enormous extent of the country included in the operations of the Survey, and especially its nearness to the principal north magnetic pole, offered a rare opportunity for the investigation of the problem of terrestrial magnetism. Observations began at an early date, and have been continued up to the present time, at a constantly increasing number of stations. In addition to a regular periodical study of the magnetic elements at a large number of specially selected points, by the most approved methods and the best of instrumental appliances, the Survey has maintained a photographic registering magnetic observatory, which it has moved, from time to time, from one part of the country to another. It has made extensive publication of the data thus obtained, including a series of magnetic charts, which are of the greatest value to navigators at sea and surveyors on the land. Its archives contain a mass of reliable information concerning terrestrial magnetism unequalled in extent and importance.

In common with several similar organizations in Europe, it has devoted much attention, mostly during the past twenty-five years, to the study of terrestrial gravity. Beginning with methods long in use, its observers were quick to detect and point out certain serious and hitherto unsuspected faults, necessitating considerable corrections in nearly all accumulated data relating to that subject.

Instruments were also improved and methods greatly changed, increasing at once the precision and rapidity of gravity measurements. Expeditions have been sent to various quarters of the globe for the purpose of gravity observations, and

Coast Survey pendulums have swung in all continents except Australia, in most important cities, on several of the highest mountains, and on many islands in the several oceans. No others have been vibrated so near the pole as these, and none over so wide a range in longitude. The results of these operations, together with the measurement of the great arc of unrivalled length, form a contribution of no ordinary interest to the more precise solution of the great problems of dimensional geography.

THE TREATY WITH ABYSSINIA.

THE only boundary referred to in Mr. Rennell Rodd's treaty with the Emperor Menelek is that of British Somaliland, and this has been settled in the spirit of mutual concessions. The agreements made with France on February 1, 1888, and Italy on May 5, 1894,* are not affected by this new settlement. The boundary, as now finally settled, begins at the well of Hadu, between Jibuti, the rising capital of "French Somaliland" and Zeila, follows the caravan route as far as Abasuen and the hill of Sumadu, and then continues in a south-south-west direction up to

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the pass above Egu, which lies only 10 miles to the north of Harar, at an elevation of 7500 feet above the sea. Thence it turns abruptly to the east, leaving the northern slope of the mountains with Britain. At Moga Medir ("Moga's eye-tooth"), a heap of rock concerning which Burton tells us a pretty legend, the boundary turns to the south-east, passing through Eylinta Kaddo to Arran Arrhe, near the intersection of the 9th parallel with the 44th meridian. From this point

* See *Geographical Journal*, vol. iv., 1894, p. 56.

a straight line is drawn to the intersection of the 8th parallel and the 47th meridian. The rest of the frontier remains as laid down in the Anglo-Italian Protocol of 1894.* The area thus enclosed and recognized as British Somaliland amounts to 69,000 square miles.

Tribes owning grazing-grounds on both sides of the boundary, as thus defined, are not to be interfered with in their migrations, and are permitted access to the wells nearest to them; but they are to be subject to the jurisdiction of the territorial authority whose frontier they may have crossed.

The caravan route from Zeila to Harar is to be open to the commerce of both "nations."

The treaty provides, moreover, that subjects of and persons under the protection of either party shall be at liberty to come and go freely, and to engage in commerce. "Armed bands," however, are not to be permitted to cross the frontiers without a previous authorization. British subjects are to enjoy every advantage with respect to customs, duties, and local taxation that may have been or shall be granted to other nations. Materials destined exclusively for the service of the Ethiopian State shall be allowed to pass through British territory free of duty. This provision will apply to arms and munitions of war, subject to the rules laid down in the General Act of the Brussels Conference of 1890.

Lastly, Menelik declares the Mahdists to be the enemies of his empire, and undertakes to prevent the passage through his dominions of arms and ammunitions intended for them. This important provision was to have taken effect at once, and before the exchange of ratifications.

THE MONTHLY RECORD.

THE SOCIETY.

The Vasco da Gama Celebration.—The Council have decided to hold a special meeting of the Society on Monday, May 16, in commemoration of the fourth centenary of the discovery of the route to India by the great Portuguese navigator, Vasco da Gama. It is expected that H.R.H. the Prince of Wales and His Excellency M. de Soveral, the Portuguese Minister, will be present.

EUROPE.

Twenty-fifth Anniversary of the Founding of the Hamburg Geographical Society.—An intimation has been received from the president and secretary of the Hamburg Geographical Society to the effect that it is proposed to celebrate the twenty-fifth anniversary of the founding of the society in March next. On the 17th of the month a meeting will be held in the hall of the Hamburger Hof at 11 a.m., whilst a dinner in honour of the occasion will take place on the same day at 6 p.m. The Hamburg Society invites the sister-societies and other associations concerned with kindred sciences to take part in the celebration by the sending of delegates. An early reply, with the names of the delegates appointed, is requested.

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* Italy, by the treaty concluded at Addis Abeba on October 26, 1896, is conceded a strip, 180 miles in width, along the Somali coast, as shown in our sketch-map.

The Moraine Amphitheatre of Lake Garda.—In the January number of *Petermanns Mitteilungen*, Dr. Theo. Fischer calls attention to a relief representation of this district that has been drawn up with great technical and artistical skill by the cartographer, Domenico Locchi, under the direction of Lieut.-Colonel Porro, teacher of military geography at the military school of Turin. It has been prepared so as either to be mounted on a stand or fastened to a wall, has a height of rather more than 5½ feet and a width of 5¼ feet, and is on the horizontal scale of 1 : 25,000, and the vertical scale of 1 : 10,000. It appeared at the end of 1896, and its price is 250 lire. Apropos of this production, Dr. Fischer furnishes an account of the district thus illustrated, with references to the original authorities, and points out in some detail how instructive this relief is from a political and a strategical point of view, as well as with regard to the history of the glaciers of recent ice-periods, the nature of ice-action generally, and the local distribution of towns and villages. The communication is illustrated by a sketch-map.

ASIA.

Captain Wellby's and Lieut. Malcolm's Journey across Tibet.—A detailed report on the route across Tibet taken by Captain Wellby and Lieut. Malcolm, accompanied by route-maps on the scale of 16 miles to an inch, has been issued by the Intelligence Branch at Simla. It takes the form of an itinerary, showing the nature of each separate day's march, the names of the halting-places, etc., but containing no general descriptions of the country passed through. By the help of the maps, however, it is possible to trace the precise direction of the route, from the Pangong lake near Leh, to Sining east of Koko Nor. The general direction was at first somewhat to the east of north-east, until near the intersection of the 81st meridian with the 35th parallel. Thenceforward the direction varied little from easterly until the 95th meridian was crossed, the route never reaching the 36th parallel of north latitude during this distance, and but rarely crossing to the south of the 35th parallel. From 95° onwards it diverged more towards the north, until it struck the northern shore of Koko Nor. During 14° of longitude, therefore—from about 81° to 95° E.—the travellers were crossing the least-known part of Northern Tibet, in a direction parallel to the main chain of the Kuen Lun, their route being intersected, during the greater part of this distance, only by those of Littledale and Bonvalot, both running roughly from north to south. The country appears to have been similar to that of Northern Tibet generally, containing no well-marked orographical or hydrographical systems, but consisting of a series of plains or shallow valleys occupied by lakes (salt or fresh), or traversed by nullahs (sometimes dry, sometimes bearing water), and separated by passes of no great elevation above the general level (15,000 to 16,000 feet). Grass seems to have been fairly plentiful, and water could generally be obtained by digging, even when none appeared above the surface. Between 81° and 83° ranges of mountains were seen, both to the north and south—in the latter direction snow-clad. Snow-peaks were also seen subsequently at various points, especially between 88° and 91° and east of 94°, being apparently more numerous on the north. As regards drainage, a northerly direction appears to have predominated between 82¼° and 84°, and a southerly one between 85½° and 87½°. An easterly flowing system was met with in about 91½° : it ended in a fresh-water lake a little before 93°, the lake being separated only by a narrow divide from the source of the Chumar, the principal northern tributary of the Di-chu or Upper Yangtse. This was followed down, according to the map, in a due easterly direction almost to 95°. It appears doubtful, however, whether the longitudes are to be trusted at this part of the route, as the junction of the Chumar with the Di-chu, before which it flows almost southerly, has been placed by other travellers west of 95°. The Chumar was a rapid stream, and soon increased to a considerable size: where split up into several channels, the whole bed was sometimes a mile in width. From the Chumar onwards the route led through country already traversed by Prjevalsky, Rockhill, and others, and the additions to our knowledge are principally in matters of detail.

Explorations in Eastern Asia Minor.—To the November and December numbers of *Petermanns Mitteilungen* (1897), Roman Oberhummer contributes an account of the journey referred to in our note on p. 332 of vol. ix., the account being accompanied by a map (in the November number) on the scale of 1 : 500,000. As stated in that note, one of the main objects of the journey was to explore that portion of the Kizil Irmak that lies between Kessek-kepri (south of Kirshehr, in about 34° 10′ E.) and Kepri-kei (south-east of Angora). No traveller, according to Prof. Kiepert, had visited the part of the valley of that river lying between the bridges at these two villages, but this gap is now filled in. The upper section of this portion of the Kizil Irmak valley was found to have, on the whole, level and well-cultivated banks, such as are met with still higher up; but lower down, in about 33° 33′ E., the river enters a narrow defile, in which its course is interrupted in two places by cataracts. At the end of this defile, Oberhummer and his companions discovered, to their surprise, the ruins of an old bridge, from the ends of which roads still lead landwards on both banks. From the style of construction, it is conjectured that this bridge may belong to Byzantine or later times. After reaching Kepri-kei the party returned southwards to Koch-hissar, to the east of the Tuz-gel, and thence turned eastwards to a ford of the Kizil-Irmak in 33° 49′ E., which had previously been crossed by Prof. Ramsay. Two or three miles south of this ford, in returning to Nevshehr, they passed a mound about 130 feet high, the vicinity of which was strewn with stones, and behind which, at the distance of about 100 yards, they saw three fragments of a wall built with stone and mortar, upwards of 6 feet in height and about 5 feet thick, standing almost in one line at intervals of 16 to about 30 feet. Oberhummer thinks it not impossible that this may have been the site of a considerable settlement (perhaps the ancient Parnassos), if it was not a military station for the protection of the road that crossed the river close by. The following estimates of population, made by Oberhummer for different places on his route, may be mentioned: Homs, nearly 40,000; Hamah, about 60,000; Aleppo probably not less than 150,000, including 25,000 Christians; Nigde, 6000; Kaisariah, about 60,000, including 15,000 Christians; Kirshehr, 4000. Some of these estimates differ considerably from those of Cuinet. Oberhummer expresses warm gratitude for the protection afforded throughout by the Turkish Government, and the courtesy of the officials with whom he was brought in contact.

The Climates of Eastern Siberia and Northern America.—An instructive study on this subject is contributed to the *Annales de Géographie* (November, 1897, and January, 1898) by the well-known Russian meteorologist, Dr. A. Woeikof. The writer devotes his chief attention to a careful examination of the principal characteristics of the climate of Eastern Siberia, briefly pointing out, in the concluding section of his paper, the chief points of difference to be observed in Northern North America. Eastern Siberia is one of the great *anti-cyclonic* regions of the globe, marked in winter by a consistent high pressure, accompanied by calms and very low temperature. The annual amplitude of temperature is also excessive. Our knowledge of the climate is based at present on observations made in the valleys of the principal rivers, whilst the varied nature of the surface entitles us to look for great differences of temperature between neighbouring localities. An estimate may be formed of the temperatures of the upper strata of the atmosphere, and of the mountains as opposed to the valleys, by a study of the phenomena observed in Europe at the time of the most marked anti-cyclones. Dr. Woeikof concludes from this comparison, that as a rule the upper strata are at a considerably higher temperature than those adjacent to the surface of the ground, and thinks that this explains the fact that stations near the Arctic ocean have a less rigorous winter than those in the interior of the country. This is certainly not due to the influence of the sea, but rather to the fact that the northern *tundras* are more exposed to the action of the winds, which, by mingling the strata of the atmosphere, raise the temperature of the lower layers. It seems probable also that the mean annual temperature of the mountains is above that of the valleys, the anti-cyclonic conditions of winter (when the compression of descending currents is a source of warmth) predominating over those of the short summer. As regards the annual range of temperature, it is greatest in the interior valleys, the coasts being distinguished by their low summer temperature. Dr. Woeikof devotes a separate section to the climate of Southern Irkutsk and Transbaikalia, which correspond in latitude to the principal centres of population in Europe, and which are now attracting attention as a possible field for emigration. In spite of the low mean temperature of the year, the summer temperature is sufficient to ripen the cereals of Russia and Central Europe, while the clear sky and pure air of winter renders the country eminently adapted as a sanatorium for consumptives, and the abundance of sunlight gives exceptional facilities for cultivation under glass. The climate of the Amur provinces and of the eastern coast region is much less favourable owing to the strong winds of winter and the humidity of the summer months. In Northern America the winter temperatures are not nearly so low as in corresponding latitudes in Eastern Siberia. The reason assigned by Dr. Woeikof is that in the former country there is a greater movement of the air, due both to topographical and to meteorological causes. From a table showing the mean summer and winter temperatures of positions in corresponding latitudes in Eastern Asia and North America, it appears that, whereas in lat. 56° 30′ N. the difference between the winter temperatures is trifling, further south the difference in favour of America amounts to nearly 20° Fahr. This may be explained by the greater frequency of south-west winds on the east coast of America and by the influence of the Gulf of Mexico. As regards summer temperature, America is generally colder than Asia.

Discovery in Celebes.—The January number of *Petermanns Mitteilungen* contains a letter from the Dutch missionary, the Rev. A. C. Kruijt, the rediscoverer of Lake Poso (*Journal*, vol. viii. p. 296), giving an account of a journey in which he, in company with Dr. Adriani, discovered Lake Lindu. Hitherto this lake had been known only through the inquiries of von Muschenbroek and von Rosenberg, and doubts had occasionally been expressed as to its existence, but these doubts are now set at rest. The lake is of about one-fifth of the size of Lake Poso, oval in shape, with low marshy shores, overgrown with aquatic plants, abounding in fish, so that many of them were caught by hand by members of the explorers' party. It lies at the height of about 3000 feet above sea-level, and is drained by the Palos, a map of whose basin has been prepared by the explorers. The results from a linguistic and ethnological point of view are also important, and a collection of stones has been sent to Prof. Wichmann of Utrecht.

Dutch Expedition across Borneo in 1896–97.—An account of this expedition, accompanied by a map of the Mahakam or Kutei basin, on the scale of 1 : 2,000,000, and an enlargement of the upper part of the river on twice that scale, is given in the January number of *Petermanns Mitteilungen* by its leader, Dr. A. W. Nieuwenhuis. Dr. Nieuwenhuis had been a member of the expedition which had been compelled to turn back in 1894 by the hostility of the natives, and, residing for two months on the banks of the Mendalam to study the Kayan-Dayaks of that district, he had learnt the cause of this hostility. The natives had been alarmed by the somewhat military aspect of the previous expedition. He therefore determined to organize an expedition with as little appearance of this sort as possible, and receiving the sanction of the Netherlandish-Indian Government and the financial support of the Dutch Society, he set out from Batavia at the end of February, 1896, with a party of two Europeans (Demmeni, the sergeant of the topographical department, Batavia, and F. Count v. Berchtold, who was to prepare the zoological specimens), and two Javanese from the botanical gardens of Buitenzorg. Obtaining fifty Kayan boatmen and bearers, the party started from Putus Sibau, on the Kapuas, on July 3. No serious difficulties occurred with the natives. Everywhere medicines and small presents of rings, needles, beads, and tin boxes were found to be the best means of arriving at an understanding. About the end of August the party established themselves at a station among the upper waters of the Mahakam, and there they remained exploring and collecting till April 23, 1897. They then descended the Mahakam in boats to Tepu at the commencement of regular steamer navigation, and thence they and their collections were brought down in two steamers by the Sultan of Kutei and the local official at Samarinda. All the party, except one of the Javanese, who had been attacked by beri-beri (from which he afterwards recovered), arrived at Batavia in the best of health on June 16. The collections also, including thirty-three boxes of living plants from Central Borneo, were little injured.

New Island near Kudat, British North Borneo.—A short note by Mr. R. M. Little, describing a visit to a small island which rose from the sea during the earthquake of last year, appears in the *British North Borneo Herald* for January 1. The island, which is about 100 yards square, is situated about 4 miles south-east of Malundangan island, which lies to the east of the larger island of Banguez. It rises 3 feet above high-water mark, and is covered with large boulders of hard sandstone, coloured, like the whole island, of a greyish white. The substratum is fire-clay traversed by cracks running from north-east to south-west. Coral of various kinds is strewn over the surface, and the boulders are covered with small oysters. Deep water is found to the north-west and west of the island, but to the south-east the sea is shallow. A shoal, partly visible at low water, had existed previously, according to native accounts. The emergence of the island is said to have been accompanied by the appearance of two waves, crossing the sea to the north, and by a rumbling noise, as well as a furious wind.

AFRICA.

The Navigability of the Middle Niger.—The work of Lieut. Hourst has been supplemented, as far as relates to the navigability of the Niger below Timbuktu, by a canoe voyage carried out in May, 1897, by Lieut. de Chevigné (*Comptes Rendus*, Paris Geographical Society, 1897, p. 369). Lieut. Hourst, who descended this part of the river during the season of high water, found it free from obstructions as far as Ansongo. M. de Chevigné, however, experienced great difficulties in getting his canoes over the numerous sandbanks exposed in May, at which season the river falls with great suddenness. At Keina jagged rocks are said to obstruct the passage completely. The Niger can therefore be considered navigable from Timbuktu to Ansongo only at high water, whilst below that place navigation is always difficult, and all but impossible during nine months of the year.

Recent Surveys in Unyamwezi.—A large-scale map, embodying recent surveys by Pater Capus and Lieut. v. Wulffen in Unyamwezi, is given in Part 4 of the *Mitteilungen aus den Deutschen Schutzgebieten* for 1897. According to a note by Dr. R. Kiepert, the routes of these travellers fill up a previously blank space between the routes of Speke (1858) and Stuhlmann (1890), and supply information respecting a number of new districts in Unyamwezi. The map—which is intended as one of a series which are to bring up to date certain sheets of the map of German East Africa on the scale of 1 : 300,000—also lays down, for the first time with all the details, a section of Count Götzen's route of 1894.

Captain Ramsay's Expedition to Ruanda.—We have already referred to recent explorations by Captain Ramsay, commandant of the German post at Ujiji, near the north end of Lake Tanganyika (*Journal*, vol. ix. p. 326). He has since made another journey through Uha, Urundi, and Ruanda, some details respecting which are given in the *Mitteilungen aus den Deutschen Schutzgebieten* (1897, part 3). Starting from Ujiji with three other Europeans, Captain Ramsay passed by the source of the Malagarazi and proceeded northwards down the valley of the river, crossing it afterwards into the territory of Luassa, the most powerful sultan of Uha. His country is extremely fertile and well peopled. Crossing the Malagarazi again, the expedition entered Urundi, and proceeded across a mountainous but well-peopled district to the Ruvuvu, considered by Dr. Baumann to be the head-stream of the Kagera. This view is not held by Captain Ramsay, who visited the confluence of the Ruvuvu and Akanyaru, and considers the latter to be far the more important. It is often known as the Kagera, whilst the Ruvuvu never is. At the junction Captain Ramsay crossed into Kisakka, a part of Ruanda, following up the course of the Akanyaru and discovering several small lakes connected with it. The junction of the Nyavarongo and Akanyaru was found to be a short day's march south of Count Götzen's route. It was difficult to decide which was the larger stream, but the Akanyaru seemed to have somewhat the more water. Having visited Kiseke, the capital of Ruanda, and made a treaty with the sultan, Captain Ramsay traversed the most beautiful and thickly peopled part of that country, and reached the Akanyaru near the spot where it was crossed for the second time by Baumann. His attempts to discover the sources of this river and of the Nyavarongo in the Nyakisu mountains proved unavailing, but he was able to convince himself that both rivers rise in the high range shown on the maps at the edge of the Ruanda plateau. Again entering Urundi on the return route, the travellers were, for the second time on their journey, hailed as "mami" kings, receiving an ovation similar to that accorded to Dr. Baumann. Captain Ramsay differs from the latter with regard to King Mwezi, and the Mwezi or Moon mountains. The name, he says, belongs to the present king, from whom the mountains take their name, since he happens to live near them. Ruanda is described as an immense plateau, without trees or brushwood; densely populated and very fertile. Its rulers are Watussi. They, as well as the Wanya-Ruanda, are well clothed with stuff brought by traders from Karagwe, while the people of Urundi wear only bark-cloth. The latter country is said to be the finest in German East Africa.

M. Foa's Route across Africa.—M. Foa arrived in Paris about the middle of January, and soon afterwards gave, at a meeting of persons interested in Africa, some details as to his recent journey across that continent (*Politique Coloniale*, January 23; *Mouvement Géographique*, No. 5). Arrived at the south end of Lake Tanganyika, M. Foa made the complete circuit of the lake by water, and from Ujiji, then in ruins, crossed over to the west side, reaching the Congo north of Nyangwe by a new route. On the way he fell in with the revolted troops of Baron Dhanis, and further progress was a matter of difficulty. He finally descended the Congo by canoe, the voyage taking five and a half months. He has taken over 800 astronomical observations, and brought back extensive zoological collections. He speaks highly of the work of the Belgians on the Congo, but reports that the results obtained in French Congo are almost *nil*.

Frontiers of German East Africa.—In the definition of the boundary between German East Africa and Nyasaland by the treaty of 1890, it was supposed that the point where the Songwe river makes a sudden bend to the north lay to the west of the 33rd meridian of east longitude, to which line, from its mouth in Lake Nyasa, the course of the river was to form the boundary. It has lately been proved by astronomical observations (*Globus*, 1898, p. 84) that the point mentioned lies 6' east of 33° E., so that an ambiguity arises as to the interpretation of the agreement. A preliminary arrangement was arrived at in October last between Mr. Alfred Sharpe and Herr von Elpons, whereby the boundary would follow the Lagange or Katendo, a tributary of the Songwe, as far as a place named Vimba, whence it would strike across to the Congo watershed. This will require, however, to be ratified by a duly accredited commission. Rumours have lately circulated with regard to difficulties between Germany and the Congo state as to their mutual frontier north of Lake Tanganyika. It is stated, however, in the *Mouvement Géographique*, that no question had arisen, officially, between the two powers—the boundary of the state being clearly defined by various international agreements, an enumeration of which, eleven in all, is given by the Belgian paper.

AMERICA.

Fogs on the Newfoundland Banks.—A recent number of the *Annalen der Hydrographie* contains a paper by Dr. Gerhard Schott on the average distribution of fogs on the Newfoundland banks, accompanied by twelve maps, showing the regions of greatest frequency for each month. The discussion is based upon all the data collected by the *Deutsche Seewarte* during the last twenty-one years, and is a contribution to our knowledge of the subject of marked scientific and practical importance. Dr. Schott finds that the period of greatest frequency of fogs begins in April and lasts till August; there is a sudden diminution in September, and the smallest number of fogs is recorded in February. Two regions are most frequently visited—one near the east coast of America, south of Nova Scotia, and another on the eastern margin of the Great Bank. Applying the conclusions arrived at to the needs of the mariner following the recognized steamer routes, it appears that in general he may expect: From 70° to 65° W., much fog; from 65° to 52° W., little fog; from 52° to 47° W., very much fog; from 47° to 40° W., little or no fog. The monthly charts, of course, give further information as to the probable extent of a foggy area, and the quickest way out of it. The routes adopted by the great steamship lines in 1891, and modified last year, have been laid down with an almost exclusive regard to the danger from drift-ice. Dr. Schott combines the risks of ice and fog, and recommends as follows: (1) From middle of January to end of March, the 49th meridian should be crossed in 42° N. lat. by westward-bound ships, in 41° 10' N. by eastward-bound ships (danger of ice). (2) From beginning of April to end of August, the 49th meridian should be crossed in 41° N. lat. by westward-bound ships, in 40° 10' N. by eastward-bound ships (danger of fog and ice). (3) From beginning of September to middle of January, the 49th meridian should be cut in 46° N. lat. and in 45° 10' N. lat. by westward and eastward bound ships respectively. In the first case a somewhat more northerly course than usual is allowed; in the second it is recommended to continue the southerly route for six weeks longer than usual.

Transcontinental Arc Measurement.—On March 3, 1871, the United States Congress made an appropriation "for extending the triangulation of the coast survey, so as to form a geodetic connection between the Atlantic and Pacific coasts of the United States." Mr. E. D. Preston, in a paper before the Philosophical Society of Washington (*Bulletin*, vol. xiii. pp. 204–222, map), deals with the magnitude and importance of the work. The transcontinental arc is practically completed, and is stated to be the largest arc of longitude ever measured by any single government. It extends from Cape May lighthouse, in New Jersey, to Point Arena light, in California, the distance being 2625·6 miles. These points are within a very few miles on the same parallel of latitude. In this great network there are 266 primary stations. The arc consists exclusively of quadrilaterals, or figures equally as strong. Four stations are above 14,000 feet elevation, and twenty are beyond 10,000 feet. On the transcontinental arc nine bases have been measured. The longest line observed was from Uncompahgre, with an elevation of 14,300 feet, to Mount Ellen, 11,300 feet high, giving the unprecedented single sight through a distance of 183 miles. There are more than twenty lines over 100 miles in length, each of which has been observed from both directions. In pointing out the value of the transcontinental arc, the author says, "Not only is it national in its use, but every state through which it passes comes into possession of accurate geographical positions; and not alone that, but every state lying near the thirty-ninth parallel can, at slight expense, fix its own boundaries with an accuracy not inferior to that given by the best government surveys in the world. No less than sixteen states are directly benefited by the triangulation across the continent, and as many more have the possibility of benefit."

Proposed Meteorological Station on Mount Satulah, North Carolina.—A note in the *Monthly Weather Review* for October, 1897, refers to a suggestion by Mr. B. C. Hawkins, that an observing station might with advantage be established on Mount Satulah, 4490 feet, one of the highest summits at the south end of the Blue Ridge, in the southern Appalachians. In the same number of the *Review*, Mr. Hawkins calls attention to the area of heavy rainfall which exists in the southern Blue Ridge mountains, the annual total being 68 miles or more throughout the area, which includes parts of Georgia and of North and South Carolina. It is, however, pointed out by the editor, that although a continuous record at the summit of Satulah mountain would help to elucidate some interesting problems, previous attempts to maintain self-registering apparatus at such stations have met with little success.

The "Moodus Noises" in the Connecticut Valley.—Prof. W. M. Davis has a short note in *Science* for December 3 on the so-called "Moodus noises," which, after a cessation of twelve years, have lately been heard again in the lower Connecticut valley. These noises, which seem to indicate local disturbances in the geological formations of the district, had been heard by the Indians before the coming of white men, and were particularly frequent in the early part of last century. During the present century they had previously been heard twice, in 1852 and 1885. The sounds recently heard are likened to muffled thunder, and to the roar of a distant cataract or of the wind in a tempest. Houses, etc., trembled as in an earthquake. Prof. Davis remarks that these sounds deserve special study in view of the compressed condition of the rocks in the Monson quarries.

POLAR REGIONS.

Proposed Polar Expeditions.—*Science* for January 28 contains the report by Prof. Heilprin, as chairman of the Committee on Antarctic Exploration, appointed at the Philadelphia meeting of the American Society of Naturalists, 1895. The report shows that great difficulties have been met with in arriving at any feasible scheme for an Antarctic expedition. Suggestions have been made as to the feasibility of one or more joint commercial (whaling) and scientific enterprises; but, in view of the large capital outlay required, the Committee doubt the desirability of such an undertaking. It is considered preferable that any expedition sent out should be purely scientific in character; and the belief is expressed that the required funds would be forthcoming if an appeal were made for the co-operation of a selected number of scientific associations and institutions of general learning. According to a correspondent of the *Times*, a Canadian North Pole expedition is also under consideration, its projector being Captain Bernier, who has had much experience of sealing and other voyages. He proposes to start in June next, and to proceed by Bering Strait to the spot where the *Jeannette* was wrecked, and thence make for the pole with dog and reindeer sledges. (It does not appear whence fodder for the latter is to be obtained during a journey over the frozen ocean.) The Quebec Geographical Society is reported to have expressed its approval of the scheme, and to have voted an application to the Federal government for a subsidy. It is also announced that the Duke of the Abbruzzi, the leader of the expedition which successfully ascended Mount St. Elias last summer, will start during the present year on a three years' voyage of arctic exploration. He intends to spend the first winter in Franz Josef Land, and will endeavour to make his way thence towards the pole.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

A Speculation in Topographical Climatology.—We have received a reprint of a paper by Prof. W. M. Davis, published under the above title in the final number of the *American Meteorological Journal*, now defunct. Attention is drawn to certain phases in the general progress of the denudation of land-areas, which deserve the notice of meteorologists because the explanation of various existing topographic features, now in process of formation, requires a recognition of their close dependence on existing climatic conditions, and because the interpretation of other features, of more ancient origin, leads to an understanding of the climatic conditions under which they were produced. A closer study of these phases would lead to the establishment of more definite relations between climate and topography, which would not only make the interpretation of existing conditions within any given area much easier, but would enable us to write climatological history from topographical records. A more forcible illustration of Prof. Davis' thesis could hardly be found than has been afforded by Prof. Penck's recent studies in the north-west highlands of Scotland, noticed in our February number. The first difficulty which has to be met is, of course, the absence of adequate geographical and meteorological training in the case of most travellers; only an observer of special knowledge and experience can identify the characteristic features of topography associated with, say, arid, humid, or glacial conditions. Prof. Davis sketches very briefly a few main points to be looked for under each of these typical conditions, and directs the student to good models of this class of work. The general importance of observations of the species in question is brought out by some very interesting speculation as to the topographical changes to be expected from such a shifting of the great climatic belts as might result from a displacement of the poles. We know that such a displacement is as much a "mathematical impossibility" as the oscillations of the earth's axis recently discovered by Chandler, but the possibility of its having occurred is worth investigating, and at present the necessary information is almost wholly wanting.

German Deep-Sea Expedition.—We learn from the *Geographische Zeitschrift* (February, 1898) that a sum of 300,000 marks has been voted by the budget committee of the Reichstag in order to carry out the project of a German deep-sea expedition, brought forward by Prof. Chun at a recent scientific congress at Brunswick. The expedition is to start in August, and, after investigating the deep-sea organisms between Scotland and the Shetland islands, will proceed to the West African coast, there to carry out researches on various points connected with marine life and ocean currents. The programme also includes an investigation of the antarctic current, and of the line of meeting of the same with the warm currents from the Indian ocean, and it is proposed to continue the voyage through the Indian ocean, Red sea, and Mediterranean.

Magnetic Surveys of Austria-Hungary.—The first magnetic survey of Austria-Hungary was made between the years 1843 and 1858, the results being reduced to the year 1850. On the initiative of Prof. Dr. Julius Hann, a fresh survey was begun in 1888 under the direction of Prof. Liznar, attached to the *Meteorologische Central-Anstalt*, who brought the work to a successful conclusion in 1894. Observations of declination, dip, and intensity have been made with all modern refinements at 210 stations, including 38 in Hungary, 28 in Bosnia, and 42 on the coasts of the Adriatic; and the results have been reduced by the most approved methods to date midnight January 1, 1890. Investigations into the periodic and secular changes of the magnetic elements are now being carried out with the help of the older data, but it seems that the discussion of the magnetic "disturbances" is likely to yield the most striking results. The great centres of disturbance are Eastern Galicia, the coasts of Adria, and Transylvania. The disturbances are greatest in Eastern Galicia, very slight in Tirol, while Adria shows the remarkable feature that the disturbances are positive in direction on the coast of the mainland, and negative on the islands. There are indications that in Transylvania the disturbing forces tend towards a central point.

Deep Currents of the Bay of Biscay.—In the *Comptes Rendus* of the Paris Academy of Sciences (1898, No. 3) Prof. Thoulet gives the results of his analyses of the deep-water deposits obtained by him during the cruise of the *Caudan* in the Bay of Biscay in 1895. On the hypothesis that the terrigenous material is to a large extent sorted according to density and size of particles before it is deposited, he finds in the distribution of particles of magnetite and other heavy minerals, and of fine clay, evidence for the probable existence of a deep current. The submarine current appears to flow from west to east along the north coast of Spain, and to be deflected along the coast of France, afterwards turning towards the north-west or west-north-west. Its direction is thus opposed to that of the well-established surface current.

GENERAL.

Geography as a Natural Science.—In *Die Natur* for February 13, Prof. Willi Ule, the new editor of that paper, devotes a leading article to the consideration of the claims of geography to rank as a natural science. Surprise had been expressed that he had not ceased to call himself a geographer when he had assumed the editorship of a scientific paper, and thus presumably professed to be a scientific man. Prof. Ule shows how such views result naturally enough from the old style of school-books, in which the impression is conveyed that geography deals only with names. He points out the essential distinction between Topography and Geography, and by several quotations from leading German geographers, confutes the view held by certain educationists, that geography is topography and nothing more. In protesting against taking a simple translation of the word "geography" as a definition of the thing that word signifies, the editor of *Die Natur* says, "What is Geography? It is the science of the phenomena of the Earth. This is more than a translation of the word 'geography.' The phenomena must be conceived of scientifically, and their cause and effects established; the phenomena are mutually related, and unite together to form a single whole; . . . the object of geography is to explain this whole. . . . The above definition may thus be given a wider and at the same time more precise expression:—Geography is the science of the phenomena of the Earth in their causal interrelations." Prof. Ule points out that it is only within the last few decades, and largely as the result of the continuation of the work of Humboldt and Ritter by Peschel, Richthofen, and Kirchhoff, that this scientific conception of geography has been recognized. The relations of this scientific geography to other sciences can best be understood by the classification of the subject-matter. Besides the necessary distinction between general geography, the object of which is the Earth as a whole, and special geography, which deals with one or other of its various parts, Prof. Ule emphasises the importance of subdividing both special and general geography into three groups: (1) Mathematical geography, which draws largely on astronomy: (2) Physical geography, which enters into close relationships with geology, chemistry, and physics; and (3) Biological geography, which receives aid from botany and zoology, anthropology and history. He concludes this vindication of the position of geography with the words, "I am a geographer, and therefore a man of science."

The Seventh International Geographical Congress.—It is announced in the February number of the *Geographische Zeitschrift*, that some preliminary decisions with regard to the next International Geographical Congress were arrived at at a meeting held in December, under the presidency of Baron v. Richthofen. The first week in August, 1899, has been chosen as the date of the meeting. It will be requested that no special delegates be appointed by the countries which take part in it, owing to certain difficulties to which the system of delegates gives rise. Among the new subjects proposed for discussion, the following are mentioned: The study of drift-ice, the utilization of regions with deficient rainfall, the nomenclature of the oceans, the use of the metre for ocean depths, etc. German, English, French, and Italian are the languages permissible at the meetings.

Geography at the Sixty-ninth Assembly of German Naturalists and Physicians at Brunswick, 1897.—A report on this subject appears in the January number of *Petermanns Mitteilungen*. Among the papers more or less connected with geography read at this meeting were one by Dr. Schreiber of Mainz, on the Points of Contact between Anthropology and Philology; one by Prof. Schmidt of Leipzig, on the Todas of the Nilgiri Hills; one by Neumayer on the History of Pendulum Observations, and another by the same author on South Polar Exploration; one by Dr. Wilser of Heidelberg, on Human Races and the History of the World (chiefly taken up with a theory of the origin and dispersion of the Aryan race, whose earliest seat the author places in Scania); one by Theod. Scheimpflug, lieutenant in the Imperial Navy, on the Application of the Magic Lantern in the Construction of Maps and Plans; one by P. Kahle, assistant in the Technical High School of Brunswick, on the Apparatus and Methods of Topographical Surveying in High Mountains; one by Dr. Chun of Breslau, on Deep-Sea Exploration; one by Prof. Selenga of Munich, on Photography in Journeys of Exploration (India, Ceylon, and Japan); and one by Dr. Hermann Meyer, on Journeys amongst the Headwaters of the Xingu.

Presentation to Dr. Julius Hann.—A special meeting of the Austrian Meteorological Society was held at the University of Vienna on February 12, on the occasion of presenting to the Hofrath Julius Hann the medal struck in his honour by the Society. Prof. J. M. Pernter delivered a lecture on the development of meteorology in Austria.

Death of Lieut. Brasseur.—The death of this enterprising traveller, to whose explorations in the south-east portion of the Congo Free State frequent allusion has been made in our pages, is announced by the *Mouvement Géographique* (1898, No. 7). Lieut. Brasseur was killed while leading an attack on the *boma* of Chiwala, an Arab chief much given to brigandage, who had established himself on the banks of the Luapula in about 12° S. lat. With a short interval he had been on active service under the Congo State since 1890.

Life of Sir Stamford Raffles.*—The interest attaching to the career of Sir Stamford Raffles is largely of a geographical kind; and the copious biography which Mr. Boulger has prepared will be welcome to all students of the Malay Archipelago. Sir Stamford Raffles was born on board ship in the West Indies in 1781, he administered Java for the East India Company during the brief period while it was held as a British possession, strongly opposed its return to the Dutch, founded Singapore in 1819, and died in 1826. The foundation of Singapore was a piece of geographical prescience of the highest order, as the whole eighty years of its existence have proved. It is definitely established in this biography that Sir Stamford Raffles, attracted to the site of Singapore from its historical associations, fully recognized its true value. His official statement says, "I have now the satisfaction to report . . . that a British station commanding the southern entrance of the Straits of Malacca, and combining extraordinary local advantages with a peculiarly admirable geographical position, has been established at Singapore, the ancient capital of the King of Johore."

Two Journeys in Northern Somaliland.—The photographs in Mr. Aylmer's paper (*Geog. Journal* for January) are by Mr. Frederick Gillett, except the first, which is by Mr. F. Gunnis.

Major Grant's Occultation Method.—In the note by Mr. E. A. Reeves, in the February number of this *Journal*, "To find the Angles from the Vertex of the Moon," etc., the paragraph (p. 167) commencing, "The last four lines" to the end of the note, should be read *after the footnote*, to which it belongs.

The Indian Survey Report.—General Strahan, the Surveyor General, writes with reference to a statement in the article in the January number of the *Journal* on the Indian Survey Report for 1895–96, that no change has been made in the Survey year, which has always been from October 1 to September 30, and that the delay in issuing the last report was due to causes beyond the control of the Survey Department.

CORRESPONDENCE.

Maskat.

London, February 14, 1898.

MAY I be permitted to reply to the remarks of Senhor Cordeiro on my Maskat paper, printed in the February number of the *Journal*.

The correction of the inscription had already been made, practically as proposed by Senhor Cordeiro, in my letter printed underneath that gentleman's, and I think the copy of the inscription has proved to be as accurate as could be expected after three hundred years' weathering.

With regard to the date of Dom Henry's death, I should perhaps have written 1579–80, as the year 1579 then was not completed until March, 1580.

* 'The Life of Sir Stamford Raffles.' By Demetrius Charles Boulger. With portraits, maps, and illustrations. London: Horace Marshall & Son, 1897.

The Portuguese were finally driven out of Oman (the province on the Arabian coast) in 1560, as stated in my paper—Maskat being the last place held by them in that country. Their establishment at Kong was on the Persian coast, opposite to Oman. I hope to write about the settlement at Kong in a future paper.

I should be glad to learn whether the names of kings of Portugal or Spain are usually only given as initials in such inscriptions.

I feel much indebted to Senhor Cordeiro for his careful criticism, and quite sympathize with his patriotic feeling about the unjust invasion and seizure of Portugal by Philip II. of Spain, which undoubtedly was one of the chief causes of the ruin of the great Portuguese empire in the East.

ARTHUR W. STIFFE.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897-98.

Sixth Ordinary Meeting, January 31, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Rushton Webber Adamson; George William Bird; Peter McNeil Carney; George Richard Clarke; Rev. Henry Dalzell, M.A.; Arthur Matthew Weld Downing, M.A., D.Sc.; Robert Fenner; Hon. Wm. Chas. Hanbury-Tracy; Richard Henry Harris; Lieut.-Colonel G. H. Henderson; Frederick G. Henriques; Robert Louis Jefferson; Henry Knight; Hy. A. Hallam Farnaby Lennard; Arthur Edward Lightbody; Allan McGregor; Duncan Mackinnon; Captain John Marriott (Norfolk Regiment); Richard Caldwell Minton; Major Henry Courtenay Morland (Retired, 9th Lancers); Alfred Edward Moxon; Admiral Gerard Henry U. Noel; L. C. F. Oppenheim; Rev. Hy. Wm. Leycester O'Rorke, M.A.; Gilbert Parker; Legh Sylvester Powell; Ambrose Beatty Rathbone; T. Sankey; Fred. Sykes; Arthur Boddam Taylor; Charles Erskine Vertue; Stuart Monteith Vines, B.A.; Sir Charles George Walpole, C.B.; William Gibson Welderspoon; Brigurs Robert Williams; John Clark Wilson; Oswald Vavasseur Yates.*

The Paper read was:—

"Through Somaliland to Lake Rudolf." By H. S. H. Cavendish.

Seventh Ordinary Meeting, February 14, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Edward Dodson; Captain J. Markham (60th Rifles); Richard Smith; William Myers Wills; Basil Aubrey Holland Wood.*

The PRESIDENT said: Before we commence the proceedings of the evening, I should like to mention that some progress has been made with regard to private antarctic work. Mr. Borchgrevink has purchased a very strongly-built whaler in Norway, well fitted for ice-work, and he is now, I believe, busily engaged in preparing his expedition, which will sail next July. I am sure that we wish him all possible success. I trust also that M. de Gerlache, in spite of very limited resources, will soon be able to send us home a report of useful results.

The paper read was:—

"A Recent Journey in Western Australia." By the Hon. David W. Carnegie.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Alps. *Mem. S.G. Italiana* **7** (1897): 63-80. **Marson.**
Sui ghiacciai del massiccio del Monte Disgrazia, osservazioni del 1896. Nota del socio prof. Luigi Marson. *With Illustrations.*

Alps. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 88-113. **Zwiedineck-Südenhorst.**
Die Ostalpen in den Franzosenkriegen. Von Hans v. Zwiedineck-Südenhorst.

On the Eastern Alps during the French invasions of 1796-97, 1799, 1800-1801.

Alps—Eastern. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 154-357. **Various Authors.**
Aus dem Alpenkranze des Defereggerthales, von L. Purtscheller (154-187). Die Reichenspitzgruppe, von Dr. Fritz Koegel (188-220). Die Alpen des Grosinathales, von M. v. Prielmayer (229-263). Der Wilde Kaiser, von Joseph Enzensperger (264-292). Die Rosengartengruppe, von L. Norman Neruder (293-333). Eine Wanderung durch die Bergamasker Alpen, von H. Steinitzer (334-357).

Alps—Place-Names. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 72-87. **Redlich.**
Ueber Ortsnamen der östlichen Alpenländer und ihre Bedeutung. Von Oswald Redlich.

On the meanings of place-names in the Eastern Alps, and their origin.

Austria. **Finsterwalder.**
Wissenschaftliche Ergänzungshefte zur Zeitschrift des D. u. Ö. Alpenvereins. I. Band,—I. Heft. Der Vernagtferner, seine Geschichte und seine Vermessung in den Jahren 1888 und 1889. Von Dr. S. Finsterwalder. Dazu ein Anhang: Die Nachmessungen am Vernagtferner in den Jahren 1891, 1893, und 1895. Von Dr. A. Blümcke und Dr. H. Hess. Graz: Verlag des Deutschen und Oesterreichischen Alpenvereins, 1897. Size 11½ × 8, pp. 112. *Maps and Plates.*

This will receive special notice.

Austria—Alpine Lakes. **Richter.**
Seestudien. Erläuterungen zur zweiten Lieferung des Atlas der österreichischen Alpenseen. Von Dr. Eduard Richter.—Geographische Abhandlungen. Herausgegeben von Prof. Dr. Albrecht Penck. Band vi., Heft 2. Wien: E. Hölzel, 1897. Size 11 × 7½, pp. 72. *Diagrams. Presented by Prof. Dr. A. Penck.*

Austria—Karst. *Riv. G. Italiana* **4** (1897): 385-391. **Marinelli.**
Fenomeni carsici, grotte e sorgenti nelle prealpi Giulie Occidentali. Del Prof. O. Marinelli.

Austria—Sonnblick. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 52-71. **Penck.**
Gletscherstudien im Sonnblickgebiete. Von Albrecht Penck. *With Illustrations.*

Austria—Tauern. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 114–134. **Grasberger.**
Aus dem alten Tauriskerlande. Von Hans Grasberger.

Austria—Tyrol. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 34–51. **Löwl.**
Kals. Von Ferdinand Löwl.
On the physical geography and geology of the Kals valley.

Baltic. **Cleve, Ekman, Hjort, Pettersson.**
Skageracks Tillstånd under den nuvarande Sillfiskeperioden. Af P. T. Cleve, G. Ekman, J. Hjort, O. Pettersson. Göteborg: D. F. Bonnier, 1897. Size 12 × 9½, pp. 40. *Map and Plates.*
On the physical and biological conditions of the Skagerrak in 1893.

Belgium. *Mém. Couronnés A.R. Belgique* **54** (1896): 1–56. **Fraipont and Tihon.**
Explorations scientifiques des cavernes de la vallée de la Mehaigne. Par Julien Fraipont et F. Tihon. *With Plates.*
The caves are studied in their geographical, geological, and anthropological aspects.

Belgium and France. *Mém. Couronnés A.R. Belgique* **48** (1895): 1–588. **Kurth.**
La frontière linguistique en Belgique et dans le nord de la France. Par Godefroid Kurth.
This memoir gained the Stassart Prize of the Royal Belgian Academy for a memoir prescribed as follows: "To trace on the map of Belgium and the neighbouring departments of France, a line of demarcation separating the regions of romance and germanic languages as at present existing. To consult ancient documents containing lists of place-names, and to obtain evidence whether the present line has remained the same during past centuries, or if, for example, particular Walloon communes have become Flemish, or *vice versâ*. To prepare historical maps showing the fluctuations for periods, the extent of which it is left for the competitors to decide. Finally, to discuss the causes of the changes or the permanence which has been demonstrated." Unfortunately, the memoir is not illustrated by maps.

Switzerland—Cartography. *Mém. S.G. Genève* **36** (1897): 1–21. **Lochmann.**
La cartographie moderne de la Suisse. Par M. le Colonel J.-J. Lochmann.
An account of the chief Swiss maps published since 1830.

Switzerland—Lake of Geneva. *Z. Ges. Erdk. Berlin* **32** (1897): 219–243. **Halbfass.**
Morphometrie des Genfer Sees. Von Dr. Wilhelm Halbfass. *With Diagrams.*
This will receive special notice.

Switzerland—Mont Salève. *B.S.G. Genève* **36** (1897): 127–148. **Pitard.**
Notes sur la faune des vertébrés du mont Salève. Par M. Eugène Pitard.

Switzerland—People. ———
Statistique de la Suisse. 111e livraison. Examen pédagogique des recrues en automne 1896. Publié par le Bureau de statistique du Département fédéral de l'intérieur. Berne, 1897. Size 11 × 9, pp. 14 and 29. *Map.*

Switzerland—Ticino. *Deutsche Rundschau G.* **20** (1897): 97–103. **Halbfass.**
Bosco, das einzige deutsche Dorf im Tessin. Von Dr. W. Halbfass.

Turkey—Adrianople. **Gaetani.**
Bollettino del Ministero degli Affari Esteri. November, 1897. Turchia. Il Vilayet di Adrianopoli. Rapporto del cav. O. Gaetani d'Aragona di Castelmola. Roma: Libreria Bocca. Size 9 × 6½, pp. 16.

Turkey—Albania. *B.S.G. Italiana* **11** (1898): 23–27. **Baldacci.**
Vromonero e le sue acque solfuree. Comunicazione del socio dott. A. Baldacci.
On the sulphurous wells of Vromonero at the confluence of the rivers Sarantaporos and Vojussi.

Turkey—Albania. *Verh. Ges. Erdk. Berlin* **24** (1897): 529–544. **Hassert.**
Herr Dr. Kurt Hassert: Streifzüge in Ober-Albanien. *With Map.*
This will be specially noted.

Turkey—Bosphorus. *G.Z.* **4** (1898): 16–26. **Philippson.**
Bosporus und Hellespont. Von Privatdocent Dr. A. Philippson. *With Map and Plates.*
On the physical geography of the region on both sides of the Bosphorus.

United Kingdom—Coal Supply. *J.R. Statistical S.* **60** (1897): 789–810. **Courtney.**
"Jevons's Coal Question: Thirty Years after." The Inaugural Address of the Right Hon. Leonard H. Courtney, M.A., M.P., President of the Royal Statistical Society. Session 1897–98. *With Diagram.*

United Kingdom—England. *Nineteenth Century* **43** (1898): 47–60. **Jessopp.**
Parish Life in England before the Great Pillage. By the Rev. Dr. Jessopp.
An endeavour to trace the condition of the parish or ecclesiastical geographical unit in England during the thirteenth and fourteenth centuries.

United Kingdom—England. **Murray.**
A Handbook for Travellers in Surrey (including Aldershot). Fifth Edition. With Maps. London: John Murray, 1898. Size 7 × 5, pp. [18] and 450. *Price* 6s. *Presented by the Publisher.*
Surrey is made the subject of a special volume in this edition; the information, although arranged in the same manner as formerly, is revised where necessary.

United Kingdom—Ethnographical Survey. ——
British Association for the Advancement of Science. Toronto Meeting, 1897. Fifth Report on the Ethnographical Survey of the United Kingdom. [Proof incomplete.] London: Offices of the Association. Size 8½ × 5½, pp. 58.

United Kingdom—Ireland. *P.R. Dublin S.* **8** (1897): 421–431. **Kilroe.**
The Distribution of Drift in Ireland in its Relation to Agriculture. By J. R. Kilroe. *With Map.*
A note on this paper will be given.

United Kingdom—Ireland. **Martel.**
Mitchelstown Cave. By E. A. Martel. Reprinted from the *Irish Naturalist*, April, 1896. Dublin: Printed by Alex. Thom & Co., 1896. Size 9 × 6, pp. [6]. *Plan. Presented by the Author.*

United Kingdom—Ireland. *Sci. P.R. Dublin S.* **8** (1897): 475–508. **Praeger and Sollas.**
Report of the Committee consisting of Prof. W. J. Sollas, F.R.S., R. Lloyd Praeger, A. F. Dixon, and Alfred Delap, appointed by the Royal Dublin Society to investigate the recent Bog-flow in Kerry. Drawn up by R. Lloyd Praeger and Prof. Sollas. *Map and Plates.*
This is an authoritative account of the great bog-burst near Killarney, which occurred on December 28, 1896.

United Kingdom—Ireland. *T.R. Dublin S.* **5** (1896): 785–822. **Sollas.**
A Map to show the Distribution of Eskers in Ireland. By Prof. W. J. Sollas, LL.D., etc. *With Maps.*
An interesting piece of work, to which further reference may be made.

United Kingdom—Ireland. *P.R. Irish A.* **4** (1897): 542–549. **Westropp.**
The Distribution of "Cromlechs" in the County of Clare. By Thomas Johnson Westropp, M.A. *With Map and Plates.*

United Kingdom—Rainfall. **Gaster.**
Official No. 114. Rainfall Tables of the British Islands, 1866–90. Published by the Authority of the Meteorological Council. London: Eyre and Spottiswoode, 1897. Size 10 × 6, pp. ii. and 284. *Maps. Price* 6s. *Presented by the Meteorological Office.*
Tables of actual monthly rainfall for (in Part i.) 492 stations for the years 1881–90, with monthly and annual means for the two five-yearly periods 1881–85, 1886–90; (in Part ii.) for 158 stations for varying periods before 1880; and (in Part iii.) an abstract of the mean monthly and annual rainfalls for the period 1881–90 arranged according to counties taken in geographical order. Mr. R. H. Scott gives a preface stating that the work was done in the Meteorological Office under the charge of Mr. Gaster. There are three sketch-maps showing river-basins. It is interesting to look at this Government publication side by side with the Austrian Hydrographic Service Report referred to on p. 191 of this *Journal.*

United Kingdom—Scotland. **Baddeley and Jordan.**
Black's Guide to the Clyde River, and Firth. Edited by M. J. B. Baddeley, B.A., and E. D. Jordan, B.A. Five Maps and Plans. London: A. & C. Black, 1897. Size 7 × 4½, pp. viii. and 84. *Presented by the Publishers.*
This little guide-book of about 90 pages of reading matter is ballasted with 130 pages of advertisements referring mainly to hotels in other parts of the British Islands.

The guide is fairly up to date; but it does not treat of the features which give to the Firth and Lochs of Clyde their greatest charm and interest for intelligent visitors.

ASIA.

Arabia—Kuria-Muria Islands. **Magistris.**

L. F. de Magistris. Le Isole Curiân-Muriân. (Estr. da "Le Comunicazioni di un Collega," a. III. (1896), n. 3.) Pp. 44–47. *Map.* Size 10 × 7. Also a leaflet on the Area of the Islands from *B.S.G. Italiana* (1896), Fasc. v. *Presented by the Author.*

Asia. *Iz. E. Siberian Sect. Imp. Russian G.T.* **27** (1896): 1–40. **Obrucheff.**

W. Obrutscheff Kurze Uebersicht der von der Kaiserlich-Russischen Geographischen Gesellschaft ausgerüsteten Expeditionen zur Erforschung Asiens. [In Russian.]

An epitome of Russian exploration in Asia from 1846 to 1896, one of the papers presented at the Jubilee of the Russian Geographical Society.

Asia—Central. **Lapparent.**

Dans les sables de l'Asie Centrale. Les voyages de M. Sven Hedin. Par A. de Lapparent. Extrait du *Correspondant.* Paris: L. De Soye et Fils, 1898. Size 9¾ × 6½, pp. 22. *Presented by the Author.*

Asia—Central. **Obrucheff.**

Iz. E. Siberian Sect. Imp. Russian G.S. **28** (1897): 144–156.

Sven Hedin's Journey across the Takla-Makan desert, between Kotan and Keria-Dariya, and Lob-Nor. By V. A. Obrucheff. [In Russian; *résumé* in German.]

Asia—Eastern. *Verh. Ges. Erdk. Berlin* **24** (1897): 387–397. **Müller-Beeck.**

Herr Müller-Beeck: Die geographischen Errungenschaften und neuen geographischen Aufgaben in Ost-Asien nach dem japanisch-chinesischen Krieg.

Asia—Eastern. **Orleans.**

From Tonkin to India by the sources of the Irawadi, January, '95—January, '96. By Prince Henri d'Orleans. Translated by Hamley Bent, M.A. London: Methuen & Co., 1898. Size 10¼ × 7¼, pp. xii. and 468. *Map and Illustrations. Price 25s. Presented by the Publishers. A second copy, presented by the Author.*

This will be specially noticed.

Asia Minor, etc. *Petermanns M.* **43** (1897): 249–261, 280–288. **Oberhummer.**

Bericht über eine Reise in Syrien und Kleinasien. Von Roman Oberhummer. *With Map.*

China. *Blackwood's Mag.* **163** (1898): 295–312. ——

The Crisis in China. *With Map.*

China. *Fortnightly Rev.* **63** (1898): 264–279. **Johnstone.**

From Canton to Mandalay. By William Johnstone.

This journey from Canton, occupying six months of 1897, was made *viâ* Mengtze in Yunnan, across the Red river, Ta Lang, Purh-Fu, Sze Mao, across the Mekong, and through the Shan country to Tawnio, Lashio, and Mandalay.

China. *Contemporary Rev.* **73** (1898): 235–240. **Fraser.**

Our Trade with Western China. By John Foster Fraser.

China. **Thomson.**

Through China with a Camera. By John Thomson. London: A. Constable & Co., 1898. Size 9 × 7, pp. xiv. and 284. *Illustrations. Price 21s. Presented by the Publishers.*

A special note will be given on this book.

China—Anthropology. *Mém. Couronnés A.R. Belgique* **54** (1896): 1–104. **Harlez.**

Essai d'Anthropologie Chinoise. Par Ch. de Harlez.

This consists of the results of researches in the Chinese classics, mainly in the form of translated extracts.

China—Historical. **Hirth.**

XI. Internationaler Orientalisten-Congress, Paris, September 1897. Über die einheimischen quellen zur Geschichte der Chinesischen Malerei von den ältesten zeiten bis zum 14. Jahrhundert. Von Prof. Dr. Friedrich Hirth. München and Leipzig: G. Hirth's Verlag, 1897. Size 9 × 6, pp. 40. *Presented by the Author.*

This was referred to in the *Journal* for January, p. 67.

China—Kiao-chow. **Hirth.**
Die Bucht von Kiau-tschau und ihr Hinterland. Vortrag des Professors Dr. Friedrich Hirth gehalten am 6 Dezember 1897 in der Abtheilung München der Deutschen Kolonialgesellschaft. Sonder-Abdruck aus den "Münchner Neuesten Nachrichten." München: Knorr & Hirth. Size 7 × 4½, pp. 22. *Map. Presented by the Author.*

A timely lecture delivered to the Munich branch of the German Colonization Society by Prof. Hirth, whose knowledge of the literature bearing on China well fits him to give a conspectus of the existing information regarding Kiao-chow.

China—Manchuria. **Pozdneyeff.**
Description of Manchuria. Issued by the Imperial Ministry of Finance, and edited by Demetrius Pozdneyeff. Vol. i. St. Petersburg, 1897. [In Russian.] Size 10½ × 7, pp. 620. *Map. Presented by M. Venukoff.* Also *Zemlevedenie* 4 (1897): 101–127.

China—Manchuria. *Zemlevedenie* **3**, 1896 (1897): 149–157. **Sviyagin.**
Eastern Manchuria. By Sviyagin. [In Russian.]

China—Mongolia. **Klemenz.**
Protocol Troitzkosavsk-Kyakhta Br. Amur Sect. Imp. Russian G.S. No. 4 (1896): 5–16.
On the Glaciers of Mongolia. By D. Klemenz. [In Russian.]

China—Mongolia. **Klemenz.**
Iz. E. Siberian Sect. Imp. Russian G.S. **28** (1897): No. 2, 157–159.
Notice on two extinct volcanoes in Khangai Mountains, Northern Mongolia. By D. A. Klemenz. Plan and Profile. [In Russian, summary in German.]

China—Railways. *A travers le Monde, Tour du Monde* **4** (1898): 17–20. **Perrenoud.**
Le chemin de fer de Tientsin à Pékin. Par Alfred Perrenoud. *With Illustrations.*

China—Tibet. *J. Buddhist Text and Anthrop. S.* 5 (1897): 4–23. **Billi.**
A Short Account of the Great Kingdom of Tibet. In 1729 A.D. By Fra Francesco Orazio Della Penna di Billi.

China—Turkistan. **Shaw.**
The History of the Khojas of Eastern-Turkistan, summarized from the Tazkira-i-Khwajagan of Muhammad Sadiq Kashghari, by the late Robert Barkley Shaw. Edited, with Introduction and Notes, by N. Elias. [Published as Supplement to the *Journal* of the Asiatic Society of Bengal, vol. lxvi., part i., 1897.] Calcutta, 1897. Size 9½ × 6½, pp. vi. and 68.

Dutch East Indies. **Van der Kemp.**
Bijd. Taal-, Land- en Volkenk. Ned.-Indië **5** (1898): 8–168.
Het afbreken van onze betrekkingen met Bandjermasin onder Daendels en de herstelling van het Nederlandsch gezag aldaar op den 1e Januari 1817. Door R. H. van der Kemp.

French Indo-China. **d'Enjoy.**
La Colonization de la Cochin-Chine (Manuel du Colon). Par Paul d'Enjoy. Paris: Société d'Editions Scientifiques, 1898 [1897]. Size 7½ × 5, pp. 390. *Price 7 fr. 50.*

A general account of Cochin China, dealing mainly with the economic and social conditions, the regulations affecting the acquisition of land, and advice to intending immigrants. A scheme for a railway from Saigon to Tongking is described.

French Indo-China—Tonkin. *Ann. G.* **6** (1897): 431–449. **Billet.**
Le Haut-Tonkin (région de Cao-Bang). Par M. A. Billet. *With Map.*

A careful study of Cao-Bang with regard to physical geography and resources. The map is on the scale of 1 : 300,000.

India. **Raverty.**
The Mihrán of Sind and its Tributaries: a Geographical and Historical Study. By Major H. G. Raverty. [Reprinted from the *Journal*, Asiatic Society of Bengal, vol. lxi. part i., Extra No. 2, 1892.] Calcutta: Printed at the Baptist Mission Press, 1897. Size 9 × 6½, pp. 293–508. *Maps and Plate. Presented by the Author.*

This completes Major Raverty's laborious research into the history of the Mihran of Sind.

India—Ajmer. *Indian Antiquary* **26** (1897): 162–164. **Bühler.**
The Origin of the Town of Ajmer and of its Name. By G. Bühler.

India—Burma.

Memorandum on the Internal Trade of Burma for the year ending March 31, 1897. Rangoon, 1897. Size 13 × 8½, pp. 8 and xlvi. *Map.*

India—Historical. **Lopes.**

Quarto Centenario do Descobrimento da India. Contribuções da Sociedade de Geographia de Lisboa. Chronica dos Reis de Bisnaga. Manuscripto inedito do Seculo XVI., publicado por David Lopes, S.S.G.L. Lisboa, 1897. Size 10 × 6½, pp. xc. and 124. *Illustrations. Presented by the Hakluyt Society.*

India—Historical. *J. Asiatic S. Bengal* **66** (pt. 1) (1897): 85-112. **Pargiter.**

Ancient Countries in Eastern India. By F. E. Pargiter. *With Map.*

A collection of passages from the Mahabharata and other classics referring to each of the ancient countries of Eastern India.

India—Kashmir—Ladak. *Globus* **73** (1898): 1-8. **Francke.**

Ein Besuch im buddhistischen Kloster Hemis (Ladák). Von Missionar H. Francke. *With Illustrations.*

This article contains many pictures of ceremonial masks worn by the Buddhist monks.

India—Madras. *Globus* **73** (1898): 60-65. **Schmidt.**

Die Mappillas (Morplahs) der Malabarküste. Von Emil Schmidt.

India—Nicobar. *Indian Antiquary* **26** (1897): 217-222. **Man.**

Notes on the Nicobarese. By E. H. Man. No. 1. Numeric System and Arithmetic.

Indian Ports. **Burrard and Roberts.**

Tide-Tables for the Indian Ports for the year 1898 (also January, 1899). Part i.—Western Ports (Aden to Pámban Pass). Part ii.—Eastern and Burma Ports (Negapatam to Port Blair). By Captain S. G. Burrard, and E. Roberts. Size 6½ × 4½, pp. 1140.

India—Poona and the Deccan. **Crawford.**

Our Troubles in Poona and the Deccan. By Arthur Crawford, C.M.G. London: A. Constable & Co., 1897. Size 9 × 6, pp. xx. and 254. *Illustrations. Price 14s. Presented by the Publishers.*

The first four chapters contain a brief history of Poona from A.D. 1500; the remaining sixteen discuss various aspects of modern life in Poona and the Deccan, especially as regards the native peoples and their religious and social views. The author protests in the preface against the Hunterian system of spelling Indian names, which he does not adopt in the text.

India—Rajputana. *J. Asiatic S. Bengal* **66** (Pt. 1) (1897): 164-169. **Pandia.**

Separation of Banswara from Dungarpur State in Rajputana. By Mohanlal Vishnulal Pandia.

Indo-China. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 39-55. **Parker.**

The Keng-hung Contention and the Upper Mekong Trade. By E. H. Parker. *With Map.*

Historical account of the Keng-hung district, and a discussion of the future development of the country.

Japan—Proverbs. **Ehmann.**

Die Sprichwörter und bildlichen Ausdrücke der japanischen Sprache. Gesammelt, übersetzt und erklärt von P. Ehmann. Theil II. (von *Gyakuseki* bis *Ki*). Supplement der "Mittheilungen" der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens. Tokyo, 1897. Size 9 × 6, pp. 49-144.

A collection of Japanese proverbs phonetically transcribed with German translation and explanatory notes.

Korea. **Bishop.**

Korea and Her Neighbours. A Narrative of Travel, with an Account of the Recent Vicissitudes and present position of the Country. By Mrs. Bishop. With a Preface by Sir Walter C. Hillier, K.C.M.G. 2 vols. London: J. Murray, 1898. Size 8½ × 6, pp. (vol. i.) xviii. and 262; (vol. ii.) x. and 322. *Maps and Illustrations. Price 24s. Presented by the Author.*

This important work is specially noticed.

Korea. *Fortnightly Rev.* 63 (1898): 222-238. **Parker.**

Corea. By E. H. Parker.

Mainly historical and political.

Malay Archipelago—Java. *Naturw. Wochenschrift* 13 (1898): 13-18. **Fürst.**

Reise durch Javas unabhängige Fürstenthümer. Von Dr. Fürst.

A visit to some of the native states of Java, in order to study the primitive habits of the Javanese.

Malay Archipelago—Java. **Kohlbrugge.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 14 (1897): 695-712.

Geographische Beschrijving van het Janggebergte (Argopoero) op Java. Door Dr. J. H. F. Kohlbrugge. *With Maps.*

The topographical results of a scientific study of the Jang mountains of Java carried out in January, 1897. The geological and zoological specimens collected are being studied by specialists.

Malay Archipelago—Java. **Scidmore.**

Java, the Garden of the East. By Eliza Ruhamah Scidmore. New York: The Century Co., 1897. Size 8 × 5½, pp. xiv. and 340. *Illustrations. Presented by the Author.*

Miss Scidmore is an experienced traveller, and in her lively description of a tour in Java, she is able to compare that island with other tropical countries. The book is mainly a record of impressions during a visit to Batavia, and to the towns and ruined temples along the railway to Djokjakarta. Two chapters are devoted to the "Culture system," the great economic experiment for which Java is famous.

Malay Archipelago—Philippines. *Globus* 73 (1898): 10-12. **Herrmann.**

Besuch im Golddistrikt von Camarines Norte (Luzon). Von Dr. Rafael Herrmann.

Malay Archipelago—Wallace's Line. ——
Tijds. k. Ned. Aard. Genoots. Amsterdam 14 (1897): 758-765.

De geschiedenis van de lijn van Wallace. Door J. F. Niermeyer.

Summary of the results with regard to Wallace's line as a zoogeographical boundary, expressed in Dr. Weber's recently published work on the zoological results of a journey in the Dutch East Indies.

AFRICA.

British South Africa. ——

Rhodesia: its Goldfields and Prospects. Being the Christmas Number of the *Cape Times.* [1897.] Size 17 × 11½, pp. 56. *Portraits and Illustrations.* Price 1s. *Presented by the Editor of the "Cape Times."*

British South Africa. *Contemporary Rev.* 73 (1898): 282-297. **Mackenzie.**

Bechuanaland. By the Rev. John Mackenzie.

Cape Colony. ——

Colony of the Cape of Good Hope. Agricultural and Livestock Returns for 1896-97. Issued in connection with the Statistical Register, 1896. Cape Town: W. A. Richards & Sons, 1897. Size 13½ × 8½, pp. xvi. and 16.

Central Africa. **Gibbons.**

Exploration and Hunting in Central Africa, 1895-96. By A. St. H. Gibbons. London: Methuen & Co., 1898. Size 9½ × 6, pp. xii. and 408. *Portrait, Map, and Illustrations. Price* 15s. *Presented by the Publishers.*

This will be referred to with other books on Africa.

Congo State. *Mouvement G.* 15 (1898): 1-6. **Cerckel.**

Les galeries souterraines de Mokana (Monts Mitumba). Par Lieut. Léon Cerckel. *With Map.*

Congo State. *Mém. Couronnés A.R. Belgique* 53 (1896): 1-368. **Durand and Schinz**

Études sur la Flore de l'État indépendant du Congo. Par Th. Durand et Hans Schinz.

Congo State—Urua. *Mouvement G.* 14 (1897): 409, 423, 436, 447. **Brasseur.**

L'Urua et le Katanga. Par le commandant Brasseur. *With Map.*

Egypt. **Baedeker.**

Egypt. Handbook for Travellers. Edited by Karl Baedeker. With 22 Maps, 55 Plans, and 66 Views and Vignettes. Fourth Edition. Leipsic: Karl Baedeker:

London: Dulau & Co., 1898. Size 6¾ × 4½, pp. cciv. and 396. *Price 15 marks. Presented by Messrs. Dulau & Co.*

The two volumes previously devoted to Lower and Upper Egypt have been united for this edition, and the text curtailed by one-third. The whole work has been re-arranged and largely re-written by Prof. Georg Steindorff, of Leipzig, and the number of maps increased. The arrangement adopted provides for general articles on such subjects as the origin and present condition of the Egyptians, by Dr. Schweinfurth; and brief treatises on Egyptian History, Geography, Hieroglyphics, etc., as well as the detailed treatment of routes.

Egypt—Cairo. **Reynolds-Ball.**
Cairo of To-Day: a Practical Guide to Cairo and its Environs. By E. A. Reynolds-Ball, B.A. London: A. & C. Black, 1898. Size 7 × 4½, pp. viii. and 256. *Map and Plan. Price 2s. 6d. Presented by the Publishers.*

A compact guide-book of convenient size, and with the notable advantages of large type and clear maps. The information given is of a very practical kind; not the least valuable section to a hurried tourist being entitled "What to omit." The information as to hotels is particularly satisfactory.

Egyptian Sudan. ——
Sudan Almanac, 1898. Compiled in the Intelligence Division, War Office (London). Calculations made at the Nautical Almanac Office. Size 5¼ × 4, pp. 26.

Egyptian Sudan. *B.S.G. Marseille* **21** (1897): 324-327. **Léotard.**
Les compétitions européennes dans le Soudan Egyptien. Par M. Jacques Léotard.

French Sudan. *La Géographie* **11** (1898): 159-162. **d'Attanoux and Lolié.**
Le Soudan Français et les campagnes contre Samory. Par MM. J.-B. d'Attanoux et F. Lolié.

French West Africa. *Rev. Scientifique* **9** (1898): 11-16. **Dex.**
Notre Transsoudanien. Par M. Léo Dex. *With Map.*

On the proposed railway on French territory from the Senegal to the Niger.

German Colonies. *G.Z.* **3** (1897): 585-588. **Kossmat.**
Die Geologie der deutschen Schutzgebiete in Afrika. Von Dr. Franz Kossmat.

German East Africa—Uhehe. *Globus* **73** (1898): 37-43. **Pfeil.**
Uhehe in Deutsch-Ostafrika. Ein Land für weisse Einwanderer. Von Joachim Graf v. Pfeil. *With Illustrations.*

An attractive description of Uhehe as a healthy country for European settlement. The article is illustrated by sketches from Count Pfeil's water-colours of Uhehe scenery.

Madagascar. *B.S.G. Lyon* **14** (1897): 553-575. **Mœurs, Boussand, and Grosclaude.**
Madagascar. Par MM. Mœurs et Boussand, et Grosclaude.

The record of a visit to Madagascar in 1895, in order to study the mineral resources of the island, concerning which there are useful notes.

Madagascar. *B.S.G. Marseille* **21** (1897): 163-174, 277-285. **Sikora.**
Sept ans à Madagascar. Conférence de M. François Sikora.

Madagascar. **Voeltzkow.**
Wissenschaftliche Ergebnisse der Reisen in Madagaskar und Ostafrika in den Jahren 1889-1895, von Dr. A. Voeltzkow. Einleitung von Alfred Voeltzkow. (Sonderabdruck aus den Adhandlungen der Senckenbergischen naturforschenden Gesellschaft, Band xxi., Heft 1.) Frankfurt a. M., 1897. Size 12 × 9½, pp. 76. *Maps and Plates. Presented by the Author.*

This work is divided into parts relating to Madagascar, Juan de Nova (an island in the Mozambique channel), and Aldabra. The last-named island was visited in 1895, and its description occupies nearly half the memoir. Most attention is paid to fauna, but other natural features are also described, and the people also receive some attention. A number of quarto plates give reproductions of photographs.

Somaliland—Zoology. **Magistris.**
L. F. de Magistris. Risultati zoologici della prima spedizione Bòttego nella Somàlia. Roma, 1896. Size 9 × 6, pp. 8.

South Africa. **Bigelow.**
White Man's Africa. By Poultney Bigelow. London and New York: Harper & Brothers, 1898. Size 9 × 6, pp. xvi. and 324. *Illustrations. Price 16s.*

A record of recent history, dealing with the relations of the different states of South Africa since December, 1895.

South Africa. **Coillard.**

François Coillard. Sur le Haut-Zambèze. Voyages et Travaux de Mission. Préface de M. J. de Seynes. Paris: Berger-Levrault & Cie., 1898. Size 11½ × 9, pp. xxviii. and 590. *Portraits, Maps, and Illustrations. Price* 15*s*.

This will be referred to elsewhere.

South Africa. *Verh. Ges. Erdk. Berlin* **24** (1897): 475–478. **Passarge.**

Herr Dr. S. Passarge über seine Reisen in Süd-Afrika (Aus einen Brief an Herrn v. Richthofen).

Notes on travel in the Lake Ngami region, with a sketch-map of the environs of the lake.

West Africa. *La G.* **11** (1897): 150–153. **Chanoine.**

La mission Chanoine au Gourounsi. *With Map.*

NORTH AMERICA.

Cabot's Landfall. **O'Brien.**

Presidential Address on Cabot's Landfall. By Most Rev. Archbishop O'Brien, D.D. From the *Transactions of the Royal Society of Canada.* Second Series, 1897–98. Vol. iii. *Proceedings.* Ottawa: J. Durie & Son. 1897. Size 10 × 7, pp. cv.–cxl. *With Map and Chart.*

Canada. ———

Western Canada Manitoba, Assiniboia, Alberta, Saskatchewan, and North-Western Ontario. How to Get There; How to Select Lands; How to Begin; How to Make a Home. 1897. Size 9 × 6, pp. 56. *Map and Illustrations.*

Canada. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 93–119. **Hodgins.**

Canada's Loss by the Treaty of Independence and since. By Thomas Hodgins, Q.C.

A discussion of the manner in which the boundary treaty between Canada and the United States was carried out.

Canada. **Kennedy.**

The Story of Canada. By Howard Angus Kennedy. (The Story of the Empire Series.) London: H. Marshall & Son [1897]. Size 7 × 4½, pp. 176. *Maps. Price* 1*s.* 6*d.* *Presented by the Publishers.*

A short but exceedingly clear and accurate account of the rise of Canada, the picturesque history of the French colony bulking much more largely than the settlement and development of the west.

Canada. **White.**

The Topographical Work of the Geological Survey of Canada. By J. White. From the *Geographical Journal* for December, 1897. Size 10 × 6½, pp. 8.

This paper, which was read to the British Association in Toronto by Mr. J. White, was accidentally assigned to Mr. J. B. Tyrrell, when it was published in the *Journal.*

Canada—British Columbia. ———

Eighteenth Annual Report of the British Columbia Board of Trade, together with various Appendices, List of Members, Office Bearers, Commercial Charges, etc. August, 1897. Victoria, B.C.: The Colonist Printing and Publishing Co., 1897. Size 9 × 6, pp. 90. *Map and Illustrations.*

Canada—British Columbia. ———

British Columbia, Canada's most Westerly Province. Its Position, Advantages, Resources, and Climate. New Fields for Mining, Farming, and Ranching along the Lines of the Canadian Pacific Railway. Information for Prospectors, Miners, and Intending Settlers. 1897. Size 9 × 6, pp. 32. *Map and Illustrations.*

Canada—British Columbia. **McCain.**

History of the s.s. *Beaver.* Being a Graphic and Vivid Sketch of this Noted Pioneer Steamer and her romantic Cruise for over Half a Century on the Placid Island-dotted Waters of the North Pacific. Compiled by Charles W. McCain. Vancouver, B.C., 1894. Size 6¾ × 5, pp. 100. *Illustrations. Presented by Lady Evans.*

A pleasing account of the life-work of the Hudson Bay Co.'s *Beaver* launched on the Thames in the presence of King William IV. in 1834, the first steamer to enter the Pacific, where she plied for over fifty years with her original engines, and was wrecked at the entrance to Burrard's inlet in 1888.

Canada—Irrigation. **Dennis.**
General Report on Irrigation and Canadian Irrigation Surveys for the year 1895, by J. S. Dennis. Annual Report of the Department of the Interior for the year 1896. Pp. 1–112. Ottawa, 1897. Size 10 × 6½. *Maps and Plates.*

Canada—Montreal. ——
Export Trade of the Port of Montreal for Season 1897. Compiled by the Commercial Department of the *Gazette*, Montreal. Size 9 × 6, pp. 78. *Plan.*

Canada—Niagara Falls. ——
The British Association for the Advancement of Science, at Niagara Falls, Saturday, August 21, 1897. Issued by the Local Committee, Niagara Falls, Canada. Size 10½ × 7, pp. [30]. *Map and Illustrations.*

Canada—Ontario. ——
The Gold Fields of Ontario. From the Fifth Report of the Bureau of Mines and Prof. Coleman's Preliminary Report of Work in 1896. Toronto, 1897. Size 10 × 7, pp. vi. and 156. *Map and Illustrations.*

The official account of the new gold-mining districts, with numerous maps and illustrations.

Canada—Ottawa. ——
Guide to the Central Experimental Farm. Prepared for the year 1897, with Information regarding Crops, etc. Ottawa: Government Printing Bureau, 1897. Size 8 × 6, pp. 14. *Plan.*

Canada—Rocky Mountains. *J. School G.* **1** (1897): 293–299. **Wilcox.**
General Features of the Canadian Rockies. By W. D. Wilcox.

Canada—Yukon District. *B.S.G. Lyon* **14** (1897): 626–630. **Cambefort.**
L'Alaska et les Mines d'or du Klondyke. Par M. J. Cambefort.

An account of the new gold fields and the way thither compiled from various sources.

Canada—Yukon District. *Globus* **72** (1897): 357–362. **Bach.**
Der Golddistrikt am Yukonflusse in Nordwest-Amerika. Von R. Bach. *With Map and Illustrations.*

Canada—Yukon District. *G.Z.* **4** (1898): 26–32. **Deckert.**
Die Goldfelder von Klondike. Von Dr. Emil Deckert.

Canada—Yukon District. **Haverly.**
Klondyke and Fortune. The Experiences of a Miner who has acquired a Fortune in the Yukon Valley. By Charles E. Haverly. London: Southwood, Smith & Co. Size 7½ × 5, pp. iv. and 136. *Price 1s. Presented by the Author.*

This little book gives the story of the gold discovery at Klondike, told in the first person. The writer explains in the preface, "The editor . . . having ascertained that Mr. Clemens, an experienced Californian miner, had returned with a fortune acquired in the Canadian Yukon, he at once took steps to secure from this gentleman, not only useful facts, but matter interesting to fortune-seekers in the frozen north."

Canada—Yukon District. **Ogilvie.**
Extracts from Reports of Wm. Ogilvie, D.L.S., Boundary and other Surveys in the Yukon District—its gold mines, resources, etc. Annual Report of the Department of the Interior for the year 1896. Pp. 40–55. Ottawa, 1897. Size 10 × 6¾.

Mexico and United States. *Trans. Texas A. Sci.* **2** (1897): 33–86. **Townsend.**
On the Biogeography of Mexico and the South-Western United States. II. By C. H. Tyler Townsend.

Red River of the North. **Upham.**
Department of the Interior. Monographs of the United States Geological Survey. Vol. xxv. The Glacial Lake Agassiz. By Warren Upham. Washington, 1895. Size 12 × 9½, pp. xxiv. and 658. *Maps and Plates. Presented by the Survey.*

This magnificent monograph will be the subject of a special notice.

United States—Alaska. **Dall.**
Report on Coal and Lignite of Alaska. By W. H. Dall. Seventeenth Annual Report of the United States Geological Survey . . . 1895–96. Part i. Pp. 771–908. *Maps and Illustrations.* Washington, 1896. Size 12 × 8.

United States—Artesian Wells. **Darton.**
Department of the Interior. Bulletin of the United States Geological Survey. No. 138. Artesian Well Prospects in the Atlantic Coastal Plain Region. By N. H. Darton. Washington, 1896. Size 9½ × 6, pp. 232. *Maps and Plates. Presented by the Survey.*

United States—California. **Lindgren.**
The Gold-Quartz Veins of Nevada City and Grass Valley, California. By Waldemar Lindgren. Seventeenth Annual Report of the United States Geological Survey .... 1895–96. Part ii. Pp. 13–262. *Maps and Illustrations.* Washington, 1896. Size 12 × 8.

United States—California. **Perrine.**
Department of the Interior. Bulletin of the United States Geological Survey. No. 147. Earthquakes in California in 1895. By C. D. Perrine. Washington, 1896. Size 9 × 6, pp. 24. *Presented by the Survey.*

United States—Colorado. **Emmons.**
The Mines of Custer County, Colorado. By S. F. Emmons. Seventeenth Annual Report of the United States Geological Survey . . . 1895–96. Part ii. Pp. 411–472. *Illustrations.* Washington, 1896. Size 12 × 8.

United States—Colorado. **Emmons, Cross, Eldridge.**
Department of the Interior. Monographs of the United States Geological Survey. Vol. xxvii. Geology of the Denver Basin in Colorado. By Samuel Franklin Emmons, Whitman Cross, and George Homans Eldridge. Washington, 1896. Size 12 × 9½, pp. xxii. and 556. *Maps and Plates. Presented by the Survey.*

A complete discussion of the geology of the Denver basin, with a series of beautifully executed maps on the scale of 1 : 125,000, showing the topography, areal geology, economic geology, and geological sections. The short physiographical introduction is illustrated by some photographs of scenery and diagrammatic sections. Most of the other illustrations are drawings of restored fossil vertebrates.

United States—Colorado. **Gilbert.**
The Underground Water of the Arkansas Valley in Eastern Colorado. By G. K. Gilbert. Seventeenth Annual Report of the United States Geological Survey . . . 1895–96. Part ii. Pp. 557–601. *Illustrations.* Washington, 1896. Size 12 × 8.

United States—Dakota. **Darton.**
Preliminary Report on Artesian Waters of a portion of the Dakotas. By N. H. Darton. Seventeenth Annual Report of the United States Geological Survey . . . 1895–96. Part ii. Pp. 609–694. *Maps and Illustrations.* Washington, 1896. Size 12 × 8.

United States—Dakota. **Todd.**
Department of the Interior. Bulletin of the United States Geological Survey. No. 144. The Moraines of the Missouri Coteau and their attendant Deposits. By J. E. Todd. Washington, 1896. Size 9½ × 6, pp. 72. *Map and Illustrations. Presented by the Survey.*

United States—D.C. *National G. Mag.* **8** (1897): 337–344. **Gaillard.**
The Washington Aqueduct and Cabin John Bridge. By D. D. Gaillard. *With Illustrations.*

United States—Geological Survey. **Walcott.**
Seventeenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1895–96. Charles D. Walcott, Director. In three parts. Part i.—Director's Report and other Papers; Part ii.—Economic Geology and Hydrography. Washington, 1896. Size 12 × 8, pp. (part i.) xxii. and 1076; (part ii.) xxvi. and 864. *Maps and Plates. Presented by the Survey.*

United States—Geology. **Darton and Weeks.**
Department of the Interior. Bulletins of the United States Geological Survey. No. 127. Catalogue and Index of Contributions to North American Geology, 1732–1891, by Nelson Horatio Darton (pp. 1046); No. 130, Bibliography and Index of North American Geology, Paleontology, Petrology, and Mineralogy for 1892 and 1893, by F. B. Weeks (pp. 210); No. 135, Ditto for the year 1894, by the same (pp. 142); No. 146, Ditto for the year 1895, by the same (pp. 130). Washington, 1896. Size 9½ × 6. *Presented by the Survey.*

A massive contribution to bibliography, arranged in one alphabet containing authors', geographical, and stratigraphical names. The state is the geographical unit, the subdivisions under each state being chronological.

United States—Hydrography. **Newell.**
Department of the Interior. Bulletin of the United States Geological Survey. No. 140. Report of Progress of the Division of Hydrography for the Calendar Year 1895. By F. H. Newell. Washington, 1896. Size 9 × 6. *Presented by the Survey.*

United States—Hydrography. *Scottish G. Mag.* **14** (1898): 9-18. **Newell.**
The Hydrography of the United States. By Frederick Haynes Newell. *With Maps and Diagram.*

United States—Illinois. **Leverett.**
The Water Resources of Illinois. By Frank Leverett. Seventeenth Annual Report of the United States Geological Survey . . . 1895-96. Part. ii. Pp. 701-849. *Maps.* Washington, 1896. Size 12 × 8.

United States—Indiana. **Dryer.**
Studies in Indiana Geography. Edited by Charles Redway Dryer, M.A., M.D. First Series. Terre Haute, Ind., the Inland Publishing Co., 1897. Size 11 × 8, pp. 114. *Maps.*

This book is dedicated to Prof. W. M. Davis, in recognition for his efforts to improve the teaching and the study of geography. It is an attempt to give the physical geography of the state on a modern basis.

United States—Irrigation.
Department of the Interior. Water-Supply and Irrigation Papers of the United States Geological Survey. No. 4, A Reconnoissance in South-eastern Washington, by I. C. Russell (pp. 56); No. 5, Irrigation Practice on the Great Plains, by E. B. Cowgill (pp. 38); No. 6, Underground Waters of South-western Kansas, by E. Haworth (pp. 64); No. 7, Seepage Water of Northern Utah, by S. Fortier (pp. 50); No. 8, Windmills for Irrigation, by E. C. Murphy (pp. 48); No. 9, Irrigation near Greeley, Colorado, by D. Boyd (pp. 90). Washington, 1897. Size 9 × 6. *Maps and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Pelleschi.**
Los Indios Matacos y su lengua, por Juan Pelleschi. Con una Introducción, por S. A. Lafone Quevedo. Publicado en el Boletin del Instituto Geográfico, Tomo xvii., Cuadernos 10, 11 y 12 y Tomo xviii., Cuadernos 4, 5 y 6. Buenos Aires, 1897. Size 11 × 7½, pp. 248. *Maps. Presented by the Author.*

Bolivia. **Kramer.**
Pedro Kramer. Un nuevo Departamento. (Proyecto de Ley presentado á la Legislatura de 1896.) La Paz, 1897. Size 8 × 5, pp. 86.

A plea for the establishment of a new department in the north-west of Bolivia.

Bolivia. *Globus* **73** (1898): 21-23. **Nusser-Asport.**
Die Arbeiten zur Feststellung der nordwestlichen Grenzen von Bolivia. Von Chr. Nusser-Asport.

On the boundary fixed by the joint Brazilian and Peruvian Commissioners of 1896, and the position of the boundary stones.

Bolivia and Peru. **Zarco.**
Sociedad Geográfica de La Paz—Bolivia. Cuestión de limites entre Bolivia y el Perú. Breve exposición de los antecedentes y del estado actual del litigio. Por José Zarco. La Paz, 1897. Size 8½ × 6, pp. 116. *Presented by M. V. Ballivian.*

Brazil—Tocantins. **Coudreau.**
Henri Coudreau. Voyage au Tocantins-Araguaya 31 décembre 1896—23 mai 1897. Paris: A. Lahure, 1897. Size 11½ × 9, pp. 298. *Map and Illustrations. Price 6s.*

Describes a journey up the Tocantins. Illustrated with a map of the portion of the river traversed on the scale of 1 : 100,000, and numerous views of scenery and portraits of the native tribes. At the end are tables of meteorological observations, etc., and long vocabularies of the Carajá and Cayapó languages.

Chile. *Verh. Ges. Erdk. Berlin* **24** (1897): 461-474. **Steffen.**
Die Chilenische Aisen-Expedition. Von Dr. Hans Steffen.

Chile. *J. School G.* **1** (1897): 289-292. **Ward.**
The Climatic Control of Occupation in Chile. By R. De C. Ward.

Colombia. *Naturw. Wochenschrift* **12** (1897): 231, 265, 289, 301, 349. **Regel.**
Reisebriefe aus Colombia. Von Prof. Dr. Fritz Regel.

Peru and Bolivia—Archæology. **Hodge.**
Bandelier's Researches in Peru and Bolivia. By Frederick Webb Hodge. [From the American *Anthropologist* for September, 1897.] Washington, 1897. Size 9½ × 6½, pp. [10]. *Presented by the Author.*

Venezuela. **Vincent and Humbert.**
B.S.G. Com. Bordeaux **20** (1897): 241–246, 381–389, 422–430.
L'instruction publique au Vénézuela. Par Le Dr. L. Vincent et J. Humbert.
A historical account of education in Venezuela during the eighteenth and nineteenth centuries.

West Indies. *Fortnightly Rev.* **63** (1898): 308–320. **Baden-Powell.**
Hope for the West Indies. By Sir George Baden-Powell, K.C.M.G., M.P.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia—Gold Fields. **Schmeisser.**
Die Goldfelder Australasiens. Unter Mitwirkung des Königlichen Bergassessors Dr. Karl Vogelsang. Herausgegeben von Karl Schmeisser. Berlin: D. Reimer, 1897. Size 11½ × 8, pp. xvi. and 166. *Maps and Illustrations. Price* 12*s.*
This is a record of a long visit of investigation to the goldfields of Australia, Tasmania, and New Zealand, undertaken by Herr Schmeisser, chief of the Prussian Department of Mines, on the part of an English company. The Prussian Government gave him leave of absence on condition of delivering to them the same report as he submitted to the company. This volume contains an account of the journey, maps of the goldfields, and a detailed description of most of them.

Australia. *Deutsche G. Blätter* **20** (1897): 277–287. **Greffrath.**
Geographisch-statistische Übersicht über die australischen Kolonien. II. Die Kolonie Südaustralien. III. Die Kolonie Queensland. Von Henry Greffrath.

Australia—Natural History. *J.R. Colonial I.* **29** (1898): 83–107. **Saville-Kent.**
Australian Natural History Gleanings. By W. Saville-Kent.

Australian English. **Morris.**
Austral English, a Dictionary of Australasian Words, Phrases, and Usages, with those Aboriginal-Australian and Maori Words which have become incorporated in the language, and the commoner scientific words that have had their origin in Australasia. By Edward E. Morris. London: Macmillan & Co., 1898 [1897]. Size 9 × 5¾, pp. xxiv. and 526. *Price* 16*s. Presented by the Publishers.*
This is much more than a list of words. Each reference is fortified by quotations so carefully selected, and so generous in their completeness, as to give an adequate description of most of the things sufficiently characteristic of Australasia to have acquired a special name amongst colonists. A curious history is given of the word "Anabranch," which was applied by Colonel Jackson in the R.G.S. *Journal* of 1834 to the branch of a river which reunites lower down with the main stream. While entirely forgotten by the geographers of Europe, this term has been kept alive for the side channels of rivers in Australia; and amusing instances are cited of its being misunderstood even by the editor of the R.G.S. *Journal* a few years after it was first proposed.

British New Guinea. **Macgregor.**
Report in continuation of Despatch No. 34—Ascent of Mambare River, Punishment of Murderers, etc., etc. [No. 42.] Brisbane, 1897. Size 13½ × 9, pp. 8. *Presented by the Colonial Office.*

British New Guinea. **Macgregor.**
Despatch from the Lieut.-Governor of British New Guinea, reporting on the Mambare Massacre. [No. 34.] London: Printed for Her Majesty's Stationery Office, by Darling & Son, 1897. Size 13½ × 8½, pp. 8. *Presented by the Colonial Office.*

Ellice Group. **Hedley.**
Australian Museum, Sydney. Memoir III. The Atoll of Funafuti, Ellice Group: its Zoology, Botany, Ethnology, and General Structure, based on Collections made by Mr. Charles Hedley. Parts 4 and 5. Sydney, 1897. Size 10 × 6½. *Illustrations. Presented by the Australian Museum.*
Part 4 deals with the ethnology, the author being Mr. Charles Hedley; and Part 5 describes some of the zoological collections.

Hawaii—Molokai. *Globus* **73** (1898): 8–10. **Krämer.**
Der Phallusberg von Molokai (Hawaii-Inseln). Von Dr. Augustin Krämer. *Illustrations.*

New Guinea. **Dorsey and Holmes.**
Field Columbian Museum, Publication 21. Anthropological Series. Vol. ii., No. 1. Observations on a Collection of Papuan Crania. By George A. Dorsey. With Notes on Preservation and Decorative Features. By William H. Holmes. Chicago, 1897. Size 10 × 6¾, pp. 48. *Illustrations.*

New Hebrides. *A travers le Monde, Tour du Monde* 3 (1897): 409-412. **Saint-Seine.**
Les Nouvelles-Hébrides. Mœurs des Indigènes. Par le Comte Jean Le Gouz de Saint-Seine. *With Illustrations.*

New South Wales. *P.R.S. Victoria* 9 (1897): 22-28. **Kitson.**
Geological Notes on the Gehi and Indi Rivers and Monara Gap, Mount Koscuisko, N.S.W. By A. E. Kitson.

New Zealand. **Dadelszen.**
The New Zealand Official Year-Book, 1897. Prepared . . . by E. J. von Dadelszen, Registrar-General. Wellington, 1897. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. vi. and 568. *Illustrations.*
This year-book is enlarged, and rendered even more useful than hitherto.

New Zealand—Southern Alps. **Kronecker.**
Z. Deutschen u. Oesterreich. Alpenv. 28 (1897): 1-33.
Reisen in den Südlichen Alpen Neuseelands. Von Dr. med. Franz Kronecker. *With Illustrations and Map.*
A mountain tour made in 1894.

Queensland. **Rands.**
Queensland. Eidsvold Gold Field. (Second Report by William H. Rands, Assistant Government Geologist.) Brisbane, 1895. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 6. *Map.*

Queensland. **Rands.**
Queensland. Report on the Eidsvold Gold Field. (By William H. Rands, Assistant Government Geologist.) Brisbane, 1897. Size $13\frac{1}{2} \times 9$, pp. 6. *Plans.*

Queensland. **Skertchly.**
Queensland. Tin Mines of Watsonville, and various Tin, Silver, Copper, and Gold Mines at Herberton, Montalbion, Irvinebank, Muldiva, Calcifer, Chillagoe, California Creek, the Tate River, etc.; also Geological Notes on Myola, on the recovery of lost Lodes, and on the Copper Plant. (Report by Sydney B. J. Skertchly, Assistant Government Geologist.) Brisbane, 1897. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 64. *Maps and Sections.*

Queensland. **Skertchly.**
Queensland. Deep (Tin) Lead, Herberton. (Report on the). [By Mr. S. B. J. Skertchly.] Brisbane. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 16. *Maps and Sections.*

Queensland—Geological Survey. ———
Queensland. Annual Progress Report of the Geological Survey for the year 1895. With four maps. Extracted from the Annual Report of the Under Secretary for Mines, for the year 1895. Brisbane, 1896. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 28.

Victoria. *P.R.S. Victoria* 9 (1897): 34-53. **Lucas.**
On some Facts in the Geographical Distribution of Land and Fresh-water Vertebrates in Victoria. By A. H. S. Lucas, M.A., B.SC.
A note on the conclusions arrived at in this paper will be given.

MATHEMATICAL GEOGRAPHY.

Cartography. **Gelcich, Sauter, Dinse.**
Sammlung Göschen. Kartenkunde geschichtlich dargestellt von E. Gelcich und F. Sauter. Zweite . . . Auflage. Von Dr. Paul Dinse. Leipzig: G. J. Göschen, 1897. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. 168. *Illustrations. Price 1s. Presented by Dr. Paul Dinse.*
An excellent little text-book, packed closely with a remarkable amount of accurate and clearly expressed instruction on projections and map-drawing.

Fixing Positions. **Harzer.**
Ueber geographische Ortsbestimmungen ohne astronomische Instrumente. Elementare Darstellung von Dr. Paul Harzer. Dr. A. Petermanns Mitteilungen, Ergänzungsheft. No. 123. Gotha: Justus Perthes, 1897. Size $11 \times 7\frac{1}{2}$, pp. viii. and 128.
This will be specially noticed.

Geodesy. *Ann. Hydrographie* 25 (1897): 535-542. **Neumayer.**
Zur Geschichte der Pendelbeobachtungen. Ein Vortrag, gehalten in der "Gesellschaft Deutscher Naturforscher und Aerzte," geodätisch-geographische Abtheilung, im September, 1897. Von Dr. Neumayer.

Geodesy—Gravity. ——

Veröffentlichungen des Hydrographischen Amtes der Kaiserlichen und Königlichen Kriegs-Marine in Pola. Gruppe iii. Relative Schwerebestimmungen durch Pendelbeobachtungen. I. Heft. Beobachtungen in den Jahren 1893–1896 während der Reisen S. M. Schiffe "Fasana," "Donau," "Aurora," und "Miramar." Pola, 1897. Size 13 × 10, pp. vi. and 76. *Plate.*

Map Projections. *Rev. G. Italiana* **4** (1897): 489–501, 554–560. **Saija and Marinelli.**

Saggio di una classificazione elementare delle proiezioni geografiche dei professori Giuseppe Saija e Olinto Marinelli.

Mathematical and Physical Geography. *Iz. E. Sib. Sect. Imp. Russian G.S.* **27** (1896): 102–120. **Woznessensky.**

A. Woznessensky. Ueber die Thätigkeit der Kaiserlich-Russischen Geographischen Gesellschaft auf dem Gebiete der mathematischen und physischen Geographie. [In Russian.]

Time and Longitude. *C. Rd.* **126** (1898): 192–194. **Sarrauton.**

Sur le Système de l'heure decimale, les divisions du jour et du circle, et la Table géographique. Mémoire de M. Henri de Serrauton.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Astronomy. *Rev. Scientifique* **8** (1897): 481–486, 711–717. **Leclère.**

Le Zodiaque cambodgien. Par M. Adhémard Leclère.

Coral Reefs. *G.Z.* **3** (1897): 514–529, 566–581, 631–643. **Langenbeck.**

Die neueren Forschungen über die Korallenriffe. Von Dr. R. Langenbeck.

A thorough and careful analysis of the theories of coral formation resulting from the study of existing and fossil reefs, leading to the conclusion that fringing and shallow-water reefs are formed in regions which are either stationary or undergoing elevation, while barrier reefs and atolls characterize regions of subsidence.

Geomorphology. *J. Geology* **5** (1897): 809–812. **Smith.**

A Note on the Migration of Divides. By Wm. Sidney Tangier Smith. *Diagrams.*

A study, suggested by San Clemente island lying off the south coast of California, of "the effect on a previously established drainage system of faulting with consequent migration of divides."

Geomorphology. **Suess.**

La Face de la Terre (Das Antlitz der Erde), par Ed. Suess. Traduit de l'Allemand, avec l'autorisation de l'auteur et annoté sous la direction de Emm. de Margerie. Avec une Préface, par Marcel Bertrand. Tome i. Paris: A. Colin et Cie., 1897. Size 10 × 6½, pp. xvi. and 836. *Maps and Illustrations. Presented by the Publishers.*

This will be noticed in the Monthly Record.

Lakes. *Nature* **57** (1898): 321–322. **Wheeler.**

Undulations in Lakes and Inland Seas due to Wind and Atmospheric Pressure. By W. H. Wheeler.

A summary of recent results on seiches and similar phenomena.

Meteorology—Sunspots. *Rev. Scientifique* **8** (1897): 783–786. **Duponchal.**

Les taches solaires et les variations de la température. Par M. A. Duponchal.

Oceanography. *J. School G.* **2** (1898): 16–20. **Davis.**

Winds and Ocean Currents. By W. M. Davis.

Oceanography. **Herdman, Thompson, and Scott.**

On the Plankton collected continuously during two traverses of the North Atlantic in the summer of 1897, with descriptions of new species of Copepoda; and an Appendix on dredging in Puget Sound. By W. A. Herdman, F.R.S.; J. C. Thompson, F.L.S.; and Andrew Scott. [From Trans. L'pool Biol. Soc. Vol. xii. Read November 12, 1897.] Liverpool: T. Dobb & Co., 1897. Size 8½ × 6, pp. [58]. *Plates. Presented by Prof. W. A. Herdman, F.R.S.*

This describes a method of collecting plankton on board an ocean steamer continuously throughout the voyage, and records the results of the application on two voyages between Liverpool and the St. Lawrence.

Oceanography. *Naturw. Wochenschrift* **12** (1897): 518–523, 529–536. **Hjort.**

Untersuchungen über die Organismen und Stromverhältnisse im norwegischen Nordmeere. Von Dr. Johan Hjort. *With Diagrams.*

Oceanography. *Petermanns M.* **43** (1897): 273-279. **Lindenkohl.**
Das spezifische Gewicht des Meerwassers im Nordost-Pacifischen Ozean im Zusammenhange mit Temperatur- und Strömungszuständen. Von A. Lindenkohl. *With Map.*

The map shows the surface salinity of the North-East Pacific from data derived from all the expeditions which have studied that ocean.

Oceanography—Animal Life. *C. Rd.* **126** (1898): 275-277. **Locard.**
Sur l'existence d'une faune malacologique polybathyque dans les grands fonds de l'Atlantique et de la Méditerranée. Note de M. Arnould Locard.

Oceanography—Currents. *C. Rd.* **126** (1898): 293-295. **Thoulet.**
Considérations sur la circulation océanique dans le golfe de Gascogne. Note de M. J. Thoulet.

A note on this will be given.

Oceanography—Currents. *B.S.G. Marseille* **21** (1897): 251-264. **Thoulet.**
De l'emploi d'épaves artificielles pour l'étude des courants marins. Par M. J. Thoulet.

This will be referred to elsewhere.

Oceanography—Gulf of St. Laurence. *Ann. Hydrographie* **25** (1897): 542-547. **Schott.**
Dritter Beitrag zur Hydrographie des St. Lorenz-Golfes. Von Dr. Gerhard Schott. *With Map.*

A summary, with critical remarks, of Mr. W. Bell Dawson's report on the currents in the Gulf of St. Lawrence.

Oceanography—North Sea. *Scottish G. Mag.* **13** (1897): 636-645. **Fulton**
The Surface Currents of the North Sea. By T. Wemyss Fulton, M.B. *With Maps and Illustration.*

Oceanography—Red Sea. **Gräffe.**
Vorläufiger Bericht über die mikroskopischen organismen des aus der Tiefe des Rothen-Meeres gedredschten Schlammes der Expedition S. M. Schiffes "Pola" in den Jahren 1895 bis 1896. Von Dr. E. Gräffe. (Aus den Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien, Mathem.-naturw. Classe; Bd. cvi. Abth. I. October 1897.) Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 8.

Oceanography—Red Sea. **Steuer.**
Vorläufiger Bericht über die pelagische Thierwelt des Rothen Meeres. Von Dr. Adolf Steuer. (Aus den Sitzungsberichten der Kaiserl. Akademie der Wissenschaften in Wien, Mathem.-naturw. Classe; Bd. cvi. Abth. I. Juli 1897.) Wien, 1897. Size $10 \times 6\frac{1}{2}$, pp. 18. *Map.*

Physical Geography. **Günther.**
Handbuch der Geophysik. Von Dr. Siegmund Günther. Zweite Auflage. Erster Band. Stuttgart: F. Enke, 1897. Size $10 \times 6\frac{1}{2}$, pp. xii. and 648. *Illustrations. Price* 15*s.*

The author explains that only the skeleton of the book remains unchanged. While the subdivisions are the same as in the first edition, the work itself has been entirely rewritten. It deals with the place of the Earth in the Universe, the size and form of the Earth, mathematical geography, the physical conditions of the crust, terrestrial magnetism and the aurora. An important historical chapter, indicating the manner in which the modern science of geography arose, is prefixed.

Physical Geography Models. **Davis and Curtis.**
P. Boston S. Nat. Hist. **28** (1897): 85-110.
The Harvard Geographical Models. By William Morris Davis. With a Note on the Construction of the Models. By G. C. Curtis. *With Plates.*
This will be referred to in a note.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Historical—Cosmas. **McCrindle.**
The Christian Topography of Cosmas, an Egyptian Monk. Translated from the Greek, and Edited, with Notes and Introduction, by J. W. McCrindle, M.A. [Hakluyt Society Publication, No. xcviii.] London: Printed for the Hakluyt Society, 1897. Size 9×6, pp. xii., xxviii., and 398. *Plates. Presented by the Hakluyt Society.*

Mr. McCrindle has translated the whole text of Cosmas into English for the first time, thus rendering accessible one of the most important pieces of literature in the history of geography. Cosmas wrote before the knowledge of the ancient Greek geographers had been lost sight of, and his arguments against the true form of the Earth are curiously like those of the Earth-flatteners of to-day. He probably did more than any other man to arrest the progress of geography; and the notes added by Mr. McCrindle, Mr. Coles, and Dr. Burgess demonstrate very clearly the various fallacies which misled him.

Historical Geography. **Hamy.**

Études historiques et géographiques. Par le Dr. E.-T. Hamy. Paris: E. Leroux, 1896. Size 10 × 6½, pp. viii. and 480. *Maps. Price 20s.*

A collection of twenty memoirs, followed by eight appendices dealing with various questions of interest in the history of geography from 1332 to 1804. The longest paper is on the sources of the cartography of Northern Europe.

Historical—Glareanus. **Elter.**

Antonii Elter P.P.O. de Henrico Glareano geographo et antiquissima forma 'Americae' commentatio. Bonnae. Size 11½ × 9, pp. 30. *Facsimile Maps.*

A discussion of several maps by H. Glareanus, dated 1510 onwards, containing the name America, and of Stobnicza's map in the Cracow edition of Ptolemy, published 1512. These maps are reproduced. A note on the subject appeared in the September *Journal*, vol. x. (1897), p. 328.

BIOGRAPHY.

Joest. *Globus* **73** (1898): 46–48. **Andree.**

Wilhelm Joest. Von Richard Andree. *With Portrait.*

Prof. Wilhelm Joest, born March 15, 1852, in Cologne, was distinguished as a scientific traveller in all parts of the world, devoted his attention mainly to anthropology, and died on November 25, 1897, in the Melanesian island of Santa Cruz.

Maples. ———

Chauncy Maples, D.D., F.R.G.S., Pioneer Missionary in East Central Africa for Nineteen Years, and Bishop of Likoma, Lake Nyasa A.D. 1895. A sketch of his Life, with selections from his letters. By his Sister. With Portraits and a Map. London: Longmans & Co., 1897. Size 8 × 5½, pp. viii. and 404. *Price 7s. 6d. Presented by the Publishers.*

This will be specially noticed.

Marco Polo. *Deutsche Rundschau G.* **20** (1898): 181–185. **Wolkenhauer.**

Marco Polo. Von W. Wolkenhauer. *With Portrait.*

Marsigli. *Rev. Scientifique* **8** (1897): 801–805. **Thoulet.**

Un des fondateurs de l'océanographie, Marsigli. Par M. J. Thoulet.

Marsigli lived from 1658 to 1730, and was the author of a work on the physical history of the sea, on account of which M. Thoulet hails him as "the father of oceanography."

Nansen. **Stephen.**

Nansen. By Leslie Stephen.—From *International Journal of Ethics*, vol. viii., No. 1, October, 1897, pp. 1–22. Size 10 × 6½.

This essay takes Nansen's expedition as the text for a discourse on the ethics of adventure, looking on the matter, not from the view-point of science, but of sport. The conclusion is that such enterprises are worthy of commendation.

Raffles. **Boulger.**

The Life of Sir Stamford Raffles. By Demetrius Charles Boulger. London: H. Marshall & Son, 1897. Size 10½ × 7, pp. xvi. and 404. *Portraits, Maps, and Illustrations. Price 21s. Presented by the Publishers.*

A separate note will be given on this book.

Seemann. *Ann. Hydrographie* **25** (1897): 422–424. ———

Karl Hinrich Seemann, geboren den 19 Januar 1843 in Cuxhaven, gestorben den 24 September 1897 in Hamburg.

Captain Seemann (1843–1897), a student of climatology, was an assistant in the German Naval Observatory.

Seler. *Deutsche Rundschau G.* **20** (1897): 133–136. ———

Dr. Eduard Seler. *With Portrait.*

Dr. Seler is a prominent authority on the anthropology of America.

Villegagnon. **Heulhard.**

Arthur Heulhard. Villegagnon, roi d'Amérique un homme de mer au XVI[e] Siècle (1510–1572). Paris: E. Leroux, 1897. Size 13 × 10½, pp. vi. and 366. *Illustrations.*

The biography of one of the most remarkable adventurers of the sixteenth century, with interesting reproductions of ancient illustrations and contemporary maps, relating largely to the Brazilian colony known as "La France Antarctique," which he founded.

Wells. *Deutsche Rundschau G.* **20** (1898): 185–186. **Greffrath.**
Charles Frederick Wells. Von H. Greffrath. *With Portrait.*

Mr. Wells perished in the Calvert expedition across the great desert in Australia.

Zannoni. *Rev. G.* **41** (1897): 401–413. **Drapeyron.**
J.-A. Rizzi Zannoni, géographe italien (1736–1814). Son séjour en France (1757–1776). Par L. Drapeyron.

Zannoni, a native of Dalmatia, was the first hydrographic engineer of the French navy, and a diligent cartographer.

GENERAL.

Almanac. ———
Annuaire pour l'an 1898, publié par le Bureau des Longitudes. Avec des Notices scientifiques. Paris: Gauthier-Villars et Fils. Size 6 × 4, pp. vi., 660, 36, 16, 40, 4, 12, 38.

Almanac. **Olsen.**
1898. The Fisherman's Nautical Almanack and Tide Tables. A Directory of British and Foreign Fishing Vessels, Steamers, etc. By O. T. Olsen. London: J. D. Potter, etc. Size 7½ × 5, pp. 418. *Plan. Presented by the Compiler.*

Asia and Europe—Magnetic Observations. **Fritsche.**
Observations magnétiques sur 500 lieux faites en Asie et en Europe pendant la période de 1867–1894. Par Dr. H. Fritsche. St. Petersbourg, 1897. Size 9 × 6½, pp. 44. *Maps. Presented by the Author.*

Photolithographed tables, maps, and notes on magnetic observations.

Bibliography. **Ritchie.**
Occasional Publications, No. 2. List of the Books in the English Language on Travel, Exploration, and Mountaineering. Published within the Year ending August Thirty-First, 1897. Prepared by John Ritchie, Jr., Librarian of the Society. Boston: Boston Scientific Society, 1897. Size 9 × 6, pp. 18. *Presented by the Author.*

Useful in containing the titles of some books of travel published in the United States, which have not been prominently brought before the British public.

Book of Reference. **Trübner.**
Minerva. Jahrbuch der Gelehrten Welt. Herausgegeben von K. Trübner. Siebenter Jahrgang. 1897–98. Strassburg: Karl J. Trübner, 1898. Size 6½ × 4½, pp. xxiv. and 1130. *Portrait.*

This invaluable work of reference is enlarged and improved, taking account of the chief learned Societies as well as the Universities of the world. The new volume has a fine etching of Dr. Nansen as frontispiece.

British Colonies. ———
Combined Circulars on Canada, and the Australasian and South African Colonies. Circulars Nos. 1–3. January 1, 1898. London: Emigrants' Information Office. Size 8½ × 5½, pp. 14, 42, 16. *Sketch-Map.*

The first of a new series of circulars to be issued quarterly and supplied free of charge to any one applying for them. They give recent official information as to the conditions of the various colonies, the demand for immigrants, the necessary outfits, passage-rates, etc.

Calendar. **Meyer.**
Meyers Historisch-Geographischer Kalender auf das Jahr. 1898. Leipzig und Wien: Bibliographisches Institut. Size 10 × 6½, pp. iv. and 365. *Illustrations.*

A pictorial "tearing-off" calendar, with the picture of some important town or portrait of some famous man for every day of the year. It seems singularly well adapted for arousing interest in geographical and historical matters.

Educational. **[Herbertson.]**
British Association for the Advancement of Science. Toronto, 1897. The Position of Geography in the Educational System of the Country. Report of the Committee. Size 8½ × 5½, pp. 42. *Presented by the Secretary of the Committee.*

A special note on this Report will be given.

Educational—Methods. *Scottish G. Mag.* **14** (1898): 24–29. **Davis.**
Geography as a University Subject. By Prof. William Morris Davis. (Read at the Meeting of the British Association, Toronto, 1897.)

Educational—Methods. **Farnham.**

The Oswego Normal Method of Teaching Geography, prepared for the Practice Department of the Oswego State Normal and Training School of Oswego, N.Y. By Amos W. Farnham. Syracuse, N.Y.: C. W. Bardeen, 1896. Size 7 × 5, pp. 128.

This little book is clear and practical, giving useful hints for teaching geography as an observational science without a book and from the earliest period of school life. While some of the work is applicable to America alone, and some of the methods represent the author's personal views, it is worthy of attention in this country.

Educational—Methods. *G.Z.* 3 (1897): 680-694. **Rittau.**

Das Entwerfen von Kartenskizzen im Unterricht und die Bestimmungen der neuen Lehrpläne darüber. Von Dr. Rittau.

Dr. Rittau controverts Dr. Bludau's objections to the practice of map-drawing in schools, and maintains the usefulness and educational character of such work.

Educational—Textbook. **Mill.**

Pitt Press Series. Elementary Commercial Geography. By Hugh Robert Mill, D.SC. Cambridge: The University Press, 1897. Size 7 × 5, pp. 196. *Price* 1s. 6d. *Presented by the Author.*

Revised to the end of 1897.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Bartholomew**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheets: 15, Norfolk; and 20, Suffolk. John Bartholomew & Co., Edinburgh. *Price* 2s. *each. Presented by the Publishers.*

These two maps form part of the "Reduced Ordnance Survey Series" of England and Wales, in course of publication by John Bartholomew & Co. They are orographically coloured in six shades.

England and Wales. **Ordnance Survey.**

Publications issued since January 8, 1898.

1-inch—General Maps (revision):—

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(*E. Stanford, Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**
Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1897. Sheets: 455, Eupen; 456, Euskirchen. Scale 1 : 100,000 or 1·5 stat. mile to an inch. *Price* 1.50 *mark each sheet.*

Historical Geography. **Poole.**
Historical Atlas of Modern Europe from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Lecturer in Diplomatic in the University of Oxford. Part XV. Oxford: The Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1898. *Price* 3*s.* 6*d. each part. Presented by the Clarendon Press.*

This part contains: Map 27, Scotland about the year 1600, by G. Gregory Smith, M.A.; Map 61, The Spanish Peninsula, showing the Ecclesiastical Divisions from the thirteenth century, by the Editor; and Map 78, Western Asia under the Mohammedan Dynasties, about 970 and 1070 A.D., by S. Lane Poole, M.A. These maps are accompanied by letterpress by the several authors.

Italy. **Instituto Geografico Militare, Firenze.**
Carta d'Italia. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheets: 7, Pizzo Bernina; 11, M. Marmolada; 22, Feltro; 26, S. Pietro Al Natisone; 33, Bergamo; 46, Treviglio; 88, Imola. Instituto Geografico Militare, Firenze. *Price* 1 *li* 50 *centimes each sheet.*

ASIA.

Asia Minor. **Oberhummer.**
Routen-Aufnahmen in Kleinasien ausgeführt im Herbst 1896 von Roman Oberhummer. Scale 1 : 500,000 or 7·8 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1897, Tafel 18. Gotha: Justus Perthes, 1897. *Presented by the Publisher.*

Borneo. **Nieuwenhuis.**
Karte des Mahakam-Flusses in Borneo. Scale 1 : 2,000,000 or 31 stat. miles to an inch. By Dr. A. W. Nieuwenhuis. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 2. Gotha: Justus Perthes. *Presented by the Publisher.*

AFRICA.

German East Africa. **Triloff.**
Die Schambalai oder West-Usambara. Nach einer Skizzenkarte des Missionars F. Lang-Heinrich in Wuga und verschiedenen gedruckten und ungedruckten Quellen, bearbeitet von P. Hermann Triloff. Scale 1 : 200,000 or 3·1 stat. miles to an inch. Gotha: Justus Perthes, 1897. *Petermanns Geographische Mitteilungen*, Jahrgang, 1897, Tafel 20. *Presented by the Publisher.*

Niger. **Caron, Lefort.**
Atlas du Cours du Niger entre Manambougou et Tombouctou. Scale 1 : 50,000 or 1·5 stat. mile to an inch. Cartes levées par E. Caron, Lieutenant de Vaisseau, et P. Lefort, Lieutenant d'Infanterie de Marine. Dressées par J. Hansen, Cartographe de la Société de Géographie de Paris. Paris, 1898. 42 sheets.

This is an important atlas consisting of 41 sheets, and an index map, of the upper Niger between Manambugu and Timbuktu. A line of sounding is given throughout the course of the river between these points, as well as notes on the nature of the country passed through by the surveyors.

AMERICA

Labrador. **Geological Survey of Canada.**

Geological Map of Labrador. Scale 1:1,584,000 or 21·6 stat. miles to an inch. Geological Survey of Canada, 1896. *Presented by the Publishers.* 4 sheets.

This map, which has been compiled from the most recent material, has for its primary object the illustration of the geology of Labrador peninsula, but in addition to this, it is the best map of this region that has been published, and exhibits the results of all explorations up to 1897.

Yukon Gold Fields. **Year Book of British Columbia.**

Map of the Canadian Yukon and Northern Territory of British Columbia. Compiled and engraved for the Year Book of British Columbia, by the Province Publishing Company, Limited, Victoria and Vancouver. Scale 1:654,480 or 18 stat. miles to an inch. 1897.

This is a preliminary map without any hill shading. It shows part of Alaska and northern British Columbia, where the Yukon goldfields are situated. It has been published as recently as January last by a Government Department, and therefore such information as it gives may be taken as the most recent and reliable with regard to the Klondike district.

AUSTRALIA.

Australia. **Hassenstein.**

Karte von Horns Expedition in Zentral-Australien unter Führung von Ch. Winnecke, 1894. Mit Benutzung aller früheren Reisen und Aufnahmen entworfen u. gezeichnet von Dr. B. Hassenstein. Scale 1:1,500,000 or 23·5 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 1. Gotha: Justus Perthes. *Presented by the Publisher.*

GENERAL.

World. **Johnston.**

Johnston's Commercial and Library Chart of the World, on Mercator's Projection. W. & A. K. Johnston, Edinburgh, 1898. 4 sheets. *Presented by the Publishers.*

This map has been brought up to date, and gives a large amount of information with regard to means of communication by land and sea, coaling-stations, naval stations, currents, and depths of the ocean. In addition to this, maps on an enlarged scale are given of Central Europe, the principal British possessions, the Suez Canal and Nile Delta, and the Isthmus of Panama. The map is nicely drawn, and is well suited for general reference in the library or office.

World. **Johnston.**

Royal Atlas of Modern Geography. W. & A. K. Johnston, Edinburgh, 1898. *Price £6 6s. Presented by the Publishers.*

Several additions have been made in the present edition of this atlas. As regards America, the map of the United States on three sheets, which appeared in the last edition, has been replaced by one on four sheets drawn on a larger scale; a new map of Central Canada has also been added. We draw attention to certain corrections and additions which should have been made. On the north polar chart, notwithstanding that Dr. Nansen reached the farthest north ever attained, no notice whatever is taken of it, though the farthest north of other explorers is given; neither is any of the new work in Franz Josef Land shown, nor is it shown correctly on the Mercator map of the world. On the map of South Africa, the railways have not been brought up to date, the Buluwayo railway not being shown as opened beyond Palachwe: this also applies to the Egyptian railways. On the general map of North America, the large Noddawai river, flowing into James bay, is not laid down. The map of British Columbia is out of date, several important places, such as Rossland, being omitted, and the register is unsatisfactory.

The World. **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. Sheets 7, 8, and 9. *Price 2 fr. each sheet.*

No. 7 is a political map of Europe; No. 8 is a physical map of France; No. 9 is a political map of France. Each map is accompanied by a short note, in which mention is made of the material from which it has been constructed.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during November and December, 1897. *Presented by the Hydrographic Department, Admiralty.*

No. Inches.	
2957 to 2960	Quarterly current charts for the Pacific ocean. 1s. each.
2017 m = 4·4	Ireland, south coast:—Dungarvan harbour. 1s. 6d.
431 {m = 1·0, m = 0·47}	North Atlantic ocean:—Gorringe or Gettysburg bank, Princess bank. 1s. 6d.
148 m = 8·9	Balearic islands:—Port Mahon (plan, port Fornells). 2s. 6d.
221 m = 6·0	Greece:—Ports Galaxidi and Itea. 2s. 6d.
1436 m = var.	Plans of anchorages in the Morea:—Port Ieraka, Monemvasia, Xyli bay, Vatika bay (reproduction). 1s. 6d.
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894 m = 3·0	Greece:—Salamis strait and Georgio channel. 1s. 6d.
1526 m = var.	Plans of anchorages in the Grecian archipelago:—Port Raphti, Port St. Nikolo, Port Mandri and Agastira bay, Mandri channel (reproduction). 1s. 6d.
1892 m = var.	Plans of anchorages in the Grecian archipelago:—Kara-agatch bay and lake Burughiul, Xeros islands, Port Baklar (reproduction). 1s. 6d.
1832 m = {4·7, 3·8}	Plans of anchorages in the Grecian archipelago:—Port Trio, Port Naussa (reproduction). 1s. 6d.
1904 m = 7·8	Crete:—Megalo Kastron, or Candia. 1s. 6d.
2982 m = 8·0	Crete:—Anchorages on the south coast of Standia island. 1s. 6d.
1891 m = var.	Plans of anchorages in the Grecian archipelago:—Psara island, Strati island, Purnea bay, Kastro (reproduction). 1s. 6d.
1889 m = var.	Anchorages in the Grecian archipelago:—Cape Krio, with the ruins of Cnidus, town and road of Kos, Gumishlu, Bargylia creek, Levitha islands. 1s. 6d.
1635 m = var.	Plans of anchorages in the strait of Khios:—Port Egri-liman, Port Mersin, Port Sikia-Chesme, Spalmatori islands and port Kolokithia (reproduction). 1s. 6d.
1533 m = var.	Plans of anchorages in the gulf of Kos:—Shehir Oghlan islands, Port Gallipoli, Port Deremen, Yedi Atala (reproduction). 1s. 6d.
1614 m = 5·9	Falkland islands:—Stanley harbour. 1s. 6d.
408 m = var.	Harbours and anchorages in the Bahama islands:—Wide opening, Mira-porvos passage, Clarence harbour (reproduction). 1s. 6d.
409 m = var.	Harbours and anchorages in the Bahama islands:—Hawk's nest anchorage, Cockburn harbour, Ragged island harbour, Wax cay cut (reproduction.) 1s. 6d.
700 m = {1·0, 14·0}	Plans of anchorages in Jamaica:—Negril bay and harbour, Hope bay anchorage. 1s. 6d.
2988 m = {2·6, 1·9}	Gulf of Honduras:—Port Cortez, St. Thomas bight. 1s. 6d.
192 m = 1·75	Gulf of Mexico:—Galveston entrance. 1s. 6d.
2839 m = 1·8	North America, west coast:—Columbia river. 2s. 6d.
1228 m = 0·4	Africa, west coast:—Cape Spartel to Cape Ghir. 2s. 6d.
118 m = 0·52	India, west coast:—Kodiwari mouth to Nirani creek. 2s. 6d.
43 m = 0·45	India, west coast:—Gulf of Kutch. 2s. 6d.
2986 m = 3·0	Andaman islands:—Port Cornwallis. 1s. 6d.
990 m = 3·9	Liu Kiu islands:—Naha roads. 2s. 6d.
1495 m = 0·13	Japan Abumtani bay to Ando Zaki, including Oki islands and Wakasa bay. 2s. 6d.
712 m = 2·0	Australia, west coast:—South Bejaling to Gascoyne road. 1s. 6d.
1437 m = 5·9	Australia, west coast:—Port Hedland. 2s. 6d.
2973 m = 2·9	Australia, south coast:—Esperance bay anchorage. 1s. 6d.
2920 m = 0·5	Australia, east coast:—Cape Direction to Cape Grenville. 2s. 6d.
384 m = 2·0	Plans in Tasmania:—Wedge bay. 1s. 6d.
2983 m = {2·0, 6·0}	Ellice islands:—Funafuti atoll. Fongafale anchorage. 2s. 6d.
2902 m = {1·0, 3·0}	South Pacific ocean:—Rotuma island, Foviung Enua anchorage. 1s. 6d.
17	Santa Cruz islands:—Plan added, Carlisle bay.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2017	Dungarvan harbour.	New Chart. Dungarvan harbour	2017
434	Gorringe or Gettysburg bank.	New Chart. Gorringe or Gettysburg bank, Princess Alice bank	434
148	Port Mahon.	New Chart. Port Mahon	148
1600	Plan of Ports Salona and Galaxidi on this chart.	New Chart. Ports Galaxidi and Itea	221
1437	Xyli bay.		
1436	Vatika bay and Cervi island.	New Chart. Plans of anchorages in the Morea	1436
1519	Port Ieraka Monemvasia.		
1515	Towns and ports of Ægeria.	Ports of anchorages in the gulf of Athens	1816
1816	Port Epidavro.		
894	Salamis strait and Georgio channel.	New Chart. Salamis strait and Georgio channel	894
215	Port Raphti.		
1526	Mandri channel.		
1512	Port Mandri and Agastira bay.	Plans of anchorages in the Grecian archipelago	1526
1516	Port St. Nikolo (Zea island).		
2283	Xeros islands.		
2288	Port Baklar.	Plans of anchorages in the Grecian archipelago	1892
1892	Kara-agatch bay and Lake Barughiul.		
1835	Port Trio.	New Chart. Plans of anchorages in the Grecian archipelago	1832
1832	Port Naussa.		
1904	Megalo Kastron.	New Chart. Megalo Kastron, or Candia	1904
2715	Plans of anchorages in Standia island on this sheet.	New Chart. Anchorages on the south coast of Standia island	2982
1524	Psara island.		
1891	Strati island.	New Chart. Plan of anchorages in the Grecian archipelago	1891
1660	Kastro.		
1662	Purnea bay.		
1559	Town and road of Kos.		
1889	Levitha islands.	New Chart. Plans of anchorages in the Grecian archipelago	1889
1531	Gumishlu Bargylia creek.		
1553	Cape Krio.		
1633	Spalmatori islands and Port Kola Kithia.		
1635	Chesmeh.	New Chart. Plans of anchorages in the strait of Khios	1635
1636	Port Egrilar, Port Mersin, Port Sikia.		
1641	Port Egri-liman.		
1534	Port Gallipoli.		
1535	Shehir, Oghlan islands.	New Chart. Plans of anchorages in the gulf of Kos	1533
1533	Port Deremen.		
1536	Yedi Atala.		
1614	Stanley harbour.	New Chart. Stanley harbour	1614
409	Hawk's Nest anchorage.	New Chart. Harbours and anchorages in the Bahama islands	409
1472	Ragged island harbour.		
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2332	Cockburn harbour.		
408	Mira-por-vos passage.	New Chart. Harbours and anchorages in the Bahama islands	408
2093	Clarence harbour.		
2109	Wide opening.		
1786	Plans of Port Cortez and Omoa harbour to Port Cortez on this sheet.	New Chart. Port Cortez, St. Thomas bight	2988

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2831	Plan of Galveston entrance on this sheet.	New Chart. Galveston entrance	192
1227	Cape Spartel to Azimur.	New Chart. Cape Spartel to Cape Ghir	1228
1228	Azimur to Santa Cruz.		
43	Gulf of Kutch	New Chart. Gulf of Kutch	43
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837	Port Cornwallis.	New Chart. Port Cornwallis	2986
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1055	Plan of Port Hedland on this sheet.	New Chart. Port Hedland	1437
1056	Plan of Gascoyne road on this sheet.	New Chart. South Bejaling to Gascoyne road	712
2920	Cape Direction to Cape Grenville.	New Chart. Cape Direction to Cape Grenville	2920
1079	Plan of Burnett harbour on this sheet.	New Chart. Plans in Tasmania	384
987	Plan of Rotuma island on this sheet.	New Chart. Rotuma island, etc.	2982
766	Plans of Funafuti and of Funafuti anchorage on this sheet.	New Chart. Funafuti atoll	2983

Charts that have received Important Corrections.

No. 1543, England, east coast:—Yarmouth and Lowestoft roads. 2397B, Scotland:—North and east coasts, etc. 1954, Scotland:—Thurso bay to the North Minch, etc. 262A, Channel islands:—Guernsey, Herm, and Serk. 2595, Germany:—Ameland to Jade river, etc. 189, Sicily:—Trapani to Marsala and Ægadean islands. 1233, Black sea:—Kustenji anchorage. 1774, Falkland islands:—Stanley harbour, with Ports William and Harriet. 267, North America, east coast:—Albemarle sound to Cape Fear. 2186, South America, east coast:—Pará river. 2001, South America, east coast:—Monte Video bay, etc. 1324, South America, east coast:—Rio de la Plata to Rio Negro. 1313, Chile:—Channels between Port de Ancud and Port Montt. 1923A, British Columbia:—Cape Caution to Port Simpson, etc. 579, British Columbia:—Quatsino sound, etc. 461, Africa, west coast:—Wari and Benin rivers and creeks. 795, Malacca strait:—Cape Rachado to Singapore. 2402, Straits of Durion, Suji, and Jombol. 2403, Singapore strait. 1680, Borneo:—Darvel bay. 2661A, China sea, northern portion. 1000, Siam:—Pulo Condore group. 1342, Cochin China:—Fan-rang bay to Tong King gulf. 2653, China:—Peiho or Peking river (sheet 1), from the entrance to Ko-ku. 1418, Australia, south coast:—Princess Royal harbour. 1710, Australia, west coast:—Gage roads. 624, Australia, south coast, Hobson bay and Yarra river to Melbourne. 2901, Solomon islands to Ellice islands. 845, Fiji islands:—Kandavu passage to Kowata island, etc. 2691, Fiji islands.

(*J. D. Potter, Agent.*)

North Pacific Ocean. **Lindenkohl.**

Spezifisches Gewicht ($S\frac{17°}{17°}$) des Oberflächenwassers im Nord-Östlichen Grossen Ozean. Gezeichnet von A. Lindenkohl. *Petermanns Geographische Mitteilungen*, Jahrgang 1897, Tafel 19. Gotha: Justus Perthes, 1897. *Presented by the Publisher.*

Pacific Ocean. **Hydrographic Department, Admiralty.**

Quarterly Current Charts for the Pacific Ocean. London: Published at the Admiralty, October 23, 1897, under the superintendence of Rear-Admiral Sir W. J. L. Wharton, K.C.B., F.R.S., Hydrographer. *Presented by the Hydrographer and the Meteorological Office.*

This atlas contains four charts, showing the currents of the Pacific Ocean for the months of January, April, July, and October. These charts have been constructed from a very large amount of material in the Meteorological Office, and afterwards generalized at the Hydrographic Department of the Admiralty by Commander H. E. Purey-Cust, R.N. In the notice accompanying the charts a list is given of the material employed, which includes many thousands of log-books, remark-books, and observations, a considerable number of which have been supplied by foreign governments. The system on which these charts have been drawn is exceedingly simple, and when taken together with the instructions contained in the accompanying notice, should be easily understood by any navigator or student of physical geography.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for January, 1898, and North Pacific Ocean for January and February, 1898. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Afghanistan. **Yate.**

Twenty-six Photographs of Southern Afghanistan, in the neighbourhood of the railway to Kandahar, and the Baluchistan boundary, taken by Major A. C. Yate, 1896-97. *Presented by Major A. C. Yate.*

As the following list will show, these photographs have been taken in a region to which considerable attention is turned at the present time:—

(1) Khattak sword dance; (2) Khattaks of the 2nd Baluch Battalion, doing feats of skill with the sword; (3) View of hills towards Kandahar (north-westward from Chaman), Sarbaldak hill and Amir's fort in foreground; (4) the Residency Quetta; (5) Corner of Chaman Bazar: Pathans shopping, itinerant cobbler in the foreground; (6) Tajik dog and bird fancier in Chaman Bazar; (7) Tame mottled polecat (*Putorius sarmaticus*); (8) Camel plough: owner (a Nurzai Pathan) in centre, his son on his left, and a tramp from Kandahar on his right; (9) Banérwál Malik, or headman; (10) Interior of caravanserai, Chaman; (11) Khattak company of the 2nd Baluchis at sword dance: native officers and musicians in centre; (12) Achakzai nomad camp; (13) Bullocks and plough: Pathans of the Pishin district: Achakzai in centre, and Kákars (father and son) on either side; (14) Back of commanding officer's bungalow at Chaman: laying in firewood for the winter; (15) Railway station at Chaman: tug of war, Pathan *v.* Panjabi Mohammedan (2nd) Baluchis; (16) View on rifle range: team practising for Quetta District Rifle Meeting for 1897; (17) Mir Allahdad Khan, Kurd, from the Bolán, and attendants; (18) Camp of Baluch horsedealers just arrived from Herat; Chaman, September, 1897; (19) Bullock plough; (20) Achakzai nomad camp: camel-hair cloth tents, larder (goat) on pole; (21) Baluch horsedealers; (22) Photograph at Octroi House at Chaman, taken by Lieut. Hawkes, of the 2nd Baluchis; (23) Khattak sword dance; (24) 88th Boundary Pillar of the Baluch-Afghan Boundary, 1¼ mile north-west of Chaman, on the road to Kandahar; (25) Resort in Chaman of Kalandars, Fakirs, Hafizes, and other professional Mohammedan mendicants; (26) Loralai cantonment.

Beira Railway. **Good.**

Seventy-three Photographs of the Beira railway and neighbourhood, taken by H. Good, Esq., 1897. *Presented by H. Good, Esq.*

This set of photographs contains views of the Beira railway and the country through which it passes for the whole of its present length. The views have been well chosen to convey an idea of the general scenery, and form a valuable addition to the Society's collection.

(1) Old ferry, Beira; (2) Roman Catholic church, Beira; (3) Creek on north side of Beira; (4) Portion of Beira in 1893; (5) Beira from lighthouse; (6) Beira lighthouse and meteorological station; (7) Lighthouse near Beira; (8) Main street in Beira; (9) Beira railway hospital; (10) Native kraal near Beira; (11) 10-mile siding; (12) 7 miles from Beira; (13) 25 miles from Beira; (14) Native kraals at Jabas; (15) Orange trees at Jabas; (16) Type of natives; (17) Maintenance Engineer's house at Fontesvilla; (18) The first camp in Fontesvilla; (19) The old landing station at Fontesvilla; (20) Fontesvilla: Pungwe river to the left; (21) 71 miles from Beira: doctor's camp near Cheruva hills; (22) About 72 miles from Beira; (23) 72 miles from Beira (in forest at foot of Liluvu hills); (24) About 74 miles from Beira; (25) About 75 miles from Beira; (26) About 76 miles from Beira; (27) 83 miles from Beira; (28) About 84 miles from Beira; (29) The plate-laying gang at 88 miles from Beira; (30) About 92 miles from Beira; (31) About 93 miles from Beira; (32) About 97 miles from Beira; (33) Reserving-station at 98 miles from Beira; (34) Reserving-station 98 miles from Beira and 62 from Fontesvilla; (35) Railway camp at Amatongas; (36) Railway camp about 100 miles from Beira; (37) Earthworks at 102 miles from Beira; (38) At about 107 miles from Beira; (39) Mudicherri river at 108 miles from Beira; (40) At 108 miles from Beira; (41) About 108 miles from Beira; (42) 108½ miles from Beira; (43) Hoboken: main street; (44) Hoboken back street (111 miles from Beira);

(45) Hoboken (111 miles from Beira); (46) At 111 miles from Beira; (47) Camp at 111 miles from Beira; (48) Railway camp at 111 miles from Beira; (49) About 112 miles from Beira; (50) At 112 miles from Beira; (51) About 113 miles from Beira; (52) About 113 miles from Beira; (53) At 113¼ miles from Beira; (54) About 115 miles from Beira; (55) Manangibas station, engine shed, 116 miles from Beira; (56) About 117 miles from Beira; (57) At 117 miles from Beira; (58) In forest about 117 miles from Beira; (59) In forest at 117 miles from Beira; (60) Police camp, Old Umtali; (61) "Royal Hotel," Umtali; coach leaving for Salisbury; (62) "Richmond" store, 4 miles from Umtali (New); (63) Coach leaving Chimoio with team of oxen; (64) Chimoio, with granite mountain in distance; (65) Chimoio; (66) Store and camp on main transport road between Massi-Kessi and New Umtali (5 miles from Massi-Kessi); (67) Massi-Kessi, Vumba mountain in distance; (68) Temporary bridge near Massi-Kessi; (69) An adit at the "Guy Fawkes" mine, near Massi-Kessi; (70) Massi-Kessi, temporary station; (71) Remains of fort at Old Massi-Kessi; (72) Native huts; (73) Home from the hunting trip.

Kashmir. **Hastings.**

Forty-two photographs of the neighbourhood of Gilgit, Chilas, Nanga Parbat, etc., taken by G. Hastings, Esq. *Presented by G. Hastings, Esq.*

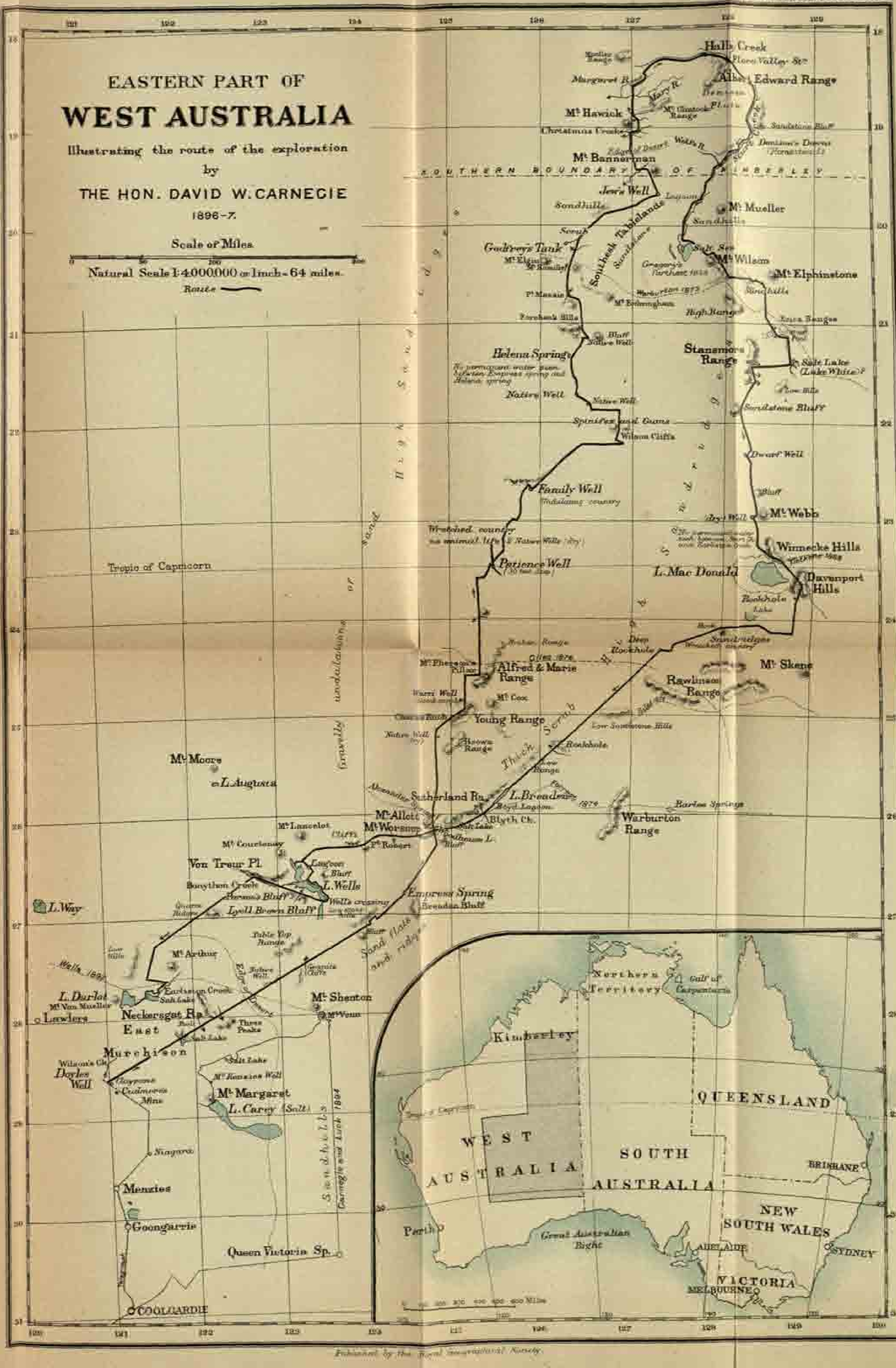
This is a remarkably good set of photographs, and contains some striking examples of the grand mountain scenery of Kashmir.

(1) View of Nanga Parbat (26,620 feet) from Bunji (4600 feet); distance, 36 miles; time, sunrise. (2) Nanga Parbat, from Bunji; time, sunset. (3) Nanga Parbat, the north-west face, taken from the Diamirai Nullah (runs north-west into the Indus). The bank in front is the left lateral moraine of glacier, here from 11,000 to 12,000 feet. (4) Bridge over Indus. (5) River cliff above the Gilgit stream; view looking up the Bagrot nullah. (6) Baltit, the capital of Hunza. (7) Peaks over Nagar, 23,500 feet high. (8) View of the Rupal valley on south side of Nanga Parbat, taken from near to the Tarshing glacier. (9) Nanga Parbat, 26,620 feet, as seen from the south-west, taken *en route* to the Mazeno pass. (10) Hunza valley: view from Nilt, looking across Hunza river towards Maiun. (11) Hunza: the golden Peri and Barpu glacier. (12) Hunza: village shrine. (13) Bridge over the Indus, 6 miles above Bunji. (14) View of Nanga Parbat from the Bunji plain, 41 miles from summit; time, sunrise. (15) View up the Gilgit nullah from the Bunji plain. (16) Tragbal Choki. (17) View of Nanga Parbat and the Gonalo peak from the Indus valley 2 miles below Rhamghat, the junction of the Astor and Indus rivers. (18) Bridge over the Kishenganga river above Gurais. (19) Tragbal Choki, on the Gilgit road. (20) Wular lake from Sonarwain, Bandipore. (21) Nanga Parbat as seen from the Kamri pass, 13,300 feet; distance to summit, 35 miles. (22) Group of coolies from the villages of Tarshing, Zaipuri, and Chorit. (23) A Hunza village, with shrine outside. (24) The Rakiote glacier and moraine cliff of right side of glacier; large forest grows on the outer slope of the lateral moraines. (25) Goatherds hut, and corral in the Lubar valley below the Mazeno pass (north side). (26) Group of headmen from the Bunar villages (Chilas). (27) View up the Indus valley from Chilas fort. (28) The gate of Chilas fort. (29) Bastion of Chilas fort. (30) Bagolah nullah below Chilas fort. (31) Nanga Parbat from the north-west, taken from the Diamirai nullah. The bank on left is the outer slope of the lateral moraine. (32) The Diamirai peak (19,000 feet), the end peak of the western ridge of Nanga Parbat, taken from the right-hand side of the Diamirai nullah, looking south. (33) View over Bandipore nullah, looking on to the Wular lake, Kashmir. (34) Post of Lechir, 6 miles below Ramgat in the Indus valley, site of temporary dam caused by slipping of hillside in 1841, which occasioned immense flood down the Indus valley. (35) Indus river near Bunar post, 15 miles above Chilas. (36) Chilas fort, with main gate and view over Indus valley of hillside on right bank. (37–40) Panorama in four sections of the north face of the west ridge of Nanga Parbat. (41–42) Panorama in two sections of Nanga Parbat and the Gonalo peak.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

Published by the Royal Geographical Society.

E. S. Weller



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VISITS TO BARENTS AND KARA SEAS, WITH RAMBLES IN NOVAYA ZEMLYA, 1895 AND 1897.*

By Colonel H. W. FEILDEN.

The paper which I have the honour of reading to-night contains no thrilling narrative of arctic adventure, no conflicts with "thick-ribbed ice," no dangers or perils which are not incidental to an ordinary yacht voyage in the arctic seas, and no suffering from want of food or the vicissitudes of climate. So far our story will be humdrum enough.

First of all, I must apologize for reading this paper; properly my colleague, Mr. Pearson, ought to have done so, as he was the originator of both voyages and paid for them. The interesting photographic slides which illustrate the voyages were all taken by Mr. Pearson, and represent an enormous amount of labour and hard work.

The chief reason that induced me to draw up this paper was to bring to your notice the very abnormal conditions of the floating ice, in Barents sea, the Kara sea, in the polar ocean around Franz Josef Land, about Spitsbergen, and away to the eastward of the Yugor straits as far as the mouth of the Yenisei, during the summer of 1897. Curiously enough, on almost the opposite side of the globe, in the polar sea beyond the straits of Bering, the ice conditions appear to have been very unfavourable during the past season. We learn that a considerable part of the American whaling fleet has been caught by the unusually early closing of the ice-pack on the Alaskan shore, to the eastward of Point Barrow, and grave fears are entertained that these whaling ships will be destroyed by the polar pack, though it seems probable that the crews will be saved by wintering with the natives of that coast.

It is a matter for congratulation that during the past season,

* Read at the Royal Geographical Society, December 13, 1897. Map, p. 464.

over the great area extending from Spitsbergen to the Yenisei, British explorers, whalers, yachtsmen, and traders have been pursuing their callings at various points, so that we shall rely for a description of this very remarkable ice-season, not on one set of observations, but on many. There are the voyages of the Jackson-Harmsworth yacht *Windward* to and from Franz Josef Land; the Dundee whalers pursuing their business in the same quarter of the polar sea; Mr. Arnold Pike, in the *Victoria*, passing down Hinlopen straits and effecting an easy landing on Wiche's island; Mr. F. W. L. Popham, in the *Blencathra*, conducting a fleet of steamers through Yugor straits to the Yenisei; and Mr. Pearson passing in the *Laura* through the Matyushin shar, finding no ice in the Kara sea and along the east shore of the north island of Novaya Zemlya, as far north as Pachtvssoff island in 74° 24'. But, in order to make it clear to you how abnormal the ice-conditions were in Barents sea this summer, I must ask you to accompany me for a few minutes in our preliminary voyage to Novaya Zemlya in 1895. Mr. Pearson for this trip chartered the English yacht *Saxon*, a small but staunch little steamer of some 50 tons net register and 117 tons yacht measurement. The drawback to this vessel was her small coal-carrying capacity, but she made up for her deficiency in size by the vivacity of her performances; she was certainly the most lively little craft I ever went in. I do not think any of us who sailed in her that summer in Barents sea will ever forget the shakings and knocking about that we received.

I pass over a glorious run through the fjords of the west coast of Norway, which so many of you know well, and those who do not ought to, for it embraces the finest scenery of its kind in Europe, and take you at once to Vardö, merely remarking that the veteran ice-navigator, Captain Johan Kjeldsen, joined us at Tromsö as our ice-master. Leaving Vardö on June 14, our course was laid for the north-west of Novaya Zemlya. Two days after leaving Vardö, on the evening of June 16, we passed through a good deal of loose ice, and at midnight were brought up by heavy pack, which extended north-west, north, and east without a break, and no sign of a water-cloud. Towards those points of the compass an ominous yellow ice-blink hung over the ice-pack. We were then in 72° N. lat. and 45° E. long., the nearest part of Novaya Zemlya being about 120 miles distant. During the two next days we worked along the edge of the ice in a south-easterly direction; every likely bight was entered, and in some places these indentations in the pack-ice were followed up for miles, but invariably they ended in blind leads, and we were brought up by impenetrable ice. On June 17 we reached our nearest to Novaya Zemlya, on the 71st parallel, Goose Land being 80 miles distant. Still working south, and hugging the edge of the pack, we found ourselves on June 19 in lat. 70° N., but the trend of the ice had forced us to the westward some 120 miles from the shores of Novaya Zemlya. At this stage of our voyage we were confronted with the difficulty always hanging over us, viz. the paucity of our coal-supply. The *Saxon* at this juncture had only enough fuel left to take her back to Vardö, whilst little dependence could be placed in her sailing. Our attempt to reach Novaya Zemlya had to be abandoned; we shaped our course for the Murman coast of Russian Lapland, entered the Ukanskoe river, to the westward of Sviatoi Noss, and went into camp near the Lapp summer settlement of Lutni. In the mean time the *Saxon* returned to Vardö for coal.

We passed a delightful week at Lutni, and, if time permitted, I should like to tell you about the Lapps, and their reindeer, and their salmon-fishing, and their houses, and their modes of living, and of the birds and

AUKERY, NAMELESS BAY, NOVAYA ZEMLYA.
(From a photograph by H. J. Pearson, Esq.)

animals and the natural features of that country, and the flowers, and many other things. On June 28 the *Saxon* had returned from Vardö, and we left Lutni. In the afternoon we were abreast of Cape Kanin, which marks the eastern entrance to the White sea, a low uninviting tundra-land, then streaked with patches of snow. Early the next morning we sighted the island Kolguev, and by 7 a.m. were abreast of its northern extremity. Shortly after we saw the ice-pack on our starboard quarter stretching north and south in a solid mass, and resting on the north end of Kolguev. We kept close to the edge of this pack, working to the north-north-west; a midnight observation on July 1 placed us in 71° 3′ N. lat., our approximate longitude being 49° 5′ E.

On July 2, still sailing north-westerly along the edge of the ice, we met with a broad lane or lead between the ice-fields, opening up in the desired direction. With full steam, and every bit of canvas set, we pressed on, for the wind was also favourable. At midnight the high lands of Novaya Zemlya were visible, and in a couple of hours we were within 8 or 10 miles of the low shores of Goose Land. There our further progress was stopped by a close pack, which stretched some 8 miles wide along the entire length of Goose Land, and joined with the main fields of ice which lay on our port and starboard, and through which we had run some 40 miles.

Some narrow leads and cracks showing in the ice to the north-west, the yacht was worked into the pack in that direction, in the hopes that we might get round North Goose cape, and that open water might be found beyond. By the morning of July 3 we had pushed into the pack as far as lat. 72° 10', but we had been edged out nearly 30 miles from the land. We had, therefore, not improved our prospects, but, on the contrary, as the narrow leads we had steamed through were constantly shifting and closing, we were in danger of being beset, and we had consequently to retrace our steps. This was done, and after some difficulty in pushing through narrow barriers of ice, which taxed to the utmost the weak steam-power of the *Saxon*, we entered into a large space of open water, which lay between the pack that girdled Novaya Zemlya and the main ice-fields of Barents sea to the westward. For the rest of that day we moved slowly along the edge of the pack that barred us from the land. It was plain that great movements were taking place in the ice-fields of Barents sea. To our westward, a broad channel some 3 or 4 miles wide opened up. Evidently the entire pack was loosening off the land, and moving forth for its annual break-up in Barents sea. Our stock of coal was now reduced to so low an ebb that we had no alternative but to retreat again. With a favouring wind and a full head of steam, we ran down the channel of water to the south-west at a speed of 9 knots, and in three hours had cleared the ice on our starboard, but still kept it on our port side all the way to the island of Kolguev, which we sighted on the evening of July 4.

On July 5, under very favourable circumstances, we ran down the west side of Kolguev, and made a landing near the mouth of the Gobista river. Our camp equipage and stores were put on shore in all haste, but none too soon, for just as the crew and boats returned to the yacht, and the "farewell" had been hoisted and the *Saxon* bore away for Vardö, the wind had arisen, the waves came thundering on shore, and for the next ten days there was never a time that a boat could have communicated with us. During three days of our stay, the ice-pack came down from the northward and surrounded the western side of Kolguev. I should like to give you some account of this dreary, melancholy island, fog-environed and wind-tormented, but time will only permit a few words. In its scenery there is not one redeeming feature, no mountains, no brawling streams, no woods, no rocky cliffs to ennoble the view. Its entire western shore, from the mouth of the Gusina river to that of the Gobista, is a long straight line of mud and clay bluff, running nearly due north and south. These bluffs rise to a height of about 100 feet at the north-west end of the island, but the beds of which they are composed sink by an almost imperceptible dip from north to south until at the mouth of the Gobista the summit of the bluff is not more than 40 feet above sea-level, and this dip continues in the same direction, for at the mouth of the Kriva river the land almost merges with the sea. Kolguev is, in fact, a recent upheaval of a part of Barents sea, and no doubt gives

DRIFTWOOD, CAPE MATIUSELA, WAIGATS.

(From a photograph by H. J. Pearson, Esq.)

us an accurate representation of the deposits which rest below the waters over a wide surrounding area.

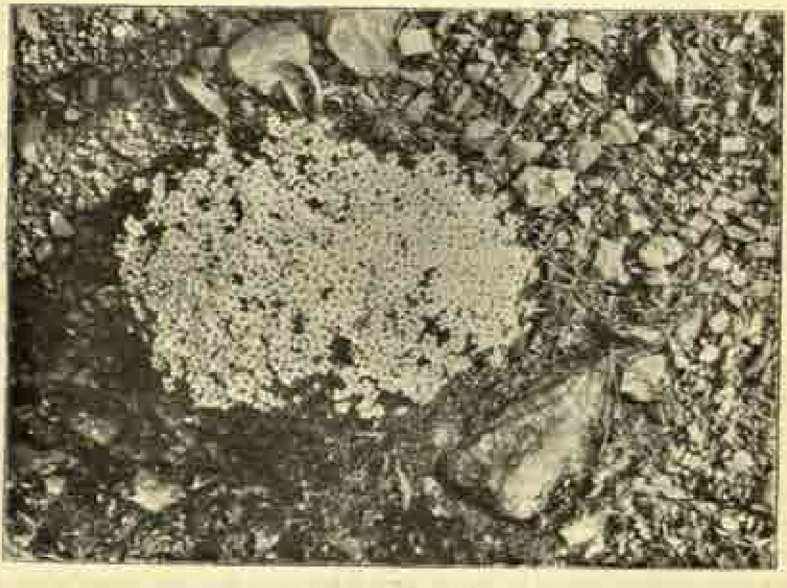
Kolguev is of considerable interest to the naturalist, for, as far as I know, it is the only island of Europe that we can be assured has not had any connection with the mainland since its recent emergence from the surrounding ocean. Consequently its entire flora and fauna must be due to comparatively recent immigration, and the fact that we found earthworms and three species of fresh-water mollusca there is a remarkable proof of how these invertebrates can be transported by natural agencies across the sea. I have a great inclination to linger over this gloomy but to me most interesting island, with its nesting grey plovers, and little stints, and Bewick's swans, and its delightful flora, but we must hurry on.

On the morning of July 16 the *Saxon* returned from Vardö and anchored off the mouth of the Gobista river. Three hours after we were again steaming northward on our third attempt to reach Novaya Zemlya. Rounding the north of the island, we found that a marvellous change had taken place during the past ten days. The endless fields of pack-ice which before extended from Kolguev to Novaya Zemlya had entirely disappeared, now and again we passed a sodden dirty fragment of ice rapidly melting, the fog had gone, and in bright sunlight and with a favouring wind we made the northern entrance of the Kostin schar on the evening of July 17.

We spent the next ten days in visiting the islands in the Kostin shar, exploring the inland waters of the lake of Nekwatowa, and in rambles over Goose Land, leaving the shores of Novaya Zemlya on July 27, and returning direct to Norway.

I have inflicted this summary of our 1895 voyage on you with the object of showing the position of the Barents sea ice in an average summer; but all of us who have voyaged much in arctic seas know how uncertain it is to lay down beforehand, with the smallest likelihood of our predictions being verified, the extension or position of the ice-fields in any given summer season. A few words as to the nature of the Barents sea ice: I speak under correction from men of greater experience. It appears to me that the ice I have met in Barents sea has two very distinct characteristics. There is a northern pack of tolerably heavy oceanic ice, which apparently comes down from between Franz Josef Land and Novaya Zemlya. This ice makes a formidable pack, very much the same as that met with to the north and north-east of Spitsbergen. It does not compare, however, in thickness with the ice that comes down the east coast of Greenland and round Cape Farewell, nor with the ice that comes down Smith sound, or which is to be met with in the polar ocean to the north of Greenland and Grinnell Land. The other description of ice is very different in its nature, and I think is the winter's ice that has been formed between Cape Kanin, Kolguev, and the island of Waigats, and along the shores and in the rivers of the mainland of Russia. The floes are not as thick as those forming the northern pack, but the peculiarity about it is its dirtiness; the floes and hummocks of which it is made up are covered with mud, shingle, and earth. We have sailed for miles along the edge of this pack, and noticed the same features. Later on I will refer more fully to this subject, for I cannot but think that this annual transport of immense quantities of land *débris* to the floor of the ocean must have considerable physical effects.

During 1896, Mr. Pearson, contemplating a sea-voyage to the arctic shores of Russia, endeavoured to find a suitable vessel at home, but, failing in this, went over to Norway and chartered a Norwegian sailing vessel that had been employed in the North Atlantic whale fishery. This ship, about 160 tons register, was thoroughly strengthened, fitted with auxiliary steam power, and renamed the *Laura*. Our old friend Kjeldsen was given the command, and he selected his own crew from amongst the experienced arctic sailors of Tromsö. We sailed under the Norwegian flag. I may here say that the *Laura* proved a most commodious and suitable ship for the service required, and that no one could wish to sail with a better or more obliging crew than our Norwegians. Accustomed to annual trips to Spitsbergen and Novaya Zemlya in their hunting-sloops, these men are thoroughly acquainted



SILENE ACAULIS, WAIGATS
(*From a photograph by H. J. Pearson, Esq.*)

with every shift and turn of the ice, and the vicissitudes of arctic work. Captain Kjeldsen's career and character is so well known amongst all those who take an interest in the doings of the brave Norsk skippers who sail from Tromsö and Hammerfest to the icy seas, that no words of commendation from me could add to his reputation.

On June 4 of the past summer we arrived at Bergen, and went on board the *Laura*. Our party consisted of Mr. H. J. Pearson, Mr. F. Curtis of Guy's Hospital our medical officer, and myself. We sailed the next day for Tromsö. On June 12 we let go our anchor in Tromsö harbour. From Tromsö we steamed to the island of Skaaro, where Mr. J. Giæver, our vice-consul, and from whom Mr. Pearson had chartered the vessel, has a large whaling establishment. There we took in coal from the s.s. *Esk*, direct from England. The steam-petroleum launch which had been supplied to the *Laura* proving quite useless, it became necessary to exchange it for a large steam-launch belonging to Mr. Giæver, which was lying at Skaaro. It was too large to be taken inboard, so it had to be decked over with canvas and towed. Many were the shakings of heads and ominous predictions about this venture. In the end they were all falsified, and the launch returned to Norway in safety, after doing most useful work; indeed, without a steam-launch, not a tenth of the excursions we made could possibly have been accomplished.

Leaving Skaaro on June 17, we essayed to round the North cape, but meeting a stiff north-easterly gale, which we struggled with for twenty-four hours, we had in the end to give in, and take the inside passage between the island of Maagero and the mainland. Calling in at Honnings Vaag, a considerable fishing station on that island, we posted our letters and sent off wires, and then steered our course to the eastward. June 22 opened with a cloudless sky and serene and beautiful weather, the prevailing east wind changed into the south-west. All sail was set. The shade temperature was 60° Fahr., in the sun 80° Fahr. The ship was dressed with every flag we could muster. At mid-day we fired a salute of twenty-one guns on t. - poop from our small arms. The Norwegian crew of their own accord came aft, and gave three ringing cheers for "the good Queen," which they repeated again and again. They afterwards sat down to a good dinner, and our gracious sovereign's health was drunk amidst great enthusiasm.

Early in the morning of the 25th we sighted Kolguev, the sea calm, weather warm and misty; we were within 3 miles of its south-west end when we picked up the island. During the remainder of the day we coasted along its northern and western shore. Kolguev looked as ugly and forbidding as usual, but there was far less snow lying on it than in July, 1895, and not a speck of floating ice in its neighbourhood.

After rounding the north end of Kolguev we were surprised to see no ice; the weather continued very warm, hardly any wind, with occasional banks of fog. We set our course for the island of Dolgoi. On the morning of June 27 we were abreast of the great range of sand islands that fringe the embouchure of the Pechora river, but too far out—some 30 miles—to have even a glimpse of that low-lying land. The weather was perfect; temperature in shade, 52°; of the surface water, 50°. It was pleasant to wash on deck, for the water was brackish, and of a brown peaty colour. The great river had awakened into life, and was pouring its volumes into the icy sea. All around the ship, trees, branches, roots, the tribute of Russian forests, were floating broadcast. It is difficult to realize, until brought face to face with the fact, the great ameliorating influence which the discharge of the mighty rivers of Asia, America, and Europe into the arctic sea must exert on the polar ice and over the polar area.

However, there must be an end to sailing on halcyon seas in every part of the world, and at mid-day, on June 27, we came up to the ice, extending north and south on the meridian of 57°. We ran through some stream ice, and, finding the pack beyond quite impenetrable, we tied up to a large floe and filled up our water-casks. Then we moved slowly under steam along the edge of the pack to the south-west, hoping to find a land-water; but the ice continued across the main entrance to the Pechora delta, and was piled up on the Gouliaieff sandbanks, so there was no road for us that way. Being quite satisfied on that point, we retraced our course along the edge of the pack, and by mid-day of June 28 we were almost in the same position as we had been the day before—namely, N. lat. 69° 40′ and 57° 12′ E. long. The ice we encountered was extremely dirty, covered with gravel and silt; many logs, branches, and trunks of trees were scattered over it. It was of no great thickness, perhaps 8 feet at most; but when pack-ice is broken up and pushed into hummocks and ridges, it gets piled up many feet above its real level of flotation, and gives an impression of thickness far beyond the reality. The sea was like a mirror, of that oily character and absolute smoothness which I have never seen save when steaming through ice in a calm. Such a day is one of the great charms of the arctic seas. The large and handsome king eiders were not uncommon, and my companions shot several of them. All of these birds had their gullets crammed with unbroken *Mya truncata* an inch and more long, and in some cases large *Mactra*, as well as crustaceans, not in the least digested, showing that these birds were getting their food on the spot over which they were diving; as there are no soundings of less than 10 fathoms for miles from where the birds were feeding, it seems that these ducks were popping down to a depth of 60 feet or more for every mouthful! In the afternoon we passed beyond the beautiful sunlight into banks of fog; then came a northerly wind and cold grey fog. We kept along the edge of the pack at the distance of a good cast with a salmon rod; the northerly wind was jamming it up like a wall, and as the waves broke over it the ice-fragments swayed and staggered, and rattled with that peculiar gruesome sound that angry ice affects. What contrasts unfold themselves in these arctic seas! One moment nature basking in warm sunlight and perfect repose, the next everything weird, wild, and melancholy. I am puzzled how to account for the extreme dirtiness of this southern pack, for, in addition to the patches of gravel and earth and silt that lay here and there upon it, it was covered broadcast with a dirty mantle. I think that must result from the extreme shallowness of these seas. When a storm arises the bottom is probably churned up, and the muddy water is washed over the broken floes, leaving a coating of sediment.

We continued coasting along this southern pack, hugging each point, and making north-east whenever we could. It was a dirty night, with fog, sometimes dense; then it lifted, at midnight it cleared, and early in the morning of June 29 we saw land, the hilltops rising like black hummocks above the ice-pack. We at once recognized our position, that we were in the entrance of the Kara straits, and that the black hummocks were the islands at the mouth of Dolga bay, in the north end of Waigats. There were 2 or 3 miles of stream ice, then a mile of close pack to push through between us and open water in Dolga bay. Being determined to make land if possible, we put the ship at the ice, and rammed and charged and pushed; all hands with long poles were pushing and shoving, on and off the ship. Finally our efforts succeeded, and we gained the clear water at the entrance of the bay. I have told you that we had a steam-launch in tow, and during this skirmish with the ice the treatment this poor craft received was very comical. It was decked over with canvas like a Noah's ark, and to see the poor thing dragged over hummocks 6 and 8 feet high was very painful to our feeling. Sometimes it was on an even keel, then dragged along on its beam-ends; at times it was half buried in the ice; but, wonderful to relate, the hawser did not part, and our invaluable launch tumbled into the water of Dolga bay like a harried duck regaining a pond.

I think we were very pleased to gain a safe refuge in Waigats so easily—certainly as much by luck, owing to the friendliness of the ice, as by good guidance. For I am not aware that along the whole coast-line of that island, with the exception of some bights in the straits of Yugor, there is a single safe anchorage but Dolga bay, when the pack-ice is moving up and down in the early part of the season. Though there are several ice-worn islets, with ugly reefs on both sides of the entrance to the bay, yet the centre is clear of dangers, with 20 fathoms of water, and quite easy to make. We anchored in decidedly the best spot, immediately under the south side of the innermost island on the east side of the bay, in 6½ fathoms, clay bottom. I am somewhat precise in these sailing directions, for neither the English nor Russian charts give any particulars, nor can I find that any exploring ship previous to ourselves has anchored in Dolga bay.

As we had been thwarted in our intentions to make Dolgoi island, and from there pass to the mainland of Arctic Russia, which was Mr. Pearson's object when we left England, it was felt desirable that we should make the best of our alternative landing on Waigats.

It is remarkable how very little is really known about an island that, for the past three hundred years, has had such frequent mention in the annals of north-eastern discovery. Scores of expeditions, Dutch, English, Swedish, and Russian, have touched at its shores, but until Mr. Frederick Jackson, in the autumn of 1894, made the complete circuit of the island in company with Samoyeds, and gave us his interesting experiences,* I am not aware that any description had been given of the interior of the island.

As we remained for ten days in Dolga bay, and made many trips in the steam-launch to various parts of the coast, and also wandered far and wide inland, we obtained an experience of the north end of the island in summer which may be worth recording, for Mr. Jackson's visit was made in autumn, when the snow lay on the ground, and consequently we had better opportunities for observation than he had. The valleys of Waigats are so well covered with herbage, that in June and July, when the snow has generally disappeared, and only remains in scattered patches on northern slopes or hollows, it is difficult to realize

BEAR BAY GLACIER, LUTKE LAND.
(*From a photograph by H. J. Pearson, Esq.*)

what a terribly severe winter climate reigns there. Waigats has no glaciers—no attempt, indeed, at any permanent snow deposit. There are no mountain ranges; the highest ridges in the north end may be 300 feet, but the greater part do not exceed 200 feet and less. The island sinks gradually towards the south. The rock formation of Waigats consists chiefly of slates and limestones, which have undergone great upheaval and subsequent denudation. They are nearly vertical, and their strike is from north-west to south-east. Consequently the ridges are formed by the line of strike, and run in the same direction. The

* 'Great Frozen Land' (London: 1895).

troughs or valleys between the ridges are covered with a thick layer of marine boreal clay, containing the shells of *Mya truncata*, *saxicava*, *astarte*, and other mollusca now occurring abundantly in the surrounding sea. Everywhere around we can trace the signs of very recent emergence from the ocean. The modern island of Waigats is, geologically, an upheaval of yesterday. This clay deposit in the valleys and troughs is dotted over with tarns and lakes. Many of these are surrounded with peaty growths. There are consequently three distinct soils—that of the disintegrated rocky ridges, then the predominant marine boreal clay, and the more local peat formations resting on the clay. Each of these divisions of soil have their special flora. The flowers of Waigats make up for the comparative paucity of species by the lavish growth of individual plants. Nowhere in the arctic regions have I seen such wonderful masses of colour; one may wade through acres of blossoming plants a foot high, veritable arctic flower-gardens. In the end of June and beginning of July, *Matthiola nudicaulis*, a delicate pink-blossomed cruciferous plant, with the arctic yellow poppy and louseworts of many colours, from glorious yellow to rich pinks, are spread broadcast. *Polemonium cœruleum*, with its grand blue blossoms, coloured acres; *Saxifraga hirculus*, with its yellow flowers, is perhaps the most abundant and widespread of the plants. Buttercups of several species are predominant, carpeting wide areas; one water-loving species, *Ranunculus Pallasii*, floating on meres and tarns like a miniature water-lily, and pervading the air with its fragrance. *Silene acaulis* is likewise most abundant, growing in clumps and bosses on dry spots and the sides of the ridges among the disintegrated rocks, in such dense masses as to give colour to the cliffs. Then comes the alpine forget-me-not, with its lovely colourings, varying from white to the purest cœrulean blue. My words fail, I know, to give any adequate description of the immense charm attaching to this arctic flora. There are no trees, in the ordinary acceptation of the word, growing on Waigats, but two or three species of willow are abundant; they are, however, only stunted bushes, not growing higher than a foot or a foot and a half.

The tarns and lakes I have spoken of are the resort of many wading birds and divers. We found the little stint (*Tringa minuta*) breeding abundantly, and Mr. Pearson added to his collection the finest series of the eggs of this bird that has ever been brought together. We found that singular bird the ruff (*Machetes pugnax*), and the dotterel (*Eudromias morinellus*) makes Waigats its summer quarters and breeds there. The peregrine falcon nests in the cliffs, and so does the large rough-legged buzzard (*Archibuteo lagopus*). These are interesting facts for ornithologists.

During our stay at Dolga bay we met no Samoyeds, but at Voronoff Noss they have a more or less permanent station. We saw there many sealskins pegged out to dry, and accumulations of blubber ready for transport. Subsequently the Russians of Khabarova told us that small parties of Samoyeds generally winter at Bolvanski Nos and Voronoff Nos, as those are the best stations for winter hunting in the island. On the eastern side of Dolga bay we came across an old sacrificial pile of the Samoyeds; very ancient ice-bears' skulls were the chief garniture of the spot, but a decayed gunstock and other odds and ends showed that offerings had been made there in comparatively recent times.

On July 4 the pack-ice which had been moving up and down the west side of Waigats came swirling into Dolga bay, completely filling it, and packing closely around the ship, but it was not heavy enough to give us the slightest anxiety. It curtailed our launch expeditions, and

LAURA, IN DOLGA BAY, WAIGATS.
(*From a photograph by H. J. Pearson, Esq.*)

obliged us to drag our boats over the pack to and from the shore. This pack-ice, to a great extent, moved in and out of Dolga bay under the influence of wind and tide. As we scrambled over this dripping, rotting, and melting pack, we took notice of the enormous quantities of detritus deposited on the surface of the floe-pieces—stones, gravel, and mud. As the ice-rafts decay this material is thrown to the bottom. It is impossible to form any estimate as to the amount of material transported annually into Barents sea from the mainland, but it is prodigious, and in the course of ages must have exercised great influence in decreasing the depths of that sea. As the valley muds and clays of Waigats and Novaya Zemlya are precisely of the same character as those which come up in the dredge or on the flukes of the anchor from the bays and fiords, there can be no doubt that they were deposited by the same process as we see progressing to-day.

On July 8 there was a thunderstorm. The day had been hot and close, with a warm south-east wind; in the evening the rain came down on us as we were walking on the land, large plashing drops. But the rain-storm we encountered was nothing to that which swept down the centre of the bay. The thunder roared, and was accompanied by vivid flashes of lightning. The violent squalls raised the sea and tossed the ice about. A splendid double rainbow shone forth, and the effect was grand. It is a mistake to suppose that thunderstorms with lightning in the arctic regions are always accompanied by hail; none fell that day. July 9 was a perfect day, temperature in the shade 60° Fahr. The floes around us were dripping at a great rate, and much of the pack had been driven out of the bay by the storm. We took advantage of this, heaved the anchor, and steamed out, working along the western side of the bay where the ice was more loose; by midday we had cleared the headlands and off-lying islets, never having less than 12 fathoms of water. Outside we got into loose, heavy-sailing ice, evidently fragments that had drifted from the Kara sea; but for the exception of occasional heavy pieces of floe, the strait was clear to the eastward as far as our vision extended, and I ought to add that the same conditions existed during the entire time we remained in the north end of Waigats. On no occasion were we able to see the land of Novaya Zemlya from Waigats.

During that day and most of the 10th we steamed leisurely down the west coast, in a perfectly calm sea, and through occasional banks of fog; the shade temperature was from 50° to 53°. We let down the dredge in 20 and 17 fathoms. We passed many dead dragon-flies floating on the water. By the evening the fog had entirely lifted, so we headed in for Liamtschina bay, steering for the mouth of the Talata river. This bay is full of rocks and dangers. We were groping our way in, going dead slow; the leadsman called out 7, 6, then 2½ fathoms, and the next instant we slid up on a rock and stuck there. Fortunately, the sea was like glass, there was little or no wind, and the ice-pack on our port side was asleep. We got up steam in the launch, put our chain cables into the boats alongside, put out a kedge anchor astern, and by dint of hauling at her bow with the steam-launch, and going full speed astern, we got the ship off in a couple of hours without the slightest injury, and no coal had to be thrown overboard. As we had no special interest in discovering more hidden rocks, we departed from Liamtschina bay and worked quietly down to Cape Greben, the south-west point of Waigats, which marks the entrance to Yugor straits. Not a speck of ice was to be seen; the strait was absolutely clear. We anchored in a bay to the eastward of Cape Greben, in 3½ fathoms. Early on the 11th our invaluable steam-launch put us ashore at Cape Greben. The shade temperature when leaving the ship was 60°, on shore intensely hot. Yugor strait lay iceless, calm, and placid. It might have been a summer's day in the Mediterranean. When we landed on the tundra—for the south part of Waigats is far more level than its northern area—we were astonished with the profusion of the flowers: we walked through flower-gardens. Dotterels, little stints, purple sandpipers, with their freshly hatched out broods, ran around us; reeves were fewer in numbers; snow-buntings, shore-larks, and Lapland buntings hopped around; snowy owls sat on the peaty knolls and watched our proceedings with serious interest; the tarns were alive with red-necked phalaropes, chasing one another. It was indeed a very delightful experience. One can hardly hope for elysium on this earth, and this

CAPE GREBEN, WAIGATS.
(*From a photograph by H. J. Pearson, Esq.*)

almost perfect day had one drawback in the myriads of mosquitoes that rose from the tundra. They settled in swarms on our necks and hands, making it necessary to crush the pests every few minutes. Towards evening a dense fog came rolling in from Barents sea; it enveloped us with a pall. The flowers closed their petals, and the birds disappeared, and the mosquitoes as well. Cold and damp, we hurried back to the launch, and made our way to the ship through the dense fog. We found a family party of Samoyeds on board; having seen the ship, they had crossed over from the mainland, and brought with them a large supply of *Salmo alpinus* and *Salmo omyl*. The party consisted of an old man and his wife, their two sons, a daughter-in-law, and her two children, the eldest about two years old. These little Samoyeds in their fur-lined caps are pretty creatures; they of course were stuffed with sugar and chocolate. I brought out a flaring red-checked hand kerchief and tied it round the baby's head. The mother was charmed, and beckoned to one of the young men, who brought up the two largest fish in the boat, some four or five pounds each; these she put into my hands. They asked for vodki, and were refused it; but they left us apparently delighted with a tin of tea, which was given them in exchange for their fish.

On July 13 we crossed the strait, and anchored about a mile from Khabarova, in 5½ fathoms. This little settlement of a few log houses, several Samoyed chooms, a church, and a large store-house, is better known by name than many important towns of Russia. It owes its fame to its unique position. Placed on the shores of Yugor strait, the highway to the Siberian coast-line, it is the last post of civilization on the confines of Europe, and consequently all trading vessels bound to the Yenisei, or exploring ships proceeding to the Kara sea, call in at Khabarova. The settlement is built on a raised beach of gravel; behind is the flat, dreary, monotonous, treeless tundra stretching away for hundreds of miles. The choice of Khabarova for a settlement must, I think, have been determined by the existence of a small lagoon behind the raised beach, into which falls the Nikolski river. The water from this stream keeps open a narrow passage through the bar of shingle, some 30 feet wide, and with some 5 or 6 feet of water at high tide. Through this narrow passage the Russians are able to push their shallow-draught lodjas and karbasses into the lagoon. Once inside they are safe from the ice, no matter how much may be passing through the strait. Most of the Russian traders who summer at Khabarova are natives of the Pechora district, where they pass the winter. In the early spring they leave Pustosesk with their reindeer, and sledge along the shores of the arctic sea to their destination; and when the snows of autumn again make the tundra fit for reindeer-sledging, they return to their homes, with the furs and produce of the chase which their Samoyed employés have collected during the preceding winter. We were cordially received by the chief trader, Ivan Alexandrovich Koshevin and his son, who is well known to several of the gentlemen present here this evening, and indeed by all the Russians at Khabarova. I have no doubt this was in a great measure due to the kindness of Colonel Jule Shokolasky, one of the secretaries of the Imperial Geographical Society of St. Petersburg, who had taken great interest in our expedition, and also informed the Khabarova traders, before they left Pustosesk in the spring, of our contemplated visit to the great Samoyed tundra. We were especially desirous of learning from the Russians what was the likelihood of being able to land from our vessel at the mouth of the Koratoika river, or at any point beyond that to the gulf of Khapidirsk. They one and all expressed doubts, but said, "We cannot be certain, for we know not of any such attempt having been made, not even by our light-draught lodjas. If you want information about the route by land from here to Pustosesk, we can tell you every verst of the way, and the best places to cross the rivers, but we know nothing about the coast navigation. We believe the shore to be shallow for many miles out, and the ice usually remains late in the gulf of Khapidirsk. Some of us have landed on Dolgoi island, but not further south in that direction." This information was truly disheartening, for the object of the expedition was to land on the shores of the great tundra and study the ornithology of that remote region. I will not occupy your time by recounting our walks over the tundra around Khabarova, for that locality has already been described by better-qualified persons than myself, notably Mr. Frederick Jackson.

The weather continuing remarkably fine, a run into the Kara sea was determined on. We left Khabarova early in the morning of July 18, and steamed through the Yugor strait. No ice visible in any direction, and we passed along the east coast of Waigats, in a blue and tranquil sea. So settled was the weather, that when in the afternoon we got abreast of Cape Matiusela, we did not hesitate to drop anchor about a mile from that iron-bound coast, in 5½ fathoms, and to go on shore for a long run.

Marine boreal beds are very conspicuous on this part of Waigats, and for several miles both north and south of Cape Matiusela. They occur as thick beds of clays and sands, resting unconformably on the fundamental rocks of the island. At the Falushiba river to the northward, they attain the great thickness of 115 feet. I found layers of compressed wood in these beds, almost approaching lignite—no doubt sunken driftwood. Moreover, these marine boreal beds are crowded with erratics, many of immense size, often beautifully polished, and grooved and scratched. Near the coast-line streams and runnels flowing from the inland tundra have eaten out dells through the soft sandy marine beds, and the disconnected areas have worn away into rounded knobs, so that at a distance it appears that a line of low hills fringes this coast. At the time of our visit the land was green and covered with flowers, so that, with the bright blue sea and many birds, the scenery was cheerful enough. Almost at the north-eastern extremity of Cape Matiusela, a considerable mass of rock protrudes from the marine boreal clay, like a nunatak from the ice, and on it the Samoyeds have a holy place. It is a poor modern reproduction compared with those described and figured by the early voyagers to Waigats. A cairn of large stones built on the summit of the rocky eminence had a fir pole 8 feet long wedged in. The point of this pole was sharpened, and stuck on it was the cervical vertebra of an ice-bear, muscular fibre and flesh still adhering to this bone. Piled around were seven reindeer skulls and horns, and the skull of one ice-bear. Numerous offerings in the shape of broken tally-sticks, old powder-cans, scraps of iron, and useless odds and ends, were scattered around. It is evident that a remembrance of their ancient heathen worship still lingers amongst the Samoyeds, probably more as an old-fashioned custom to bring good luck in the chase than anything else.

We left Cape Matiusela at midnight of July 18, and returned through the Yugor strait to Khabarova, and steamed to the westward with the object of testing the feasibility of making a landing at the mouth of the Korotaika river. After clearing the Yugor strait we steered to the southward, running parallel and some 8 miles off the Russian coast, and heading for Chornoi Nos. The day was beautiful, the sea like glass, with hardly a breath of air. By the evening of July 19, we were in lat. 69° 20′, just on the last line of soundings given in the chart, but we only got 8 fathoms; as we proceeded the depth continued to shoal gradually but evenly. By midnight, some 20 miles further south, the depth had decreased to 4 fathoms; our ship was drawing 10 feet. We were still some 20 miles from the mouth of the Korotaika. We thought of trying to get there in our launch, but the risk was too great, for if a gale happened to spring up, there was no knowing where our ship might be driven to. The coal for the launch would be expended, and we left on an uninhabited shore, supposing it had been possible to make the land. We reluctantly came to the conclusion that our ship's draught was too great for this shallow coast, so we turned back on our course until we were abreast of the island of Dolgoi, and then bore down to it. In the morning of July 20, we came to anchor about a mile from its eastern shore, in 7 fathoms, hard bottom. Dolgoi Ostrov, or long island, is about 17 miles in length, and a little over 2 miles wide at its broadest. It is the largest of a group of five which lie off Cape Medenski Savarot, and stretch into the sea in a north-north-westerly direction. These islets were well known to the navigators of the sixteenth century, and are mentioned several times in the first and second voyages of Barents. Admiral Lutke gives some little information about them, but I cannot find that they have been visited by our countrymen during recent years, nor am I aware of any published information in regard to their geological structure or natural history.

The rocks of which Dolgoi is made are chiefly limestones and conglomerates, and, as far as my observation goes, are unfossiliferous. They dip very regularly at an angle of 45° to the eastward, and this holds good of the rock exposures on both sides of the island. The entire surface has been worn down to nearly a uniform level. The higher elevations are gentle swells, the most considerable not more than 50 feet in elevation. The whole is covered with a layer of the marine boreal clay, of the same character as that of Waigats and the tundra around Khabarova.

Innumerable shallow meres and ponds are scattered over it. So numerous are they, that walking a straight course is almost out of the question. One has to traverse devious peat ridges and wet marshes to get round the ponds. This Dolgoi is a paradise for birds. Dunlins and red-necked phalaropes flew round and about in scores; the air was alive with divers of two species—red-necked and black-throated; grey plover and their young whirled over their breeding-grounds; reeves, turnstones, shore-larks, snow-buntings, Lapland buntings, red-throated pipits, king eiders, long-tailed ducks, glaucus gulls, and Richardson skuas were all common. The birds seemed to be unacquainted with the murderous propensities of man, for when I shot some ducks the skuas swooped down and battled with me for the prey. I found the botany of the island most interesting; a striking feature was the abundance of *Cassiopeiá tetragona* and *Andromeda polifolia*, two of the *ericaceæ* which I

STINT LAKE, WAIGATS.
(*From a photograph by H. J. Pearson, Esq.*)

had not met with on the tundra around Khabarova, and which are absent from the flora of Waigats and Novaya Zemlya.

On the western shore we came across a Samoyed burial-place. Two weather-beaten old trunks, made of rough-hewn boards, lay under the shelter of a rock. The length of the one was 5 feet by 23 inches, and 13 inches in depth; the other was 5 feet 6 inches long, 24 inches in width, and 14 inches in depth. The boards were put together with wooden pegs and some iron nails. Heavy stones were laid on the lids. On removing these stones and raising the lids, we found that each trunk contained the skeleton of an adult. Judging from the wearing down of the teeth, they might have been elderly folk. But the wearing down of the teeth in savage or semi-civilized races who live by the chase, is not always a safe criterion for age. Both bodies had been buried in all their clothing, and the mouldering remains of their skin "psks" shrouded the skeletons. By their right side lay several articles of domestic use, such as broken wooden bowls, a snuff-box, and scraps of old iron. The long black hair still clung to the skulls. Around the graves were three sledges, more or less broken, and the bone gear for the harness lay scattered about; the reindeer-hide harness had disappeared. A rusty and damaged hatchet-head and a broken iron pot were lying close by. That the dead were left on an island had not been forgotten, for a pair of wooden paddles lay by the sledges. Some hundred yards north of these graves was a smaller box, containing the fragmentary remains of a child, likewise wrapped in reindeer-skin clothing. The second teeth were showing in the lower jaw; probably the age of the child was about five years. There is an incident connected with this grave which is almost a counterpart of what Captain Lyon tells us he met with in an Eskimo child's grave at Igloolik. At the Samoyed child's feet was a snow-bunting's nest containing five eggs, and lying on the mouldering "pesk" a dead snow-bunting with outspread wings.

When I got down to the shore opposite to where the steam-launch was at anchor, with my loads of birds, plants, and rocks, the evening was well advanced, and the weather was still calm and beautiful, but the sea was rolling in with a long ominous swell, so often the presage of wind. In half an hour I was joined by my companions, and we at once started for the ship, which lay about 3 miles farther up the coast. By the time we got alongside, a north-easterly wind had sprung up, and blew so strong that I doubt if we could then have landed or got off the island. The waves were rushing in and breaking on the rocky foreshore, tossing great wreaths of spray 20 feet in the air. Kjeldsen, who was rather anxious about our running the stay on shore so fine, was all ready to leave, and in five minutes after we got alongside, the ship was steaming away from this dangerous lee shore. It was midnight before we had cleared the north point of Dolgoi. The following day we sighted Waigats, but we held on our course for South Goose cape of Novaya Zemlya. We had run out of the bad weather and into a sea like glass; no ice was visible in any direction. At evening time we sighted the southern land of Novaya Zemlya.

July 22 was another bright and beautiful day, and for the greater part of it we were coasting along the west side of Meshdusharsky island. To our surprise we saw through our glasses a frame house with flag-staff and glazed windows on shore, and we afterwards learnt that it had been put up by the Russians for the accommodation of their Samoyed employés, who winter there. In the evening we were abreast of the north-west end of Meshdusharsky. Here are some extensive loomeries, and my companions went on shore and brought back a good supply of looms, *Uria bruennichi*, for the use of the ship's company.

We dropped anchor in Belusha bay, South Goose Land, early in the morning of July 23, just abreast of the Samoyed settlement on the west side of that bay. We had anchored here in 1895, and made acquaintance with the Samoyed settlers of the place, so that we looked forward to renewing our acquaintance with these nice people. We were soon ashore, and went to the settlement. There were the same amount of yelling dogs, and the same amount, if not more, of dirt and filth, that we had met with in our previous visit; but Mrs. Taitaina, the wife of the chief man, was as pleasant and smiling as ever. She recognized us at once, and said, "You are the people who came here two summers ago." Then Mr. Pearson handed to her copies of the photographs of herself and her children, and her choom and her dogs, which he had taken in 1895. She was delighted with them, and her broad honest face illumined with smiles. She told us all the men were inland fishing and

ROSMYSSLOFF'S WINTER QUARTERS, 1768–69.

(From a photograph by H. J. Pearson, Esq.)

hunting, but she hoped they would be back before we left. Then she took us over her establishment, and into a shed where blubber and geese and seal meat and many things were kept. There were long strings of geese-bills hanging up, which she treated somewhat disdainfully, saying, "These are playthings which the children collect;" but when she saw me counting the bills, which I did to see how many belonged to white-fronted geese and how many to bean geese, she begged me to take one of the strings of nebs with as nice manners as one might expect from a great lady in England doing the honours of her house. In this shed, filled with decomposed geese and ill-smelling blubber and reindeer meat, were several glass fishing-floats, which are used by the Loffoden fishermen, and which Mrs. Taitaina informed us are washed up at times on the coast—a very interesting fact, which illustrates that the influence of the Gulf Stream is a real factor on the west coast of Novaya Zemlya.

You may very reasonably ask how we were able to converse so easily with the Russians and Samoyeds; but Kjeldsen can speak Russian fairly well, whilst Petersen, our mate, who had likewise been engaged as interpreter, had resided several years in Siberia, and consequently had an excellent colloquial knowledge of Russian, and an equally good acquaintance with the English language.

Returning to the ship, Mr. Pearson and Kjeldsen shortly after started for the head of the bay in the steam-launch, with the object of exploring more fully a river which discharges into the north-east angle of Belusha bay, and which we partially examined in 1895, and thought must be a stream of considerable magnitude. We gave it then the name of Saxon river, after our yacht.

Mr. Pearson returned to the ship at midnight. He had taken the launch, with considerable difficulty owing to shallows, as far up Saxon river as our turning-point in 1895. Then he took to the land, and after walking along its banks for less than an hour, and passing a few rapids, the so-called river dwindled into the usual type of Novaya Zemlya streams, which at this time of the year might be waded over in many places, not above the ankle. The river in its lower reach was in reality a creek communicating with the sea. Certainly, in 1895 we had tasted the water at our extreme point, and then pronounced it fresh, but no doubt this must have been owing to a stratum of river-water floating on the sea-water. The party had been fortunate in finding many white-fronted and bean geese at the head of the bay and in the creek. These birds were not able to fly, having lately moulted their wing feathers. They brought back thirty-six fine birds, which proved most acceptable, as we had all been living for some time on preserved and salted meats.

We left Belusha bay early in the morning of July 24. The wind was from the south-east, but when we had cleared the bay we set our square sails and ran out between Meshdusharsky and the mainland, keeping the centre of the strait. It is necessary to give Podvezoff island, lying off South Goose cape, a wide berth, as a dangerous submerged reef runs out from it for two, maybe three, miles in a north and south direction. We were nearly wrecked on this reef in 1895. The wind continued favourable till the afternoon, then it shifted to the northward and blew hard, which brought up such a heavy tumultuous sea that we were glad to alter our course and run to the north-west all through that night. On the morning of July 25 we headed in-shore. By evening we had cleared North Goose cape, and were steering for shelter under Cape Britwin (the Razor cape). The next day turned out fine, with light northerly winds; the sea had gone down, and we steamed northwards at a distance of 3 or 4 miles from the shore. The coast-line from Cape Britwin to Nameless bay is not more than 300 to 400 feet high, sloping, and well covered with herbage; snow lay in patches in far greater quantities than on Goose Land farther south. The marks of elevation along this coast are quite distinct; the land runs in parallel lines of grass-covered slopes. We could distinctly trace them to an elevation of not less than 200 feet. At mid-day Nameless bay opened up; we stopped and sounded 3 miles from shore, and got 20 fathoms. Thousands of Bruennich guillemots were passing and repassing to their rock-nurseries in this bay.

In the neighbourhood of the Matyushin shar, and on both sides of that strait, the mountain ranges of Novaya Zemlya rise in series of bold and lofty peaks, snow-clad and entwined by glaciers. Through this alpine region passes a narrow but deep channel connecting the waters of the Barents and Kara seas, and separating the island of Novaya

IRIS GLACIER, ZIWOLKA FIORD.
(From a photograph by H. J. Pearson, Esq.)

Zemlya from the north island, which has been very appropriately named Lutke Land for its southern part, and Barents Land for its northern half. We entered the Matyushin shar on the evening of July 26, and anchored in Cairn bay. The night was gloomy, and the mountains were shrouded in mist. At the head of this bay we were surprised to see a couple of good houses and signs of a permanent settlement.

Very soon after we dropped anchor, the headman of the settlement, a Samoyed, and half a dozen men and boys came off to interview us. We found the chief man extremely intelligent. He was dressed in a coarse cloth great-coat, and wore a Russian decoration; his followers were clad in the ordinary Samoyed dress.

Returning with them on shore, we were assailed as usual by a pack of hungry curs, but the ladies and children rushed out from the house armed with sticks, and belaboured the poor brutes into the semblance of good behaviour; one or two sulky ones were tied up in a trice, and in a few minutes amicable relations existed between us and the dogs.

The larger of the two houses at Cairn bay is an excellent one, built of logs brought from Russia, and boarded over in front. A staircase leads up to the door, which opens into an entrance hall, beyond that a nice room with glazed windows, and a large well-built brick-and-tile stove. A sloping bed of planks occupied one side of the room, which was lined with pine boards. On the walls hung an Ikon, coloured prints, and photographs. Everything was scrupulously clean. In a few minutes the kind mistress placed on the table an immense dish of raw chopped fish and brown bread, which our Norwegian companions discussed with great zest. As Mr. Pearson and I did not join, we were each handed a fine *Salmo alpinus*, a most delicious red-fleshed char, to take away with us.

Our host informed us that this year the ice opened in the strait in May, an unparalleled event in the experience of the Samoyeds; that he and his family had wintered the last three years at Cairn bay; that he had been nine consecutive years in Novaya Zemlya. The winters were undoubtedly long and cold, but that the hunting of ice-bears during the periods of moonlight was most enjoyable. He and his men had killed thirty-nine ice-bears during the past winter. A week before our arrival the Russian trading steamer had called in and taken the skins away. I inquired what price he was given for them, but he could not say until the accounts came back from Russia. He had been credited with fifty-three roubles a skin for the ice-bears he had sold the year before. He told us, also, that year by year animals were getting scarcer, and that the Samoyeds had to keep pushing their hunting-stations farther north. He was just on the point of despatching a party of his men, who would winter at Admiralty peninsula for the purpose of hunting.

We left Cairn harbour the following day, and steamed through this wonderful Matyushin shar to the eastward. The weather was perfect, and we were lost in admiration of the superb scenery through which we passed. I have seen it stated that the towering precipices on either side of this strait crowd together and form a narrow gulf, with only a streak of sky visible between the frowning masses. This is an exaggeration, but all the same the reality is very grand. Nowhere is this strait 2 miles wide, and in some places it contracts to a quarter of a mile; seldom is there any stretch where the water is not lost to view by the closing in of the headlands, and one appears to be passing through a series of lakes surrounded by lofty mountains and overhanging precipices. Many glaciers pour down from the mountains almost to the water's edge, but I do not think that a single one actually discharges into the sea in the whole length of the strait. In the afternoon we steamed into Belusha bay, on the north side of the strait, towards the eastern or Kara sea entrance, and anchored in Seal bay, a most perfect and snug little cove, so small that we had to moor the ship, there being no room for her to swing, and with an entrance between two flat gravel spits just large enough to admit our ship; inside we got 3½ fathoms. As far as protection from the sea or floating ice is concerned, we might have been in a dock.

We remained in Seal bay from July 27 till August 5. During this time the weather on the whole was very good, though on one occasion it blew with great fury for some hours over our anchorage. This fierce wind was, I believe, strictly local. Originating in the lofty snow and ice-covered interior, it came tearing down Belusha bay like a draught through a funnel. Apparently this tempest did not extend to any width, for whilst the entrance to the bay was lashed into foam, the straits both east and west were comparatively tranquil. The tide flows from the Kara, and the rise and fall in Seal bay at neap is about 2 feet. A great amount of Siberian driftwood is stranded on the shores of Belusha bay.

We made almost daily excursions in the steam-launch to various points on both sides of the Matyushin shar, and took long walks into the interior, but time will not permit me to give even a slight account of these pleasant expeditions. We botanized, studied the geology of those parts, collected the birds, and made many observations, the results of which will be published in the future. Perhaps the most interesting series of facts I have to record are the universal proofs of the secular elevation of these lands. Around Belusha bay stretch vast lines of old sea margins. The highest I could locate there with absolute certainty was 500 feet above present sea-level. In places where streams had cut through at that altitude, I found sections replete with the shells of *Mya truncata* and *Saxicava arctica*, then, as now, the commonest mollusk of these arctic seas. Equally significant of the marine origin of these beds is the presence of the tests of foraminifera of the same species as now abound in the surrounding seas. Mr. Joseph Wright, our greatest living authority on the subject, and who has taken in hand the investigation of the samples I brought back, writes me that a specimen of clay weighing 3 oz. troy, that I took from a shell bed at an elevation of 300 feet in the neighbourhood of Belusha bay, contained between two and three thousand specimens of foraminifera of thirty-five different species! Nor are signs of recent elevation confined to a limit of 500 feet, for I found on the summits of mountains 800 feet high, erratic boulders of granite and foreign rocks, the presence of which I cannot refer to the action of terrene, but to floating ice. These marine terraces likewise fringe the shore-line of to-day, a very notable one about 100 feet in height girdling the entire east side of Belusha bay. Subsequent stream-erosion has in some places effected great denudation, but outliers in the shape of rounded isolated hills, which remind one of eskers, are common enough. One of these has been dignified by von Heuglin in his chart* of Belusha bay as Albert peak.

* Special plan, Chart No. 318, published May, 1872 (Hydrographical Office, Washington, D.C.).

Can it be that this comparatively recent emergence from the sea, of the Russian tundra bordering the arctic ocean, of Waigats, of Novaya Zemlya, of Lutke and Barents Lands, has caused the withdrawal of the glacial period from Lapland, Scandinavia, and possibly Great Britain? This is certainly a startling theory for me to advance. But I found evidences which seem to me convincing, that the Russian tundra bordering the arctic sea, Waigats, Novaya Zemlya, and the North island were submerged in post-pliocene times 1000 feet below their level of to-day. This submergence must have permitted the ice of the eastern arctic seas to press down on Lapland and Scandinavia. What was the decrease at the shore-line in the mean annual temperature of Lapland and North Scandinavia under those conditions, is a matter for calculation, but it must have been very great.

Then came the secular upheaval of the lands I have mentioned, to a height of 1000 feet, and a nearly continuous breakwater of 600 to 700 miles long was raised, running nearly north and south into the polar sea. The results arising from this interposition of land we can see for ourselves. On the one side is the "ice-cellar" of the Kara, on the other the comparatively warm waters of Barents sea. A certain amount of the Kara sea ice now pushes through the straits of Yugor and the Kara strait, but this volume of ice has little effect in lowering the temperature of the waters of Barents sea. How different would be the result if the stupendous accumulation of ice, which is now fended off by Waigats and Novaya Zemlya, was pressed upon the shores of Lapland and North Norway! It would be an ice-drift equalling, if not exceeding in magnitude, the great polar drift which, sweeping down the east coast of Greenland, glaciates that island-continent, to nearly the same parallel as the Shetlands. This question, however, if it were dealt with in detail, would lead us rather beyond the science of geography, and I have discussed it fully in a paper which I hope to read in a few weeks' time before the Geological Society of London.

I think it ought to be mentioned that one of our excursions was to a bay on the south side of Matyushin shar, immediately west of Gubin bay, into which runs a stream marked in charts under the name of Farassowa. The sides of the mountains on both flanks of this valley are largely composed of iron ore for a thickness of some hundreds of feet. The bottom of the valley is filled with fragments that have been washed down or fallen. I also obtained traces of copper ore. This valley is well worthy the attention of a Russian mineralogist.

We did not realize, until near the close of our stay in Seal bay, that this was the same Seal bay where the celebrated Russian explorer Rosmyssloff passed the winter of 1768–69, and but for a fortuitous discovery of some graves, we should have left the place oblivious of the fact. Those who are acquainted with the history of Russian scientific discovery in Novaya Zemlya, may remember that when Rosmyssloff determined to winter, his resources were so inadequate, and his means of housing his party so limited, that he divided it, one portion under the pilot Gubin settling at Cape Wood (Drowanoi Myss), on the south side of the channel, and he himself and the rest of his men putting up their hut in Seal bay. The ruins of Gubin's hut on Cape Wood are still quite recognizable, and the remains of bears' bones, crumbling and lichen-covered, are strewed around. Lately (1889) the Russians have erected at this spot a wooden cross with an inscription, to commemorate the wintering of Rosmyssloff's party. Whilst examining the rocky promontory that forms the western side of Seal bay, we came upon a cairn of large stones inside of it was a coffin. Some of the stones had fallen down and bulged in the lid; we removed these, and inside lay

IRIS GLACIER, ZIWOLKA FIORD.

(*From a photograph by H. J. Pearson, Esq.*)

the perfect skeleton of a very tall man. The coffin had been made with much labour out of hewn boards, probably from driftwood. The care which had been taken in the burial showed that it must be that of a person of some importance, for close by was another skeleton simply covered over with a cairn; a further search showed five more graves of the same description. Then we felt sure that these graves must have some connection with the ruins of a Russian hut built on the gravel spit immediately below. And it dawned on us that Rosmyssloff's party lost seven of their number, and that the second in command, the pilot Tschirakin, died after great suffering on November 17, 1768. We therefore feel tolerably sure that the skeleton of the tall man in the coffin is that of the pilot. But at some little distance from the grave a portion of an inscribed head-board was found lying among the rocks, which we brought away, and if decipherable will settle the point. Then we mended the lid, re-covered the coffin and re-built the cairn, placing great stones as supports across the side walls to protect the coffin, and reared up a cairn, so that the pilot's remains may rest undisturbed by the elements for centuries to come. The ruins of Rosmyssloff's hut stand on the flat stretch of shingle at the entrance to Seal bay, about 2 feet above high-water mark, and some 50 yards from the shore. The roof, which had been made of logs simply laid across the side-walls and covered over with shingle, had fallen in; the timbers have nearly mouldered away. The foundations of the hut are easily traced—only two rooms leading the one into the other, the larger 14 by 14 feet, the outer 12 by 12 feet; the brick stove was built in the larger room. After shovelling out the gravel and coming to the floor of the hut, we came across many articles that had been left by these Russians; some of them we brought away.

We left Seal bay on August 5, and entered the Kara sea. The weather was most beautiful, a light easterly wind, and a long rolling swell; temperature 45° to 50°. The height of the land rapidly decreases from Belusha bay to the eastern exit of Matyushin shar. Both sides of the straits are faced with lines of old sea margins. These stupendous terraces rise tier upon tier to a height of probably 600 feet; the slope of each terrace may be 100 feet; the angles and slopes are so sharply defined that they look as if they might be Cyclopean lines of fortifications. These terraces are splendidly exhibited on Myss Wychodnoy (Cape Exit), the northern extremity of the eastern entrance to the Matyushin shar. It was from this point, on April 8, 1835, that Ziwolka, the able lieutenant of the celebrated Pachtussoff, started on his sledge journey to explore the eastern coast of Lutke Land. Taking provisions with them on their sledges for a month, they pushed northward over the billowy shore-ice. They passed several bays, which the party had not time to explore, but which Ziwolka named in the following order: Cancrin bay, Unknown bay (Saliw Nesnaemy), and Bear bay (Saliw Medweshji). On April 24 the party reached Flotow peninsula, round Five Finger cape (Myss patj Palizow). Here the loosening of the ice to the north, and their provisions running short, compelled them to return. Ziwolka there erected a cross out of driftwood with the inscription, "This cross was erected by Ziwolka, captain of the company who penetrated thus far through the ice on a coast survey, April 24, 1835." They then beat a retreat. On the 30th he reached Cape Wood (Drowanoi Myss); on May 6 he again entered Pachtussoff's winter quarters in the Matyushin shar. That indefatigable explorer, having failed in the summer of the same year to circumnavigate Novaya Zembla from the westward, now determined to try if it would be possible to reach the north point of Barents land by the east coast. For this purpose he sailed eastward through the Matyushin shar in a small karbasse with a surgeon and five sailors. On August 15, 1835, he reached Cape Wood, worked his way through the drift-ice to the east entrance, and began the survey of the coast to the north. He was often obliged to take shelter behind stranded icebergs, jutting spits of land, and in inlets. In this way he succeeded in reaching the island which has since been named for him Pachtussoff island, in N. lat. 74° 24', 35 versts beyond Ziwolka's extreme point. It was impossible to push further, in consequence of the masses of coast ice. So, returning on August 28, he reached the mouth of the Matyushin shar, and from there his winter settlement.

How very different were our experiences this past summer to those of Pachtussoff! In the same month of the year as he met with almost impenetrable obstacles from the ice of the Kara sea, we were steaming along that shore in waters that would not have disgraced the Caribbean. During the evening of August 5 we were abreast of Cancrin bay. Near the shore the land is a low flat tundra rising in terraces to 500 or 600 feet; behind are the lofty interior snow-clad mountains. August 6 ushered in as beautiful a day as the preceding, and we

NEST OF LITTLE STINT, WAIGATS.
(From a photograph by H. J. Pearson, Esq.)

steamed northward within a mile or two of the shore. The first icebergs we had seen, either in Barents or the Kara sea, lay grounded on the foul ground and islets and reefs at the entrance of Bear bay. By evening we reached Pachtussoff island, and anchored on its western side in 5 fathoms of water, about a quarter of a mile from shore. We soon landed, and were scouring over the islands; for, though it is put on the chart as one, in reality there are several islands close together, with narrow and deep channels between, which might afford safe anchorage but for the risk of being sealed up by the ice of the Kara sea. The rocks of the island are hard grey limestone, but varying to yellow. The strata dip at a high, almost vertical angle from the east to west. There are fossil organisms in much of the grey limestone—very imperfect, however, but sufficient, I think, to be determined. I put them down as of Silurian age. The surface geology shows the usual characteristics of gradual emergence, in the shape of terraces round the bays, and on the slopes, beds of marine clay with shells, and erratic boulders. Between thirty and forty species of flowering plants were gathered on these desolate islets. There is a conspicuous cairn placed on the most western of the islets, at an elevation of 130 feet. We searched it for a record, thinking that Pachtussoff might have left one there in 1835. Our search proved fruitless, but we carefully restored the cairn and placed inside of it a notice of our visit.

From the highest point of Pachtussoff islands, no ice, nor any appearance of ice, was visible, save a few small bergs. The next day we proceeded up the fiord that runs into the interior directly opposite Pachtussoff island. We steamed up this noble indentation for a distance of about 12 miles, until we got within a quarter of a mile of the glacier at its end; we sounded there, and found 40 fathoms. The sea-ice had entirely cleared out of the fiord, but over its blue surface were scattered huge blocks of glacier ice, and bergs of considerable size were stranded at many points. Mr. Pearson and Mr. Curtis, on landing, ascended the glacier from its flank, and travelled a long way over it, reaching an elevation of 650 feet. Down its centre is a medial moraine, in which occur most perfectly rounded water-worn stones. In company with one of the crew, Daniel Johannssen, who generally attended me in my walks, we ascended one of the hills that bordered the south side of the glacier. We found it a somewhat arduous climb, which took us over two hours to accomplish. We reached the summit at midnight; the temperature was 40°, and we threw ourselves, our clothes saturated with perspiration, on the ground. I had forgotten my aneroid. Daniel estimated the height at 2000 feet. I think 1400 feet would be within the mark. Phanerogamic vegetation entirely ceased at 400 feet from the top, and is replaced by a rich growth of lichens and mosses. *Cardamine bellidifolia* was the highest growing flowering plant. We were well repaid for our climb, as we looked upon a scene of rare beauty. The sun had disappeared behind the opposing hills that form the northern side of the fiord and hem in the glacier. They rise to about the same altitude as that on which we stood, and for miles look down upon the fiord, almost sheer for half their height, then as very steep screes to the water's edge. Amber-tinted fleecy clouds floated in the northward, against a background of pale cold blue sky, so characteristic of polar regions, whilst rosy tints tipped the mountain tops of the interior. Immediately below us lay the glacier some 3 miles across, but narrowing to about a mile where it discharges. Looking inland, the glacier seemed smooth, but at the contracted outlet it was greatly crevassed transversely.

To seaward the Pachtussoff islands lay like a network of reefs; and, looking beyond them, the Kara sea stretched north, east, and south without a sign of ice, save a few stranded bergs along the coast. About 10 miles inland five lofty nunataks rose from the centre of the glacier. They are black in colour, though streaked with patches of snow or ice. From each of these descended moraines, which, coalescing, formed the great medial one. Beyond stretched, as far as our range of vision, the *mer de glace*, broken here and there by lofty snow-clad mountains, but extending inland until its convex horizon merged into the pale blue sky. I think we may safely assume that the interior of Lutke land and Barents land is occupied by a *mer de glace*. As this grand fiord is unnamed on the charts, and we were the first to explore it, we desire to give to it the name of Ziwolka, in remembrance of Pachtussoff's able lieutenant; and to the glacier the "Ibis," in compliment to our brethren of the British Ornithological Union.

As we descended the hill, we saw the front of Ibis glacier calve. An immense mass of the ice-cliff fell forward from a line of crevasse into the water. We first saw a portion of the face of the glacier move, rock, and then fall forward, then clouds of vapour, then a dull roar as of thunder, and then the circling waves rolling outwards. Though several great masses of the calf remained apparently stranded at the edge of the glacier, yet fragments showing as large as big cottages floated away, and a fan of these ice-blocks soon spread for a mile or so around.

Our voyage had been so pleasant, and the weeks had passed so swiftly, that it was hard to realize that the limit had been reached for further progress, more especially as there would, in my opinion, have been no physical obstacle to exploring the unknown coast-line from Pachtussoff island to Barents winter-quarters. The coal left, however, was barely sufficient to take the *Laura* back to Tromsö, in accordance with the date fixed for the termination of the charter party.

On our way south we steamed into Bear bay, and photographs were taken of the glacier at its head. By midday of August 9 we were back in the Matyushin shar. The weather continued to be fine and warm; we literally basked on deck in the heat of the sun. Before quitting the strait, the ship was stopped for a few hours, and Mr. Pearson ascended a mountain on the north side to an altitude of 2000 feet, from whence a series of photographic views were obtained, which illustrate the character of that part of the interior of the south and north islands. We put into Cairn harbour to say good-bye to our pleasant Samoyed acquaintances. Then we steamed down the coast to Nameless bay to have a look at its immense rock-nurseries of the arctic loom (*Uria bruennichi*). These wonderful breeding-haunts, with their countless numbers, have been well described by Admiral Markham.* He tells us that none

* 'A Polar Reconnaissance,' p. 131.

of the "loomeries" that he has visited in Greenland and other parts of the arctic regions can be compared with those of Nameless bay. I quite agree with him. But it was early in the season when he visited the place, and the birds were sitting on their eggs. As we saw the cliffs later in the year, when the entire progeny had hatched out as well, and the myriads of the rising generation were huddled together along with their parents on the ledges, it is truly a wonderful sight which baffles description. We killed sufficient of the birds to supply our crew with ample fresh food for the return voyage to Norway, and on the evening of August 12 we left the shores of Novaya Zemlya, and set a course for Vardö. Though the primary object of the expedition had failed, namely, to land on and investigate the great Samoyed tundra, yet the alternative trip had turned out most interesting and delightful. We had a splendid run across Barents sea to Vardö, where we called for our letters, and then on to Tromsö, which we reached on August 20. There we took the mail steamer to Bergen, reaching Hull on the 30th.

A few words as to the scientific results of the voyage.

The ornithology of Waigats, Novaya Zemlya, and the North island is, I think now, practically worked out. The results of our observations, along with those of our predecessors, have been embodied in a paper by Mr. Pearson, which will shortly be published in the *Ibis*.

The botanical collections are satisfactory. They embrace at least three-quarters of the phanerogamic flora already recorded from the Novaya Zemlya group of islands, and I have added several interesting plants to those already observed there. But by far the most important discovery was my finding what has hitherto been considered the rarest and most inaccessible of flowering plants, growing in the greatest profusion both in Novaya Zemlya and Lutke Land. The localities where this beautiful little grass, *Pleuropogon Sabinii*, has been obtained were recently enumerated by Mr. Fisher, the botanist to the Jackson-Harmsworth expedition, before this Society.* I may say that von Baer found it in Novaya Zemlya in 1837. Prof. Aagard, who took part in von Heuglin's expedition to the same island in 1871, brought back a single example; and in later years a few specimens have been found there by Russian explorers. Now I have to tell you that I found this plant growing abundantly at Belusha bay of South Goose land, at Nameless bay, and in every valley I visited on both sides of the Matyushin shar, Silver bay, and many other localities. In the neighbourhood of Belusha bay of Lutke Land, I found it in great quantities around meres and over wide areas of wet ground, to an elevation of 700 feet. I consider it to be the commonest grass of Novaya Zemlya and Lutke land.

The examination and description of the large series of rocks that I collected at each locality visited has most kindly been undertaken by

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* *Geographical Journal*, vol. viii. p. 560.

Prof. Bonney, and his report will undoubtedly largely add to our knowledge of the rocks composing Dolgoi island, Waigats, and Novaya Zemlya. In stratigraphical geology a not unimportant fact brought to light is the knowledge that on the eastern shore of Lutke land, in N. lat. 74° 24′, there are rocks of Silurian age. Since writing this paper, I have obtained from Mr. E. T. Newton, F.R.S., who has been so good as to examine the fossils I brought back from Waigats and Novaya Zemlya, the following preliminary report: "The series of fossils from Cape Greben, Waigats, are without doubt Upper Silurian; but the specimens from Pachtussoff island are not so certain. I think that in all probability they also are Upper Silurian, but as there is a possibility, according to Lindström, of some of Nordenskjold's fossils (*i.e.* from Cape Greben) being from passage beds between Upper Silurian and Devonian, there is just the same possibility with yours; the forms of *Favosites* and *Syringopora* not being distinctive."

The collections of insects, marine invertebrates, and soundings have been placed in the hands of specialists.*

A CRUISE ON THE EAST OF SPITSBERGEN.†

By ARNOLD PIKE.

Towards the end of last July, after a quick passage from Norway, without seeing ice, we steamed up Stor fjord on the east coast of Spitsbergen. Stor fjord was ice-free except for a small quantity of broken-up stuff at the north end.

Wishing to reach the east coast of North-East Land, we steamed through Freeman's straits. At the east end some large floes were drifting about, lanes between them opening and shutting very quickly, so we returned and tried Helis sound. Violent currents rush through this sound at, I judge, a speed of ten knots per hour. After steaming through the sound we found much open water to the eastward, but there was enough light stuff to prevent us from reaching Kong Karl's Land. The ice was fast to Cape Mohn. None of it was heavy or badly packed; indeed, it seemed to be mostly ice of the year. With the intention of returning later, we steamed up Hinlopen straits. Northerly winds had been and were prevalent, but we were not prepared to find the big bays on the east side of the straits entirely free of ice; neither was there any ice in the straits. Old walrus-hunters said they had not seen the like before. Curiously enough there was also much open water along the north coast, and we reached Charles XII. island with but little difficulty. North of this point there was some heavy ice, apparently tight, but to the eastward it was lighter, and evidently

* For discussion, see p. 370.

† Read at the Royal Geographical Society, December 13, 1897. Map, p. 464.

KONG KARL (WICHE) ISLAND.

melting up, although it was not possible to reach Cape Leigh Smith. A few days later, in the middle of August, several walrus sloops rounded the cape and reached Great island. In the mean time we had returned down Hinlopen straits and stood towards Swedish foreland in an ice-free sea. Off the north coast of this group of islands there was a great deal of floe-ice. We worked some way northward through it, hoping to reach White island, but in the continued thick weather we could not find a way between the floes; nor could we find, in the fog, a high island which we reckoned to have seen in an east-north-easterly direction from the north end of Bremer sound. We then worked through loose ice about 35 miles east by north of the east point of Kong Karl's Land, still in the fog. From here we drifted back with the ice before a strong easterly gale, and with a westerly current, to a rather low island off the east point. This island, which is not marked on the charts, is about 8 miles in length, and lies immediately east of Abel island. It is apparently basaltic and quite barren. Without a reckoning, in the fog, we took this to be one of the islands reported to have been seen by Andreassen and Johannesen in 1884, but which we afterwards found do not exist.

Next day, August 20, the weather became clearer, and we steamed along the south coast of Kong Karl. From the east point the cliffs are from 50 to 100 feet. Behind them is a basaltic plain 3 or 4 miles in length, covered with small lakes and tarns. The land then rises in a rounded hill 800 to 1000 feet high, and sinks again to a low isthmus and plain, at the western extremity of which is the high land and a detached table-topped mountain at the west end of the island. The shape of the island is roughly a figure of eight, the eastern loop being much the smaller. We landed in the big bay on the west of Tömmernaes—as it was necessary to refer to this bay afterwards, we called it Victoria bay—and crossed the narrowest part of the isthmus, a little upwards of a mile, to the sea on the north coast of the island. There was no snow ashore, except on a small ice-cap on the slope of the above-mentioned hill, and on a small glacier on the sea-slope. The land rose sharply in what looked like well-marked raised sea-beaches, which did not, however, seem continuous. They were of round, sea-worn, basaltic pebbles. I did not count them, but we crossed probably a dozen before reaching the summit. Some of the beaches were composed entirely of very small pebbles, and others of much larger pebbles, as if they had been exposed to the action of the sea for widely differing spaces of time. It would seem that heavy seas must have washed, and probably do wash, this coast. The hill to the eastward

KONG KARL LAND, FROM NORTH.

was of the same rock—I think, dolomite—of which the whole island seems composed. The highest point where we crossed was from 150 to 200 feet above sea-level, and there were pieces of driftwood all the

KONG KARL LAND, FROM NORTH.

way to the summit. Those nearer the sea were not so decayed as those higher up. I do not think that they had been pushed up by ice, but that the land is rising. We saw no soil or vegetation. Between the foot of the above hill and the sea there is a little moss, and on the hill itself a few lichens and scattered reindeer moss, but that is all. We saw no reindeer sign on this island, but a great number of bears. There was so little ice at sea that the bears seemed to have taken up their quarters ashore. A small glacier or ice-foot along the coast was pitted with lairs, and others had dug holes in a snow-patch near the summit of the hill. We killed many. They were all in fair condition. Birds were very scarce—a few glaucous gulls only. I afterwards saw one flock of snow-buntings.

After cruising amongst some light loose ice off the south coast of Swedish foreland, we stood in and landed on Cape Weissenfels, a mass of columnar basalt about 100 feet high. Kittiwakes and ivory gulls

EAST COAST SWEDISH FORELAND, LOOKING NORTH-WEST UP BREMER SOUND FROM CAPE WEISSENFELS.

were nesting together on it, and a few Mandts guillemots. It is connected by a stretch of yellow sea-sand with a high flat-topped cliff, which, with a sea frontage of about 4 miles, terminates at Cape Hammerfest. The cliff is composed of what seemed to be well-defined horizontal strata of shale and sandstone, but they may have been simply intrusive sheets of a basaltic nature. They were capped with dolomite or hyperite. We did not land there. This high land stretches away, level-topped, to the north-west, forming the backbone of the island—Swedish foreland. A long sandy slope, on which are patches of moss or grass, runs from this backbone to form the western shore of Bremer sound at this end of the island. We saw a quantity of big drift timber on this slope. On the summit of the basalt ridge, say 150 feet, which juts out to form Cape Hammerfest, we found old whale bones, mostly very much decayed. We found also old reindeer horns, but saw no beasts.

Bremer sound is here about 12 or 14 miles wide, with a bad shoal, 1½ fathom of water, in mid-channel.

Observations taken with sextant and artificial horizon, both on Cape Weisenfells and near Tömmernaes, agreed very nearly with our position on the Admiralty Chart.

On August 23 we worked about 40 miles in a north-easterly direction from north-east point of Kong Karl's Land, through scattered light ice in thick fog, and lay all night in D.R. N. 79°, E. 33° 25′. Next morning, August 24, at 3 a.m., the weather was quite clear. From the mast-head no land was in sight. To the eastward the ice, although light and apparently rapidly melting, was tight, and we steamed a straight course back to Kong Karl's Land. The two islands which

CAPE HAARFAGRE, SWEDISH FORELAND, FROM NORTH-EAST.

were supposed to lie to the east of Kong Karl's Land do not therefore exist. I feel convinced that the mistake arose through the shape of Kong Karl's Land itself which, when viewed from a short distance, appears as two, or from some points of view as three, islands.

We then steamed up through Bremer sound, and on August 25 found the ice still fast to Cape Mohn, and stretching eastwards. It was light floe-ice, and I have no doubt there were leads through it, but there was too much fog to see much, and we did not wait. After drifting in dense fog up Hinlopen straits again, we returned to Kong Karl's Land and cruised along the north coast, seeing nothing but broken up bay ice. On August 28 I climbed about 500 feet up the hill at the east end of Kong Karl. Light broken ice was scattered over the sea in north, east, and south, but there was mostly open water. When we left on August 30, the ice to the south had become jammed together by a slight breeze, and we could not work through it either to the west or east. We therefore went northwards, and cleared it on the 31st when about 12 miles south-west by west from Haarfagrehaugen, the north-west point of Swedish foreland. We made the mouth of Freemans straits, and steamed down the east coast of Edge island in clear weather on September 1 without seeing ice except the usual flat-topped bergs, hundreds of which were aground there. Not being able to find any ice, we took a departure from South Cape on September 3.

It is hard to say what has become of the heavy old polar pack this year. Strong northerly winds prevailed during the spring and summer, and one would have expected to find heavy ice jammed tight to the north coast and north of Kong Karl's Land. During the whole voyage, however, we saw no old pack, although there seemed to be some heavy ice beyond Charles XII. island. The sea to the eastward of Hope island, according to the accounts of the walrus-hunters, was also remarkably free from ice, and the temperature of the water much higher than usual. There was not much ice last year when my vessel, the *Victoria*, also visited Kong Karl's Land, but this year there was still less, and unless the old pack appears from "somewhere" this winter, there will be nothing but "year's ice" to prevent a man from going where he wishes to on the east coast of Spitsbergen next summer.

In opening the meeting, the PRESIDENT said: We have with us this evening a number of arctic navigators, from some of whom we hope to hear very interesting accounts of their experiences and the work they have done. Especially we have here an old friend, Colonel Feilden, who is going to read a paper on his summer cruise in Novaya Zemlya, and tell us of the remarkable condition of the ice in that part of the arctic regions during the last season. I will now call upon my old messmate, Colonel Feilden, to read his paper.

After the reading of the papers, the PRESIDENT said: There are several distinguished arctic officers of an earlier period here, and several eminent naturalists. Quite possibly some of them may wish to make remarks on the subjects of the papers we have just heard. I also see here Lieut. Peary. I should particularly like to ask him whether he would kindly tell us something of the condition of the ice this year in Melville bay and the northern parts of Baffin's bay, and whether his testimony agrees with that of Colonel Feilden and Mr. Pike with reference to the remarkable character of the season.

Lieut. PEARY: Mr. President, I had hoped to come here to-night as a listener rather than to speak. I did not have the pleasure of hearing Colonel Feilden's paper this evening, but will add my little quota to the information in regard to the character of the ice this season in another portion of the arctic regions. I found the same conditions as those already noted by the distinguished gentlemen who have preceded me this evening. We sailed close to the Labrador coast, and we saw absolutely none of the usually southerly trending stream of ice, which has been there in every previous summer that I have been north, all along the coast. I found no ice on crossing Hudson strait. We crossed the mouth of Cumberland sound in a fog, and off Cape Walsingham we barely touched a limited stream, but by making a *détour* of 5 miles we rounded it, and then bore away to the Greenland coast, and followed that up to Disco, across Wagiat strait, touched at Uppernavik, and it was then clear up to the peninsula, at the northern end of which is the Devil's Thumb. In trying to get across Melville bay we were obliged to clear some icebergs, but no crushed ice; after that we encountered no field-ice until we struck the northern shore of Melville bay, about 35 miles east of Cape York. We forced our way through the glacier *débris*, out by the headland, and back to the meteorite island directly inside the Bushland island, and there was no ice, and by the little island off Cape Labric there was no ice. There we encountered a severe snowstorm; it was snowing so thickly that we could not see the length of our ship—150 feet. But there was no sign of pack-ice anywhere about Cape Sabine, and had it been clear I should have gone on north, and I expect I could have reached Cape Bergotz, and probably have tried Kane sound, but it was so thick. I had with me such a scant supply of coal that I turned back, but had circumstances permitted it I feel sure I could have gone forward. Returning, we crossed to Cape Walsingham, where two years ago I was hung up for three days in the middle of September, and kept on through the strait of Belle isle down to Sydney, Cape Breton, without having seen one piece of pack-ice. Whether this means there was no ice above there, I am not prepared to say. My own opinion is that, rather than take that view of affairs, I should be inclined to think that the heavy arctic ice had jammed somewhere, and that the ice below it had passed away to the southward. As a matter of fact, very heavy arctic ice passed down the Newfoundland coast early this spring, and created a great deal of trouble with the whalers, as several of them were injured in the earliest arctic ice any of them had seen. I don't believe there was any middle pack to speak of in Baffin's bay. The summer of 1894 was just the reverse of this; for years I doubt whether there was so much or so heavy ice as in 1894. In 1895 the middle pack was heavy, but there was little or no ice south of that; but 1897 was an abnormal season. I trust these remarks may be of interest in connection with the remarks from other speakers.

The PRESIDENT: We have had a particularly interesting evening, especially when we were on the subject of the remarkably open season this summer. We have heard how Mr. Pearson and Colonel Feilden have with perfect ease passed through the Matyushin shar, and might have proceeded as far as the northern shore of Novaya Zemlya itself. We have had a most interesting account from Mr. Pike of the way in which he has steamed through and round Wiche's islands, and we have heard from Lieut. Peary of the remarkable conditions in Baffin's bay. I am afraid that I agree with Lieut. Peary that the cause of this open season is a jam of ice in some narrow parts of the arctic sea to the northward. I presume, owing to certain conditions of winds and currents, the ice has been stopped to the northward, and I should hesitate to think the same conditions would prevail in the following year, although that may be the case. We have to thank these gentlemen for the interesting accounts they have given of the condition of the ice, and we have especially to thank Colonel Feilden for his most interesting account of the Waigats island, and of the flora of Novaya Zemlya, illustrated by the slides he showed us of the flowering plants and the birds nesting among them. We have to thank Mr. Pike for his paper, and we have particularly to thank the two gentlemen who served in the Jackson-Harmsworth expedition for their investigations of the flora and geology of Franz Josef Land.* I may here remark that Sir Leopold M'Clintock said to me the other day that the gentlemen who composed the Jackson-Harmsworth expedition are the first who have voluntarily remained for three winters in the arctic regions. The Rosses remained there for four winters, McClure and Collinson for three winters, but that was compulsory. Out of zeal for science these gentlemen remained voluntarily on Franz Josef Land for three winters. You will all, I am sure, pass a vote of thanks by acclamation to the gentlemen who have addressed us this evening, to Colonel Feilden, Mr. Pike, Dr. Koettlitz, Mr. Fisher, and to Lieut. Peary.

* For reports of the statements by Dr. Koettlitz and Mr. Fisher, see *Geographical Journal*, vol. xi. pp. 132-135.

THROUGH SOMALILAND AND AROUND AND SOUTH OF LAKE RUDOLF.*

By H. S. H. CAVENDISH.

Returning from a two years' shooting and sight-seeing trip in South Africa, on the mail steamer from the Cape, I happened to see a number of newspapers and magazines in which there was a great deal of information about Somaliland and the various expeditions to Lake Rudolf and its neighbourhood. It occurred to me that somebody ought, as soon as possible, to explore the west coast of Lake Rudolf, and that, as no Englishman had yet attempted exploration in that part of Africa, it was high time for British travellers to bestir themselves in the matter. From the accounts I read, it seemed that excellent big-game shooting was to be had, and the idea grew upon me, so that by the time I arrived at Southampton I had made up my mind to start for Lake Rudolf as soon as I could get an expedition ready. As I arrived home in June, I felt that the sooner I started the more likely I should be to hit off the rainy season in an unexplored district. Thanks to Lord George Hamilton's kind advice and help, I soon had everything ready, and sailed for Aden at the end of August, 1896.

When I got to Aden I found I had only thirty rifles, and was told by Colonel Ferris that it was absolutely ridiculous to go with so few. The deficiency was kindly supplied by General Cummingham, who gave me all the rifles he could spare—about another thirty. At Aden I found a registered headman who had been with Count Teleki, and he recruited the number of men I wanted, viz. 84. Half of my troubles during the journey were due to the rascality of this headman, through whose dishonesty I had to pay more than double the usual wages.

I bought all the trade goods I required at Aden, being badly swindled over the transaction, and eventually got my men and loads across to Berbera. Just before leaving Aden I had the good fortune to meet Lieut. H. Andrew, who was then on leave; after a short conversation he agreed to accompany me, and, though without an outfit, he started at once, hoping to pick up what he wanted on the Somali coast—as he eventually did. I wish, before proceeding further, to express my thanks to Lieut. Andrew for kindly allowing me to use, in preparing this paper, his copious notes on a part of the road which he took and I did not. Captain Merryweather, a resident at Berbera, gave me great assistance in collecting transport animals, though for several reasons I had to pay pretty heavily for camels, and even then could not get good ones.

* Read at the Royal Geographical Society, January 31, 1898. Map, p. 464.

We relieved the monotony of bargaining for our transport animals by having daily shooting-matches. At one of these the breech-block blew out of a Lee-Metford, and the rifle burst, slightly wounding Captain Merryweather. The accident might have been a serious one.

Andrew and I left Berbera on September 5 with a party of forty men, leaving the main caravan to follow. Three weeks afterwards the whole caravan assembled on the Silo plain, about 150 miles from the coast, and this point may be said to have been virtually the starting-point of the expedition. From here to the Webbe Shebeli we travelled southwards for a month, by a route which more or less closely coincided with that of Dr. Donaldson Smith, and need not, therefore, be described again. There are, however, a few points that may be of interest. We have very pleasant memories of encountering Prof. Elliot and his caravan. In addition to giving us valuable information, Prof. Elliot very kindly supplied us with a large quantity of trading goods, baggage animals, and live stock. During this part of the journey, which on the whole was very monotonous, we had one or two of the little experiences which African travellers well know. On one occasion we camped on the bank of what was apparently once the bed of a mountain torrent. Instead of crossing this depression before camping, we camped on arriving at its nearest bank, and what was our astonishment the following morning to find that it was a roaring torrent many feet deep, which prevented any of us from crossing for two days!

On crossing the Webbe Shebeli we found a Berbera trading caravan in great tribulation, having been raided the day before by a neighbouring tribe called the Aulehans, who had killed and wounded some of the party, and carried off their trading goods and baggage animals. We immediately followed the marauders, who, finding themselves opposed by so large a force headed by Europeans, immediately came to terms. We made them pay blood-money and return the stolen goods and animals.

Continuing for another fortnight, we came to the town of Lobari. Here we found that we were in the rear of an Abyssinian war-party, which had left only the day before, after looting the surrounding villages and driving off all the unfortunate natives' live stock. The natives begged us to join them with a view to recovering some of their stolen property, but this, of course, we were not in a position to do.

For the next four days we marched through desolate country, which had been devastated immediately before by the Abyssinian hordes. The men were very nervous, and the constant alarms during the night prevented any of us from getting any rest. We therefore decided to change our route, as there are pleasanter occupations than marching in the rear of an Abyssinian war-party, with the chances of unintentionally overtaking it—a contingency that might happen at any moment, as its progress was, to say the least of it, not rapid.

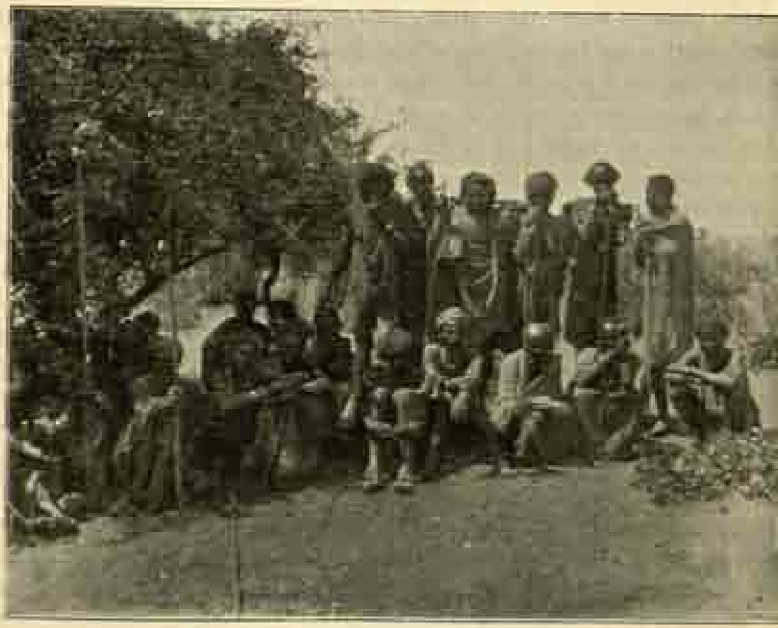
We decided to go southward and make a bee line for Lugh. On approaching Lugh after three days' march, we found the ground in every direction strewn with discharged Remington cartridge-cases, and the marks of hundreds of horses' hoofs. A little further on we came in sight of a fort, the walls of which were lined by troops. Waving handkerchiefs, we approached, not knowing, as a matter of fact, whether we were nearing Abyssinians or friends. The Italian flag was hoisted, and, on approaching the fort, an Italian officer, Captain Fernandez, met us, and jovially informed us that he had very nearly saluted us with a volley, having mistaken us for Abyssinians, with whom he had had a very sharp engagement the preceding day. This grand old veteran, we found, had held the fort, though constantly attacked by the Abyssinians, for months after the Italian forces had met with such terrible reverses in Abyssinia. There we spent a very pleasant week, entertained by the commandant and his subordinates. We went out shooting hippo and small game, but the commandant always insisted on our crossing the river into British territory, as he considered it absolutely unsafe for a small party outside the fort on his own side of the river. We were very sorry to say good-bye to this gallant officer, who, though his provisions and ammunition had run short (for he had received no supplies for months), would not leave his post.

Another two days' march brought us to the Webbe Dau river. Here we were delayed by our first real bout of fever, half the caravan being incapacitated at one time. We carried our sick on the camels, and immediately left the swampy neighbourhood of the Dau.

On December 9, four days from the Dau, we first saw fresh elephant spoor. That evening we sat up expecting to see game coming to drink, and were very nearly trodden on by an elephant. He had arrived noiselessly from the direction in which we were not looking, and was within two yards of us before we were aware of his proximity, but as he moved off we recovered ourselves and shot him.

Here we had again great trouble in getting into communication with the natives, as they mistook us for an Abyssinian force, and they have been so badly treated by the Abyssinians that the mere mention of such a force in the country is enough to make them desert their villages and disappear. For the next ten days, marching west, we had some good elephant-shooting, bagging ten fine tuskers averaging 60 lbs. a tusk. I may say that during the whole expedition we made a rule never to fire at an elephant whose tusks we calculated were under 80 lbs. a pair.

On discovering that we were Europeans, and not an Abyssinian force, the natives became reassured, and returned to their homes. We were now for the first time among the Boran Gallas, and in that particular section of the tribe which gave Donaldson Smith so much trouble. They treated us in the most friendly manner, pressing every kind of present that they considered valuable upon us, and we had the greatest difficulty in making them accept a return present. We found these people undoubtedly the most friendly natives whom we met during the whole expedition; they besought us to stay with them, and when we refused to do so, they begged us to lay a petition before the great chief of the English, begging him to extend the protection to them which they said he had afforded to Somaliland. One sentence from my diary I may quote. It is as follows: "One of the chiefs said, 'We know your



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chiefs rule in Somaliland; the Somalis are happy, and we want to be under your chief.'" They brought us numbers of people who had been horribly mutilated by the Abyssinians, and again begged us to stay with and protect them. Abeferlato, the Boran king, though we never passed nearer to him than 100 miles, hearing that Englishmen were in his country, sent his son to us with a present of thirty oxen and the best pony we saw in Africa. The son refused to take the present we wished to send to the king, so after his departure, when leaving the country, we sent him one ourselves by special messenger. The Borans were the most industrious and thriving and the richest race we encountered; in fact, looking back on our sojourn in the Boran Galla country, I would say it was the pleasantest time we spent among natives between Berbera and Mombasa. In spite of the fact that these people are nominally under British protection, and carry on a trade in rubber, fibre, rope, honey, gum, and ivory with the Somali coast, the Abyssinians levy tribute to the extent of half of every caravan that leaves the country.

A few notes regarding the Boran people may not be amiss here.

The Boran resemble the Somali in build and general appearance, but are, perhaps, not quite so good-looking on the average. They are nomads, and count their wealth in camels, cattle, etc. The men look upon their women as slaves, but at the same time, unlike the Somali, they do some work. The Boran man wears a big loose kind of knickerbockers, made of very coarse strong native cloth, which the Konso people manufacture near Abaya; also a long piece of the same material round his shoulders, and several ornaments, such as rings, bracelets, beads, etc. In fact, they are covered with every description of native finery, made either of ivory, copper, steel, brass, iron, rhino-horn, string, or hair. They seldom carry shield or spear, but only a long stick with a big knob. Their wives are dressed in dirty greasy skins, and do the greater part of the work. They have no hostile tribes among them such as the Somalis, and never raid amongst themselves, so that they are rich in oxen, sheep, etc. They do not know much about game except the elephant and giraffe, which they hunt on horseback with spears. They gather honey, make rope out of higloes, and a native beer (tembo), and trade in ivory. They have no religion, and, although they call their god by the name of Wak, they never seem to pay any attention to him. They eat meat dried in the sun, and drink the warm blood of any beast they kill. They also mix blood with their milk, and drink the latter thick and sour. A Boran chief does not eat camel's flesh, but the common people do. They carry a small quantity of ostrich feathers, one of which they put in their hair directly they kill a man. Each ivory bracelet worn on the right arm signifies that a man has been killed by the wearer, while for every bracelet of brass or other metal, one beast of some description or other has been killed. Ponies are very numerous amongst them, but very seldom worth having, and the only good one we had was that sent to me as a present by Abeferlato, the king of the Borans.

On January 6, 1897, we left Egder, and, diverging from Dr. Smith's route, struck a new line almost due west for Lake Stefanie. After three days' marching, we arrived at Dedesotdato, where salt is obtained from a lake in the bottom of a crater. It was near this that the Borans made their final stand against Dr. Smith, thinking that he wanted to rob them of their salt. Here, assisted by the natives, we stayed three days taking photographs, which I will show you presently. We were able to leave our caravan in camp and wander about the country, with a few natives as guides, without other escort.

Another month's marching brought us to the limit of the Boran country, which we were sincerely sorry to leave, for while there we had been able to go about singly without fear. It was the only country throughout the part of Africa traversed by us in which we could go alone miles from the camp, knowing that any of the natives whom we met would help us in every way—a country in which we could go to any village, ask for a drink of milk and get it, the donors refusing payment. It is easy to imagine how sorry, as sportsmen, we were to leave a country where we could shoot at will without being hampered by an escort.

The old chief made the most extraordinary request we ever had from a native, and that was to give him a real English dinner—and you can imagine how he enjoyed it.

After two days' march through very mountainous and rocky country, we reached the north end of Lake Stefanie, and camped on the right bank of the Galana, which there joins the lake. Here were seven Wandorobo villages, and the people were friendly, and gave us presents. We heard that the Italians also had camped here about three months before. The water of the lake we always found drinkable, although salter near the south end.

The Wandorobo form here a very small group of people, dwelling in seven small villages under one chief at the north end of Lake Stefanie. They cultivate "juari," viz. maize of the best quality, and live on oxen, sheep, etc., and elephant's flesh. They drink milk, coffee, and blood. They barter juari for cloth with the Konso people, and for coffee with the Harbora people. Their religion is confined to a belief in "Wak." They marry as many wives as they choose, paying for them in cattle. No camels or ponies are to be seen among them, but they have a great number of small donkeys. They are descended from the Korai tribe of Borans, one of those subject to Abeferlato, and resemble the Boran in every particular except that their features are not quite so good, the nostrils in particular being more dilated. They wear a brass band round their heads, with a flattened leaf-shaped piece, about 2½ inches long, hanging from the centre in front. This is rather an extraordinary-looking ornament. They cultivate crops and gather honey, but do not hunt or fish. As weapons they carry a long spear and a shield made of elephant's hide.

Three days' march from the Galana brought us to the southern extremity of the lake, where we were lucky enough to find perhaps the most useful thing that has yet been found in tropical Africa—that is to say, coal, and coal in large quantities. Though at the time a couple of hundred yards from the present level of the lake, the coal had evidently been laid bare by the action of the water. The outcrop at this point was several hundred yards square. As we found elephants to be numerous, we decided to make two camps a few hours apart, and to stay there some time for the sake of sport.

On February 19 Andrew and I started together, and, coming soon upon a herd of elephants, Andrew decided to follow them and to form his camp close by. I then proceeded to the place where Count Teleki's camp had been when he touched the south end of Lake Stefanie, which, as he mentions in his book, at that time abounded in elephants. After about three hours' marching, I spied an old bull elephant with good tusks standing under a tree taking a doze in the heat of the day, and proceeded to stalk him. Getting within about 15 yards, I fired my right barrel for his heart, at which he walked forward a few paces and then stood still, when I gave him the left. He then turned right round, offering me the right shoulder, and, after two more bullets, dropped dead.

We went on to Teleki's old camp, which was marked by two large trees—practically the only trees within miles—and found that a large grass fire had burned up the whole country for miles round, and that it had been evacuated by the elephants on account of the absence of grass. As we reached the trees, a fine leopard bounded out into the open, but at the same moment we espied a large elephant out in the plain coming towards the trees, so we did not follow it. We crouched down beside a half-burnt bush, and as the elephant passed about 30 yards away, I gave him my right behind the shoulder, when he turned round and made off, receiving the left barrel through his back towards the chest. He seemed very sick, and walked slowly along the open by the lake towards some thin bush about 3 miles off. My gun-bearers then advised me to turn the elephant with the two horses I had with me, and go up to him in the open; but, thinking that it was too foolhardy, and not liking the look of this elephant, I decided to allow him to get among the bushes before attacking him again. When he had entered the bushes, I started to follow him, when yet another elephant appeared about 50 yards in front of me, and walked under a thick bush, in the shade of which he stood still. We crept up as close as we could, and got within a few yards of him, as the bush was so dense that we could not see through it at a greater distance. After a time he moved his head forward a little, and I could just catch sight of his ear; so, aiming quickly just below the orifice, I fired, and he rolled over at once, and we finished him off while he was rolling on the ground. The cartridges I had been firing this day were very heavily loaded, and the recoil of the gun quite dazed me for a few minutes, so I sat down under the bush and took a smoke, while I sent the boys to find out where the other wounded elephant was. They soon returned to say that he was about 200 yards off, so we started off to have a look at him. We saw that he was very angry, swaying his trunk above his head, and throwing up sand every now and then. I saw that he was certain to charge if I did not kill him with the first shot, and thought that we had better leave him alone; but my gun-bearer advanced with my 10-bore gun to a little bush in the middle of the plain, at the other edge of which the elephant was standing, so, not wishing to be looked upon as a coward by any of my boys, I followed up to the bush, and took as good a shot as I could get below his ear at a distance of about 40 yards. The bullet seemed to have no effect, for the elephant just turned round facing us, and walked straight for the bush by which we were concealed. He then stopped a second, with his trunk scenting the wind along the ground, and we could see that he knew exactly where we were. Unfortunately, my left barrel had only an empty cartridge-case in it, which had

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jammed, and which I was unable to remove. My gun-bearer then said we had better make a run for it, and at that moment the elephant charged. The only way back to the bushes was over a plain about 100 yards wide, so, giving my gun to my bearer, we started off in different directions; but the elephant had caught sight of us, and made for me as straight as a dart. I was unable to run very fast on account of the terribly rough ground, which had been broken up by the elephants, the holes being concealed by the grass. I tried to dodge him, but he was too quick for me, and as I neared the thin mimosa bush, I saw him just over me with his trunk in the air, so I threw myself to the left on my face and kept still, thinking that the elephant might go on; he, however, stopped immediately, and, spinning round, knelt down behind me with his head right over me, and took a drive at me with his tusks, which I luckily avoided by rolling in closer under his chest. He then pushed me under him with his trunk, and tried to pound me with his knees, but, as luck would have it, I was just out of his reach: I kept dodging his legs as they came down. This continued, my boys said, for half an hour; but he was very much occupied watching my gun-bearers, who were shooting and shouting from some distance off. At one moment he lay on me, and I expected every moment to hear the bones crack; but suddenly his weight was lifted off me, and I pretended I was dead, and, not wishing to see the *coup de grâce* coming, closed my eyes and remained quite still. The boys told me afterwards that he got up and backed off my body, and knocked his leg against a log of wood lying close behind. Mistaking the log for me, he vented his rage on it: he must have been badly wounded. After a time I heard the boys coming closer, and, waiting till they were fairly near, in case the elephant might not have gone far, I looked carefully round and saw him standing some 170 yards off. I got on my legs as fast as my bruises would let me, and staggered toward my pony. The boys, on seeing me get up, were dumbfoundered, and my groom, who was a great hulking fellow, wanted to carry me, thinking I must have some bones broken; but, although my left leg was seriously bruised, and my scalp damaged, I was in other respects unhurt. On my return to camp I went to bed, and sent out twenty boys to finish off the wounded elephant. This they succeeded in doing after putting about thirty bullets into him; he charged in every direction, and died hard. For the next ten days I remained in bed, too stiff to move, but was carried out to photograph the elephant and superintend the skinning and decapitation. The head I have had mounted since my return, as a momento of this lucky escape.

In the mean time, a party of forty boys had been sent to the west side of Lake Stefanie, to visit the Harbora people, with whom Dr. Donaldson Smith had had to fight. There are four tribes living on that side of the lake, viz. the Wandorobo, the Harbora, the Hamerkoke, and the Galubba. Doubtless there are several more on the other side of the range of hills between Lakes Stefanie and Rudolf, in which the Galubba live. These last are cut off from the west shore of Lake Stefanie, and it is a very difficult road to get to them. The other three tribes, consisting of about 1000 individuals each on the average, live only 10 miles apart, but bear no relation to each other, and each speaks a different language. They are sometimes at enmity with one another, and sometimes on good terms. The Wandorobo and Harbora we found very friendly indeed, and very anxious to trade. The chief articles of barter were beads and cloth with the Harbora, and beads only with the Hamerkoke, for these wear absolutely no clothes, and would not put a bit of cloth on, however much you gave them.

Providence has given them the cotton tree growing wild all round them, but, strange to say, neither they nor the Wandorobo or Harbora ever make use of it, and the two last still wear clothes which they get from the Konso people. The Harbora have three large villages on the plain halfway down the west side of the lake. Here they cultivate coffee, as well as a little juari, and also collect honey. They wear clothes and trade freely, but never move from the lake. Like the Wandorobo, they believe in Wak. In dress and ornaments they resemble the Boran, except that they wear in addition a large ivory bracelet in the shape of a crown, but in feature and colour they take after the Sudanese. Their weapons are spears, elephant-hide shields, and poisoned arrows. They hunt and kill elephants with bows and poisoned arrows, but have little ivory. They are great friends with the Borans, and possess an abundance of sheep, oxen, and small donkeys.

The Hamerkoke are nomads, having no villages, but living in open zeribas among the hills at the south-west end of Lake Stefanie. They cultivate coffee and juari in the plain below, and supplement their means of subsistence by collecting honey. They resemble Somali in their good looks and their colour, but speak a language of their own. Few ornaments are seen among them, and the men wear absolutely no clothes, the women a small piece of skin with a small bundle and heavy tassel of string. The Hamerkoke were formerly under the sway of the Harbora, but are now free and as powerful as the latter. They hunt and kill elephants; their wealth consists in sheep, oxen, and small donkeys. These people, rushing down on us from the hills, deliberately attacked us when we approached their country, but were driven off with the loss of two men, and we fortunately succeeded in making very good friends with them afterwards, through the aid of the Harbora people. This tribe and the Turkana were the only people with whom we ever had any difficulty.

We heard that the Harbora were industrious people and did a great deal of trade with the natives, and as we were short of coffee we were glad to be able to do some trade with them. Although Donaldson Smith had fought with them, they showed themselves exceedingly friendly to us, and even went so far as to help us to make friends with the Hamerkoke. On the west side of Lake Stefanie there was scarcely any game. The Harbora have a curious dislike for camels, not even allowing the transport camels of a trading caravan anywhere near their villages.

On the return of our reconnoitring party on March 7, the whole camp was again re-united, and started south-west for Lake Rudolf the following day.

From here to Rudolf—a distance which it took us five days to traverse—the wells were a very interesting feature, having all been made by the Kore people, who are an offshoot of the Masai. This tribe was at one time very strong, but at present numbered a few hundreds only, and lived on the borders of the Masai country—in fact, intermingled with the Masai.

In our satisfaction at the sight of Lake Rudolf, we immediately determined to take a few days' rest. This done, we started northwards, and, after a day and a half's hard marching, reached the mouth of the river Omo, where the Reshiat people live, on March 22.

The Reshiat people, also known as Darsonich (whom Count Teleki describes as being so rich at the time when he visited them), were now literally starving, having been looted by the Borans on several occasions, and having, besides, lost all their wealth of cattle through the rinderpest. Our introduction to them was as follows: Riding along the shore within about 6 miles of their villages, we saw four Reshiat men picking berries off a thick green bush. They were stark naked, except for a diedie skin hanging halfway down their backs, and a few strips of skin round their wrists and ankles. They each carried a bow, a quiver full of arrows, and a spear, and had with them a dog. They all had ostrich feathers in their hair, and one had long hair all plastered over with mud of a dirty black colour, which gave his head an uncomely appearance. In this topknot ostrich feathers were stuck. Two of them had, by way of ornament, cow-tails hanging from their elbows. These were supposed to increase their attractions in the eyes of the ladies. The only other ornament was a flat circular piece of ivory fixed to the centre of the forehead by a piece of hide round the head. This little party greeted us with smiles, and without the slightest fear or shyness they followed us to the camp, and appeared simply overjoyed to see a European. On the way I killed a hartebeest, and, having removed the skin, offered them the meat, whereupon they proceeded as follows: Carefully cutting open the carcase, they took out all the entrails, squeezed the green-coloured liquid from the contents of the stomach, and mixed it with the congealed blood and the berries they had collected, together with some leaves of the same bush from which they had got the berries. They then drank the concoction lukewarm, as if it was the greatest delicacy in the world. The berries I tasted myself; they had a rather hot taste, not at all disagreeable. The villages of these people are collections of huts of a low round shape, made of reeds. Wak is their god. They wear no clothes except a piece of skin down the back, the women indulging in one piece of goatskin. They are fond of trading, and extremely friendly with all the tribes in the vicinity as far as Lake Stefanie, but never move from the neighbourhood of the lake or river. They speak a language of their own. When raided and oppressed by the Borans, they fight with spears and poisoned arrows. They hunt very little game, although in the days of their wealth they used to kill elephant. Both sexes affect but few ornaments: besides those already mentioned, they wear a piece of wire about 3 inches long, to which they sometimes attach a ring or two; this they pass through their lower lip. To guard themselves from capture, they wear a very sharp knife bracelet, and when fighting they remove the sheath. They do not bury their dead when killed fighting.

Although our caravan tried to dissuade us from attempting the passage of the Omo, which they said was impracticable, there being no canoes, I determined to make the attempt. I held a consultation with Andrew, the outcome of which was that we decided to separate; for, even though I should succeed in crossing the Omo with a few men, it would still be impossible to take the main caravan, with the loads and

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camels, across. We therefore arranged to meet at the south end of Lake Rudolf, Andrew taking the east coast, while I was to attempt the west. Before we separated I was fortunate enough to get a guide, who volunteered to come with me for some cloth. He said that he knew the road very well, as he had been with Dr. Donaldson Smith and with Captain Bottego. This man proved a most excellent guide, and accompanied us round the north end of Lake Rudolf until we entered the Turkana country. He was a Masai Liguenani (chief), and came up to Rudolf with the Ligop, intermarrying there with the Darsonich.

After separating from Lieut. Andrew on March 26, I started with forty-two boys, some thirty donkeys, and a few camels, to try to cross the river Omo, following up its left bank. During the first few days' march the donkeys were very restive, as they had never before carried loads, and galloped about in every direction, losing the loads, and sometimes requiring the whole forty men to catch them again. My progress in consequence was very slow, and I could not do more than 10 miles a day. On the second day after we started we came on some people called Legumi, who are Wandorobo, and live by hunting. They belong to the same race as the Turkana; in fact, they say they are their brothers. They lived on the south of Lake Rudolf, but came up here a few years ago to look for game and plant maize along the river-banks. Their weapons consist of bows and poisoned arrows and a long stabbing-spear. They also carry a long narrow shield, and their chiefs wear a cap made of human hair, woven and ornamented with beads and feathers, and resembling a wig placed on the top of their own hair. Every ostrich feather in this head-dress is said to denote one man killed by the wearer. The women are clothed, but the men wear only a small apron. They are a half-starved looking race. Like the Darsonich people, they drink the blood of the animals they kill. When hunting game, they roll themselves in the mud, as they say that, owing to their wearing no clothes, the game cannot scent them, and cannot see them for any distance when covered with mud. They also use traps, which they tie to trees. These consist of spikes which are fixed round the inner side of a ring, the points being free and almost meeting in the centre. The circles are of different sizes, according to the kind of animal they wish to catch. These traps are laid on the ground over a shallow hole filled with brushwood, and when the animal puts its foot in the ring, the thorns give way and allow the foot or leg to pass through, but the spikes will then not allow the leg to be withdrawn. The animal is then unable to run fast or far, in consequence of this anklet fixed round his leg.

Having come from the south of the lake, this people have never learned the language of their immediate neighbours at Darsonich, but talk a kind of Masai.

On the following day, March 28, we marched to Murle, on the river Omo. The Murle people are a regular river tribe, and have two small dug-outs for crossing the river. They sow maize on both banks in large patches. They are the enemies of every tribe around them, being a great fighting power, and enriching themselves at their neighbours' expense. Their language is absolutely different from that of either the Legumi or the Darsonich. They have not even an apology for clothes, but are absolutely naked. Their weapons consist of bows and arrows and spears, but the spear-blades are much longer than those of neighbouring tribes, being 3 and even 4 feet in length with thin blades, and a leather or wicker shield, such as is also seen among the Labuma. But their most singular weapon is the circular knife which they wear round their wrist, similar to that described as in use among the Darsonich. When they are not fighting, this knife is covered with hide, so that they may not hurt themselves with it. This weapon they use not only for fighting, but also to cut up their meat when they are eating. It may be described as an iron bracelet with a sharp cutting-edge outside, the blade being about 2 to 4 inches wide. Another very peculiar weapon of offence, which I did not see anywhere else, consists of a very hard stick about 3 feet long. This makes a kind of battle-axe, being fitted with a wooden blade, half-moon-shaped, and about 3 inches broad and 6 inches long, sharpened and hardened in the fire. The chief peculiarity of this weapon is that the cutting-edge is covered with tightly stretched skin. These people also wear human hair caps, like those of the Legumi.

Having seen only one Swahili caravan before, which they had driven out of the country in spite of its guns, they were at first inclined to attack us; but, as we arrived unexpectedly in the country, some of the chiefs interviewed us while the warriors were collecting. Not having seen a European before, their curiosity overcame their warlike instincts, and they remained on friendly terms with us. As already mentioned, this tribe possessed two dug-outs, but being very suspicious, as they had all their flocks and large plantations on the right bank of the Omo, it required a good deal of explanation and handing over of presents before they would lend us these canoes to cross the river. Even then I had to pay my rascally headman £100 as a bribe to proceed, before he would begin to take the caravan across.

Further north on this bank, next to the Murle, is a tribe called the Bagata, with a different language. The only crop they grow is maize. Due north of them is the Ammur tribe, still further up the river-bank.

After crossing the river, I explored up the right bank, which is densely populated by a strong, rich tribe called the Murutu. The Omo flows through a plain about 10 miles wide, on each side of which, about 5 miles from the river, mountains rise abruptly. To the northward the river apparently flows through a deep gorge, with dense forests on either bank; this gorge begins at about 50 miles from the lake. The river at Murle is from 80 to 100 yards wide, and by my aneroid, 1370 feet above the sea-level.

At its entrance into Lake Rudolf the river is at least a quarter of a mile broad, with a current of between 3 and 4 knots an hour, and, judging from its size alone, there is absolutely no doubt in my mind as to its identity with the Omo reached by travellers from the south of Abyssinia, the termination of which has so long been a disputed point in African geography. The identity of the two rivers has been virtually demonstrated by Captain Bottego, although I believe he did not actually trace the whole course of the valley.

We now turned southwards, and on April 3 marched for six hours down the river, following the right bank, through many Legumi villages (the people being friendly), and camped on an open spot near the river. Crocodiles and hippopotami were numerous, and I shot some of the latter for the natives; my own men would not eat hippo.

On April 7 we found that we had to turn north, as we had been following a promontory which stretched into Lake Rudolf. Cutting across the isthmus, we reached the lake again at the foot of Mount Narkwa. Here the people, who are a branch of the Darsonich tribe, live almost entirely by fishing, spearing the fish by the light of a torch fixed in the bow of the canoe at night. They also do a little cultivation on the shore of the lake. The whole promontory is a plateau, the edges of which descend sharply about 100 feet to the level of the present lake-shore, which is a couple of miles broad, but was evidently at a recent period a part of the lake-bottom. Game is scarce.

On April 9 we marched across an immense plain, where I saw a herd of sourgalgall, or hartebeest, and, on going closer to it, saw two antelopes of another species. I was lucky enough to shoot what I now believe to be a new species of *Kobus*, though my specimens have not yet been officially described.

The next day we reached the last of the Darsonich villages, on a little river called the Errek. The people, being very friendly, gave us much information, including the last news that I heard of Captain Bottego. They said that he had been wounded by an elephant, and with some of his people stayed on the river Omo. The other Europeans and the rest of his men had come to their neighbourhood to get food and cattle from the Turkana. They had tried to march down the west side of Rudolf, but, after five days' incessant fighting, had been obliged to retire; this occurred about four months before I was there. They also told us that as soon as we got into the Turkana country we should be attacked. Between these people and the Turkana there is a neutral ground, consisting of a small plain not much more than a quarter of a mile in width. If a party of either race crosses this plain, it is taken as a declaration of war.

The Darsonich pay a sort of yearly tribute to the Turkana, in return for which the Turkana leave them more or less in peace.

Leaving next morning, we crossed the neutral territory into Turkana-land, keeping the caravan in close order, and allowing no stragglers. We saw numbers of deserted villages, the result of the Turkana raids, and eventually caught sight of some people hiding in the reeds by the lake, but, on approaching, we found that they were Darsonich fishermen, who lived in a village built on piles among the reeds 300 or 400 yards from the lake-shore. They told us that the Turkana, hearing of our being in the vicinity, had left their villages and driven their cattle up into the mountains.

On the evening of April 11 we arrived at the foot of Mount Lubur, which is one of the landmarks of the country. After a quiet night, I took fifteen men and ascended Mount Lubur, the ascent not being accomplished without great difficulty, as there was no path on that side of the mountain. The crater on the top must be nearly 2 miles across, and in it there is good grass growing and fresh-water springs. The natives use the crater in time of war as a stronghold and refuge for their flocks and herds. There is only one path by which even goats can ascend, the sides are so precipitous. This is a dangerous and easily defended road up to the mountain. From here I was able to see down to the second island of Lake Rudolf, and to the westward, as far as the eye could reach, were great chains of mountains covered with forests. As it looked like a good shooting country, I wished to explore

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in that direction, but the native guides maintained that there was absolutely no water for many days' journey, so I had to relinquish the project. At the top of the mountain my aneroid registered 5300 feet, and here I took some photographs of the surrounding country, which I will show later.

On descending next day to the foot of the mountain, we found that the men I had left in camp had been under arms all night, as the natives had tried to enter the camp under cover of the darkness.

Before proceeding further, it may be well to describe briefly the people into whose country we had lately entered. The Turkana are a vast people of about the same strength as the Borans, and are a perfectly united nation under one big chief, whose name is Logorinyum. He is quite blind, and a very bad old man. He pretends to be a prophet, and says that he has dreams which tell him that if his men go and fight the surrounding people they will be victorious and capture a lot of cattle and camels, so he is always sending out his men and fighting the surrounding tribes, and is thus naturally very much disliked. He lives on a river called Geriu, which skirts the northern end of the mountain chain south of the Turkwell. The men are absolutely without clothing, and wear a long mat of hair, which is woven together and added to for generations, reaching very often down to their thighs. Inside this head-gear they have a kind of bag, in which they put anything they want to carry. At the end of the hair is attached a long wire, which is bent so as to come over the head, with a tassel dangling at the end of it. Higher up they wear ostrich feathers dyed in blood, one for every man that they kill in warfare. Their faces are of a long flat shape, of the ugliest type we ever came across, and, to make them still more hideous, they cover them with red and white lines. They wear ordinary copper bracelets and iron ones, like those of the Borans. Their weapons consist of a throwing-spear, stabbing-spear, and an oblong shield, which is made either of wickerwork or hide. They also always carry a native pillow and a tobacco-box made from the horn of the oryx, and decorated with cow-tail and lizard skins. Their powers of endurance are simply marvellous, and I have measured several of their strides, made when running, which have been 84 inches from heel to toe. I think they are the fastest runners of all the tribes in East Africa, being even faster than the Masai. When on the war-path every warrior is accompanied by one or more dogs, which he uses to track his enemy, as they always fight during the night-time. They also wear a wrist-knife like the Reshiat people. Their war-cry is the same as that of the Suk, an imitation of the bark of the zebra, which is so good that it is very hard to distinguish from the cry of the true animal. The tribe which suffers most from the raids of these Turkana is a prosperous and industrious one called the Rendile, who live east of the south end of Lake Rudolf and due south of the Boran country. These the Turkana not only rob of their live stock, but also carry the people themselves into slavery. Being the strongest nation in this part, they levy taxes on all their surrounding tribes.

At Mount Lubur our faithful Masai guide Loraisi implored us to let him return, as his life was now in danger if any natives saw him. Loth as I was to do so, I allowed him to go, making him happy with a present of cloth, beads, and wire.

The next day we passed several dry river-beds, and after five hours' march came opposite to a mountainous island rising abruptly out of the lake, about 3 miles long and 5 miles from the lake-shores. The island looks an old volcano, which it probably is.

On April 16 the Turkana, who had been following us night and day during our marches, succeeded, owing to the carelessness of our boys, in driving off the troop of camels and donkeys which I had been able to take across the Omo, and so had with me. Though rapidly followed, the marauders had got such a start that they succeeded in hiding away the animals in their mountain fastnesses. My search party was attacked while following the trail, but luckily, on their way back to camp, fell in with a herd of camels in the bush, among which I found one of my own marked animals.

Though often threatened by large masses of natives for the next four or five days, we were not actually attacked until the night of the 26th. As we kept close to the lake-shore, the natives never had an opportunity of surrounding us or of attacking us except on one side. We passed numbers of temporarily deserted villages, as, this being the wet season, the greater number of the inhabitants leave the low-lying land near the lake and betake themselves with their herds to the mountains. During these five or six days we passed through country at times covered with dense patches of palm trees and various creeping plants, and anon consisting of open and arid sandy flats sparsely sprinkled with thorn and spear-grass. Several sandbanks, varying only in size, run out from the shore into the lake. They are composed of loose silver sand, the largest forming a promontory which almost reaches to what I call the second island counting from the northward.

During the march of the 26th, some of my boys were attacked by the Turkana at a little distance from the caravan, and one of them wounded. That night, as I had been doing for the last two or three days, I went out on a sandspit into the lake and camped, cutting down the bush and placing it across the shore end of the bank so as to form a boma. At one o'clock in the morning the Turkana attacked and succeeded in breaking through the boma, a few of them getting into camp. We succeeded in driving them out, and, though they again attacked several times, we kept them in check till daylight, when they retired. The custom of these people is always to attack in force in the early morning. As soon as daylight broke, we arranged a kind of stretcher-bed on several of the camels, and so carried four of the more seriously wounded men fairly comfortably. We marched for five hours, continually harassed by the natives, and then, finding another sandspit running out into the lake, formed a similar camp to that of the evening before. While building the zeriba a mass of the enemy advanced to the attack, but on my charging them with half the men they withdrew, and though we could hear them in close proximity to the boma during the night, a few random volleys discouraged them from attacking us again.

During the succeeding six days the same kind of guerilla warfare continued. The enemy never came to close quarters again, as we always camped at night on sandspits, and made strong bomas with thorns.

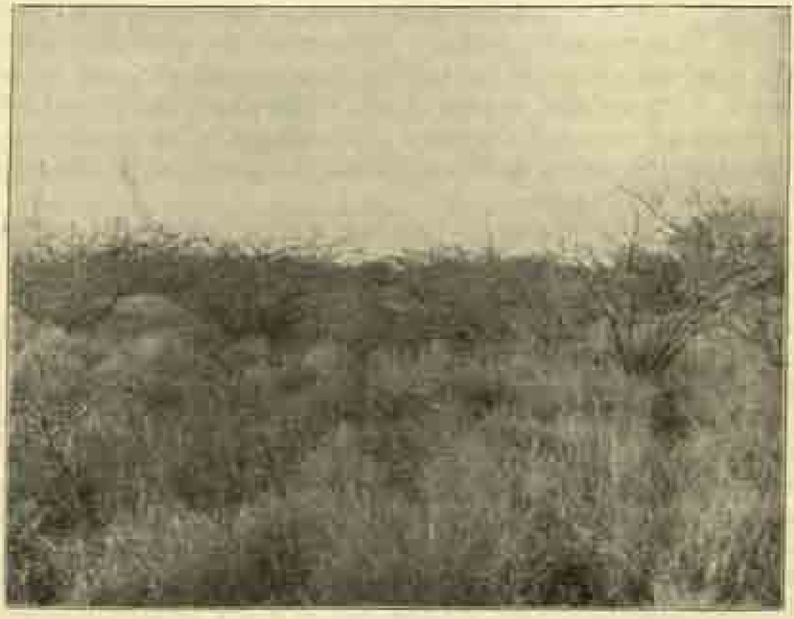
On May 3 we luckily captured a woman, and, with her as an interpreter, got into communication with some of her friends among the hostile natives. After much palaver and a few presents, we satisfied them that we only wished to pass through the country, and had no intention of stealing anything, nor was fighting a pleasure to us; whereupon they, probably with the hope of getting rid of us more rapidly, provided us with guides. These were most acceptable, as from this point there was some difficult country, including a range of mountains, to cross, and we had still 50 miles' journey to get to the south end of the lake. By thus providing us with guides, the Turkana made satisfactory amends for all the trouble they had occasioned us.

Here, as of course you know, we were in the country which Count Teleki had already explored. Among these mountains we had great difficulty in travelling, the wounded particularly giving us trouble, as the lava and iron-bearing rock of which the mountains are composed made the road as difficult to traverse as any I had the misfortune to attempt. Our animals for some days past had had little or no food, and in consequence were scarcely able to crawl.

On arriving at the south end of the lake, I was surprised to find that Teleki's active volcano had entirely disappeared, its place being taken by an absolutely flat plain of lava. We got hold of some Ligob men who lived at the south end of Lake Rudolf, and within a couple of miles of the volcano, who told us that about six months ago the lake overflowed, and as the waters rushed towards the mountain—the native name of which is Lubburua—there was a vast explosion, after which the waters swept in where the crater had been and put out the fire. Since that time there has been no sign of the crater in that place, and there is now only a vast field of cold lava running right down into the lake; but a new crater has opened about 3 miles due south, the native name of which is Luttur. This has only just lately become active, and some of the Ligob people, who have ascended to the edge of the crater, report that there is a fire in the inside, and even we ourselves during the night could see the glare over the mountain. The new crater is as yet not more than about 130 feet high, but the cracks and crevices in the lava did not permit of our ascending.

The Ligob, just alluded to, are a very scattered tribe, who live on the shores of Rudolf and Baringo. Once very powerful and the masters of the Masai, they are now linked with the Rendile tribe under one big chief, called Legom. Their own chief is Ladumma. They are now very poor, and live chiefly by fishing, wandering about very often in pairs up and down the lake, but we found them extremely friendly and very willing to trade. They speak the Masai language. They are the only people who live on the different islands of Lakes Rudolf and Baringo, and were it not for these little strongholds they would hardly exist. One of their biggest strongholds is an island called Elmolo, in the south of Lake Rudolf. About thirty years ago, it is said, the lake was dry at this end, and some Elmolo fishing people, of the same tribe as those who live in Alia, happened to have their village on the high ground of Elmolo, with their sheep and goats. One morning they woke up to find themselves entirely surrounded with water, and, having no boats, have been unable to reach the mainland ever since.

Continuing round the lake and going northward by the east shore, on the third day I met Andrew with the main caravan. He had followed the east shore of the lake, which he had found uninhabited, having had excellent shooting in consequence. On one occasion he had a very narrow escape from the charge of a wounded elephant. He had fired



COUNTRY SOUTH OF LAKE STEFANIE.

both barrels without apparent effect, and was forced to run on an open plain with no cover whatever. The brute was within 20 yards of him, when he broke his fetlock and came with a crash to the ground, breaking his tusk in the fall; otherwise, either Andrew or his gun-bearer must inevitably have been caught.

On leaving the south of Lake Rudolf for Baringo, we found the country exceedingly difficult; in fact, in parts we could only succeed in doing a mile after six hours' marching, having to climb almost impassable mountains. Then our guides deserted us, necessitating our sending back to the Turkana country for others. But it's an ill wind that blows nobody good. While we were waiting for guides we discovered an entirely new sheet of water, and paid many visits to it. It lies about 30 miles due south from Lake Rudolf. Its shores are very barren, entirely enclosed by mountains, and there are three islands, apparently quite barren, near the east shore. It is fed by two rivers. What water there was in this lake was exceedingly hot, and near to the north end, where a smouldering volcano was situated, was just as hot as one would like to wash one's hands in. This volcano I propose to call, after my companion, Andrew volcano. In places where the water had dried up, the lake-bed was composed of black mud, very deep and hot, but with a hard crust over the surface. One boy that we happened to send in after a wounded Spanish flamingo, sank through this crust and scalded his foot so badly that the following day his toe-nails came off. Former high-water marks were strewn with a mass of fish-bones, and skeletons of fish, large and small, evidently killed when the water was heated. The dried-up portions of the lake are crusted with salt, and on the borders there are solid mounds of salt. There were one or two wells of fresh water here, and many sites of old villages, which we afterwards found from the natives had been deserted on account of the fire mountain, which is still active.

The altitude of the lake is 1300 feet, and the height of the volcano 1600 feet. We found that, after running north and south for about 25 miles, the lake winds round in a south-westerly direction for about 10 miles. It has an arm which we did not explore. Sugota is its native name, while that of the volcano is Sugobo. Before this became active, the lake is said to have been full of water, which was good to drink.

From here we still continued our bee-line for Lake Baringo, and experienced the most serious difficulties of our trip. We had a mutinous camp and two captured guides, of whom we were never quite sure, and exceedingly little water. The route also was barely passable, and, after having to change our loads from camels to donkeys, we were finally compelled to carry them up ourselves. If it had not been for fortunate rain-showers and a lucky find of a few puddles, we should never have got through this country.

On May 24 we camped at Inuro, and stayed there two days. On this plateau the aneroid registered 4540 feet, whilst a high mountain rose abruptly from the north-east side. We had heard that the natives, a branch of the Legup or Ligob who lived in these mountains, were friendly, but we found them timid. They were shy and would not trade—in fact, were quite unwilling to leave their mountain home, the size of our caravan perhaps scaring them. Hence we followed a winding and difficult path, and at a camp called Gemos, at which we arrived on June 2, and where a tribe of Rendile used to live, our camels first suffered from sickness. No less than forty camels in one day became unable to stand, and we thus had to leave them outside camp all night. This was not caused through fly, but, as we afterwards found, through a poisonous bush, which we unfortunately did not notice on our arrival. Ten of these camels died or had to be shot, the remainder recovered after three days.

The country about there abounds in lions, and on June 26, at a place called Bahgar, we had a most exciting time, killing a lioness and capturing her two cubs.

On July 6 we were delighted to catch a glimpse of Baringo, and to know that we now had water for certain.

Here we had an adventure with a rhino, which came near having serious consequences. We were with our gun-bearers, I being in front, when suddenly we heard a peculiar grunt, which sounded so exactly like a lion that we halted immediately. It was Andrew's shot, and I was just getting off my mule, when, instead of a lion, out of the bush charged a grunting rhino. We were in a little gully, with a rise in front of us, a hill on our left, and a bit of thick bush from which the rhino charged on our right. About 10 yards off, the rhino made several short erratic charges, and then, unfortunately, decided to go down the narrow path along which Andrew was riding. When about 15 yards distant, the sensible mule turned tail and bolted, but before he had gone 20 yards the rhino was within a yard of him. The rhino was gaining fast, so Andrew tried to turn his mule into the bush on the left, but a mule is a mule, and he would not be turned. Andrew then threw himself off on one side, hoping the rhino would attack the mule; but no, he swerved in his course so quickly that he managed to strike Andrew in the middle of the back, but fortunately the horn only ripped up the back of his coat and shirt. After the shock he knew very little, except that he remembers lying flat and seeing a mass of clumsy legs over him. When these disappeared, he had just enough sense and strength to crawl into the bush, and was greatly relieved to find that he could even crawl. I then saw the rhino standing over Andrew and showing no signs of moving. I rushed on the animal, the men following me, all shouting, as we had no guns, and the rhino then made up his mind and charged the fleeing mule, which he came up with, but, though he knocked it flying into the scrub, did it no serious damage. We brought Andrew in a semi-conscious condition into camp; he was badly bruised, and had his knee sprained, the latter injury preventing him from walking at all for many weeks.

At Lake Baringo we were pleased to get news of white men in the neighbourhood. They eventually turned out to be Mr. Jackson and Dr. Macpherson of the Uganda Protectorate, whom we saw at the latter's station on the Eldoma escarpment. We followed Sclater's road to Kibwezi, and from Kibwezi the Mackinnon road to the head of the Uganda railway, where the officials showed us every kindness, even going so far as to take our whole caravan and loads down to Mombasa by special train. This act of courtesy saved us perhaps a week's march, including the crossing of the Taru desert.

Before the reading of the paper, the PRESIDENT said: We are to be occupied this evening with one of the two great undiscovered and unexplored regions of Africa which I referred to in my first address to this Society. Since that time a great deal has been done in the first and most interesting of those two regions; nothing in the second. Only two years ago we had a most interesting paper here from Dr. Donaldson Smith, who had penetrated far into that region, and solved one or two of its problems. Since that time we have news of the important expedition of Captain Bottego, whose death we all deplore, for he was a most distinguished traveller; and now we welcome here for the first time the young traveller Mr. Cavendish, whose expedition has gone far to solve other problems connected with that region, and has brought us to the very edge of the still undiscovered portion. I will now request Mr. Cavendish to read his paper.

After the reading of the paper, the following discussion took place:—

Mr. S. L. HINDE: I had the pleasure of meeting Mr. Cavendish in East Africa when he was nearly at the end of his journey. What struck me most, on seeing the caravan arrive, was the good state of his transport animals; those that were brought through were in excellent health. In the paper to-night he said that the only time his transport animals were ill was after they had been starved. I think this point worth noticing. They came into the fertile country after having been partially starved for some time; then, being hungry, they probably ate of some of these poisonous bush-plants, which under ordinary circumstances they would not have touched. There have been great difficulties in finding transport animals in Africa; many people attributed this to the tsetse fly. For my own part, I don't think the fly, as a rule, dangerous. I fancy it only exists for two months in the year in any part of East Africa. The probable cause of many transport animals in East Africa dying is starvation; they never get proper food on a great part of the road during the dry season. When the wet season commences, all kinds of plants grow rapidly, and many animals overeat themselves. I have known twenty or thirty die in a day after going into the fertile country, though they were in perfect health along the dry ground in the desert. I think this is a point that might be noticed and looked into in regard to our transport in East Africa. I don't think that I can say anything more about the other points; there are other gentlemen present who know more about them.

Major F. D. LUGARD: As one who has been connected with East Africa, I am very glad of the opportunity to offer my very hearty congratulations to Mr. Cavendish on his plucky journey, which, I think you will all agree with me, was very remarkable—and the more remarkable and the more pleasing to us because he is the first Englishman who has traversed that country—his predecessors, one of whom we welcomed here, were Dr. Donaldson Smith and Signor Böttego, the Italian explorer. They have done excellent work, but they are not of our own nationality. The country explored is part of our own British East African Protectorate, and therefore, I think, the more British explorers that go into the country the better, provided they work in the way Mr. Cavendish worked. He was very reticent about those who had gone before him, but we gather that he met with less hostility than they had done.

Among the Borani Gallas he was welcomed, and says that he could go from village to village and get a drink of milk anywhere, for which the natives refused any payment—a country in which they could go out singly shooting without fear of attack, and yet a country where the last explorers had to fight continually. Further on were the Hamerkoke, on the west of Lake Stefanie, and with these he again established friendly relations, where the last traveller had had a serious battle. Even in the Turkana country, in which British travellers have been (Mr. Jackson was there, but the first to enter the country was Count Teleki) and had continual fighting, Mr. Cavendish was attacked, but established friendly relations before he left. I think the more that British travellers go into that country, willing to risk their lives and spend money on these explorations, the better for British interests, provided they are undertaken on these lines.

We have heard lately—I don't know whether the statement was made on his own authority—that Mr. Cavendish is planning a second expedition. There remains a good deal of country, still further to the west, which is still unexplored by our own nation or any other, and if he elects to go into that country, we shall all agree in wishing him as great a success as in his previous expedition. That country is undeniably British, and therefore every one of our nationality has a primary right to go into it.

With regard to Mr. Cavendish's interesting paper, I noticed one point in particular—the discovery of coal. I hope before long we may see an extension of the railway to the north, when that coalfield may become valuable to the steamers on the lakes and to the railway. Another point struck me—he incidentally mentioned that the camels died of rinderpest. I have lately come from South-West Africa, where the epidemic has been raging, after having traversed the rest of the continent. I have been unfortunate in that I have followed the steps of the epidemic in both East and South-West Africa, where it destroyed the cattle and a great many species of antelope, but it is quite new to me to hear that the camel suffers.

Mr. Lort Phillips: I have very few remarks to make, except to agree with Major Lugard's remarks on the paper read by Mr. Cavendish. As one of the first explorers in Somaliland in company with my late friend, Mr. James, and others, I naturally take a very great interest in the country. In those days we got no further than the Webbe Shebeli, now a route traversed and retraversed by sportsmen who have met with kindness from the natives, and I was very glad to hear to-night that Mr. Cavendish received the same treatment during his journey. I have only to agree with Major Lugard's remarks regarding Mr. Cavendish's journey.

Dr. Bowdler Sharpe: Before this meeting separates, I would like to say, as an officer in charge at the British Museum who has had to receive Mr. Cavendish's collection, that I am sure you will be proud to hear that in all my experience we have never had such a caravan full of things come into the Museum, as the result of one expedition. I am sure Mr. Cavendish will acquit us at the British Museum on the point in his paper to-night, in which he seemed to make a reflection on us for not having worked his collection out; but since his return he has been so busy that he has not been able to give us the time necessary to help us in getting his collection into order. It occupies one side of our whale-room, and only Mr. Cavendish himself can sort this enormous mass of skulls and skins, and bones and limbs. When I do get him there, he will not be allowed to leave in a hurry, until we have got this mass of things into some sort of order, and we will then tell him the names of the animals he has brought home. Mr. Oldfield Thomas, in charge of the mammalian section, considers the collection to be of great interest, and it is interesting to hear from Mr. Cavendish's own lips to-night of the difficulties of the journey he has made, and to see the collections of horns and skins of mammals prepared by this young traveller, and brought down to the coast under such exceptionally difficult circumstances. I would merely add one remark that I have made before in this room. I do think, and I hope it will be urged in every possible quarter where any influence can be brought to bear, that it is a national disgrace to England that all our great natural history expeditions depend upon private enterprise, and that our Government does absolutely nothing in the matter. There is no country that has interests in Africa like ours. We see little principalities annexed by the Germans, and larger ones by the French, and at once a naturalist is set to work out the fauna. Our Government should insist on scientific men being appointed, and on collections being made. No sooner was Uganda taken possession of and occupied by England than German naturalists overran it, and now our naturalists can only send us what has been already described by the Germans. This is an absolute disgrace to a country like England, and we should be entirely out of the race if it were not for the private enterprise and pluck of our own men, who go out and spend their own money in bringing home these collections.

Those of us in this room to-night who have heard Major Lugard, know that he is always trying to do something for science. Mr. Lort Phillips brings back grand results at his own expense, as also do men like Sir Harry Johnston, Dr. S. L. Hinde, and Mr. F. J. Jackson, who you will be glad to hear is recovering from his wound, and is now out of danger. But one of the best results we may hope for is that a scientific expedition, under Mr. Cavendish's direction, will now, in the same way as the expeditions of Russia and France, go in the search of science. I hope that, though he has not brought back any birds this time, I shall have great results to announce to you later on.

The President: It is now my pleasant duty to propose to you a vote of thanks to Mr. Cavendish for his paper. He has thrown a great deal of light on this most interesting country in several ways. In regard to Lake Stefanie, as Major Lugard mentioned, he has discovered an important feature—the existence of coal. He has confirmed correctness of the work done by Captain Bottego and Dr. Donaldson Smith in settling the question of the Omo river. He has discovered a most interesting volcanic country to the south of the lake. Perhaps the most gratifying part of the paper he has read to us was that which showed us what friendly relations he was always able to establish with the tribes he met in that wild part of Africa, and also quite as much we feel gratified at what we heard from Mr. Hinde regarding the condition of his animals when he met him on the Uganda road. These two things show that Mr. Cavendish is an excellent traveller. The most interesting photographs he showed us were the views of the unknown country to the westward of Lake Rudolf, which he described as mountain after mountain covered with forest. For it is quite unknown. I believe he heard that it was entirely uninhabited and had no water, but that is not the least likely from the description he gives of the country. We must remember that a little further north Captain Bottego penetrated still further into the unknown region, and reached the valley of the Sobat, and I think descended one of its main tributaries for a considerable distance, but he was unfortunately murdered. Well, that vast region is entirely unknown, and it is within the sphere of British influence. We therefore look forward with the greatest interest to its discovery, as we have done for the last few years. Our friend here only reached his majority last year; he is probably the youngest man who has ever read a paper before this Society. I think we may trust he has a long and useful geographical career before him, and that under his auspices that unknown region down to the mouth of the Sobat, in the upper Nile, will not long remain unknown. We have to thank him for all his interesting information, for the admirable photographs which enable us so well to understand the nature of the country, and also for the large number of curiosities and trophies of the chase which he has brought here, and which you will find in the next room. For all these things I am sure you will pass a vote of thanks by acclamation.

FOUR YEARS' TRAVEL IN CENTRAL ASIA.*

By Dr. SVEN HEDIN.

The caravan with which I crossed the plateaux of Northern Tibet consisted of twenty-one horses, six camels, and twenty-nine asses, and when I say that forty-nine of these animals, or ninety per cent., died on the way, some idea can be formed of what we had to go through. When we reached the country where pasture was scarce or was entirely lacking, one or two of our animals died every day, and their mummified bodies, which in this high, cold atmosphere do not decay, but simply dry and shrivel up, still lie there like milestones, to mark the way we passed. We had twelve sheep as travelling provisions, and three watch-dogs, one of whom, Yolldash, who would not let any one approach my tent except my body-servant, Islam, is now boarding in the most desirable comfort with the Conseiller d'Etat, Mr. Backlund, at Pulkova, where he impatiently awaits my next journey through Asia.

On this expedition I had eight permanently engaged servants, with Islam-bay at their head. Among the others I should mention Fong-shi, a young Chinese who spoke Turki, and who was going to be my interpreter in China; Parpi-bay, a Sart who had been with Carey and Dalgleish, Bonvalot and Prince Henry of Orleans, Dutreuil de Rhins (whose murder he had witnessed), and for a time had partaken in Pevtsoff's expedition; and Hamdan-bay, from Cherchen, who had accompanied Littledale on his journey across Arka-tagh. Furthermore, I had engaged for two weeks fifteen Tagliks, two of whom deserted in the very beginning of the journey. We took with us three months' provisions for ourselves, and maize enough to last the animals for one month. I had a tent all to myself, and only Yolldash was allowed to sleep by my side, but the Tagliks slept under felt carpets spread over the maize-bags, which were piled up in form of a circular wall every time we camped. It really did not matter so much that the animals died off the one after the other, for the provisions ran low in proportion; but it was distressing to see their sufferings.

On the plateau we took the following order of march. I gave orders every evening in regard to the direction in which we were to march the next day, and early in the morning the camel-caravan set out; shortly after, the asses, with the provisions for the animals; and two hours later the horse-caravan started off, soon overtaking the others, and selecting a suitable place for the night's encampment, which must be near water and pasture. Accompanied by one man only, I came last, since I was always strictly occupied with mapping, geological surveys, etc. We had some difficulty in getting across the northern border-

* Read at the Royal Geographical Society, November 22, 1897. Continued from p. 258. Map, p. 352.

mountains of the Kuen-lun chain. I had examined the Chargalik pass, but found it impossible for the camels to traverse; but we managed to cross Jappkalik (about 16,000 feet) without unloading the animals.

We then followed one of the tributaries of Kara-muran up to its sources, where the landscape already is a transition to plateau-land. Here, in one place, a picturesque group of mountains rises from the rolling country, resembling an aggregation of truncated cones with grooved sides. They proved to be horizontal beds of tufa, protecting

WATER IN SIGHT.

substratified sandstone and very hard conglomerate from weathering. The tufa is jet-black, while the rest is brick-red; and these peculiar mountains, which were hereafter by no means scarce, could be seen like beacons at a great distance. Between Arka-tagh and a little mountain range north of this mountain, we marched east-south-east, all the time looking for an easy pass. We did not succeed in this, however, before we reached the place where Littledale had found a pass, which Hamdan-bay had undertaken to show us. He could not find it, however, so we crossed Arka-tagh by a new pass (17,000 feet high), a few miles east of Littledale's pass.

The thin air had many injurious effects upon my men. During the first weeks every one was sick, and complained of headache. Already, on reaching our fourth halting-place after leaving Lama-chimin, Fong-shi was half dead, and had to be sent home to Khotan with two Tagliks. This was a fine prospect indeed; what should I do in China without an interpreter? At the fifth halting-place, Islam-bay was so ill that we had to stop three days. He thought he was going to die, and told me to go on without him, but he fortunately got better. At the eighth encampment I turned off three Tagliks, and the others, who were to go on with us, asked to be paid half of their salary in advance, and I

THE ISFAIRAN VALLEY NEAR AUSTAN.

granted their request. I was, however, rather surprised the next morning to find that all the Tagliks had deserted, and taken a dozen asses, two horses, and provisions. I did not submit to this, however. Armed with rifles and revolvers, Parpi-bay and two other men mounted our best horses and followed the deserters until they caught up with them. They were forced to go back to the camp, where the ringleader was punished, and the others were compelled to give back the money which had been paid them in advance. After this they were kept bound at night until we were sure of them. I have not time now to describe the interesting geological section which I had the opportunity of making of the parallel mountain ranges of Kuen-lun; granite, syenite, diorite, and crystalline schist are predominating. From the Arka-tagh pass we saw, far to the south, a great chain of mountains with perpetual snow-fields and shining tops. This range is parallel to Arka-tagh, and constitutes, as I afterwards found, a continuation of Koko-shili. Its highest peak was called King Oscar's mountain, after my generous monarch and protector. Between these two gigantic chains, which run from east to west, stretches a rolling plateau, which is divided into a whole series of basins without outlet. Every such basin is bounded on the north by Arka-tagh, on the south by the parallel chain, on the east and west by small, insignificant, water-shedding passes, separating the one basin from the other. In the middle of each basin there is a lake with clear but bitter water, which the streams from the surrounding mountains collect. In travelling east we discovered twenty-three such lakes, of whose existence not even the Chinese had any idea. The largest was three days long. All this part of the country was carefully mapped, and all the mountain-tops were put down on the map.

The landscape is very desolate, and when the average height reaches 16,000 feet, it is clear that vegetation must be scanty. I collected all the plants we found. They had, as a rule, rather fleshy and downy leaves, lying close to the ground in order to protect themselves from the wind and frost. The poor pasturage which was now and then found was so scattered and bitter, that the animals would not have eaten it if they had not been driven to it by hunger. The ground is, however, generally perfectly bare, and the weathering-products, which have washed down into the central parts of the basins without outlet, have, in the course of time, been disintegrated into very fine particles, so that sand and gravel are very scarce. Since the ground is damp, as a result of dew and rain, it becomes soft, and the animals frequently sank a foot deep, which fatigued them all the more. Only the lake-shores, along which we frequently travelled, were suitable for our march. The cold was not at all great, and in the daytime one could even ride without a cloak, on account of the strong insolation. At night the temperature seldom sank under 14° Fahr. The worst of all was the wind and hail. With the regularity of clockwork, the west wind came every day at one o'clock at noon, and swooped down upon the plateau-land with intense fury. The mornings were generally fine, but in the afternoon the horizon became black, a rushing, hissing sound was heard in the distance, the noise came nearer and nearer, the whole country round was enveloped in a dark fog, and we were frequently obliged to stop because we could not see where we were going. During these storms, the lakes offered a grand spectacle. High, white-crested waves, green as emerald, beat with a metallic ring against the shore. The mountains on the other side of the lake could not be seen through the fog, and one could imagine that one stood on the shore of the great ocean, to which one always has an indescribable longing when in the centre of a great continent far from the sea. These lakes were otherwise dead and desolate; never before had their shores been trodden by human beings; and the country where they lay was just as desolate as the lakes themselves. Once or twice we saw wagtails and larks, and geese on their way to their winter quarters in India. A species of gull, of which I have brought home a specimen, was, however, very common. These gulls seemed to enjoy hail and snowstorms, for when such a storm was raging they would cover the surface of the lake by the hundred, peacefully rocking on the waves.

The only animals that were capable of putting any life into these wild, desolate regions were the yaks and khulans, and there are incredible numbers of them here. The yak-dung afforded us the very

THE CARAVAN IN THE ISPAIRAN VALLEY.

best of fuel, and every evening we could warm ourselves by fine, large camp fires. The sheep which we had taken with us soon proved to be insufficient, and when the last one had ended his days with his head turned towards Mecca, we had to shoot yaks in order to get fresh meat. Islam excelled in this sport. He provided all the men with meat, and I got the tongue, which was the tit-bit. I have brought home the skin of a magnificent specimen, a bull 11 feet long; but he was hard to shoot, that beast. He had to be given seven bullets before he would bite the dust, and the next day, when we were going to skin him, he had disappeared. We soon found him, however, not far off, walking along slowly with his nose to the ground, and there was still enough life in him for him to chase us; but after receiving four more balls, he died in earnest. He had no less than eleven Berdan bullets in his body before he would give up the ghost. It is impossible to kill the yak instantly unless the bullet pierces his heart. If he is hit in the pelvic region, he will go about three or four days before he will die; if he gets a ball in the forehead, he will only sniff a little and shake his head; but if the ball hits him in the back or in any other place where it hurts him, he will puff and snort like a high-pressure saw-mill engine, the dust flies about his nose, he throws his tail into the air, and rushes on to the man who shot him. Thus it is a dangerous hunt. The largest herd of yaks which we saw numbered about eighty, but they are usually found in numbers of from three to eight, and sometimes solitary. The khulans are generally seen wandering about in small herds, but in the frontier mountains of Tsaidam we saw herds numbering 150. The khulan is a stately animal, a higher animal in both meanings of the word; his beautiful brown and white colouring, his noble form and powerful sinewy muscles, his high-carried head, and his broad chest well fitted for powerful lungs, give him a very attractive appearance when, as swift as the wind, he darts off with light elastic bounds across the hills of the wilderness. They contemplated our caravan with dull surprise as we slowly wended our way with failing strength towards the east, accompanied by the doleful twang of the camel-bells keeping funeral time, and, in reality, each of our hungry horses looked like the Rossinante of Don Quixote in comparison with the knightly, free khulans, who had been born and brought up in this thin air, and were accustomed to the meagre pasturage. The cry of the khulan, his long ears, his tail, with its terminal tuft of hair, make them much more resemble the ass than the horse. I have brought home a hide. The flesh is unedible, and has a very disagreeable flavour; but the flesh of the yak can be used for food, though it is as tough as gutta-percha, and must be cooked for a day or two in order to get it anywhere near tender, which may depend somewhat upon the rarefaction of the air, since water boils at about 180° Fahr.

Thus we wandered day after day across the plateaux of Tibet for two months without seeing a single living being. We found traces of man only twice during this time: at the last halting-place north of Arka-tagh, where a charred pile of coals after a camp fire showed that we were crossing Littledale's route; and between our seventeenth and eighteenth halting-places, where, in the soft sand, we still found traces of Bonvalot's and Prince of Orleans' camels, these tracks having remained undisturbed for eight years. Meanwhile our caravan dwindled down in an alarming manner: at last the men had to go afoot, and we thought that it was time to try to find inhabited country.

North-east of the last great lake, Arka-tagh showed a great incision in its summit, and by two rather comfortable passes we reached the sources of a river, which was afterwards found to be a tributary of

Napchitai-muren. On September 30 we saw the first traces of Mongolians. On the west bank of the river there was a fine *obo*, or stone cairn, raised in honour of the gods of the mountains. It consisted of forty-nine black slabs of slate, as thin and smooth as school-slates, and so placed that they resembled a stable with three stalls. They were covered on both sides with beautifully chiselled Tibetan writing-signs. Since the great pilgrimage route of the Mongolian pilgrims to Lhasa crosses just here the frontier mountains of Tsaidam, I thought that this stone book contained important historical documents, but soon found that the same writing-signs re-occurred in a defined order all the way. It was the

THE CARAVAN ON THE SUMMIT OF THE TENGIS-BAI PASS.

Tibetan creed: "On mane padme hum," which was engraved four thousand times in the stone, and it was our first acquaintance with the religious excesses of Lamaism.

When, on October 1, we went further down through the valley, we saw some grazing yaks on a spur of rock. Islam-bay stole carefully into range. After two shots had missed, an old woman came running towards us, shouting and gesticulating, and we then understood that they were tame yaks, and that we had now reached the first human dwellings after two months of solitude. The old woman took us to a tent made of nothing but rags, and surrounded by heaps of "argal" and great pieces of yaks' flesh. An eight-year-old boy was her only companion. Our conversation with this old woman was a test of eloquence. She, of course, did not know whether we were "birds or fishes," and none of us understood any Mongolian. I knew the three words usual on the maps: *ula*, which means "mountain;" *gol*, "river;" and *nor*, "lake;" but to get the old woman to understand, by the help of this vocabulary, that we wanted, first of all, to buy a sheep, was no easy matter. So I began to bleat like a ram, and showed her a Chinese two-liang piece, and she understood me. Thus we had fresh mutton for supper this evening. Her husband, Dorchey, came back in the evening from the mountains, where he had been hunting yaks. They stay here all winter, and supply their tribe in Tsaidam with yak-meat. Dorchey was not a little surprised at seeing us, but he was a clever fellow, and became my first teacher in the Mongolian language. He was afterwards our guide across Yeskey-Tsagan-davan, in the Tsagan-ula mountains, down to Tsagan-gol in Tsaidam. Every evening I took a long lesson in Mongolian, and when we had been together a fortnight I could speak the language tolerably well, and never afterwards needed any interpreter. At Tsagan-gol I discharged several servants, and bought twenty horses.

Between Astun-tagh and the southern Koko-nor chain in the north and the Kuen-luns parallel chains in the south, extends the great basin called Tsaidam, which in physical geography has the same importance as the Tarim basin, although it is smaller, more rolling, and situated about 5000 feet higher. In its central portions there are several salt lakes, of which Dabasun-nor is the largest, and into it flow the rivers from the frontier mountains.

Around the lakes there extend great wildernesses, salt deserts, and marshes, perfectly uninhabited and sometimes impossible to cross; but along the foot of the mountains there are vegetation and pasturage, where the Tsaidam Mongolians tend their flocks of sheep and goats and herds of horses. They frequent the mouths of the valleys, where the rivers discharge, or around wells. I will give a description of the customs and life of these people in the narrative of my journey, which is to be published next autumn. They received me everywhere with hospitality. We went along the foot of the southern frontier mountains, across Bhaganamaga, Hodyegor, Tsacha, Yeskey-gol, Urdu-toley, and Hattar, whence we crossed the salt desert, passing Ova-togoruk, the river Chara-ussu, and Tsaka-Tsak. All these are names of pasturages or wells, for towns and villages are entirely lacking in Tsaidam. The Mongolians live in the same kind of *yurts* as the Kirghiz.

Thus we followed the western shore of Toso-nor, where there are extensive steppes, and continued along the southern shore of Kurlyk-nor. The latter lake contains fresh water, for Baian-gol, which empties into its north-western part, passes through this lake, and continues under the name of Haluin-gol to Toso-nor, which has no outlet, and therefore is salt. At Hlakimto there is a stately *obo*, or cairn, raised in honour of the gods of the sea.

We had camped for the night on the shores of the lake Chara-nor, in whose vicinity bears are so common that the camp and the horses had to be protected by fires; and on the following day, November 1, we started for the well district, Chara-sharnin-kub. We followed a narrow path through the broad valley. Here my Mongolian guide, Loppsen, and Islam-bay discovered a fresh bear-track, and followed it. After about an hour had passed, they came back in the wildest gallop, holding their guns above their heads and crying, "Tangutian robbers;" and, sure enough, at their very heels charged a troop of twelve mounted Tangutians, all armed with long black rifles, and enveloped in a cloud of dust. It was only a moment's work to dismount, get the baggage-

SANG KUL.

horses in a protected position behind some bushes, and level our rifles ready for action. When the Tangutians found that we were quite a number, and saw our rifles gleaming in the sun, they made a sudden halt and held a council of war, after which they separated. Half of the body went up towards the mountains, and the other half rode parallel to us about two gun-shots distant, when we quietly continued our march. We had, however, a narrow rocky passage to go through, and Loppsen was afraid that the Tangutians would lie in ambush here and open fire on us. We came happily through this passage, however, and out into open country, where we encamped beside a well. At night the horses were tethered, and sentries were put on guard, with orders to beat on kettles, in order to let us, as well as the robbers, know that they were awake.

As soon as it became dark, they made themselves heard in all directions around our camp, giving wild yelps and screams like hyenas or wolves. Loppsen said this was to find out if we had dogs, and they succeeded, for our dogs barked and howled furiously until daybreak. Thus their planned attack was frustrated. The next day they followed us for some distance, but finally gave it up as a bad job. We were, however, on our guard after this. Dutreuil de Rhins had been attacked and killed in this neighbourhood, and Prjevalsky had a battle with three hundred robbers: but he had two officers, twenty-one cossacks, and a gatling-gun. I was alone with only a few natives and three rifles.

Such was our entry into the land of the Chara-Tangutians. The Mongolian name *chara*, or "black," is here synonymous to the word *mo*, meaning "bad," because the Tangutians have a bad reputation as robbers and thieves. They speak Tibetan, have the same faith as the Mongolians; they carry around the neck the same *gavos*, or case, containing *burchans*, or idols, and make the same pilgrimages to Lhasa. The present Dalai Lama is a Tangutian boy. They live in great black tents of coarse cloth, raise sheep, goats, and yaks for a living, have horses and camels, get their cereals and household utensils from Ten-kar and Si-ning, are very sure shots, and frequently plunder their Mongolian neighbours. When the Mongolians go to Si-ning or to the temple feasts in Kumbum, they always travel in large well-armed bands. The Tangutians are always armed to the teeth. At Dulan-kit we found a great Tangutian camp, and stayed there a couple of days. Here I went about among the tents with Loppsen as interpreter, making sketches and notes. They did not seem to pay any attention to us when we came in, only casting distrustful glances at us, but they were soon taken aback by my easy and cool manner.

Crossing the southern Koko-nor mountain-chain by the pass Nokaoten-kotal and the river Buhain-gol, which I forded higher up than Abbé Huc, we at last reached Koko-nor, from which lake it was still 1000 miles to Peking.

The blue lake, or the Koko-nor of the Mongolians, the Tso-ngombo of the Tibetans, and the Tsing-hay of the Chinese, is situated at an absolute height of 9975 feet, and has clear blue salt water, which gives rise to its name. The lake is frozen over three months in the year; but every violent storm causes great cracks and openings in the ice, so that pilgrims cannot ride across it to the temple on the island in the middle of the lake. They therefore make sledges, on which they take provisions and fuel for three days. They are, however, frequently hindered from reaching the island by great gaps in the ice, or they are detained on the island by thawing weather. The water-level varies much in different years. Low water prophesies a good year; but when there is high water, the herds are decimated by the wolves, the Tangutians die off in disease, and the pasturage is bad and soon dries up. In the summer the water is higher than in the winter. These irregularities have perhaps contributed to lead "Pater Huc" to think that there is an ebb and flood in Koko-nor.

Nine months before my visit, the Dungan rebels, fleeing before their Chinese pursuers, devastated the country and stole 400 sheep and 140 horses and yaks at Yeekey-ulan, but the water had been unusually high, which of course accounts for it. In several places in the Buhain-gol valley we had seen traces of the Dungan camp fires. Wherever they had gone they had devastated the country like grasshoppers.

A day's journey from the city Donkyr, where I found three of Captain

THE CARAVAN IN THE ALAI VALLEY.

Wellby's servants, lies the renowned temple Kumbum, where we arrived on November 20. It is a whole village of temples, built in motley but tasteful and elegant Tibetan style; but the main temple, Sirkang, is its nucleus, for under its roof of thick gold plates sits the god Sardinchi-yee Tsung-kaba, fully 30 feet high, overlaid with gold, and dressed in precious silk mantles, and before this god the pilgrims throw themselves on their faces. A deep and mystical twilight reigns in this temple, but before Tsung-kaba there are five lamps burning on the floor, and in front of them stand five *jolas*, or richly ornamented vessels, containing diverse edible offerings to the god, such as tsamba, butter, cereals, water; and beside these vessels there are also lamps burning, which increase the almost Catholic mystical light effects. The temple is a perfect museum, full of other gods and innumerable volumes of holy Tibetan books. The high *lama* of the temple was condescending enough to let me see everything, on my promising not to make any sketches. The way in which I kept this promise is shown by the magic-lantern slides.

Tsuggtjin-dugun is a temple whose outer balconies support a large number of *korles*, or prayer-mills, which are vertical cylinders which may be turned on their axles by means of cranks. They are filled with strips of paper covered with the sentence, "On mane padme hum," and the duty of certain *lamas* is to turn these cylinders and send the prayers to the knees of the gods. There are said to be about three hundred *lamas* in the temple. Bareheaded, barefooted, and beardless, clad in long red pieces of cloth, these simple-minded *lamas* idly wander about in the temples, in the colonnades and courtyards, and are ridiculous in the slavish devotions they pay to the images that they have themselves made. I also saw the tree on whose leaves, according to Abbé Huc, the prayer "On mane padme hum" spontaneously grew every year, and whose leaves are sold at a high price to the credulous pilgrims. Loppsen whispered in my ear, however, that the *lamas* painted the letters on the leaves during the night.

On November 23 we reached the strongly fortified city Si-ning-fu, whose western gate was decorated with a large number of human heads enclosed in wooden cages and labelled. I was told that they were the heads of chiefs who had partaken in the last Dungan rebellion. Dungans are Mohammedan Chinese, and when the Chinese mandarins interfered in a religious quarrel in the Salar district, rebellion broke out in December, 1894. The revolt took on large proportions, and in July, 1895, reached Si-ning, and the country people round about the city took all their movable property inside the walls for safety, so that the population increased from 20,000 to 50,000. Soon battles were fought near the city, and wounded Chinese were brought to the city, the temples of the gods were transformed into hospitals, and Mr. and Mrs. Ridley, two English missionaries who showed me the greatest kindness, had their hands full to tend the wounded. On September 1 the town, Tung-kwan, just outside the east gate of Si-ning, rebelled, and all the Chinese in the town were killed. Si-ning was beleaguered for five months, and famine and pestilences began to rage. People began to venture outside the city, in order to get fuel and food, but the Dungans always lay in ambush, and killed all who showed themselves.

The civil ruler of the city, the cowardly Dao-tai, was on good reasons suspected to be guilty of treason. After the war was ended, he was called before the emperor to receive the fine silk cord which means "Go home and hang yourself." He did not go, however, but killed himself with opium at Lan-chau. It was expected every day that the city would capitulate, and the Chinese gave their wives large doses of opium for them to swallow the very moment the city should be taken, in order that they might not fall victims to the Dungans. But thanks be to its strong walls and excellent Djen-tai, or super-general, Si-ning held out, and in January, 1896, received succour from General Ho, who came up from the Japanese war with two thousand men. It is impossible to form any conception of the cruelties committed on both sides—small children were transfixed on lances, and the prisoners were martyred in the most outrageous manner. When the Dungan village To-ba, which has a strongly fortified position between Ten-kar and Si-ning, had held out for several months, it was obliged to surrender, but did so on the conditions that its inhabitants should be allowed to leave the town unmolested. The Chinese accepted this proposal, but required the inhabitants of the town to stack their weapons. This was hardly done before the Dungans were attacked and killed to the last man.

The populace howled like wild animals when General Ho's soldiers came back from their campaign with Mohammedan prisoners, who were triumphantly led in chains through the streets of Si-ning to Djen-tai-jamen to receive judgment, which was soon forthcoming. They were led out again, and outside the gate their throats were cut with dull knives. Then the chest of each was opened, and the heart and liver were stuck on spear-points, and thus carrying these trophies to the nearest eating-house, the soldiers had them fried and then ate them up. The Chinese believe that if they eat up the hearts and livers of their enemies, their courage will be transferred to themselves. It is said that 50,000 Chinese and as many Dungans were killed during this rebellion. Mohammedans are brave soldiers, but in this case they had bad weapons. The Chinese are incredibly cowardly. For instance, a large force of them beleaguered a Mohammedan town near Si-ning, and shot at its walls for three days, but did not dare make an attack, fearing that the inhabitants were prepared to play a ruse on them, since there were no sentinels posted on the walls. General Ho came to the scene, and had the gate blasted open. An old blind woman, the only remaining being in the town, came up and said that all the rest had fled to the mountains long ago, and she had been wondering why the Chinese had been making such a noise with their cannon outside the walls.

It was really a sad journey we had through this part of the country. For whole days we marched through devastated fields and past ruined villages and burned cities. In Tung-kwan, the streets were lined with blind old people, for when the Chinese had taken the village, they let the old people live, but blinded them.

From Si-ning, I sent home my servants from Eastern Turkestan. Only Islam-bay accompanied me now, besides the Chinese servants, and my luggage was carried on mules to Ping-fan, from which place I continued with carts to Liang-chau, where I spent the Christmas holidays with very friendly English missionaries. A telegraph-line connects Liang-chau with Shanghai, and I therefore telegraphed to his Majesty King Oscar, and had the honour of getting an encouraging telegraphic reply from his Majesty just in time for a Christmas present. This was my first greeting in the far East from my native country.

The Chinese have their own ideas of the telegraph. They believe that the despatch is written on a piece of paper, which is rolled up and sent through the wire, and that the insulators are small halting-stations where the piece of paper can rest in case it rains.

From Liang-chau, I set off in the beginning of the new year with hired camels through the Ala-shan deserts, across Fu-ma-fu—whose *wang*, or Mongolian prince, received me politely—to Ning-sha, where Swedish missionaries have a little congregation of thirty Christian Chinese.

Our January travel through the Ordos deserts was hard. Hwang-ho, the Yellow river, lay covered with ice, and the temperature sank as low as $-27°$ Fahr. Every day we had north-west storms, and I should have frozen if I had not had a *sholoa*, or Chinese hand-oven, up there on the back of the camel. We encamped by a well at the same time as a Dungan caravan, and in the morning it was found that one of the Dungans had frozen to death. The others asked Islam-bay to say a Mohammedan prayer over the corpse, which was laid between two stones, after which the others continued their journey as if nothing had happened.

After once more crossing Hwang-ho, it was nice to rest a few days at Bau-tu, in the home of countrymen, a Swedish missionary, by the name of Helleberg, and his wife. Mr. Helleberg had converted many Chinese, and had a school for thirty little Chinese boys, who, among other things, learned English. I went to hear a lesson in geography, and was greeted, on entering the room, with a "Good morning, sir; how do you do?" by all thirty boys in concert.

But now my patience was almost finished, and I longed for my post, which was waiting for me in Peking. After having left my caravan in good hands, and with a Chinese hurried *viâ* Salati, Kwei-wa-chung, Yo-ye-chung, and Kalgan—where for the fourth time I passed the great wall—to Peking. I was received with great amiability by the European ambassadors and by Li-hung-chang.

And here in the most eastern part of the middle kingdom ended my journey through Asia, from which I now have communicated a few scattered episodes.

Before the reading of the paper, the PRESIDENT said: We have from time to time heard of the work of a very accomplished young Swedish geographer in Central Asia, and on two or three occasions we have received communications from him, but this is the first time we have had the great pleasure of welcoming him here in person. It is often said, "Poeta nascitur non fit," but it may equally well be said, and Dr. Hedin is an instance of it, "Geographicus nascitur et fit," for although geographers are often born so, it is also necessary to give them a long training. Dr. Hedin is a born geographer, and he showed this from the time that he was at school. At the age of fifteen or sixteen he made a series of maps of the arctic regions, showing the tracks of each arctic explorer, which displayed not only beauty in execution, but also very extraordinary research for a schoolboy. He made himself acquainted with all that was known of geography, studying in Sweden, in Halle, with our gold medalist Baron Richthofen in Berlin, and he became an excellent draughtsman. All the beautiful diagrams you will see on the walls were drawn by his own hand to illustrate this memorable expedition of which he is going to give us an account. He had made three previous journeys in Persia and Central Asia, so that we may naturally expect very great results from so thoroughly trained a geographer, and I must say that I have never seen work which has surpassed his in completeness and in thoroughness. Moreover, his love for geography is such that he was ready to face and overcome most desperate dangers and the greatest hardships in the pursuit of his objects, and he overcame them.

I think perhaps I ought to mention that, although Dr. Sven Hedin has addressed geographical audiences in the Swedish language, in the German language, in the Russian language, and in the French language, this is the first time he has ever addressed an English audience in the English language, and yet I think I may promise you that you will believe you are listening to an Englishman accustomed to address large audiences. It is quite certain you will hear a most interesting paper, and that it will be very beautifully illustrated both by diagrams and by photographs. I will now request Dr. Sven Hedin to address you.

After the reading of the paper, the following discussion took place:—

The President: In inviting a discussion on this very interesting paper, I can't refrain from expressing my sense of the very great loss we have sustained by the death of Mr. Ney Elias, only a fortnight after he was elected a member of this Council, on his return from twenty years' service in Asiatic countries. I looked upon him as being a great scholar as well as a great traveller, and as likely to become a successor of those illustrious men who used to make our discussions on Central Asian subjects so interesting. I am afraid that our Vice-President, Mr. Curzon, has disappeared in the darkness, but we are honoured by the presence of the Councillor of the Russian Embassy, M. Lessar, and I am sure the meeting will be very glad to hear his observations, if he should wish to make any.

M. Lessar: La Société Royale de Geographie, fidèle à ses traditions, salue et encourage sans difference de nationalité tous ceux qui contribuent aux progrès de la tâche qu'elle poursuit. Bien plus encore, avec la largeur des vues d'une réunion de savants qui ont tant fait pour l'étude de notre planète, elle associe un étranger comme moi à la solennité d'aujourdhui. J'apprecie doublement cet honneur; premièrement parceque ce n'est pas un simple voyage que nous fêtons, mais une exploration tout à fait exceptionelle, et en second lieu à cause des liens de sincere et profonde amitié qui m'unissent au héros de ce soir. Le sort a appelé l'Angleterre et la Russie a l'accomplissement d'une grande œuvre civilisatrice en Asie. Cette coopération avec la Grande Bretagne dont nous sommes fiers, a eu, entre autres, de grands resultats pour la géographie. Mais le docteur Hedin n'ayant d'autre stimulant que la poursuite des problèmes purement scientifiques a néanmoins par ses travaux de quatre ans egalé les plus celebres explorateurs contemporains de cette partie du monde. Ses lettres malheureusement mais inevitablement si rares lors de son absence et surtout ce qu'il vient de nous communiquer tout a l'heure nous indiquent suffisamment quelles nouvelles lumières précieuses apportera le rapport detaillé de son voyage a nos connaissances actuelles.

Aussi je suis très reconnaissant a Mr. le Président de m'avoir invité à joindre aux souhaits de bienvenue qu'il vient d'adresser si eloquemment au Dr. Hedin mes félicitations et mes hommages d'admiration, et je crois pouvoir dire ceux de tous les géographes russes.

Sir Henry Howorth: When Charles the King of Sweden was defeated at the battle of Pultawa, the heroic soldiers who had followed him from one victory to another were transported to Siberia. Among them were two famous men, one of whom was the first to give us a real picture of the geography, physiography, and ethnography of Central Asia. The book is anonymously written, but nothing like it has been written since. Now, one hundred and fifty years afterwards, we have another Swede who comes to rival, not this literary effort, but to rival the efforts of the greatest travellers of all time, following in the footsteps of Marco Polo, and the only European who has been able to follow in those steps.

What an interesting country this is! and I cannot help saying, and my friend will pardon me saying, how it would have delighted, "Pater et magister meus," Colonel Yule, one of the greatest of our scientific geographers, to have been here to-night. He had in his memory a most extraordinary store of knowledge of this district, and it seems to me, when the book is published which contains the record of these travels, we shall have added such a chapter as has never been added by one man before. The accounts of the cities buried in the sand, from which some of our English friends have discovered Buddhist manuscripts, and also brought home handfuls of coins, of which I have seen many, is full of extraordinary interest; it teaches us that along the northern slopes of that great tableland there was an Aryan population speaking a language allied to the Indian languages. Here we have for the first time some reason why these disappeared, and some reason why Marco Polo travelled this region in comparative ease, as well as many Chinese travellers two or three centuries before Marco Polo.

In these glaciers we have a kind of barometer, which shows us that the climate of the country has altered within comparatively recent times to effect this shrinking of the glaciers, this drying up of the sheets of water, which the Chinese geographers insist were to be found in the early centuries after Christ in a large part of this area, of which the great Lob-nor is merely a shrunken fragment; and here also we have a reason why so many of these old river tracks are found now to be full of dry sand. They are not merely winter torrents, but they are *bonâ fide* rivers which have shrunk into nothing. The cause is that the big lakes, etc., from which the rain could be gathered have shrunk into nothing. We have also another reason why the sandstorms overwhelmed the towns, from the fact that the rivers themselves have changed their beds, as it is the fashion for so many rivers to do on the other side of the mountains, and for exactly the same reason.

Two questions before I sit down. I am a great heretic on the subject of the wild camel, and I am bound to say Littledale and others have never quite convinced me. The opinion of some is that these wild camels are herds of semi-wild camels let loose for reasons of religion by the priests, and that they have become semi-wild, or feral, just like those wonderful camels in Australia, lost by the first great expedition, that traversed the continent from east to west and were actually found by one of my friends on the borders of Queensland. But there is another possible explanation. These rivers must have abandoned their old beds rapidly, if not suddenly, or else the inhabitants would not have left their books and valuables. They must have left pretty rapidly, as the inhabitants near the Yellow river have to do, and in consequence large herds of camels must have strayed and became subferal.

Another question I would like to ask is, How do the birds which spend their spring and summer in Siberia find their way down to India, their winter quarters? Several men have traversed this region, and I have seen a good many of them, but they saw no live birds along the valleys at all, and it is a puzzle to know how they cross the plateaux and the Himalayas; but that they must pass over is shown by the fact that swarms of little soft-billed birds spend their summer and spring in Siberia, and in the winter are found on the other side of this tremendous plateau, with its almost impassable heights. The subject is so full of interest one might go on for ever.

I should like to thank Dr. Hedin very cordially indeed for the extraordinary pluck and endurance he showed, unbaffled by disaster, and for the delightful piece of racy and living English in which he has embalmed and enshrined his account of the journey.

Mr. Delmar Morgan: Let me, in the first place, pay my tribute of admiration to Dr. Sven Hedin for the admirable account he has given us of his journeys in Central Asia. Probably the most interesting of his explorations is his ascent of Mount Mustagh-ata to a greater height than has been hitherto attained by any European. But it is to his surveys and observations in the region of Lob-nor that I shall confine my remarks this evening.

About twenty years ago, the late Russian traveller, Prjevalsky, gold medallist of our Society, visited the region of Lake Lob, and placed this lake on his map, assigning for it a position about one degree too far south, according to Baron von Richthofen, who relied on the Chinese maps. The controversy which took place on this question between these two authorities was published in my 'Lob-nor.' Now Dr. Sven Hedin, a pupil of Richthofen, has discovered a lake confirming the views of this eminent geographer, and he claims that this and no other is the true Lob-nor. After studying the arguments adduced by him in support of this conclusion, I must, with every respect to one who has personally visited the region in question, be allowed to differ, and I think it would be premature to alter the position of the lake on our maps before more complete surveys have been made, especially as a recent traveller, M. Kozloff, a member of Pevtsof's expedition, passed through this country and made no change in the position of the lake, but, on the contrary, confirmed the general accuracy of Prjevalsky's observations. Among the arguments brought forward by Dr. Sven Hedin, he says that Marco Polo made no mention of the lake. But it is well known that Marco Polo mentioned very few of the natural features which he must have come across in his travels. Besides, the route he took would have taken him a considerable distance to the south of Lob-nor, and would have nearly coincided with that followed by Roborovsky and Kozloff in order to reach Shachau. These travellers speak of a vast extent of saline swamps, marking what must have formerly been the continuation in a north-easterly direction of the waterspread of Lob-nor. The ancient lake-bed is, according to their surveys, clearly defined by ranges of mountains to the north and south, meeting at some point to the north-east of Prjevalsky's lake.

I trust that Dr. Sven Hedin will excuse this criticism of only one point in his extremely interesting paper, and accept my congratulations on the very successful journey he has made—a journey full of privations and hardships, which he seems to have borne better than the natives who accompanied him.

Dr. Sven Hedin: I have to offer my hearty thanks, before all other things, to the President and to the Royal Geographical Society for the friendly and honourable manner in which I have been received here, and for the friendly remarks made during the discussion. I have to thank my old and dear friend M. Lessar for his congratulations on my journey. In the year 1890–91 he received me in Bokhara, and I spent some very agreeable and pleasant days in his house. I afterwards saw him in 1893 at Tashkent, and in St. Petersburg, and I am very happy to have had an opportunity to see him here again. That gives an argument to the saying that we live in a very small planet. Sir Henry Howorth uttered some very nice words to me. As to his opinion about the wild camel, I quite agree with him. I always had an impression that the wild camels I found to the north of the Keria-daria are the successors of tame camels, and when I write in my paper that the shepherds told me that the wild camels do not fear anything so much as the smoke from the camp fires, and that when they smell the smoke they run away and do not stop for two or three days, I think that is atavism; they have the instinctive feeling that their ancestors, thirty or forty generations ago perhaps, were bound at camp fires, and now they have a feeling that human beings are their very worst enemies, and that their ancestors have been the slaves of man. I found one shepherd who had caught a wild camel only some days old, and that camel lived for a year and some weeks quite tame. Now you understand that you could not do that with a quite wild animal in a few days.

As to the routes of the birds, I do not know anything. Prjevalsky has given a very interesting explanation of the highways of the Siberian birds when going back to India. I don't remember it, as that is not my speciality; but Prjevalsky writes on the subject very ably.

Then, as to the remarks of Mr. Delmar Morgan, I did not get quite a clear impression of his opinions, and fear that I did not understand all that he said. I am glad to hear the opinion of Mr. Delmar Morgan, who has paid a great deal of attention to the Lob-nor question, but I think practical observation at the very place is more important than theory and the study of books and maps. It would be very interesting to know how Mr. Delmar Morgan, who has opinions differing from mine, explains the existence and formation of the river-bed found by Kozloff at the foot of Kuruk Yagh going eastwards as a continuation of the Tarim river; how he understands the existence of the old river-bed I found at Merdak-shahr, and another by Pevtsoff further south, and the new river-beds found by Prjevalsky? I think the river-beds give the best argument for the statement that Lob-nor is a wandering lake, and that the Tarim as well as the southern basin has moved. Only the region about the northern lake is called Lob-nor, a name absolutely unknown round the southern lake. How does he explain the absolute absence of forest round the southern lake when the whole hydrographic system of the Tarim is rich in poplar; and, lastly, the historical tradition of the inhabitants themselves, who told me that their grandfathers dwelt at a lake to the north of the southern basin? I got information from them so correctly that I could calculate that the southern basin can only be 200 years old, formed, I should think, about 1720; and in the book of General Pevtsoff, published a very little time ago, you will find proofs of the same fact.* He heard from the inhabitants of the southern basin that their grandfathers had dwelt at another lake to the north. About Marco Polo Mr. Delmar Morgan is quite

* Pevtsoff writes in his work, 'Trudii Tibetskoi Expeditsii, 1889–90,' p. 305: "The river Yarkand-darya flowed 200 yards, according to tradition, to the north of its present bed, and discharged into the small lake Ushu-kul, which is communicated by a channel with Lop-nor."

right; it is not a good argument. It is, nevertheless, very interesting to observe that Marco Polo, who passed the city of Lob, does not mention the lake Lob-nor; but that is a bad argument, because he does not mention the Yarkand-, Khotan-, and Cherchen-darias, and he must have had a difficult passage through these rivers; and he does not mention the Kuen Lun, one of the highest mountain ranges on the Earth. I am, nevertheless, very glad to hear Mr. Delmar Morgan's opinion.

The President: The meeting will, I am sure, have gathered that we have only heard a very small part of the work done by Dr. Sven Hedin. He has touched upon his ascent of Mustagh-ata. You have only to look at his diagrams to see the work he did round that mountain. Look at the way he has mapped out all the glaciers that descend from it, and I may add that he spent four months on the necessary surveys. It is the same with the desert. I saw with what thrilling interest the whole meeting listened to Dr. Hedin's graphic account of the dangers he encountered and overcame in that desert, and I heard a sigh of relief from the audience when Dr. Hedin described how he heard the duck splash into the pond, and was able to fill his boots with water to take to his dying companion. There are interesting questions connected with that moving sand and the time it takes in working across the desert. Sir Douglas Forsyth gives us some interesting remarks on the rate of travel of sand, calculated from observations on buildings on the edge of the desert. All the points and questions connected with the Keria-daria and the other rivers which lose themselves in the desert, and with the supply of water, will no doubt be further treated in Dr. Hedin's book; also the discovery of entirely new country along the Kuen Lun, and his discussion of the Lob-nor question. We have now the honour of welcoming here His Excellency the Swedish minister, and I wish to say to him how truly the Royal Geographical Society feels the debt of gratitude it owes to his Majesty the King of Sweden, for having, with such enlightened liberality, sent forward or assisted to send forward so many geographical expeditions, and more especially the expedition of Dr. Sven Hedin—I believe very largely supported by the King of Sweden—and for His Majesty's appreciation of the work of geographers by recognizing their splendid journeys on their return to their native country. I am glad to say that Dr. Sven Hedin has been decorated by his Majesty, not only with the Order of the North Star, but with the order in diamonds, a distinction which I believe has only been received by three other members of that order. You will, I am sure, pass with acclamation a vote of thanks to Dr. Hedin himself, and your thanks will include not only the work that he has done in Central Asia, and the perils he has undergone for the sake of our science, but also your thanks will include the deeply interesting and admirably delivered address which we have heard this evening, as well as the numerous beautiful illustrations by himself, and the splendid diagrams he has brought over to show us, also drawn entirely by himself. I see that it is carried by acclamation; I therefore offer your vote of thanks to Dr. Sven Hedin. Some of the most interesting things he has brought back, have just been put into my hands—drawings of the patterns and figures of Buddha sitting on lotuses, which he found on the walls of that buried city in the desert.

THE ROYAL SOCIETY'S ANTARCTIC MEETING.

On February 24 the Royal Society held one of their special meetings for discussion, at which, in addition to Fellows of the Society, other specialists are invited to take part. The subject was "The Scientific Advantages of an Antarctic Expedition;" and Sir John Evans, Treasurer of the Royal Society, who occupied the chair, intimated that the discussion should be strictly limited to the scientific advantages, and should take no account of any possible economic or political benefits which might be anticipated as a result of exploration.

The meeting was very well attended, almost all the representative scientific men in London who are interested in the sciences dealing with the Earth being present. Dr. Nansen was also at the meeting: and Dr. Neumayer, of the Deutsche Seewarte, came specially from Hamburg to add his voice to the demand for an expedition, which he was the first, now nearly thirty years ago, to urge as a necessary sequel to Ross's work. The proceedings were opened by a general paper by Dr. John Murray, whose paper in the *Journal* for January, 1894, was so complete that it is only necessary to give the following abstract of his fresh statement:—

Dr. Murray said: From a scientific point of view, the advantages to be derived from a well-equipped and well-directed expedition to the Antarctic would, at the present time, be manifold. Every department of natural knowledge would be enriched by systematic observations as to the order in which phenomena coexist and follow each other, in regions of the Earth's surface about which we know very little or are wholly ignorant. It is one of the great objects of science to collect observations of the kind here indicated, and it may be safely said that without them we can never arrive at a right understanding of the phenomena by which we are surrounded, even in the habitable parts of the globe.

Before considering the various orders of phenomena, concerning which fuller information is urgently desired, it may be well to point out a fundamental topographical difference between the Arctic and Antarctic. In the northern hemisphere there is a polar sea almost completely surrounded by continental land, and continental conditions for the most part prevail. In the southern hemisphere, on the other hand, there is almost certainly a continent at the south pole, which is completely surrounded by the ocean, and, in those latitudes, the most simple and extended oceanic conditions on the surface of the globe are encountered.

One of the most remarkable features in the meteorology of the globe is the low atmospheric pressure at all seasons in the southern hemisphere south of latitude 45° S., with the accompanying strong westerly and north-westerly winds, large rain and snow fall, all round the south polar regions. The mean pressure seems to be less than 29 inches, which is much lower than in similar latitudes in the northern hemisphere. Some meteorologists hold that this vast cyclonic system and low-pressure area continues south as far as the pole, the more southerly parts being traversed by secondary cyclones. There are, however, many indications that the extreme south polar area is occupied by a vast anti-cyclone, out of which winds blow towards the girdle of low pressure outside the ice-bound region. All our knowledge of the meteorological conditions of the Antarctic is limited to a few observations during the midsummer months, and these indicate that the temperature of the snow-covered antarctic continent is even at that time much lower than that of the surrounding sea. There would appear to be good reasons for believing that the region of the south pole is covered by what may be regarded practically as a great permanent anti-cyclone, with a much wider extension in winter than in summer. It is most likely that the prevailing winds blow out from the pole all the year round towards the surrounding sea, as in the case of Greenland, but, unlike Greenland, this area is probably seldom traversed by cyclonic disturbances. But what has been stated only shows how little real knowledge we possess concerning the atmospheric conditions of high southern latitudes. It is certain, however, that even two years' systematic observations within these regions would be of the utmost value for the future of meteorological science.

From many points of view, it would be important to learn something about the condition and distribution of antarctic sea-ice during the winter months, and especially about the position of the huge table-shaped icebergs at this and other seasons of the year. These flat-topped icebergs, with a thickness of 1200 or 1500 feet, with their stratification and their perpendicular cliffs, which rise 150 or 200 feet above and sink 1100 or 1400 feet below the level of the sea, form the most striking peculiarity of the antarctic ocean. Their form and structure seem clearly to indicate that they were formed on an extended land surface, and have been pushed out over low-lying coasts into the sea. All antarctic land is not, however, surrounded by inaccessible cliffs of ice, for along the seaward faces of the great mountain ranges of Victoria Land the ice and snow which descend to the sea apparently form cliffs not higher than 10 to 20 feet, and in 1895 Kristensen and Borchgrevink landed on a pebbly beach, occupied by a penguin rookery, at Cape Adare without encountering any land-ice descending to the sea.

Is there an antarctic continent? It has already been stated that the form and structure of the antarctic icebergs indicate that they were built up on, and had flowed over, an extended land surface. As these bergs are floated to the north and broken up in warmer latitudes, they distribute over the floor of the ocean a large quantity of glaciated rock fragments and land detritus. These materials were dredged up by the *Challenger* in considerable quantity, and they show that the rocks over which the antarctic land-ice moved were gneisses, granites, mica-schists, quartziferous diorites, grained quartzites, sandstones, limestones, and shales.

The fossil remains which have been found in the Antarctic indicate in these areas a much warmer climate in past times. We are thus in possession of abundant indications that there is a wide extent of continental land within the ice-bound regions of the southern hemisphere.

It is not likely that any living land-fauna will be discovered on the antarctic continent away from the penguin rookeries. Still, an antarctic expedition will certainly throw much light on many geological problems. Fossil finds in high latitudes are always of special importance.

In any antarctic expedition magnetic observations would, of course, form an essential part of the work to be undertaken, and the importance of such observations has been frequently dwelt upon by eminent physicists and navigators. Should a party of competent observers be stationed at Cape Adare for two years, pendulum observations could be carried out there and at other points within the Antarctic, or even on icebergs. It might be possible to measure a degree on the antarctic continent or ice-cap, which would be a most useful thing to do. By watching the motions of the icebergs and ice from land at Cape Adare, much would be learnt about oceanic currents, and our knowledge of the tides would be increased by a systematic series of tidal observations on the shores of the antarctic continent, where we have at present no observations. The series of scientific observations here indicated would fill up many other gaps in our knowledge of the physical conditions of these high southern latitudes.

In regard to the depth of the ocean immediately surrounding the antarctic continent, we have at present very meagre information, and one of the objects of an antarctic expedition would be to supplement our knowledge by an extensive series of soundings in all directions throughout the antarctic and southern oceans. It would in this way be possible, after a careful consideration of the depths and marine deposits, to trace out approximately the outlines of the antarctic continent. The depths found by the *Challenger* in the neighbourhood of the antarctic circle were from 1300 to 1800 fathoms, and further north the *Challenger* soundings ranged from 1260 to 2600 fathoms. To the south-west of South Georgia, Ross paid out 4000 fathoms of line without reaching bottom. In the charts of depth which I have constructed I have always placed a deep sea in this position, for it appears to me that Ross, who knew very well how to take soundings, was not likely to have been mistaken in work of this kind.

The deposits which have been obtained close to the antarctic continent consist of blue mud, containing glauconite, made up for the most part of detrital matters brought down from the land, but containing a considerable admixture of the remains of pelagic and other organisms. This gives place further north to diatom ooze, and then red clay. Since the views, however, as to the distribution of deep-sea deposits throughout these high southern latitudes are founded upon relatively few samples, it cannot be doubted that further samples from different depths in the unexplored regions would yield most interesting information.

The mean daily temperature of the surface waters of the antarctic, as recorded by Ross, to the south of lat. 63° S. in the summer months, varies from 27·3° to 33·6°, and the mean of all his observations is 29·85°. His mean for the air during the same period is somewhat lower, being 28·74°. In fact, all observations seem to show that the surface water is warmer than the air during the summer months. The *Challenger* observations of temperature beneath the surface indicate the presence of a stratum of colder water wedged between warmer water at the surface, and warm water at the bottom.

In the greater depths of the Antarctic, as far south as the antarctic circle, the temperature of the water varies between 32° and 35° Fahr., and is not, therefore, very different from the temperature of the deepest bottom water of the tropical regions of the ocean. The presence of this relatively warm water in the deeper parts of the antarctic ocean may be explained by a consideration of general oceanic circulation. While these views as to circulation appear to be well established, still a fuller examination of these waters is most desirable at different seasons of the year, with improved thermometers and sounding-machines. Indeed, all deep-sea apparatus has been so much improved as a result of the *Challenger* explorations, that the labour of taking observations has been very much lessened.

In the surface waters of the antarctic regions there is a great abundance of diatoms and other marine algæ. These floating banks or meadows form primarily not only the food of pelagic animals, but also the food of the abundant deep-sea life which covers the floor of the ocean in these south polar regions. Pelagic animals, such as copepods, amphipods, molluscs, and other marine organisms, are also very abundant, although species are fewer than in tropical waters. Some of these animals seem to be nearly, if not quite, identical with those found in high northern latitudes, and they have not been met with in the intervening tropical zones.

A peculiarity of the tow-net gatherings made by the *Challenger* Expedition in high southern latitudes, is the great rarity or absence of the pelagic larvæ of benthonic organisms, and in this respect they agree with similar collections from the cold waters of the arctic seas. At present we have no information as to the shallow-water fauna of the antarctic continent; but, judging from what we do know of the off-lying antarctic islands, there are relatively few species in the shallow waters in depths less than 25 fathoms. On the other hand, life in the deeper waters appears to be exceptionally abundant. An interesting point connected with the benthonic fauna and flora of these high southern latitudes is that, as with pelagic organisms, many of the species are identical with, or closely allied to, those of the arctic regions, and are not represented in the intermediate tropical areas. The *Challenger* researches show that nearly 250 species taken in high southern latitudes occur also in the northern hemisphere, but are not recorded from the tropical zone. Fifty-four species of seaweeds have also been recorded as showing a similar distribution. Bipolarity in the distribution of marine organisms is a fact, however much naturalists may differ as to its extent and the way in which it has originated.

What is urgently required with reference to the biological problems here indicated is a fuller knowledge of the facts, and it cannot be doubted that an antarctic expedition would bring back collections and observations of the greatest interest to all naturalists and physiologists, and without such information it is impossible to discuss with success the present distribution of organisms over the surface of the globe, or to form a true conception of the antecedent conditions by which that distribution has been brought about.

There are many directions in which an antarctic expedition would carry out important observations besides those already touched on in the foregoing statement. From the purely exploratory point of view, much might be urged in favour of an antarctic expedition at an early date; for the further progress of scientific geography, it is essential to have a more exact knowledge of the topography of the antarctic regions. This would enable a more just conception of the volume relations of land and sea to be formed, and in connection with pendulum observations some hints as to the density of the suboceanic crust might be obtained.

In case the above sketch may possibly have created the impression that we really know a great deal about the antarctic regions, it is necessary to re-state that all the general conclusions that have been indicated are largely hypothetical, and to again urge the necessity for a wider and more solid base for generalizations. The results of a successful antarctic expedition would mark a great advance in the philosophy —apart from the mere facts—of terrëstrial science.

No thinking person doubts that the Antarctic will be explored. The only questions are: When? and By whom? I should like to see the work undertaken at once, and by the British Navy. I should like to see a sum of £150,000 inserted in the estimates for the purpose. The Government may have sufficient grounds for declining to send forth such an expedition at the present time, but that is no reason why the scientific men of the country should not urge that the exploration of the Antarctic would lead to important additions to knowledge, and that, in the interests of British science, the United Kingdom should take a large part in any such exploration.

The Duke of Argyll, who was unable to be present, sent in writing his views as to the bearing of antarctic research on the problem of the glacial period. After pointing out that the study of Greenland has not solved the problem of the movements of an extensive ice-sheet, and after indicating the diverse views on this subject held by geologists, he concluded: These questions, and a hundred others, have to be solved by antarctic discovery; and until they are solved we cannot argue with security on the geological history of our own temperate regions. The antarctic continent is unquestionably the region of the Earth in which glacial conditions are at their maximum, and therefore it is the region in which we must look for all the information attainable towards, perhaps, the most difficult problem with which geological science has to deal.

Sir JOSEPH HOOKER said that next to a consideration of the number and complexity of the objects to be attained by an antarctic expedition, what dwelt most in his imagination was the vast area of the unknown region which is to be the field for investigation—a region which in its full extension stretches from lat. 60° S. to the southern pole, and embraces every degree of longitude.

The appearance of the circumpolar pack girdling the ocean about the antarctic circle naturally suggested questions as to its origin, to none of which could a fuller answer be given than that the floating ice-fields originated over extensive areas of open water in a higher latitude then they now occupy, that they are formed of frozen ocean water and snow, and that winds and currents have brought them to where we now find them. The other great glacial feature of the antarctic area is the ice-barrier which Ross traced for 300 miles in the 78th and 79th degree of south latitude, maintaining throughout its character of an inaccessible precipitous ice-cliff (the sea-front of a gigantic glacier) of 150 to 200 feet in height. It probably abuts upon land, possibly on an antarctic continent; but to prove this was impossible on the occasion of Ross's visit, for the height of the ship's crow's-nest above the sea-surface was not sufficient to enable him to overlook even the upper surface of the ice. The speaker saw no other method of settling this important point, except the use of a captive balloon, an implement with which he hoped future expeditions would be suppled. There were several occasions on which a balloon might have been advantageously used by Ross when near the barrier, and more when it would have greatly facilitated his navigation of the pack. He regarded the biological possibilities of an expedition as likely to commence a new epoch in that science.

Dr. NANSEN laid stress on the importance of exploring the antarctic land. He doubted whether Dr. Murray's theory of a continuous continent was correct; possibly there was only a number of groups of islands. But there was no doubt that the ice-sheets were far more extensive than that of Greenland, and the study of them would yield more important results. He did not foresee any difficulty in reaching the antarctic ice-sheets. Ice-navigation was now much better understood than in Ross's time, steam-power of itself giving an inestimable advantage, for it was just when the ice-pack was open in calm weather that a sailing ship was unable to attempt to navigate it. The risk of being caught by the ice and shut up for a length of time was much less in the south than in the north polar regions, for the open ocean all round would reduce the probability of severe pressures in the pack. Captive balloons would prove of great value. The importance of pendulum observations on the ice-sheet was very great, and he did not believe that the nature of the ice would make travelling difficult once the surface of the ice-sheet was reached. He thought, however, that it was possible that the thickness of the ice-sheet might be so great as to interpose serious difficulties from the effects of altitude alone, for the height might probably be as much as 20,000 feet. He hoped that a British expedition would be sent out, and that expeditions from other countries would co-operate with it by simultaneous observations in other parts of the area.

Dr. NEUMAYER strongly urged the importance of insisting on the purely scientific point of view in inaugurating a new expedition. The determination of the gravity constant at a number of points within the antarctic circle was of high importance, and the International Geodetic Commission had expressed their conviction that a gravity survey in that region would be of the greatest benefit to higher geodetic theories. The study of terrestrial magnetism also demanded a great number of observations in the antarctic area. While the theory of terrestrial magnetism had been placed by Gauss on a very high level, physical observations remained sadly behind. The south polar area promised much more interesting results than the north; the distribution of magnetism seemed to be simpler, but it was scarcely known. It was interesting to notice that the two foci of maximum magnetic intensity were situated to the south of the Australian continent, where magnetic storms were extremely numerous and strong; whereas on the opposite side, the circumpolar stations of 1882–83 at Orange bay and South Georgia showed a remarkably small number of disturbances. Similarly, while a great number of instances of aurora displays were recorded at Melbourne and in the seas south of Australia in 1882–83, none were seen in South Georgia. From every point of view, an expedition to study the magnetic phenomena in the far south was eminently desirable, and he trusted that the work would be carried out simultaneously by expeditions from several countries.

Sir Clements Markham said that, from the geographical point of view, it was sufficient to point out the vast extent of the unknown area, and to state that no region of like extent in any part of the Earth had ever failed to yield results of practical as well as of purely scientific interest when it was explored. In the case in point, the little we know of the antarctic region indicated unerringly the very great importance and interest of the results which are certain to attend farther research. The extent and position of the land masses, the relative extents of ice and water, and the amount of volcanic activity in the region, were all scarcely hinted at as yet. Combined together, the prospective benefits which antarctic exploration would confer on all branches of science make the discovery of the unknown parts of that region the greatest and most important work that remains for the present generation of explorers to achieve.

Dr. A. Buchan limited his remarks to the single important point of the relation of atmospheric pressure to the prevailing winds. He stated that, according to Ferrel's theory of atmospheric circulation on the globe, as set forth by Prof. Davis, an area of low pressure existed over the south pole, towards which surface winds blew in on all sides. But the observations of all antarctic expeditions which had crossed the polar circle showed that the barometer continued to rise as they proceeded southward, and that the winds blew, with scarcely an exception, from a southerly quarter or outward from the pole. This indicated that a region of high atmospheric pressure was central over the south pole, and the climate there ought to be free from excessive precipitation, and favourable to exploration. Were Ferrel's theory correct, the excessive precipitation which would necessarily result would render the antarctic region almost inaccessible to the most intrepid explorer. A well-equipped antarctic expedition was necessary in order to make observations, which should fix the position of the great ring of low atmospheric pressure surrounding the globe in the southern ocean, a feature as important in oceanography as it was in meteorology.

Sir Archibald Geikie said that geologists would hail the organization and despatch of an antarctic expedition in the confident assurance that it could not fail to advance greatly the interests of their science. It would throw light on the nature of the rocks forming the antarctic land, and on the evidence these rocks contain bearing on the history of climate in the past. It would let us see the extent to which the known fossiliferous formations can be traced towards the poles, and the bearing which they have on the evolution of terrestrial topography. The history of volcanic action in the past would also be elucidated, and the conditions under which it is now continued in the polar regions. It might be seen whether in high latitudes vulcanism, either in its internal magmas or superficial eruptions, manifests peculiarities not observable nearer the equator; what is the nature of the volcanic products now being ejected; and other important points. Again, the influence of antarctic climate on the rocks exposed to its action, and the effects of contact between ice or snow and streams of lava. Finally, the study of the physics of antarctic ice would be of value with regard to the history of the ice age in northern Europe and America.

Dr. P. L. Sclater, although not looking on the antarctic regions as particularly favourable for zoological work on the higher land vertebrates, felt that an expedition would be very valuable. There was doubtless a rich marine and sea-bird fauna which ought to be investigated; but he regarded the most promising field to be the palæontological. The few fossils obtained from the far south were very interesting, and further finds would be sure to lead to valuable results.

Prof. D'Arcy W. Thompson spoke enthusiastically of the wealth of the field of zoological research in the antarctic regions. He pointed out that all we know of the deep-sea life of the antarctic area is the result of eight hauls of the dredge on the *Challenger*; but these dredgings were the very richest of the whole cruise. He could not accept Dr. Murray's "bipolar theory" of the distribution of species as proved, and wished to see it tested by an expedition. Even if that theory were broken down, antarctic explorations would lead to other generalizations, not less interesting, to take its place.

Sir W. J. L. Wharton, in a few words, pointed out that if an expedition under naval discipline were decided on, it would be extremely popular amongst both officers and men.

Sir John Evans, remarking that the meeting had been prolonged to an hour unprecedented in the records of the Royal Society, expressed his gratification at the high level maintained in the discussion, and said that all were unanimous in the belief that immense advantages to science would result from a new exploration of the antarctic regions.

DR. HASSERT IN UPPER ALBANIA.

A recent number of the *Verhandlungen* of the *Gesellschaft für Erdkunde* of Berlin contains an admirable account of an expedition into the wilds of Upper Albania by Herr Dr. Kurt Hassert, which reminds one so frequently of the familiar narratives of exploration in the north-western frontiers of India, that it is almost impossible to believe that it refers to a country within a few hours' sail of Brindisi.

Dr. Hassert's journeys in Montenegro, in 1891 and 1892, filled him with a desire to penetrate into the happy hunting-grounds of European exploration; but one delay followed another, and it was only in the beginning of June, 1897, that he landed at Medua, the port of Skutari, in company with his former fellow-traveller, Dr. Antonio Baldacci, of Bologna. The way from Medua to Skutari crosses alternate bogs and sand-dunes to Alessio, and enters the plain of the lower Drin as a mere bridle-path. Under more favourable auspices this district might become fruitful exceedingly, but at present it is little more than a worthless, fever-stricken morass.

Skutari itself, under similar improved conditions, might become a trade centre of high importance. The fertile plain is surrounded by great mountain ranges, which enclose a lake navigable for small steamers and connected with the sea by the navigable river Boyana. Direct communication could thus be opened up, *viâ* Skutari, between the richest parts of Montenegro and the ocean; and the lake of Skutari itself abounds in fish. For the present, however, Skutari confines its attention chiefly to rudimentary agriculture, and manufactures carried on in the houses of the inhabitants.

The Wali at Skutari, although "ein sehr zuvorkommender und gebildeter Mann," could not undertake the responsibility of allowing travellers to start for the interior of the country without special authority from Constantinople. Thanks to the excellent relations existing between the German and Turkish governments, the necessary permission was not difficult to obtain; but delays were unavoidable, and, in the mean time, Dr. Hassert and his friend made short reconnaissances in which the want of Turkish recognition was not severely felt, as Turkish authority is little more than a name except in well-known and accessible parts there was no occasion to visit. An Albanian in the service of the Italian consulate, named Nikola, proved an excellent dragoman, and Turkish gendarmes and other officials were "lent" more to spy than to protect. Still, it must be admitted that Dr. Hassert was fortunate in being allowed into the interior at all.

Upper Albania compares very unfavourably in the facilities of travel with Montenegro, being, indeed, one of the most inaccessible regions in the whole of European Turkey. There are no roads and few bridle-paths; and the male part of the population is almost exclusively occupied in fighting with and plundering their own neighbours, or the Turkish authorities, or the Montenegrins; the ecclesiastical establishments offer the only refuge to travellers. These conditions are, of course, to some extent susceptible of geographical explanation; the coast is nowhere deeply indented, and the region can only be reached by crossing a series of barrier ridges. The interior is completely filled by the Dinaric "fold" mountains, forming a network of deeply cut valleys and high narrow ridges, crossed by few passes.

The first recognized journey from Skutari was to the Zukali range; a small tributary valley of the Kiri was ascended, an excellent view of the mountains of Southern Albania was obtained from the summits Mülesife and Mali Zukalit (6040 feet), and the return route to Skutari lay through entirely new country. The second and longest journey began after an ascent of Maranaj (5170 feet); the course of the Drinasa was ascended to its junction with the Drin, and the Mirdites country entered by crossing the latter river. A difficult march brought the travellers to Orosi, the Mirdite capital, where they were hospitably received by the Eminence Primo Docchi. His eminence is practically king of that country, and has travelled much in North America, India, and Europe. We learn that he regaled his guests with *Munchener Bier*. From Orosi Dr. Baldacci returned to Skutari, while Dr. Hassert continued his way eastwards, followed to the Mirdite boundary by an ensign attached to one of the district garrisons, who hoped to confiscate his maps and sketches, but was deterred by fear of the clerical escort provided. The Liuma country proved even more dangerous travelling, and Dr. Hassert only breathed freely when the main road from Skutari was again reached. This highway, a narrow bridle-path, ascends the gorge of the White Drin until it opens on the plain of Prisren.

Prisren lies picturesquely at the northern base of the Shar Dagh. The consulates and similar establishments are situated in the upper town, looking down on the "native" quarters, with their five and twenty minarets, and to the fields of Ipek and Djakova beyond. Somewhat larger than Skutari, Prisren is one of the busiest and richest of the Oriental towns, carrying on various manufactures, and even boasting a municipal water-supply; but trade is much hampered by the constant raids from the Liuma country. The inhabitants are Roman Catholic, Orthodox, and Mohammedan, the last-named faith gaining ground steadily at the expense of the others; but notwithstanding a devoutness easily raised to fanaticism, there is evidence of an undisturbed heathenism but thinly covered over. Dr. Hassert tells an amusing story of how the children play about in the churches during mass or sermon, and if one becomes too uproarious the officiating clergyman thinks it not undignified to lay the youngster across his knee and administer suitable correction.

The return journey to Skutari was made by the ordinary road, which has lost much of its importance since the development of the Macedonia railway system. It follows the narrow valley of the Drin till that river takes its great bend northward, below the junction of the Black and White branches, when it cuts across mountain and valley to the great serpentine plateau of Puka. The Turkish government is at considerable trouble to keep this road open, providing escorts between the numerous block-houses along the line of route.

Shorter journeys followed into the wilder mountainous regions, during which Dr. Hassert collected much topographical information, and gained much insight into various modes of political education practised in Turkish territory by Austria and Russia, chiefly in connection with the Roman Catholic and Greek Church organizations. It would seem, however, that little or nothing can be done in or with the country until the universal blood-feud system is abolished. At present all work is done by women. Dr. Hassert was even forced at one time to travel under the protection of an elderly matron; the men do nothing but seek revenge upon each other.

Ultimately the Turkish authorities indicated that Dr. Hassert had made enough sketches and photographs and measurements, and that he had better be off. A final excursion across the Boyana into Montenegrin territory, with an ascent of Rumija (5220 feet), accordingly concluded the expedition.

NOTES ON A SECTION OF NORTH MEXICO.*

By J. GURDON L. STEPHENSON.

On December 23, 1896, an expedition left England for North-Western Mexico. The map herewith represents a portion of their work. Guaymas, on the Californian gulf, was reached on January 24, 1897, and two days later the party proceeded down the coast for some 200 miles in a small sailing-vessel, chartered for the occasion. At Topolobampo the expedition landed, and from thence the general direction followed was as shown on the map. The instruments made use of were practically those recommended by Mr. Coles in 'Hints to Travellers.'

Frequent observations were taken as the expedition proceeded, and sketch-maps were made of the country traversed. Altitudes were taken with the boiling-point apparatus and the aneroids. Besides the best maps obtainable of the country which were made use of, Mr. J. Fewson Smith, the engineer of the Rio Grande Sierra Madre and Pacific Railway, most courteously placed his survey plans at the disposal of the author.

An excellent chart of Topolobampo harbour, by the United States Navy, exists, and examination showed that the bay can, by the expenditure of a comparatively small sum of money, be made into a fairly good port. The depth of water on the bar is now $2\frac{3}{4}$ fathoms, the rise of the tide being from $4\frac{1}{2}$ to 6 feet. The question

* Map, p. 464.

of the improvement of this harbour is now being considered by the Mexican Government.

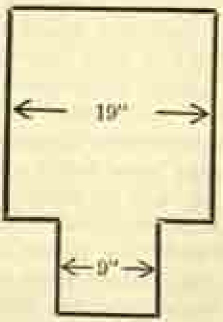
Stretching northwards for some 30 miles is an immense plain, which is fertile even under the primitive cultivation of the natives. This plain can be easily irrigated by the Fuerte river, and in places land has been taken up by American colonists. Much of it is now covered by trees of great variety, and samples were obtained of lignum vitæ, logwood, rosewood, mahogany, walnut, ebony, and many other woods suitable for cabinetwork. At San Blas are low hills, and a bar of rock across the river; here the gold belt commences, and stretches north as far as La Junta; several placers are worked by Mexicans and Indians in a very primitive way, and there are some good quartz veins in the hills. Near La Guasa there are sandstones and limestones containing fossils, while south of Fuerte is a belt of broken country, some 10 miles in width, showing frequent outcrops of schist, slate, and syenite. In the neighbourhood of Huites are extensive beds of auriferous gravel, which have been protected from denudation by sheets of recent lava. Near here one meets the foothills of the Sierra Madre, and a very short distance brings us into the mountain range itself. Throughout the district there appears to be no evidence whatever of glacial action; the valleys and gorges are very narrow, and their sides very steep.

To the north of Batopilas, however, between the river Urique and the river Guajochic, on the eastern slopes, some peculiar bowl-shape hollows in granite were met with, which were taken to be examples of the "glacial mill." The country at this place has the appearance of glacial action, the hills being rounded, and the slopes of the valleys flatter, whilst boulders which appeared to be ice-marked were met with. Batopilas is a mining town of some 5000 inhabitants, the mines being worked chiefly with American capital. Large quantities of silver have been, and are being, taken from these mines, one of them, the San Miguel, being over 900 feet in depth. At a height of from 4000 to 5000 feet the pine forests commence, oaks of three varieties also occurring below and in a few instances above this elevation; they are generally small, but there are many oaks of 15 inches diameter.

Pines run from 60 to 100 feet in height, and from 15 to 24 inches in diameter, there being usually about ten such trees to the acre, with many smaller and occasionally larger trees. In this district there are said to be some 12,000 Tarahumari Indians—a small but athletic race, whose power for travelling long distances in a short time is immense. These Indians hunt down the deer on foot. They live chiefly on corn, which they grow in the river-bottoms, and their houses are built of logs, each house usually having a small stone annexe, in which their corn is stored. Comparatively few of them now dwell in caves, the latter being now used only by the poor, and occasionally by young married couples, who have not yet built their hut and got their own piece of land cleared.

These Indians prepare the land for cultivation by girdling the trees; the stumps are afterwards burnt out, and the trees used as fences, for building their huts, or for firewood, and sometimes they are burnt *in situ* to get rid of them. The ground is ploughed by oxen with a wooden plough. The Tarahumaris possess considerable numbers of ponies, rather good-looking small cattle, and small rough sheep, from the wool of which the women weave blankets. Each settlement has its own "governor." The punishment of stealing is fourfold restitution; whilst a murderer has to support the widow of his victim until she dies or marries again, and, in the case of children, until they are able to support themselves. There are numerous cave dwellings along the Guajochic river, which formerly were used as burial-places, the corpse being placed upon the ground in a sitting posture, with a bow, arrows, and a gourd of meal beneath it, in the case of the male, rough weaving implements being substituted for the bow and arrows in the case of the female. Now when a death occurs in any of their huts, the Tarahumaris at once desert it and build another, the corpse being buried for three days, after which it is taken up from the ground by the medicine man, who kills some animal by the side of it, and dismisses the souls of both to heaven; the carcase of the animal, cow, sheep, or goat, according to the position of deceased, goes to the medicine man, whilst the corpse is buried in shallow ground, from whence it is dug up and eaten by coyotes.

In lat. 30° 10′ N., long. 108° W., there is a very perfect cave dwelling, a plan and description of which were presented to the British Museum, together with some relics removed therefrom by the author in 1897. This cave dwelling is at the head of a small cul-de-sac cañon. About 50 feet from the ground in the rock, which is here almost precipitous, occurs a rift or hollow, which bears traces of having been enlarged by the hand of man. This rift is from 7 to 8 feet in width, thus giving the same height to the cave-dwelling. The hollow goes back for a distance of some 14 or 15 feet from the face of the rock; this dimension, less the width of two walls and an outside gallery, being the width of the dwelling. All the walls are built of concrete, the outside one extending the whole length of the rift, and being pierced with splayed loopholes for arrows, and with doorways. Immediately behind this wall runs the gallery, about 3 feet in width, on the further side of which is another wall of lighter construction, pierced with openings of the following shape:—



About 12 inches from the floor, which consists of a hard cement concrete, is the bottom or sill of the doorway, which here measures 9 inches each way. At a distance of 9 inches from the sill the doorway widens to 19 inches, while the height of the whole opening from sill to lintel is 28 inches—the opening, in short, consisting of a 19-inch square resting on a 9-inch. The object of the peculiar shape of these openings, at first sight puzzling, is readily understood when one goes through them, the body passing easily through the 19-inch square, while the feet follow through the 9-inch. Frequent party walls of concrete, most of them pierced with similar openings, divide the interior into several small rooms. Some skeletons were found beneath the concrete floors in these rooms, each being wrapped first in wool, wound about with a fine cloth, then a coarser cloth, and finally the whole was enveloped in coarse matting. An olla containing very finely ground corn meal, several corn cobs of a very small size, weaving implements, the remains of bows and arrows, and some curious black pottery, were found with the skeletons, while hair and some dried flesh still remained on one of the skulls now to be seen at the British Museum. Access to the cave-dwelling is obtained by means of holes, cut in zigzag fashion on the face of this rock, just big enough to admit the fingers or toes. Near this place, in many of the gullies, exist the remains of large stone terraces, evidently constructed as soil dams, the ground above these being used afterwards for gardens, some of which are cultivated to the present day. Going east from Bocoyna, a small town on the eastern slopes of the mountain, are extensive llanos, upon which many cattle are grazed, and Cusihuiriachic, a mining camp of considerable importance, situated in a barranca below, is passed. At Coyachic there is a considerable amount of land under cultivation, which is irrigated from the river, and the country from thence to Chihuahua is barren and stony, with here and there fertile valleys. North of Bocoyna are a series of small hills; the country is well watered, and several large ranches exist.

Between Guerrero, a town of about 2000 inhabitants, in a good agricultural and mining centre, and Casas Grandes, the country consists of elevated plains with occasional low rocky hills; there are several cultivated villages, and at Balle an extensive Mormon colony, with numerous green fields, gardens, and plantations.

The Casas Grandes, Boca Grande, and Diaz valleys, which lie between Casas Grandes and the international boundary at Columbus, are fertile, and have also been partially taken up by Mormons; but the country to the east of Lake Guzman more resembles that traversed by the Mexican Central Railway, and in the dry season, at any rate, does not look inviting.

THE CAUCASUS.

The last volume of the *Memoirs* of the Caucasian Branch of the Russian Geographical Society (vol. xviii.) contains a number of papers full of interest.

M. N. Alboff, who has been engaged for several years in the study of the flora of Western Caucasus, in that part of the range which runs along the Black Sea coast, gives further results of his important work. In 1894 he made two very interesting excursions in that part of the range, and now gives, first, the diary of his excursions, and next his extremely interesting observations and conclusions relative to the flora of that region as a whole, and the flora of the limestone crags in particular. The paper is accompanied by a map, 6⅔ miles to an inch, of the Chernomorsk district, and the western part of the Sukhum *otdyel* (independent district). The first excursion was made to the Akhakhcha, the Kytsyrkha, and the neighbouring mountains; and the second, which lasted sixteen days, to the mountains Arashkha and Adzituko. This last excursion was especially full of interest, as regards new topographical observations and botanical collections. Full lists of plants collected, several of which are new (while some, like the new species named *Campanula regina* by the author, are of rare beauty), are given, as also a comparison between the limestone-crag flora of Abkhasia, Chernomorsk, and Mingrelia.

The interesting Tartar stem of the Kumyks is the subject of an anthropological sketch by M. Pantukhoff, containing a discussion of their origin, and some anthropological measurements.

In a paper on the Highlands of the Chechenes, Madame A. Rossikoff gives a detailed account of her journey in that part of Daghestan, which is the more welcome, as up till now there is no complete geographical description of the region, and the very villages are marked inaccurately on the maps. The mountaineers, who fought so brilliantly under Shamil, are also little known. Madame Rossikoff begins with the beautiful plateau or terrace of Vedeñ (last stronghold of Shamil); then she describes the Chaberloi plateau, the valley of the Keri, the gorge of the Argun, and the pass Ityn-kul. A map, 3½ miles to the inch, accompanies the paper. Several samples of Chechen folklore are given.

An interesting note concerning the Pshaves and their land, contributed by M. Khizanashwili to a Caucasian paper, is reproduced in this volume of the *Memoirs*.

Two papers are devoted to climatology, namely, one on the precipitation in Caucasia in the summer of 1894, illustrated by two maps, by A. Woznesensky, and another by K. Rossikoff, on the glaciers and the lakes of the northern slope of the main range, in which measurements of both the glaciers and the levels of the bases in 1893 and 1894 are given.

In the domain of statistics, we find four detailed papers, containing a full statistical description of the government of Baku, and statistical data relative to the provinces of Erivan, Daghestan, Kutais, and Elisabethpol; and in the domain of ethnography a splendid atlas of eight ethnographical maps of each separate province of Transcaucasia, on the scale of 13½ miles to an inch, is published by E. Kondrutenko, as well as a note concerning these maps.

The numerical data contained in V. Cuinet's work, 'La Turquie d'Asie' (1890–94), concerning the Armenian population of Asia Minor, have been utilized by General Zelenyi and Colonel Sysoeff to draw a detailed map (33½ miles to an inch) of Turkish-Armenia and Kurdistan, giving the percentage of Armenian population in each of the vilayets and the districts of the region. Besides, detailed tables, showing the distribution of Armenians in Transcaucasia, are given by the editors.

The twenty-third volume of the 'Collection of Materials for the Description of Localities and Inhabitants of Caucasia' (*Sbornik Materialov*), which continues to be published by the Caucasian School Administration, contains a number of interesting papers, including an elaborate description of the Kuban province, by L. Y. Apostolov; papers on the Mennonite settlements, and on the ancient town of Majary; and a variety of smaller notes.

EAST SIBERIA.

The last numbers of the East Siberian Branch of the Russian Geographical Society which have reached us (xvii. 1 and 2, 1896; and xviii. 3, 1897) contain an excellent review of the expeditions which were sent out by the Russian Geographical Society and its Siberian branch for the exploration of Siberia during the last fifty years, as also the yearly reports of the East Siberian branch for the years 1894, 1895, and 1896.

We learn from the latter that the exploration of the Khangai mountains was made by D. A. Klements, for the Academy of Sciences. The upper course of the Khoitu-Tamir was explored in 1894. The great range consists of granites and quartz porphyries, covered with clay slates and other metamorphic slates. A few beds of conglomerates are found on the outskirts. A formidable development of volcanic activity took place in the south-east and south-south-east Khangai, probably during the Tertiary epoch. At the sources of the Onghien and the Orkhon, hundreds of miles are covered with almost uninterrupted flows of lava. The valleys of the Khangai are well populated, and old stone graves are numerous everywhere. Parts of the Gobi-Altai were also explored, and it appeared that the Baga-Bogdo and the Artsy-Bogdo are two quite distinct ranges. The Gobi-Altai is dry and thinly populated, the breeding of camels being the chief occupation of the natives. Surveys for 1860 miles, and bulky collections of plants and insects were brought in. In the year 1895, Klements crossed the Western Khangai, and discovered a miniature glacier. In the Ubsa-hor depression he discovered layers containing coal and forest plants, which were sent to the Academy of Sciences.

A considerable sum of money having been put by M. Sibiriakoff at the disposal of the Siberian branch for the description of the Yakutsk region, an exploration on a grand scale was organized, in which about twelve persons took part. The aim is to thoroughly explore the ethnography, the anthropology, and the economical conditions of the Yakut and Tungus populations of this immense province. The exploration has been busily carried on during the last three years, and an immense mass of materials, anthropological (partly published in the *Memoirs*), ethnographical, linguistic, and economical, is already accumulated. Some of the explorers, as S. Kovalik, being thoroughly acquainted during many years of exile with their respective regions, have proceeded most systematically in their work, which promises to be of very great value. A Yakut Dictionary has been compiled by one of ten exiles, E. Pekarsky, who has learned the Yakut language as his mother-tongue, and has had at his disposal all linguistic material hitherto published, or accumulated at Irkutsk in manuscript, or collected by the Yakutsk expedition. The means for publishing this important work were also given separately by M. Sibiriakoff.

The relics of the Stone age near Irkutsk were explored by Dr. Eleneff. Under a layer, about one foot thick, of humus, and above the alluvial layer which covers the local sandstone, rich collections of stone implements, made of slate and quartzite, were found—namely, about a hundred arrows, mostly flat and triangular, but partly also pyramidal; stone awls, about a hundred cores, nearly two hundred chisels, small hatchets and fine scrapers, from three thousand to four thousand splinters, and about thirty pieces of pottery, embellished with engraved and sculptured ornaments, were found in the same spot.

Six seismoscopes have been established in different parts of Transbaikalia for the study of earthquakes.

The January number of the *Geographische Zeitschrift* contains a short note on the work carried out since 1895 under the superintendence of M. Obrucheff, with a view to the detailed study of Transbaikalia in its physical and geological aspects. M. Obrucheff himself undertook the exploration of the south-western portion of the region. The whole district between Kiachta and Lake Baikal in the west and the Yablonoi range in the east is a mass of mountains, in which only the valleys of the larger streams and lakes form level depressions. The ridges are composed of crystalline schists, metamorphic and eruptive rocks; while the valley floors consist of coal-bearing strata, probably of Tertiary age, and Post-Pliocene lacustrine sand. Magnetic iron ore is fairly plentiful, but the coalfields will not repay working, at least in the immediate future. The region between the Yablonoi range in the west and the rivers Onon and Argun in the south and east was examined by A. Gerassimoff and J. A. Gedroitz. Here the valleys are at a lower elevation, and larger plains exist on the Mongolian frontier, though a general mountainous character is maintained. Crystalline rocks still predominate; but Palæozoic, Mesozoic, and Tertiary formations occur, and eruptive rocks occupy large areas towards the south. A variety of metals are found, and some of the coalfields would repay working. Statistical investigations, dealing with questions of land tenure and the proportion of cultivable land, have also been carried out by M. Kulesmin.

THE MONTHLY RECORD.

THE SOCIETY.

Vasco da Gama Celebration.—A preliminary meeting of the British committee, formed to assist in the celebration in May next at Lisbon of the fourth centenary of the discovery of the Cape route to India by

Vasco da Gama, was held on March 21 at the rooms of the Royal Geographical Society. Sir Clements Markham presided, and there were also present Sir A. Rollit, M.P., Sir G. Birdwood, Sir D. Tennant, Sir Charles Lawson, Sir Eyre Massey Shaw, Sir George Taubman-Goldie, and others. The Portuguese Minister, Sir Luiz de Soveral, and the Royal Commissioner and Governor-General of Mozambique were also present. The chairman referred to the great geographical interest of the event which would be celebrated in Lisbon on May 17 to 20, and said that a dinner and also a meeting would be held in connection with the celebration in May at the rooms of the Royal Geographical Society, at which the Prince of Wales and the Duke of York had promised to be present. Sir A. Rollit said it had been arranged to hold a meeting in May at the India Office, over which the Secretary of State had promised to preside, and the Department had also sent charts and plans to the exhibition at Lisbon. Resolutions of congratulation to the King and people of Portugal upon the occasion were passed and were cordially acknowledged by Sir Luiz de Soveral, and a sub-committee was appointed to carry out the arrangements.

EUROPE

Exploration in the Eastern Caucasus.—Mr. Maurice de Déchy, Hon. Corr. Member R.G.S., writes that he travelled last year in the high mountains of the Eastern Caucasus, to continue the exploring work which he began many years ago. He was accompanied by two Tyrolese guides. The north side of the Pirikitelian chain was first visited, whence the Khevsurian Alps were reached and explored. The north foot of the Pirikitelian chain was visited in 1894 by the indefatigable Caucasian traveller and explorer, Dr. Radde, but glacier explorations above the snow-level were not undertaken (see "Der Nordfuss des Daghestan," Ergänzungsheft No. 117, zu *Petermanns Geogr. Mitteilungen*). In 1892 a German traveller, Herr Merzbacher, made a long and successful exploring journey on the south side of the chain, and ascended some of its highest peaks (see *Geogr. Jour.*, vol. i., 1893, p. 63). The inner Khevsurian Alps, whose wild mountain chains, as stated by Dr. Radde, no European traveller has ever crossed, remained a *terra incognita*. On the journey of Mr. de Déchy, the glaciers of the side valleys, which belong to the river system of the Argun, were explored. They all show signs of retreat. The highest peak of the Pirikitelian chain, Datakh Kort (14,020 feet), was ascended, from a camp in the Donollam valley, and a second bivouac, higher up on the sides of the Datakh glacier. The chain was crossed by a pass at the head of the Kachu glacier, Kachulam pass (11,650 feet), to the valley of the Pirikitelian Alasan. In the Khevsurian Alps great difficulty was experienced in laying down the route to be followed in the proposed exploration. A series of high passes from east to west were crossed; the Anatoris-gele (about 10,000 feet), the Kalatonis-gele (10,175 feet), the Shibu-gele (11,212 feet), and the Inkvari-gele (about 11,200 feet). The whole region consists of slates (mixed, towards the west, with calcareous sandstones). The aspect of the Khevsurian Alps is quite different from the Central Caucasus and from the adjacent mountain groups towards the east, the Tebulos group and the Perikitelian chain. The valleys are dreary, stony; the vegetation poor; the peaks comparatively insignificant, but the height of the saddles great; the glaciers small, and the snowfields in general very unimportant, despite the great height of the ridges, whose steepness may account for this. On the journey geological and botanical collections were made; the botany is under determination by the learned explorer of the Caucasian flora, Prof. Sommier, in Florence, who has already determined the phanerogams collected on Mr. de Déchy's preceding expeditions. A large series of photographs of the scenery and the people were taken.

Submerged Rock-valleys in England.—In a recent paper to the Geological Society on "Submerged Rock-valleys in South Wales, Devon, and Cornwall," Mr. T. Codrington described various valleys in which the solid rock is reached at a considerable depth below sea-level, on the sides of Milford haven and in the haven itself; beneath the Tivy, Tawe, and Neath, the Wye, the Severn, the Bristol Avon, the Dart, the Laira, the Tavy, the Tamar, and other rivers. In the case of the Dart, the rock bottom has been found at one place at a depth of 110 feet below low-water level, and in the case of other rivers at varying depths less than this. The deposits show that some of the infilling took place after the period of submerged forests, and much before this, for frequent cases of glacial deposits filling the bottoms of these submerged valleys are recorded. The fact that in the Solent and Thames the glacial deposits border the sides of the valleys, and do not occur at the bottom as in the case of the valleys described in the paper, indicates that the latter are older than the former, though they present features similar to those of some of the valleys of the north-east and north-west of England. In the discussion of the subject, Mr. Strahan considered that the description given of valleys filled with mud to so great a depth below sea-level emphasized the fact that the land must have stood at a considerably higher level in comparatively recent times, not only in South Wales, but all round our coasts. Mr. C. E. de Rance pointed out that these submerged valleys in South Wales and the south-west of England were excavated by rain and rivers before the glacial episode. He stated that similar valleys in North Wales, Cheshire, and Lancashire occur at depths of nearly 200 feet below the mean tide-level, and are filled up to the existing height with undoubted glacial deposits, through which post-glacial valleys have been excavated 1½ mile wide, and 180 feet deep. Mr. J. E. Clark called attention to two important points which the paper seemed to establish. The submergence in the south-west exceeded that in the south-east, exactly as had been shown between North-Western and North-Eastern England, and again in Western and Eastern Scotland. The deeply submerged peats and tree-stools indicated, again as in the north, that the post-glacial recovery brought the land-level almost to normal pre-glacial conditions. But its brief duration was strikingly shown by the York central plain. If the glacial beds were stripped away, there would now be a vast inland sea, hundreds of square miles in extent, reaching beyond York, whereas the post-glacial Ouse had only time to cut a narrow, 70-feet-deep gorge through the present site of the city.

The Site of the Ancient Noreia.—The position of the old town of Noreia, famous in connection with the first inroads of the Cimbri and Teutones into the lands which now form the south-west portion of the Austrian empire, is the subject of a lengthy disquisition by Fritz Pichler in the *Mitteilungen* of the Vienna Geographical Society (1897, Nos. 9 and 10). After first briefly recapitulating the work of previous commentators, who have brought forward no less than eighteen different places as claimants for the honour of identification with the ancient capital of the Taurisci, the writer carefully examines the question from all points of view, and arrives at conclusions differing from any suggested by previous writers. Noreia, which formed the centre of a gold and iron yielding district to the south of the Danube, is supposed to have given its name to the province of Noricum, inhabited by the Taurisci or Norici. According to Polybius, Strabo, and others, it was the scene of the defeat of the Roman Consul Carbo by the Cimbri in B.C. 113, and was besieged by the Boii in B.C. 59. Later on it drops out of notice, and during the Roman occupation of Noricum the chief centre of the province was Virunum, situated in the valley of the Glan, in the neighbourhood of the modern Klagenfurt. A Noreia was, however, introduced by Castorius into the 'Tabula Peutingeriana' (A.D. 365–366) as a post-station in upper Styria, and here, therefore, the site of the ancient Noreia has frequently been placed. Herr Pichler enters minutely into a variety of questions, such as the relation of the topography of the country to the military details, the history of the mining industries, the centre of the Noreia-cult (the name was also applied to the patron deity of the land) as revealed by inscriptions, and finds that everything points to the Glan valley as the site of the ancient town. He therefore concludes that, as Cæsar knew nothing of Virunum, while Pliny, who speaks of Virunum, knew nothing of Noreia, the two places were on one and the same spot, the name having been changed by the Romans when they established themselves in the country. The Noreia of Castorius will in this case be a totally different place, a post-station of later times, of which no mention is made previous to A.D. 363.

Displacements of the Confluence of the Loire and Vienne.—M. Louis Laffitte has an interesting note in the *Annales de Géographie* (November, 1897) on the subject of the changes which appear to have taken place within historic times in the *régime* of the rivers flowing through the "Val d'Anjou" (known also simply as "Vallée"). This valley, now one of the richest and most fertile districts of France, but formerly a swampy and unstable tract of country, is composed of alluvial soil, forming as it were a gulf between the higher and older lands which bound it. At the present day the Loire and Vienne, the two principal streams which debouch on this alluvial tract, unite near its upper end, at Candes; it has been thought, however, from the statements of old chroniclers, that the junction formerly took place much lower down—Gilles Ménage, who wrote in 1683, considering that in the eleventh century the two rivers joined opposite Saint-Maur. Some writers have even held that the Authion, which now flows in a separate furrow parallel to the Loire on the north, marks an old bed of the latter river; whilst others, *e.g.* Bodin (1812), assign a parallel course on the south to the Thouet, which now joins the united Loire and Vienne at Saumur. Both these suppositions are, according to M. Laffitte, erroneous. He explains the statements of the chroniclers by supposing that the present course of the Loire between Candes and Saint-Maur went sometimes by the name of one, sometimes by that of the other of the component streams. There seems to have been a series of islands or other obstacles which prevented their complete union at once, whilst from a geological point of view the section in question forms rather the continuation of the Vienne than the Loire, the latter river having in time carried the day owing to its greater volume. Even now the Vienne when in flood makes its colour perceptible as far as Saumur, and the boatmen of the present day use the two names according as they navigate by one or the other bank.

ASIA.

The Mihran of Sind.*—Major Raverty has here presented his readers with a study of comparative geography of great complexity and importance: the question of the modifications and changes through which the Indus and its tributaries have passed in the course of centuries. The most conspicuous of these changes are the disappearance of the "Mihran of Sind," or "Sind Sagar,"

* 'The Mihran of Sind and its Tributaries: a Geographical and Historical Study.' By Major H. G. Raverty, Bombay Army (retired). Reprinted from the *Journal*, Asiatic Society of Bengal. Calcutta: Baptist Mission Press.

which flowed east of the Indus, and retained as its tributaries the waters of all the rivers of the Punjab, from the Chetang to the Sindhu, or Ab-i-Sind, and the conversion of the Ab-i-Sind, or Indus, into the main stream. This westerly trend of river-courses is a process not unfamiliar to geographical students, and elaborated, if we remember right, by the physicist Von Baer. Major Raverty has devoted his attention more to the historical side of the question, and in the 353 pages of the present treatise, he reviews in the greatest detail all authorities, devoting by far the most attention to Oriental authors. The work is scarcely adapted for detailed review, and in any case would require maps to illustrate any critical or other remarks. But the influence of the physical changes will be the more readily appreciated when we bear in mind that some of them were so considerable that they reduced a vast extent of once fruitful country to a howling wilderness, and that flourishing cities and towns became ruined or deserted by their inhabitants. The elaborate disquisitions on all the principal historical events are given with all the author's usual minuteness; in fact, we should almost have preferred a more condensed treatise with the main facts indicated in greater prominence. But no one can fail to appreciate the author's extraordinary industry, and the care with which he has scrutinized the original texts of his Oriental authorities, whether published or in manuscript. There are several maps attached to the monograph, but their clearness appears to have suffered in the process of reduction from the author's original scale, and the omission by the lithographer of any explanatory dates, showing what particular years or ages they illustrate, somewhat mars their usefulness.

Mr. Thomson's Photographs of China.*—Mr. John Thomson, whose services to the Royal Geographical Society as instructor in photography have led in no small degree to the improvement recently observable in the illustrations of books of travel, has just published a work which will be widely welcomed. Mr. Thomson made an extensive tour through China about twenty-five years ago, and published a selection of his photographs on his return in four large and costly volumes, entitled 'Illustrations of China and its People,' the letterpress of which was confined to notes on the pictures. The new work, although based on the same journey, is quite a different book. It gives a series of chapters, which have been written in the light of recent occurrences, on the condition of China, the Chinaman abroad and at home, and on some of the more important districts of China. Canton and the province of Kwang-tung, the treaty ports, Shanghai, the Yang-tse-kiang, and Northern China are described, and a particularly detailed account of Formosa is given, with an appendix on the aboriginal dialects of that island. While the book will be read with interest, the value attaching to the illustrations is certainly the most striking feature of the work. The original negatives were taken by the old laborious wet-collodion process, the manipulations of which demanded the utmost skill and dexterity; but the results in the hands of an expert were far superior to those attainable by the easy dry-plate process of to-day. In China pictures taken many years ago show the same features which now present themselves to the eye, and the same which were visible to the first visitors from the west. It is a case where one can photograph the past. The hundred examples of his art chosen by Mr. Thomson are now reproduced as half-tone blocks for the first time, and the result is remarkable. The public is so much accustomed to see traveller's photographs taken hastily, preserved carelessly, and developed badly, that the carefully selected standpoints, artistic grouping, and perfect technical finish

* 'Through China with a Camera.' By John Thomson. With nearly 100 illustrations. Westminster: A. Constable & Co. 1898.

of these prints will be to many a revelation of the power of the camera in making real the scenery and the people of distant lands.

Shantung and Kiauchau Bay.—On the head of the German occupation of Kiauchau bay (which Baron von Richthofen maintains in the *Verhandlungen der Gesellschaft für Erdkunde*, Berlin, 1898, p. 71, is the only correct spelling—in German, of course—Kiautschou), has issued a pamphlet entitled 'Kiautschou, seine Weltstellung und voraussichtliche Bedeutung' (Berlin: 32 pp.), the main purpose of which appears to be to put a check to exaggerated expectations with regard to the results of this step. Baron von Richthofen maintains that the only commodity likely to form, in the first instance, an important article of export is the excellent coal of Shantung, and that Kiauchau cannot be expected to make any rapid progress till it has been connected by rail, at least, with Wei-hsien and Tsinan, and in the end with the great Peking-Hankow line of the future. In noticing this pamphlet, the editor of *Petermanns Mitteilungen*, considering that it is twenty-nine years since Baron von Richthofen has been in Shantung, thought it well to consult Mr. Otto Anz, who has just returned to Europe from Northern China, where he has been devoting himself more particularly to the wild silk industry. The results of this inquiry are briefly communicated in the February number of the periodical mentioned. Mr. Anz considers that in several particulars the views of Baron v. Richthofen do not correspond to the present situation, and believes that the establishment of an open port at the mouth of the bay would at once give a great stimulus to the export of raw silk from the mulberry moth, as well as from the oak-moth (the *Antheræa pernyi*), to that of tissues made from the product of the oak-moth, and to that of straw braid. In the last two decades this last industry has undergone a very important development in Shantung, especially in respect of quality. Mr. Anz also points out that the steady silting up of the Chinese ports on the Yellow sea which is going on, is likely to tell more and more in favour of Kiauchau, a harbour always open, even in winter. The communication is accompanied by a map, on the scale of 1 : 750,000, of Kiauchau bay and the neighbourhood, largely based on a Japanese authority, and containing a number of names not to be found on any map yet published in Europe.

AFRICA.

The British East Africa Protectorate.—The report by Sir A. Hardinge, presented to Parliament in December last, supplies a useful summary of the history of the East African Protectorate since its formation in July, 1895, and the progress made in its organization and development. A map added to the report shows clearly the boundary of the Protectorate with that of Uganda, as well as the administrative areas into which it is divided. The boundary alluded to runs from the neighbourhood of the "Natron lake" in the south to the Likipia escarpment towards the north, bending eastwards, however, so as to leave Lake Naivasha and the portion of the rift valley immediately to the south of it within the Uganda Protectorate. The four provinces which have been so far constituted (Seyyidieh, Ukamba, Tanaland, and Jubaland) are divided each into several districts, presided over by a European (named the "District officer"). These are in turn described by Sir A. Hardinge, with a sketch of their characteristic surface features, and an enumeration of the principal tribes included within them. One section of the report deals with communications. A satisfactory point noted is, that in various districts around Machako's the natives are beginning so greatly to appreciate the advantage of good roads that they have offered to construct new ones at their own expense. Ukamba, the least civilized province, is the best provided with roads, the communications of the coast provinces being largely carried on by sea, while the presence of the *tsetse* fly prevents cart transport by animals. The supply of porters, derived chiefly from Mombasa, Rabai, and Teita, does not equal the demand, and a large proportion of the goods received in Uganda is despatched through German territory. As regards river navigation, it is hoped that small steamers may shortly be provided, both for the Tana and the Juba. The slave-trade now flourishes only in two regions of the interior, Kitui, in Ukamba, and Somaliland. The historical retrospect for each of the four provinces for the first two years after the formation of the Protectorate is in the main satisfactory. The rebellion in the Seyyidieh was not an unmixed evil, as it led to the breaking, once for all, of the power of several influential Arab potentates. In Ukamba, the intertribal wars and raids which have hitherto prevailed are being steadily suppressed.

AMERICA.

The Canadian Expedition to Hudson's Bay.—During the summer of 1897 the Canadian Government took a further step towards solving the question of the practicability of the Hudson strait route to Central Canada, by the despatch of a scientific expedition to determine the length of time within which the conditions of the ice would permit the navigation of Hudson bay and strait during the summer months. We hope shortly to receive a detailed account of the expedition, but meanwhile the following particulars will be of interest. The *Diana*, a wooden whaling steamer, left Halifax for the north on June 3, having on board Dr. Bell and Mr. Lowe, of the Geological Survey. Much ice was encountered, and on attempting the entrance of the strait the ship was beset, and was for a time in great danger during a storm. The scientific members were afterwards landed for the purpose of exploring on the north and south sides of the strait, while the steamer cruised in various directions. The strait was now found to be free of ice, with the exception of a bank against the north coast. A visit was paid to the fishing-stations in Cumberland sound, in the east of Baffin Land, where one or two Europeans were found living a wretched life among the Eskimo. Hudson strait was afterwards successfully traversed, and a visit paid to Fort Churchill, after which Dr. Bell and Mr. Lowe were again taken on board, and the ship proceeded for supplies to St. John, Newfoundland. The strait was again visited in October, and only on the 30th of that month did ice begin to form in the bays, the passage still remaining free. Much good work was done by the land parties. Dr. Bell found the north side of the strait strewn with islets, and bordered throughout the summer with an ice-field. He made an expedition into the interior of Baffin Land, discovering the large lake reported by the Eskimo to Dr. F. Boas. Mr. Lowe executed a survey of the south coast of the strait, as far as the George river in Ungava bay, and found the existing maps very inaccurate. Both observers agree that the strait is open for steam navigation for at least sixteen weeks in the year, while its meteorological conditions are decidedly more favourable than those of the Strait of Belleisle.

The Rio Capim, Para, Brazil.—A preliminary account of a journey to the upper course of the Rio Capim, the river that joins the Guajara at the town of Pará, is given by Dr. Emil A. Goeldi in the February number of *Petermanns Mitteilungen*. The expedition set out from Pará on June 15, on board the Government steamer *Lauro Sodré*, which was to take them as far as the fazenda of Apronaga at the end of the pororóca section of the lower Capim. Thence they proceeded in a private steamer called the *Ondina*, drawing 6¼ feet even when lightened as much as possible. This deep draught proved unfortunate, for the steamer could not go up beyond the lowest rapid (above Acaryuçana), which was reached on June 28. A rocky barrier there crosses the river from the right bank, leaving only a narrow channel free on the left side, and in that channel a depth of only 5 to 5½ feet above a bed partly occupied by sharp-edged and pointed rocks. The party had consequently to make the rest of their way in canoes. They were without instruments for the exact determination of their position, but Dr. Goeldi believes that they ultimately reached about 3¾° S., 48½° W., on the upper Capim, and he states that, were it not for the unfortunate obstruction offered by the rapids above Acaryuçana—which, however, could be overcome with little difficulty and at little cost—the river would form a splendid waterway to the frontier of the state of Maranhão; for the Surubijú, the right head-stream of the Capim, is said to be deep, and to permit of navigation by small steamers a long way up. Between Apronaga and Acaryuçana twenty-nine tributaries were counted on the right, twenty-six on the left, bank.

Exploration in the Southern Andes.—Two Chilean expeditions have set out for the exploration of the Andes to the south of 42½° S. One of these, under Dr. H. Steffen, set out from Santiago on December 14 to explore the Cordilleras on both sides of the parallel of 44° 30′ S., between the Aisen in the south and the Palena in the north, the principal aim of the expedition being to reach the great lake-region of Argentina containing Lakes La Plata and Fontana. The other, under Dr. P. Krüger, started from Puerto Montt early in January, with the view of exploring the Cordilleras in the neighbourhood of 43° S. The expedition is to ascend the Rio Corcovado from its mouth, and to ascertain whether it is identical with the Futaleufu, which was explored last year from the lake whence it issues to the colony of October 16. If it succeeds in its aim, the exploration of the main water-parting in the latitude of 42⅔° S. will have been completed. The expedition is well provided with material and instruments (*Petermanns Mitteilungen*, February).

Exploration in Tierra del Fuego.—Dr. Otto Nordenskjöld contributes to *Petermanns Mitteilungen* (September, 1897) a preliminary notice of the Swedish expeditions of 1895–97 in Tierra del Fuego. In the zoological work Dr. Nordenskjöld was assisted by Dr. Ohlin, and in the botanical work by Herr Dusén, the Argentine authorities lending effective aid in the way of transport and otherwise. The full reports are to be published shortly in a special memoir; meanwhile, Dr. Nordenskjöld gives a new map of the region, a descriptive account of its extremely interesting and complicated topography, and sufficient of the more striking scientific results to indicate that the difficulties and risks encountered by the explorers have not been without due reward. Any contribution to our knowledge of the most southerly inhabited portions of the globe gain, of course, a special significance from a comparison with the known conditions of the northern hemisphere, a comparison remarkable while we restrict ourselves to the sea, but probably still more so when we extend it to dry land. The expedition made collections with trawl and tow-net at thirty-seven stations, and collections of land, fresh-water, and shore forms at about forty stations. Several of the localities have never before been visited, and the specimens of typical forms are therefore likely to be of peculiar interest. The same is true of the botanical collections, especially of the Cryptogams. Notwithstanding its limited area, the region has shown itself to be one of great complexity, and this fact will almost certainly be reflected in local variations of both fauna and flora. The geological collections show that in Tertiary times the climate of Tierra del Fuego was slightly warmer than it is at present; these conditions were followed by a glacial period, during which the islands were covered, and the straits of Magellan filled up, although the ice never reached beyond the parallel of 52° S. It might seem that this result was not in accordance with observations in sub-tropical regions, but the ice period was probably associated with a general subsidence of the land. Towards its end, Tierra del Fuego was probably 200 feet below its present level, although there is little or no evidence of elevation actually going on at present.

It is well known that many species of animals found on the northern side of the straits of Magellan are unknown in Tierra del Fuego; the observations of the expedition show that the list of these is much more extensive than has been supposed, and that it includes reptiles, frogs, and many invertebrates. Many plant-forms of different families exhibit the same sharp demarcation, showing that the straits of Magellan date back to a remote period, a fact abundantly supported on other grounds. The work of the Swedish expeditions serves to still further emphasize the scientific importance of an exploration of the antarctic continent, and it will prove a valuable aid in the interpretation of the information we may hope one day to possess concerning that more remote region.

AUSTRALASIA AND OCEANIC ISLANDS.

The Cambridge Expedition to Torres Straits and Borneo.—This expedition, under the leadership of Dr. A. C. Haddon, Professor of Zoology in the Royal College of Science, Dublin, sailed on March 10 for Torres straits. The party consists of Dr. W. H. R. Rivers, St. John's College, Cambridge, Lecturer on Experimental Psychology at Cambridge, and at University College, London; Mr. S H. Ray; Dr. W. McDougall, Fellow of St. John's College, Cambridge, and of St. Thomas's Hospital, London; Dr. C. S. Myers, B.A., Caius College, Cambridge, and Bartholomew's Hospital, London; Dr. C. G. Seligmann, of St. Thomas's Hospital, London; and Mr. A. Wilkin, of King's College, Cambridge. The work of the staff will be distributed as follows: Dr. Haddon will be responsible for the observations on the physical characteristics of the natives, and will continue his researches on their decorative art. Their language and phonology will be studied by Mr. Ray, the well-known authority on Oceanic languages. Drs. Rivers, McDougall, and Myers will initiate a new departure in practical anthropology by studying comparative experimental psychology in the field; Dr. Myers also paying especial attention to native music. The hygienic and medical aspects of anthropology will be studied by the four medical men. Dr. Seligmann will act as naturalist to the expedition; one of his duties will be to identify all the animals and plants which are utilized by the natives in any way. After a stay of some few months in the straits, some of the party have accepted a very generous and enthusiastic invitation to visit Mr. C. Hose, the chief magistrate of the Baram district of the Raj of Sarawak. Mr. Hose, who is a Cambridge man (Jesus College), is a keen naturalist, and has a wide knowledge of and sympathy with the natives, and has promised exceptional facilities for seeing something of the inland tribes of Borneo. Besides the ordinary instruments for anthropometry, there will be a small carefully selected collection of apparatus for experimental psychology, among which the following may be noted: a sphygmometer for recording alterations in the pulse, Cattell's algometer for testing pain, and an æsthesiometer. Various appliances will be employed for testing acuity of vision and colour-blindness, and an apparatus for quantitively studying visual illusions has been provided. Acuity of hearing will be tested by Politzer's Ohrmesser, and the range by Galton's whistles. A complete equipment has been taken out for recording reaction time, including tuning-forks, time-markers, drums, and visual and auditory signals. Several cameras will be employed in photographic work, and an attempt will be made to record natural colours by the Ives and Joly processes. A Newman and Guardia cinematograph for recording native dances and actions has been provided. The languages and music will be perpetuated on numerous phonograph cylinders.

Proposed Bibliography of Australasia.—Mr. E. A. Petherick, the well-known compiler of 'The York Gate Catalogue,' has for the last thirty years been engaged in collecting the material for an exhaustive catalogue of the literature relating to Australasia and Polynesia, published since 1600 in every language. The titles already obtained exceed 30,000 in number, and their arrangement in the double form of an authors' and classified catalogue would fill an imperial octavo volume of 900 or 1000 pages in double column. The expense of such a work will necessarily be considerable, even bearing in mind that the compilation is already completed, and as the work is one of national rather than public importance, the difficulty of securing publication is serious. The Australasian colonies are not yet sufficiently united, nor perhaps sufficiently cultured, to undertake the publication of a work which, if lost, will shroud in obscurity a mine of literary wealth, for which, when too late, they would consider no price to have been too great. Mr. Petherick has resolved to publish the work at once at his own risk, if a sufficient number of copies are subscribed for at £3 10s. each, to cover the cost of production. Application may be made direct to Mr. Petherick, at 3, York Gate, London, N.W., or to any of the leading bibliographical booksellers. While all aspects of every part of Australasia and Polynesia are dealt with in the work, its value to geographers is, perhaps, greater than to other specialists. The importance of having the whole record of discovery and settlement of so extensive an area brought together is so great, that it only requires to be pointed out to be generally recognized.

Water-supply of Queensland.—We have received the report of the hydraulic engineer of Queensland for the year 1896. To the report itself, which contains much information of geological and meteorological interest, there are added tables showing position, depth, and yield of a large number of artesian borings, some analyses of deep waters, and a map exhibiting the results of rainfall observations in an unusually effective way. Generally speaking, the artesian wells of Queensland obtain their supplies from porous sandstones and other permeable beds of the Lower Cretaceous or Rolling Downs formation. The Lower Cretaceous rocks extend westward from the Palæozoic coastal range, and, so far as at present known, stretch over some 374,358 square miles, including 56 per cent. of the whole area of Queensland. They occupy by far the greater part of Western Queensland, and extend over South Australia, entering Western Australia and New South Wales, and marking the position of the ancient Cretaceous sea which connected the Gulf of Carpentaria with the Great Australian Bight. From the borings already made, it appears that more or less satisfactory artesian water-supply exists in at least 106,000 square miles of the Queensland area. There remain about 132,000 square miles in the south-western districts still unexplored by the drill, and it is suggested that a few trial borings should be made at the expense of the State; there seems little doubt that they would be successful, and their success would give great impetus to the development of that part of the colony. The report further deals with the distribution of the artesian water-supply by irrigation, and with improved arrangements for giving warning of floods in the Brisbane, Mary, Fitzroy, and other rivers.

Currents of the Australian Coasts.—Mr. H. C. Russell recently communicated to the Royal Society of New South Wales a second list of floats or bottles picked up at various points of the Australian coast, with notes as to their probable course and rate of movement. In the small number of cases where there are opportunities of comparing this method of studying the movements of the surface layers of water in the ocean with the more delicate methods involving observations of temperature and salinity, it must be confessed that, while on the whole much better than nothing, the results are frequently very misleading. That these new observations are no exception to this rule is evident from the following: "In the present list . . . we have fifteen papers found on the east coast; three of them went to the south, eight went to the north, and four came in from the east. In view of the well-known southerly current on this coast, it is remarkable that so few of the papers found seem to go with it, and that the majority of the papers found go against the current." The most interesting cases are those of the bottles found on the coast between Melbourne and Adelaide, which include three thrown into the sea near Cape Horn. Mr. Russell suggests that the bottles are carried east by the current, and at the same time urged northward by the south-west and southerly winds, giving a resultant direction about east-north-east, which would land them on the coast. It would seem that, if we accept this suggestion and the facts just mentioned about bottles landing on the east coast, we must be driven to regard the whole method of observation as worthless. It may, however, be possible that the true interpretation is that given by M. Hautreux to his observations in the Bay of Biscay—that the current really sets to the shore with the wind, and that the water is merely banked up against the land. The doctrine that upwelling of water is caused by off-shore winds is now universally accepted, and it is difficult to see why the contrary effect of winds from the sea is so rarely admitted.

POLAR REGIONS.

Prof. Copeland's Revision of Payer's Map of Franz Josef Land.—*Petermanns Mitteilungen* for September, 1897, contains a notice from the pen of Dr. Supan of Prof. Copeland's revision of Payer's map of Franz Josef Land, published in the *Journal*. After again expressing his regret that Payer allowed his observations to be worked up and published without carefully revising them himself, Dr. Supan draws attention to some of the changes introduced by Prof. Copeland, and points out difficulties in reconciling some of them with statements recorded in Payer's own journal. For example, Payer says, "Wir waren längs der Andrée-Insel nach Süd hinabmarschiert, hatten das flache Eisgewölbe der Rainer-Insel überquert und sahen nach West die mit vielen Eisbergen erfüllte Back-Einfahrt." Andrée island is absent from Copeland's map, being merged in Karl Alexander Land, "there being no certain traces of a strait in the survey." Dr. Supan believes the riddle of Payer's Wilczek Land to be still unsolved, and protests against the reappearance of the Dove glacier in Lindemann bay. The arguments for the retention of Richthofen peak leave him unconvinced, and he points out difficulties in reconciling Prof. Copeland's statements on pp. 180 and 186 of his paper with reference to its position and height.

German Antarctic Expeditions.—As the result of a meeting of the German committee for the furtherance of south polar research, which was held in Leipzig on February 19 under the presidency of Dr. G. Neumayer, a plan has been formulated for the proposed expedition, of which Dr. E. von Drygalski has been chosen leader. The following is an outline of the scheme. A ship will take the expedition into the south polar region, and a suitable spot will be chosen for wintering. During the winter scientific observations will be carried out at the station, and in the spring an attempt will be made to advance with sledges over the continuous polar ice in the direction of the pole. In the autumn of the southern hemisphere, it is proposed to follow the coast-lines of the southern lands in the direction of the magnetic pole, and, if possible, to explore the west side of Victoria Land, the return being made thence through the pack-ice. For the advance southwards, the meridian of Kerguelen's Land is recommended for the following reasons: (1) A serious attempt has never been made on that meridian; (2) its position in regard to the observatories of Melbourne and Mauritius renders it particularly favourable for magnetic work; (3) by this route the oceanographical researches of the *Gazelle*, and those to be carried out by the deep-sea expedition under Prof. Chun, can be extended; (4) the breaking up of the ice lately observed near Kerguelen's Land promises favourable conditions during the next few years.

A complete programme for extensive scientific observations throughout the whole voyage has been drawn up. It is proposed that the expedition should start in August, 1900, while June of 1902 is suggested as the date of the return. The *personnel* would consist of twenty-five, viz. five scientists, five officers and engineers, and a crew of fifteen. It is also proposed to equip a German Government expedition to the Antarctic, mainly for deep-sea research.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Suess' 'Das Antlitz der Erde' in French.—The first volume of Suess' great work on Geomorphology was published in 1885, and at once took the leading place as the greatest contribution ever offered by geology to geography. M. de Margerie has now brought out a French edition, for the work is much more than a translation, under the title 'La Face de la Terre.'* It includes the whole of the original first volume, dealing with the movements of the crust of the Earth, and mountains, the latter heading including the origin of oceanic depressions and of continents. The new French edition is one-third longer than the original German, even allowing for the greater compactness of the German language. A considerable part of this increase is due to seventy-six new illustrations, considerably more than doubling the original number; but more must be placed to the credit of editorial notes, supplying fresh illustrative material and greatly extending the already copious bibliographies. The translation is the work of several hands, and each section bears the name of its translator. Besides M. de Margerie himself, the list of translators includes the well-known names of MM. Depéret, Gallois, Haug, Kilian, Marillier, Michel-Lévy, Raveneau, and Schirmer. They have been careful to distinguish their own notes and additions from the original matter of the classic. In his preface M. Bertrand ingeniously shows how the labours of Leopold von Buch and Elie de Beaumont, discredited as they both were by their mechanical and unbending theories, yet formed stages in the progress of the science of the Earth's crust, naturally leading to the dominant generalizations of Suess. He dwells strongly on the value of translating a book which has proved so full of suggestion as well as of instruction to all men of science who have read it in its original form, and looks for a great increase in its usefulness now that it has been so successfully made accessible to readers of the French language. It is a long-standing grievance that all the best modern geographical works exist only in foreign languages, and that English-speaking students, as a rule, cannot read them with the ease necessary for full appreciation. Why books of this class should find no market in English-speaking countries (with a population equal to that of all French and German-speaking countries put together) promising enough to tempt publishers to bring out translations by competent men, is a mystery which is not difficult to penetrate. The long-continued neglect of geography in the universities of Great Britain and America is directly responsible; but the awakening on the other side of the Atlantic has begun, and it would cause but little surprise if an English edition of Suess were produced in the United States. We can wish, though we can hardly hope, that this great work, and such other standard handbooks as the volumes of Ratzel's series, may one day be rendered freely available by publishers in this country. M. Bertrand concludes his eloquent preface with the words, "The creation of a science, like that of a world, requires more than one day; but when our successors write the history of our science, I am persuaded that they will record the work of Suess as marking the end of its first day, that in which light was created."

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* 'La Face de la Terre' ('Das Antlitz der Erde'), par Ed. Suess. Traduit avec l'autorisation de l'auteur et annoté sur la direction de Emmanuel de Margerie avec une préface par Marcel Bertrand. Tome 1[er]. Paris: Armand Colin et Cie.

A New Theory of Old Glaciers.—Prof. de Lapparent, in the *Revue des Questions Scientifiques* for October, 1897, criticizes the new theory of the history of the Swiss glaciers put forward by Prof. Stanislas Meunier in the *Revue Scientifique* for February, 1897. M. Meunier holds that there is no evidence for alpine glaciers having been previously longer or more powerful than they now are. He accounts for moraines of ancient date occurring at a long distance from the present mountain slopes by the hypothesis of glacial retrogression. He pictures the Alps as formerly consisting of a great Pamir-like plateau of great extent, the outer escarpments of which nourished glaciers similar in size to those of the present day. The glaciers of the Pamirian phase worked back like rivers by expediting the erosion of the cirques at their head, and so in time greatly narrowed the mountain belt, and retired from their early moraines. Keeping pace with the erosion, the glaciers, preserving approximately their original length, crept back from north and south towards the present central line of the Alps, leaving their moraines as a measure of their erosion. Thus the *Alpine phase* was reached. Later, the eating back reduces the height of the central line, and a *Pyrenean phase* is produced, leading still later to a *Vosgean phase*, when, the summits being worn away below the snow-line, glaciers become impossible. Prof. de Lapparent goes fully into the arguments for this hypothesis, and finds them insufficient to justify the abandonment of the earlier theory of a former great extension of alpine glaciers coincident in its period of maximum extent, and in its variations, with the movements of the North European ice-sheets as shown by the distribution of glacial drift and erratic blocks. M. Meunier explains the distribution of erratics in the neighbourhood of the Alps by the "capture" of one glacier by another, the head of which has eaten back through the dividing wall, and thus tapped the ice-supply. This hypothesis M. de Lapparent finds to be contradictory to the laws of glaciers and of ice-movement, and he prefers to look to the ice-sheet of Greenland for an explanation of existing conditions rather than to the hypothetical Pamir-like plateau. Further, he shows, by reference to the map of the Pamirs published with Mr. Curzon's paper in this *Journal* (vol. viii. p. 96), that the Pamirs do not actually form a lofty ice-free plateau surrounded on its outer slopes by a glacial halo, but form, on the contrary, a region of high valleys and lofty mountains, the glaciers of which rather tend to flow from the lofty ranges towards the great valleys of the centre, than to radiate outwards.

Earth-pillars and Pyramids.—The third number of the *Münchener Geographische Studien*, edited by Prof. Siegmund Günther, consists of a paper by Dr. Christian Kittler on earth-pillars and similar structures. Their distribution is discussed at length; they occur in different forms in more or less restricted regions of the Alps, the Carpathians, and the Pyrenees in Europe; in many parts of North and South America; in the Congo basin, the Transvaal, Zanzibar, and Teneriffe in Africa; in Asia Minor, the Himalayas, and the Malay archipelago in Asia; and in Spitsbergen. Dr. Kittler points out, however, that small temporary earth-pyramids, formed as the result of sudden melting of snow, heavy showers, or sudden squalls of wind, are to be regarded as precisely similar phenomena in a rudimentary stage. The formation is apparently due in all cases to a similar cause—rapid vertical erosion of soft fragmentary or diluvial deposits—and they accordingly reach their greatest development on steep slopes cut into by torrential streams, and exposed to sudden excessively heavy rains. The consistency of material required for the formation of true pillars is best obtained in moraine detritus, next best in trachytic tuffs and laterites, and almost as well in marls and conglomerates. Dust-laden winds, frost, and strong insolation are important factors in producing earth-pillars, but these agents rank far behind torrential downpours of rain. The action of a swift stream round the base of the columns is important in maintaining the steep angle of the sides, as it prevents accumulation. It is to be noticed that the crowning-stone at the top of the pillar is not an essential feature; the pillars are due to differences in the texture of the fragmentary mass.

GENERAL.

Geography in Education.—The report presented at the Toronto meeting of the British Association by the committee appointed in 1895 to inquire into the position of geography in the educational system of the county, has since been issued as a pamphlet. It has been prepared by Mr. A. J. Herbertson, secretary of the committee. Although unable to undertake a personal inspection of various educational institutions at home and abroad, the committee have been in correspondence with numerous authorities on the subject, whose information, combined with the individual experiences of the members, has enabled a clear view to be presented of the present position of geography, and the measures most urgently required to place the subject on a more satisfactory footing. In the elementary schools, while the syllabuses require some modification, the great desideratum is the proper training of teachers and the adoption of a loftier educational ideal in connection with the subject. Some improvement has been noted of late, and topography is often sufficiently taught, but a knowledge of geographical *principles* is too often lacking, the physical aspects of the subject being in particular imperfectly dealt with. In the secondary, including the public, schools no organization exists, and the treatment of geography varies according to the fancy and inclination of the head master—one professing no interest in the subject, while another founds all his teaching on it. In Scotland a somewhat better organization prevails than in England. An improvement in the position and quality of geography in public examinations would probably do something to ameliorate the present state of things; but here again the great need is the provision of proper training for teachers in modern geographical ideas and methods. This, of course, depends chiefly on the universities, only two of which at present recognize geography as an optional subject for the ordinary degree, whilst the only other recent advance towards improving the position of the subject has been made at Cambridge by its inclusion as a compulsory subject for the Historical Tripos. The report insists that "in our universities geography should have its due place, equivalent to that of any other university subject now fully recognized;" and that "the university should provide the skilled teaching and efficient equipment that are necessary for a subject regarded as of first-rate importance by nearly every first-class university outside the English-speaking lands." Some useful statistics, illustrative of the present position of the subject both at home and abroad, are given in appendices.

Geography in German Schools.—The Education Department has recently issued the first of a series of volumes entitled "Special Reports on Educational Subjects," compiled by Mr. M. E. Sadler. It contains reports from a number of experts on the present condition of the theory and practice of education in this country and abroad. One of these, by Mr. George Wheeldon, deals with the teaching of geography in the elementary schools of Saxe Weimar. There the instruction takes place in three standards; the first is *Anschauung* (object-lessons or demonstrations), conducted for the most part out-of-doors, and adjusted in subject to the season of the year. The objects are twofold: (1) to train the pupil to quick and comprehensive observation, and (2) to afford facility in the clear and definite description of what is seen. This leads to the fascinating system of school excursions, in which the teacher conducts his class into the country, or in towns to museums, workshops, etc., calling their attention to objects of interest, and explaining the meaning and relations of each. The excursions are made longer, and the descriptions, afterwards written by the pupils, more exacting as the second standard or *Heimatskunde* (local geography) is reached. Thus the use of maps is thoroughly and practically taught, the local fauna and flora is intimately and correctly known, and the geography of the country for many miles around the school is fixed for ever in the mind. The last standard or *Erdkunde* (geography of the globe) finds the pupil prepared to study maps as symbols of real things, and to construct easily and naturally mental pictures of distant lands, such as can never be attained in any other way. All through, geography is taught in connection with other subjects, and especially with history. Several specimen excursions in the neighbourhood of Weimar are explained in detail in the Report. In the same volume Miss Dodd gives an account of "The School Journey in Germany," in which she traces the growth of the practice of educational travel for children from the time of Rousseau, who appears to have first given effect to it, until the present time. The school journey is now a firmly established institution in Germany; and while, in fact, the vehicle of by far the most valuable educational training, it takes the form of an organized holiday, the element of taskwork being subordinated, and the discipline rendered no more irksome than the rules of a game. A description is given of two school journeys in detail, the first a three-days' walking tour, the second a six-days' excursion, partly by rail and partly on foot. The expense in the latter case amounted only to 15s. per boy, the railways granting specially low rates, the food being of the simplest kind, and the boys sleeping, as a rule, on straw in a large empty room in a village inn or farm. The journey is planned long beforehand; the boys selected to take part in it are told what they are going to see and the chief facts as to each place, and each boy draws a map of the district, showing the proposed route. An outfit is prescribed, and two days before the journey the boys are paraded, their knapsacks inspected, and their physical fitness ascertained. The departure takes place in the presence of the assembled parents and the envious fellow-scholars, who were not considered advanced enough to join. The day's journey is carefully arranged with occasional halts, and the march is cheered by much singing. All sorts of natural objects are collected and described; every crop in the fields is examined, and every industry met with explained. The salient facts of history, relative to the towns or battlefields visited, are recalled in view of the places themselves, and special attention is given to diversities of local custom or costume. In the longer excursion from Jena to the Rhön mountains in Bavaria, the Protestant children from Thuringia were taken to hear the Roman Catholic Church service for the first time, and the religious differences were explained with reference to the history of the states of Germany, which again would furnish an opportunity for explaining the constitution of the German empire.

Death of Ramon Lista, Argentine Explorer.—This explorer, author of *Viaje á los Andes Australes* (Buenos Aires, 1896), has met with a violent death while on a journey of exploration to the upper Pilcomayo. He wrote to *La Nacion* (a Buenos Aires newspaper) from Oran (Salta) on November 18, 1897, announcing his intention of making this journey. Early in December his two companions returned to Oran, saying that Lista had perished from thirst and the hardships of the journey in the forests near Miraflores in the Chaco. Search was made for his body, and when it was found his money, his watch, and his baggage were missing. His two companions, an Italian and an Argentine labourer, are now in prison on suspicion of having murdered him. Dr. Lista was an Honorary Corresponding Member of the Society.

Death of M. Bouthillier de Beaumont.—We regret to record the death of M. H. Bouthillier de Beaumont, Hon. President of the Geographical Society of

Geneva, which took place on February 4 last. The Geneva Society may be said to have almost entirely owed its success to M. de Beaumont, to whose initiative its foundation in 1858 was due, and who presided over its labours without intermission from that year until 1884. M. de Beaumont had reached the age of seventy-nine years.

Establishment of an "Urania" in Vienna.—We learn that an "Urania," that is to say, an institution in which all the most interesting features of the various branches of science and technology will be exhibited to the public in a systematic manner, has lately been founded in Vienna. The central idea of the undertaking will be the graphic and concrete representation of scientific facts, such as is the custom at the Berlin Urania. The preliminary arrangements were carried out towards the end of last year, by a committee of well-known scientists, in conjunction with a syndicate of industrial representatives. About twenty separate groups have been formed, each under its own president. That for geography and geology is to be presided over by Major-General von Steeb, director of the Military Geographical Institute. The allied sciences are represented by groups for astronomy, meteorology, geology, and anthropology.

OBITUARY.

Captain Roberto Ivens.

We regret to record the death, on January 28, of Captain Ivens, the distinguished African explorer. Roberto Ivens was the descendant of a Russian family (Ivan, Ivans, Ivens), resident for some time in Wales, then in the Azores and Portugal. His mother was a Portuguese. He was born in St. Michael's island on June 12, 1850. In 1867 he entered the Portuguese Royal Navy, travelling in Asia, Africa, North and South America. From 1876 to 1877, Lieut. Ivens surveyed some points of the western coast of Africa, from the Great Fish bay to the mouth of the Zaire-Congo, and up to Noki.

In 1877, while preparing with H. Capello and Serpa Pinto, at São Paulo de Loanda, their first great journey, they had for some time, as their guest, H. M. Stanley, just returned from his discovery of the central part of the Lualaba-Congo. Capello and Ivens started in October from Benguella to the African highlands, studied the region whence the waters run to the Cunene, the Kubango, the Kwando-Lungui-Bungo-Zambeze, the Kwanza, the Kassai, and the Kwango, which latter they followed and mapped up to the 5th parallel of south latitude (June, 1879).*

In 1884 (April), Captains Capello and Ivens started again from Pinda on the Atlantic (south of Mossamedes), explored the Koroka, the Kunene; crossed the Kubango, the Kuito, the Kwando, in 16° 15' S. lat., the Barotse valley; followed the Liambai-Kabompo; explored the high affluents of the Lualaba, Lufira, and Luapula; visited the Garanganza; studied the country between the Bangweolo-Luapula and the Luangwe-Kafukwe, reached the Zambezi at Shoa, and followed it to the Indian ocean (June, 1885, 4500 geographical miles).†

During their travels, Captains Capello and Ivens determined astronomically numerous places, made daily meteorological and magnetic observations, and brought

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* 'From Benguella to the Territory of Jacca.' 2 vols. London: 1882. Translated from the Portuguese (Lisbon: 1881).

† 'De Angola a' Contra Costa. Descripção de uma viagem atraves do Continente Africano.' 2 vols. Lisboa: 1886. This work was never translated.

to Europe large collections of the representatives of African petrology, flora, and fauna (now mostly at the Lisbon Museum of Natural History). Their scientific services were acknowledged with many honorary testimonials by the governments and geographical institutions of Portugal, Spain, France, Italy, and Germany. Captain Ivens was aide-de-camp of the King of Portugal.

Of the two travellers, Captain Ivens, although the younger, suffered the most from malarious fevers and scurvy, and never entirely recovered his previous health.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897-1898.

Eighth Ordinary Meeting, February 28, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Captain E. B. Burton (17th Bengal Cavalry); Joseph Margerison Butler; Thomas Arthur Chalk; Thomas Davies; Lieut. Francis Dixon-Johnson (6th Inniskilling Dragoons); Edward Langworthy; Lieut. Ernest Theodore Marshall (East Yorkshire Regiment); John Mathias (Commander s.s. "Ness"); V. C. H. Millard, M.A.; Rev. Joseph Henry Gybbon Spilsbury, M.A., Ph.D.; Lieut. Jas. Stevenson-Hamilton (6th Inniskilling Dragoons); William Montagu Sweet; Commander Leicester Gartside Tippinge, R.N.; Hamilton Willis.*

The Paper read was:—

"The Annual Range of Temperature in the Surface Waters of the Ocean, and its Bearing on Oceanographical Problems." By Dr. John Murray, F.R.S.

Ninth Ordinary Meeting, March 14, 1898.—General Sir CHARLES W. WILSON, R.E., K.C.B., K.C.M.G., Vice-President, in the Chair.

ELECTIONS.—*Dr. José Bach; Thomas William Bushill; Captain Herbert Lane Goodenough (Indian Staff Corps); Samuel Henry Harrison; Dr. Bendalack Hewetson, M.R.C.S., F.L.S., F.Z.S.; Edward Holden; Lieut. G. von Essen Moberley (11th Hussars); Roderick F. Murchison; Alfred John Pease; Arthur E. L. Ringrose; Joseph George Robins; Sir Albert Rollit, M.P.; Alexander Horsburgh Turnbull; Coulson Turnbull, D.Ph.; Hon. William Warren Vernon; Captain Herbert Flamstead Walters (Indian Staff Corps).*

The Paper read was:—

"Exploration in Spitsbergen, 1897." By Sir W. Martin Conway.

Afternoon Technical Meeting, Wednesday, March 16, *at* 4.30 *p.m.*—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

The Paper read was:—

"On Sea-beaches and Sandbanks." By Vaughan Cornish, M.SC., F.C.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Bohemia.

Audiatur et altera pars! Ein Beitrag zur deutsch-böhmischen Streitfrage. Von P. S. Prag, 1898. Size 9 × 6, pp. 16. *Presented by the Author.*

On the unwisdom of endeavouring to secure the exclusive use of the German language in Austria.

Austria—Lake Hallstatt. *M.k.k.G. Ges. Wien* **41** (1898): 1–218. **Liburnau.**

Der Hallstätter See. Eine limnologische Studie von Dr. Josef Ritter Lorenz von Liburnau. *With Map.*

This will be noticed along with other limnological works.

Austria-Hungary.

Monumenta Hungariæ Historica. Magyar Történelmi Emlékek. Második Osztály. Irók. XXXV. Kötet. Budapest, 1896. Size 9½ × 6½, pp. xiv. and 632. Első Osztály. Okmánytárak. XXVIII. Kötet. Budapest, 1897. Size 9½ × 6½, pp. cccxiv. and 598. *Map.*

Austria-Hungary. *Deutsche Rundschau G.* **20** (1898): 158–164. **Becker.**

Das Sóvárgebirge und das Bad Rank-Herlein. Von Dr. Anton Becker.

The Sovar mountains are in the north of Hungary, near the town of Kaschau.

Black Sea and Sea of Azoff—Lighthouses.

Description of Lighthouses, Beacons, and Landmarks of the Russian Empire along the Coasts of the Black Sea and Sea of Azoff. Published by the Hydrographical Department, Ministry of Marine. St. Petersburg, 1897. Size 6 × 9, p. 163. [In Russian.] *Presented by the Russian Hydrographic Department.*

Bulgaria. *Riv. G. Italiana* **4** (1897): 397–402. **Garnier.**

La nomenclatura orografica della Bulgaria. Del Signor Christian Garnier. *With Map.*

Denmark—Meteorology.

Annuaire météorologique pour l'année 1893, publié par l'Institut Météorologique de Danemark. Deuxième Partie (pp. 90). Ditto pour l'année, 1896. Troisième Partie. Kjøbenhavn, 1897. Size 14 × 9½, pp. xxii. and 72. *Maps and Diagrams.*

Europe—Climate. *Ann. Hydrographie* **25** (1897): 442–458. **Bebber.**

Die Hauptwetterlagen in Europa. Von Prof. Dr. W. J. van Bebber. *With Diagrams.*

Europe—Historical. *Mém. couronnés A.R. Belgique* **54** (1896): 1–368. **Lonchay.**

La rivalité de la France et de l'Espagne aux Pays-Bas (1635–1700). Étude d'histoire diplomatique et militaire. Par Henri Lonchay.

Europe—Jura. *Rev. Scientifique* **8** (1897): 717-722. **Reverchon.**
La montre dans le Jura. Par M. L. Reverchon.

On the watch-making industry of the Jura, which is credited with turning out two-thirds of all the watches made in the world. Both the French and Swiss watch-making centres are described, and a map of their distribution is given.

France and Switzerland—Speleology. *C. Rd. S.G. Paris* (1897): 416-421. **Martel.**
Résumé de la 10e campagne souterraine (1897) de M. E.-A. Martel en France et en Suisse.

France—Corsica. *B.S.G. Marseille* **21** (1897): 265-276. **Nœtinger.**
Excursions en Corse: l'Étang de Biguglia. Par M. F. Nœtinger.

France—Dauphiné and Savoy. **Joanne.**
Collection des Guides-Joanne. Guides-Diamant. Dauphiné et Savoie. Par P. Joanne. 6 Maps, 6 Plans, 1 Panorama. Paris: Hachette et Cie., 1897. Size 6 × 3¾, pp. xxxii. and 524.

France—Gard. *C. Rd.* **126** (1898): 290-293. **Martel and Viré.**
Sur les avens de Sauve (Gard) et la forme des réservoirs des sources en terrains calcaires. Note de MM. E. A. Martel et A. Viré. *With Plans.*

France—Lakes. **Delebecque.**
Les lacs français. Par André Delebecque. Paris: Typ. Chamerot et Renouard, 1898. Size 12½ × 9, pp. xii. and 436. *Maps and Illustrations. Presented by the Author.*

This beautifully executed work will be specially noticed.

France—Lakes. *Globus* **73** (1898): 43-46. **Halbfass.**
Die Seenforschung in Frankreich. Von Dr. Halbfass.

Notice of M. Delebecque's great work on French lakes.

France—La Rochefoucauld. *B.S.G. Rochefort* **19** (1897): 145-169. **Fermond.**
Quelques annales de la ville de La Rochefoucauld. Par M. J. Fermond.

Notes on the growth and changes of La Rochefoucauld from 1019 to 1887.

France—Lozère. **Martel and Viré.**
Sur l'aven Armand (Lozère) (profondeur 207m). Par MM. E.-A. Martel et A. Viré. Paris: Gauthier-Villars et Fils, 1897. Size 11 × 9, pp. 4. *Plan. Presented by the Authors.*

France—Normandy. **Joanne.**
Collection des Guides-Joanne. Itinéraire général de la France. Par Paul Joanne. Normandie. 7 Maps and 22 Plans. Paris: Hachette et Cie., 1897. Size 6½ × 4½, pp. 74, xxxviii., and 424.

France—Population. *Rev. Scientifique* **8** (1897): 796-797. **Dumont.**
La dépopulation dans l'Orne. Par M. A. Dumont.

A statement of the decline of population in a commune of Calvados and other parts of France.

France—Provence. *Ann. G.* **6** (1897): 212-229; **7** (1898): 14-33. **Bertrand.**
La basse Provence. Par M. Marcel Bertrand. *Maps.*

This fine piece of regional geography will be specially noticed.

France—Pyrenees. *B.S.G. de l'Est* (1897): 209-236. **Guénot.**
Des effets du déboisement dans les Pyrénées. Par M. Guénot.

This paper has already been published in the *B.S.G. de Toulouse.*

France—Southern. *B.S.G. Commerc. Bordeaux* **20** (1897): 405-422. **Bayle.**
La Double. Étude de géographie régionale. Par Émile Bayle.

La Double is a region north of the estuary of the Gironde.

Germany. *P.R. Artillery I.* **24** (1897): 445-456. **Bigelow.**
A Cruising Visit to some German Battle-fields. By Poultney Bigelow.

A canoe voyage down the Moldau and Elbe.

Germany. *Nineteenth Century* **43** (1898): 182-191. **Birchenough.**
The Expansion of Germany. By Henry Birchenough.

Germany. *B. Geolog. I. University of Upsala* **3** (1896): 27-114. **Munthe.**
Studien über ältere Quartärablagerungen im südbaltischen Gebiete. Von Dr. Henr. Munthe.

On the quaternary formations on the southern shore of the Baltic.

Germany—Anhalt. *M. Ver. Erdk. Halle* (1897): 64–74. **Früchtenicht.**
Die Volksdichte im Herzogtum Anhalt nach der Volkszählung vom 2 Dezember 1895 (nebst Karte). Von H. Früchtenicht.

Germany—Bavaria. *G.Z.* **3** (1897): 545–557. **Ule.**
Der Starnberger See. Von Dr. Willi Ule.
On the depths and temperature of the Starnberg lake.

Germany—Eisleben. *Naturw. Wochenschrift* **12** (1897): 409–415, 421–429. **Lang.**
Von Vulcanismus und Oberflächengliederung unabhängige Bewegungen und Erschütterungen des Erdbodens. Von Otto Lang.
On seismic movements, illustrated by the case of Eisleben.

Germany—Geodesy. ——
Jahresbericht des Direktors des Königlichen Geodätischen Instituts für die Zeit von April 1896 bis April 1897. Potsdam, 1897. Size $9\frac{1}{2} \times 6\frac{1}{4}$, pp. 28.

Germany—Harz. **Eschenhagen.**
Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Elfter Band, Heft 1. Magnetische Untersuchungen im Harz. Von Prof. Dr. M. Eschenhagen. Stuttgart: J. Engelhorn, 1898. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 20. *Plates.*
The magnetic constants of a number of stations in the Harz district are given in tables, and summarized in a map and sections.

Germany—Kyffhäuser. *M. V. Erdk. Halle* (1897): 54–64. **Grössler.**
Noch einmal über Kiffhäuser und Wodansberg auf Grund einer Darstellung der Besitzverhältnisse der Klöster Walkenried und Sittichenbach an der unteren Helme. Von Prof. Dr. H. Grössler.

Germany—Merchant Ships. *Ann. Hydrographie* **25** (1897): 475–482. **Meyer.**
Das Verhältniss der Dampfschiffahrt zur Segelschiffahrt. Nach der Statistik des Deutschen Reiches bearbeitet von Kapt. H. Meyer.
A statistical study of the number of sailing ships and steamers owned in Germany, and of those visiting German ports at five-year intervals from 1875.

Germany—Meteorology. ——
Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. Herausgegeben durch dessen Direktor Wilhelm von Bezold. 1897. Heft 1. Ergebnisse der Beobachtungen an den Stationen II. und III. Ordnung im Jahre 1897: zugleich Deutsches Meteorologisches Jahrbuch für 1897. Berlin: A. Asher & Co., 1897. Size 13 × 10, pp. 56.

Germany—Prussia. *M. V. Erdk. Halle* (1897): 74–91. **Reischel.**
Die Wüstung Sömmeringen bei Pabstorf im Kreise Oschersleben und die Wüstung Sömmeringe a. d. Elbe bei Wolmirstedt. Von Dr. G. Reischel.
A discussion as to which place corresponds to the *Sumeringe* frequently referred to in the Middle Ages.

Germany—Prussia—Climate. ——
Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts. Ergebnisse der Gewitter-Beobachtungen in den Jahren 1892, 1893, 1894. Berlin: A. Asher & Co., 1897. Size $13\frac{1}{2} \times 10\frac{1}{2}$, pp. xxxii. and 58.
The electrical phenomena of the atmosphere as observed at the meteorological stations of the German empire are here tabulated and discussed. The stations are grouped in squares of 1° of longitude and 30′ of latitude, so as to give means for the whole empire.

Germany—Shipping. *G.Z.* **4** (1898): 1–16, 78–91. **Lindeman.**
Die deutsche Seehandelsschiffahrt. Von Dr. Moritz Lindeman.

Germany—Thuringia. *M.G. Ges. Jena* **16** (1898): 59–85. **Gerbing.**
Begleitworte zur Gewässerkarte von Südwestthüringen. Von L. Gerbing. *With Map.*
The map gives simply the courses and names of rivers, while the text supplies notes, historical and physical.

Greece. *Z. Ges. Erdk. Berlin* **32** (1897): 343–348. **Philippson.**
Dr. A. Philippson's barometrische Höhenmessungen auf den griechischen Inseln des Ägäischen Meeres. Berechnet von Dr. A. Galle.

Greece. *Z. Ges. Erdk. Berlin* **32** (1897): 244–302. **Philippson.**
Reisen und Forschungen in Nord-Griechenland. Von Dr. Alfred Philippson.

This is the completion of Dr. Philippson's important memoir on Northern Greece.

Greece—Kythnos. *B.S.R. Belge G.* **21** (1897): 417–447. **Hauttecœur.**
L'Ile de Kythnos (Thermia). Par H. Hauttecœur.

Holland. **Lorié.**
Mededeelingen omtrent de Geologie van Nederland, verzameld door de Commissie voor het Geologisch Onderzoek. No. 22. I. De Sluisput bij Neder-Andel in de Afdamming der Maas; II. De Grondboringen om Wageningen; III. De Grondboringen te Winterswijk; IV. De Grondboringen bij Weesp; V. De Grondboringen langs het Merwedekanaal. Door Dr. J. Lorié. Verhandelingen der K. Akademie van Wetenschappen te Amsterdam (Tweede Sectie). Deel v. No. 9. Amsterdam: J. Müller, 1897. Size 10½ × 7½, pp. 90. *Plates.*

Holland. **Schroeder Van der Kolk.**
Mededeelingen omtrent de Geologie van Nederland, verzameld door de Commissie voor het Geologisch Onderzoek. No. 21. Bijdrage tot de Karteering onzer Zandgronden (II.). Door J. L. C. Schroeder Van der Kolk. Verhandelingen der K. Akademie van Wetenschappen te Amsterdam (Tweede Sectie). Deel v. No. 7. Amsterdam: J. Müller, 1897. Size 10½ × 7½, pp. 58. *Plates.*

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **14** (1897): 673–694. **Beekman.**
Aanwinst en verlies van gronden in Zeeland in de laatste 10 jaren. Door A. A. Beekman. *With Map.*

On the gain and loss of land during the last ten years in the province of Zeeland.

Holland—Coasts. *Engineering Mag.* **14** (1897): 402–410. **Corthell.**
The Protection of Shores against Encroachments of the Sea. By E. L. Corthell. *With Map and Plans.*

A sketch of the works by which the Dutch engineers have combated the encroachments of the sea.

Iceland. *Norske G.S. Aarbog* **8**, 1896–97 (1897): 22–36. **Thoroddsen.**
Dr. Th. Thoroddsen: Islandske forhold i nutiden.

On the economic resources of Iceland.

Italy. *J.R. United Service I.* **41** (1897): 1395–1418. **Needham.**
Between the Chiese and Adige. Translated from the *Rivista Militare Italiana* of September 1st, 1897, by Colonel C. Needham.

Some particulars of military operations in one of the most famous battle-grounds of Europe.

Italy—Abruzzi. **Hassert.**
Dott. K. Hassert. Gli Abruzzi. Traduzione dal Tedesco di L. F. de Magistris. Teramo, 1897. Size 9½ × 6½, pp. 16. L. F. de Magistris. Gli Abruzzi del Dottore Kurt Hassert. Roma, 1897. Size 9 × 6, pp. 10. *Presented by the Author.*

Italy—Apennines. **Magistris.**
Luigi Filippo de Magistris. Per gli Appennini. Noterelle di cronaca geografica, topografia—geologia—orografia—agraria e paesaggio. Roma: A. Colangeli & G. Fabbri, 1894. Size 9½ × 6½, pp. 56. Il Rizzi-Zannoni e il sistema Apulo-garganico. Notizia di L. F. De Magistris. (Estratto dalla *Rivista Geografica Italiana*, Annata iv., Fascicolo ii.—iii. 1897.) Size 9½ × 6½, pp. 6. *Presented by the Author.*

Italy—Friaul. *Z. Deutschen u. Österreich. Alpenv.* **28** (1897): 358–383. **Pock.**
Aus den Bergen der südlichsten deutschen Sprachinseln. Die Sauris oder Zahre im Friaul. Von Julius Pock.

Italy—Leghorn. **Cattolica.**
Determinazione della Latitudine dell' osservatorio della R^a Accademia Navale di Livorno fatta nel 1897 secondo il metodo di Talcott da Pasquale Leonardi Cattolica. Genova: Tip. del R. Ufficio Idrografico, 1897. Size 13 × 10, pp. 34. *Presented by the Italian Hydrographic Office.*

Italy—Rome. *B.S.G. Italiana* **11** (1898): 69–84. **Agostini.**
Esplorazioni idrografiche nei laghi vulcanici della Provincia di Roma. Nota preliminare del socio dott. Giovanni De Agostini. *With Plate.*

On the lakes of the Roman province, including the lakes of Bolsena, Bracciano, Castel Gandolfo, Vico, and several smaller, of all of which bathymetrical maps are given. They are all roughly circular in form, with steep slopes from the edge, growing much more gentle towards the centre.

Italy—Sardinia. **Magistris.**
L. F. de Magistris. I "Riu Mannu" di Sardegna. Roma: G. Civelli, 1896. Size $7\frac{1}{2} \times 5$, pp. 8. *Presented by the Author.*

A discussion of the name "Riu Mannu" applied to a river in Sardinia.

Italy—Sicily. *Atti R.A. Lincei, Rendiconti* 6 (1897): 331–337. **Palazzo.**
Risultati delle determinazioni magnetiche in Sicilia, e cenni sulle perturbazioni nelle isole vulcaniche e nei dintorni dell' Etna. Nota di Luigi Palazzo.

Mediterranean. **Wells.**
Mediterranean Days. By Samuel Wells. London: Bradbury, Agnew & Co., 1897. Size $8 \times 5\frac{1}{2}$, pp. viii. and 224. *Illustrations. Presented by the Author.*

A lively account of a pleasure cruise on a tourist steamer in the Mediterranean.

ASIA.

Arabia. *Rev. Française* **22** (1897): 695–698. **Salaignac.**
Les fortifications de Cheick-Saïd. Par A. Salaignac.

Armenia. *Nature* **57** (1898): 392–394. **Hughes.**
Notes on Some Volcanic Phenomena in Armenia. By Prof. T. McKenny Hughes, F.R.S. *With Illustrations.*

A note on this paper will be given.

Central Asia. *Verh. Ges. Erdk. Berlin* **25** (1898): 58–71. **Walther.**
Prof. Dr. Johannes Walther: Vergleichende Wüstenstudien in Transkaspien und Buchara.

Central Asia and Tibet. **Dutreuil de Rhins.**
J.-L. Dutreuil de Rhins. Mission scientifique dans la Haute Asie, 1890–1895. Première Partie Récit du Voyage (19 Février 1891—22 Février 1895). Paris: E. Leroux, 1897. Size 11×9, pp. xvi. and 454. *Portrait, Map, Plates.*

This important volume will receive special notice.

China. *C. Rd., S.G. Paris* (1897): 401–405. **Brenier.**
Le voyage de la mission lyonnaise (Indo-Chine, Yun-nan, Koui-tchéou, Se-tchouan, Kouang-si, Hou-nan). Par M. Brenier. *With Map.*

China. **Rockhill.**
Diplomatic Missions to the Court of China. The Kotow Question. By William Woodville Rockhill. [Reprinted from the *American Historical Review*, vol. ii. Nos. 3 and 4, April and July, 1897.] Size $11 \times 7\frac{1}{2}$, pp. [34].

China—Kiauchou. *Verh. Ges. Erdk. Berlin* **25** (1898): 71–74. **Richthofen.**
Die Rechtschreibung des Namens *Kiautschou*. Von v. Richthofen.

Baron Richthofen discusses the proper European spelling of the name of the new German territory in China, pointing out that the usual form Kiao-chau is doubly erroneous, the true sound being rendered by *Kiau-chou*, the final *ou* being pronounced as separate letters, *e.g.* Kyow-cho-oo.

China—Kiauchou. *Petermanns M.* **44** (1898): 43–44. ——
Die Kiautschou-Bucht. *With Map.*

The map is on the scale of 1 : 750,000, and shows the limits of the German treaty territory and sphere of influence.

China—Kiau-chou. *Oester. Monats. Orient* **23** (1897): 133–139. **Hirth.**
Die Bucht von Kiau-tschau und ihr Hinterland. Von Dr. Friedrich Hirth. *With Map.*

China—Kiau-chou. *G.Z.* **4** (1898): 103–107. **Richthofen.**
Kiautschou, seine Weltstellung und voraussichtliche Bedeutung. Nach Ferdinand Freiherrn von Richthofen.

A note on this will be given.

India. *J.S. Arts* **46** (1898): 241–254. **Duff.**
Recreations of an Indian Official. By the Right Hon. Sir M. E. Grant Duff.

India—Frontier Campaign. **Fincastle and Eliott-Lockhart.**
A Frontier Campaign. A Narrative of the Operations of the Malakand and Buner Field Forces, 1897–1898. By the Viscount Fincastle and P. C. Eliott-Lockhart.

London: Methuen & Co., 1898. Size 8 × 5½, pp. 232. *Map and Illustrations. Price 6s. Presented by the Publishers.*

Lord Fincastle and Lieut. Eliott-Lockhart here give a concise account of the operations of the Malakand and Buner field forces in the recent border campaign. The narrative abounds with stirring episodes, and there is naturally much said of the physical character of the country in which the fighting was carried on. A somewhat rough map, on the scale of 4 miles to an inch, makes the puzzling topography of the section of the frontier dealt with clear enough to allow the reader to follow the whole proceedings intelligently.

India—Madras.

Report of the Condition and Progress of the G. V. Juggarow Observatory, Vizagapatam. Including the Results of Observations for the year 1896. Published by the General Committee, G.V. Juggarow Observatory, Vizagapatam. Calcutta, 1897. Size 9 × 6½, pp. 38. *Diagrams.*

India—Punjab, Shahpur District. **Wilson.**

Gazetteer of the Shahpur District. By J. Wilson. Revised Edition, 1897. Compiled and Published by Authority of the Punjab Government. Lahore, 1897. Size 10 × 7, pp. xii., 240, and lvi. *Map.*

India—Wrecks. **Creagh.**

Return of Wrecks and Casualties in Indian Waters for the year 1896. . . . Prepared by B. P. Creagh, Commander R.I.M. Calcutta, 1897. Size 13 × 8½, pp. 76. *Chart and Diagram. Presented by Commander B. P. Creagh.*

Indo-China—Mekong. *A travers le Monde, Tour du Monde* **4** (1898): 49–52. **Combes.**

La Navigation du Mékong. Par Paul Combes. *With Illustrations.*

Japan. **Gowland.**

The Dolmens and Burial Mounds in Japan. Communicated to the Society of Antiquaries by William Gowland. London: Printed by Nichols & Sons, 1897. Size 12 × 9½, pp. 86. *Map and Illustrations. Presented by the Author.*

A careful study of pre-historic monuments in Japan, with numerous photographs of dolmens, mounds, and objects found in them, and a map showing their distribution over the Japanese islands.

Japan—Formosa. **Campbell.**

The Articles of Christian Instruction in Favorlang-Formosan, Dutch, and English from Vertrecht's Manuscript of 1650, with Psalmanazar's Dialogue between a Japanese and a Formosan, and Happart's Favorlang Vocabulary. Edited by Rev. Wm. Campbell. London: Paul & Co., 1896. Size 9 × 7, pp. xx. and 200. *Presented by the Editor.*

Interesting as specimens of the aboriginal speech of Formosa.

Japan—Formosa. *Petermanns M.* **44** (1898): 33–36. **Wirth.**

Die eingebornen Stämme auf Formosa und den Liu-Kiu. Von Dr. Albrecht Wirth.

Japan—Harbours. *J.G. Tôkyô G.S.* **9** (1897): 493–495. **Nasu.**

Harbors of Japan. By T. Nasu. [In Japanese.]

Malay Archipelago—British Borneo. *J.R. Colonial I.* **29** (1898): 107–112. **Gueritz.**

British Borneo. By E. P. Gueritz.

This is an abstract of the original paper, which is preserved for reference in the Library of the Colonial Institute.

Malay Archipelago—Java. *Ann. Hydrographie* **26** (1898): 7–10. **Hegemann.**

Ueber Häfen an der Nordküste von Java. Aus dem Reisebericht des Kapt, A. Hegemann.

Malay Archipelago—Java. *B.S.R. Belge G.* **21** (1897): 533–599. **Leclercq.**

Voyage aux Volcans de Java. Par Jules Leclercq. *With Map.*

Malay Archipelago—Java. **Leclercq.**

Les Restes de la Civilisation Hindoue à Java. Par Jules Leclercq. [Extrait des *Bulletins de l'Académie royale de Belgique*, 3^{me} série, tome xxxiv. No. 7 (juillet), 1897.] Bruxelles, 1897. Size 9 × 6, pp. [26]. *Presented by the Author.*

Malay Archipelago—Java. **Leclercq.**

Un Séjour dans l'Ile de Java. Le Pays, les Habitants, le Système Colonial. Par Jules Leclercq. Paris: E. Plon, Nourrit et Cie, 1898. Size 7½ × 5, pp. 296. *Map and Illustrations. Presented by the Author.*

M. Leclercq has added to his thirteen or fourteen books of travel a new volume describing his visit to Java in 1895. His tour extended from Batavia to Buitenzorg, Bandong and its neighbourhood, Garoet, Djokjakarta and Boro Boedoer, Soerakarta, Soerabaya, and Malang. A chapter is devoted to the Dutch colonial system; there are a few illustrations and a sketch-map.

Malay Archipelago—Java. *Petermanns M.* 44 (1898): 25–33. **Verbeek.**
Die Geologie von Java. Von Dr. R. D. M. Verbeek. *With Map.*

Malay Archipelago—North Borneo. *Mission Field* 43 (1898): 60–66. **Perry.**
The Muruts and Marutland. An Account of the New Mission in Central North Borneo. By the Rev. F. Perry. *With Illustrations.*

Malay Archipelago—Philippines. **Marcel.**
Gabriel Marcel. La Carte des Philippines du Père Murillo Velarde. Paris: Imp. Nationale, 1898. Size 10 × 6½, pp. 28. *Plates.* [Extrait du *Bulletin de géographie historique et descriptive*, No. 1, 1897.] *Presented by the Author.*

On an eighteenth-century map of the Philippine islands.

Malay States. **Swettenham.**
Report by the Resident-General of the Federated Malay States to His Excellency the High Commissioner (Sir C. B. H. Mitchell). Taiping, 1897. Size 13½ × 8½, pp. 10.

The Federated States are Perak, Selangor, Negri Sembilan, and Pahang.

Malay States—Negri Sembilan. **Birch.**
Annual Report of the State of Negri Sembilan for the year 1896. By E. W. Birch. Kuala Lumpur, 1897. Size 13½ × 8½, pp. 34.

Malay States—Pahang. **Clifford.**
Annual Report of the State of Pahang for the year 1896. By Hugh Clifford. Kuala Lumpur, 1897. Size 13½ × 8½, pp. 28.

Malay States—Pahang. **Roberts.**
P. and Trans. Queensland Br. R.G.S. Australasia 12 (1897): 1–19.
Notes on Mining Life and General Features of Pahang, Malay Peninsula. By W. Bertrand Roberts, J.P.

Malay States—Perak. **Treacher.**
Annual Report on the State of Perak for the year 1896. By W. H. Treacher, C.M.G. Taiping. Size 13½ × 8½, pp. 62.

Persia. **Morgan.**
Mission Scientifique en Perse. Par J. de Morgan. Tome Quatrième. Recherches archéologiques. Deuxième partie. Paris: E. Leroux, 1897. Size 11½ × 9½, pp. 203–402. *Plans and Plates.*

Persia. *J.R. Asiatic S.* (1898): 43–46. **Schindler.**
Marco Polo's Camadi. By General A. Houtum Schindler.

Camadi is identified with the suburb Qumadia or Qamadin of the city of Jiruft.

Persia. **Sykes.**
Recent Journeys in Persia. By Captain P. Molesworth Sykes. From the *Geographical Journal* for December, 1897. Size 10 × 6½, pp. 30. *Map and Illustrations.*

Persia—Bakhtiari Hills. *J. Asiatic S. Bengal* 66 (Pt. 1) (1897): 170–179. **Burn.**
The Bakhtiari Hills. An itinerary of the road from Isfahan to Shushtar. By Richard Burn.

Persia—Elburz. *Scottish G. Mag.* 14 (1898): 1–9. **Wells.**
Across the Elburz Mountains to the Caspian Sea. By Lieut.-Colonel H. L. Wells.

Persian Gulf. **Genthe.**
Jahresb. Frankfurter Ver. G. u. Statistik 60 (1895–6), (1897): 1–96.
Der Persische Meerbusen, Geschichte und Morphologie. Von Dr. Siegfried Genthe. *With Map.*

AFRICA.

Abyssinia. **Gleichen.**
With the Mission to Menelik, 1897. By Count Gleichen. London: E. Arnold, 1898. Size 9 × 6, pp. xii. and 364. *Maps and Illustrations. Price 16s. Presented by the Publisher.*

This will be referred to along with other books on Africa.

Abyssinia. *C. Rd. S.G. Paris* (1897): 313-319. **Poncins.**
Voyage du prince H. d'Orléans et de MM. de Poncins et Mouvrichon. D'Addis Abbaba à Djibouti. *With Map.*

Africa. **Deville.**
Partage de l'Afrique, Exploration, Colonisation, État Politique. Par M. Victor Deville. Paris: J. André et Cie., 1898. Size $7\frac{1}{2} \times 5$, pp. 460. *Maps. Price 5 fr.*

A short sketch of the history of exploration in Africa, followed by details of the numerous conventions and treaties by which the present political divisions of the continent are determined.

Algeria. *A travers le Monde, Tour du Monde* 4 (1898): 33-36. **Blanchet.**
La Kalaa des Beni-Hammad. Par P. Blanchet. *With Illustrations.*

Algeria. *Ann. G.* 7 (1898): 34-54. **Busson.**
Le développement géographique de la colonisation agricole en Algérie. Par M. H. Busson. *With Map.*

On the method and the progress of colonization in Algeria by the settlement of European farmers, cultivating the land allotted to them in the interior of the country. The map, on the scale of 1 : 2,500,000, distinguishes cultivated plains, high plains with agriculture, non-desert mountainous regions, steppes, deserts, and oases.

Algeria. **Wahl.**
L'Algérie. Par Maurice Wahl. Troisième édit. Paris: F. Alcan, 1897. Size 9×6, pp. 442. *Price 5 fr.*

British East Africa. **Fitzgerald.**
Travels in the Coastlands of British East Africa and the Islands of Zanzibar and Pemba; their agricultural resources and general characteristics. By William Walter Augustine Fitzgerald. With Maps, Illustrations, and Appendices. London: Chapman & Hall, 1898. Size 9×6, pp. xxiv. and 774. *Price 28s. Presented by the Author.*

This will be noticed along with other books on Africa.

British East Africa. **Hardinge.**
Africa. No. 7 (1897). Report by Sir A. Hardinge on the Condition and Progress of the East Africa Protectorate from its Establishment to July 20, 1897. London: Eyre & Spottiswoode, 1897. Size $10\frac{1}{2} \times 8\frac{1}{2}$, pp. 68. *Map. Price* 1s. 1d.

British East Africa—Uganda. *Church Miss. Intelligencer* 49 (1898): 102-112. ——
The Mutiny in Uganda. Extracts from Letter and Journal from Dr. A. R. Cook, and Extracts from Letters from Archdeacon Walker, the Rev. H. W. Weatherhead, and Miss Chadwick.

Canary Islands. *B.S.G. Madrid* 39 (1897): 167-172. **Ossuna y Van-den-Heede.**
El mapa de la región de Anaga (Islas Canarias). Por D. M. de Ossuna y Van-den-Heede.

Canary Islands. *C. Rd.* 126 (1898): 439-441. **Richard.**
Sur la faune des eaux douces des îles Canaries. Note de M. Jules Richard.

Congo State—Coffee. *B.S. d'Études colon* 4 (1897): 410-433. **Bouckenooghe.**
La culture du Caféier dans le Haut-Congo. Par Valère Bouckenooghe.

East Africa. **Neumann.**
Elephant-Hunting in East Equatorial Africa; being an Account of Three Years' Ivory-Hunting under Mount Kenia, and among the Ndorobo Savages of the Lorogi Mountains, including a trip to the North End of Lake Rudolph. By Arthur H. Neumann. London: Rowland Ward, 1898. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xx. and 456. *Map and Illustrations. Price 21s. Presented by the Publisher.*

This will be referred to along with other books on Africa.

East Africa—Nile Sources. *Z. Ges. Erdk. Berlin* 32 (1897): 303-342. **Martonne.**
Die Hydrographie des oberen Nil-Beckens. Von E. de Martonne. *With Maps and Profiles.*

This will be specially referred to.

East Africa—Somaliland. *Scottish G. Mag.* 14 (1898): 57-73. **Pease.**
Some Account of Somaliland: with Notes on Journeys through the Gadabursi and Western Ogaden Countries, 1896-1897. By Alfred E. Pease, M.P.

Egypt—Sudan. **Dehérain.**
Le Soudan Égyptien sous Mehemet Ali. Par Henri Dehérain. Paris: G. Carré et Naud, 1898. Size $10 \times 6\frac{1}{2}$, pp. xii. and 384. *Maps. Presented by the Publishers.*

This will be referred to along with other books on Africa.

Egypt—Sudan. *J.S. Arts* 46 (1898): 233–240. **Villiers.**
My Recent Journey from the Nile to Suakim. By Frederic Villiers.

French Congo. *C. Rd. S.G. Paris* (1897): 425–428. **Bouysson.**
Mission agricole et scientifique de M. Bouysson. La région côtière du nord du Congo.

French Sudan. *B.S.G. Paris* 18 (1897): 312–339. **Imbert.**
Reconnaissances au nord de Bakel (avril-mai 1894). Par le Capitaine Imbert. *With Map and Illustrations.*

German East Africa—Uhehe. *Deutsche Kolonialzeitung* 11 (1898): 49–51. **Arning.**
Die Uhehe-Hochebene als Ansiedelungsgebiet für Deutsche. Von Dr. W. Arning.

Marocco. *B.S.G. Madrid* 39 (1897): 173–182. **Gaudeaux.**
De Lalla Marnia á Fez y Tánger. Extracto del diario de viaje de M. Gaudeaux.

NORTH AMERICA.

American Ethnology. **Powell.**
Sixteenth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1894–1895. By J. W. Powell, Director. Washington, 1897. Size 12 × 8½, pp. cxx. and 326. *Plates. Presented by the American Bureau of Ethnology.*

Canada. **Tyrrell.**
Geological Survey of Canada. G. M. Dawson, C.M.G., etc., Director. Part F. Annual Report, vol. ix., 1896. Report on the Doobaunt, Kazan, and Ferguson Rivers and the North-West Coast of Hudson Bay, and on two overland routes from Hudson Bay to Lake Winnipeg. By J. Burr Tyrrell. Ottawa, 1897. Size 10 × 6½, pp. 218. *Maps and Illustrations.*

Canada—British Columbia. **Gosnell.**
The Year-Book of British Columbia and Manual of Provincial Information, to which is added a Chapter containing much special information respecting the Canadian, Yukon, and Northern Territory generally. R. E. Gosnell. Victoria, B.C., 1897. Size 9 × 6, pp. 500. *Maps and Illustrations. Price* 12*s.*

Canada—Climate. *Scottish G. Mag.* 14 (1898): 73–81. **Stupart.**
The Climate of Canada. By Prof. R. F. Stupart.

Canada—Earthquakes. **McLeod and Callendar.**
McGill University. Papers from the Department of Physics. No. 2.—Our Record of Canadian Earthquakes. By C. H. McLeod and Hugh L. Callendar. [Reprinted from the *Canadian Record of Science*, January, 1897.] Montreal, 1897. Size 10 × 7, pp. [4]. *Diagram.*

Canada—Geological Survey. **White.**
The Topographical Work of the Geological Survey of Canada. By J. White. From the *Geographical Journal* for December, 1897. (Revised.) Size 10 × 6½, pp. 8.

Canada—Mineral Industry. **Ingall.**
Geological Survey of Canada. G. M. Dawson, C.M.G., etc., Director. Part S. Annual Report, vol. ix. Section of Mineral Statistics and Mines, Annual Report for 1896. Elfric Drew Ingall. Ottawa, 1897. Size 10 × 6½, pp. 172.

Canada—New Brunswick. *B. Nat. Hist. S. New Brunswick* 15 (1897): 65–82. **Duff.**
Tidal Phenomena of the St. John River at Low Summer Level. By A. Wilmer Duff, M.A. *With Diagram.*

Also a separate copy.

Canada—Ontario. ——
Fifth Report of the (Ontario) Bureau of Mines, 1895. Toronto, 1896. Size 10 × 6½, pp. viii. and 298. *Illustrations.*

Canada—Ontario and British Columbia. *J.R. Colonial I.* 29 (1898): 145–171. **Rathbone.**
The Goldfields of Ontario and British Columbia. By Edgar P. Rathbone.

Canada—Quebec. *Rev. G.* 42 (1898): 104–124. **Tricoche.**
Notes de voyage dans un coin perdu du Canada, lac Megantic (province de Quebec). Par G. N. Tricoche. *With Map.*

A sympathetic account of a visit by a French tourist to a rural district in Quebec. The author discusses the deterioration of the French language in Canada, and the feeling of the people towards France.

Canada—Western. ———

Manitoba and the North-West Territories, Assiniboia, Alberta, Saskatchewan, in which are included the newly discovered Gold Fields of the Yukon. Information as to the Resources and Climates of these countries for intending Farmers, Ranchers, and Miners. 1897. Ottawa; Government Printing Bureau, 1897. Size 10 × 7, pp. 46. *Map and Illustrations.*

Canada—Yukon. **Dyer.**

The Routes and Mineral Resources of North-Western Canada. By E. Jerome Dyer. Published under the Auspices of the Incorporated London Chamber of Mines. London: G. Philip & Son, 1898. Size 9 × 6, pp. xx. and 268. *Maps and Section. Price 6s. Presented by the Publishers.*

The greater part of this book is devoted to an account of the Yukon district and the routes by which it may be reached. It is the completest discussion of the subject yet produced, and the large-scale map showing the routes and the auriferous areas will prove of great value. An extensive bibliography gives the titles of practically all that has previously been written on the Yukon district.

Mexico—Huichol Indians. **Lumholtz.**

The Huichol Indians of Mexico. By Carl Lumholtz. [Extracted from *Bulletin of the American Museum of Natural History*, vol. x. Article 1, pp. 1–14.] New York, January 21, 1898. Size 10 × 6½. *Illustrations. Presented by the Author.*

The Huichol Indians are a little-known tribe which has been carefully studied by Mr. Lumholtz. They live in the state of Jalisco.

Mexico—Tacubaya. *B. Observatorio Astron. Nac. Tacubaya* **2** (1897): 45–50. **Valle.**

Longitud del Observatorio Astronómico Nacional de Tacubaya. Por Felipe Valle.

Mount St. Elias. *Sierra Club B.* **2** (1898): 129–148. **Fillippi.**

The Expedition of His Highness Prince Luigi Amedeo of Savoy, Duke of Abruzzi, to Mt. St. Elias in Southern Alaska. By Dr. Filippo de Filippi. *With Portrait, Map, and Plate.*

North America—Coronado's March. *B. American G.S.* **29** (1897): 399–431. **Dellenbaugh.**

The True Route of Coronado's March. By F. S. Dellenbaugh. *With Map. Also a separate copy, presented by the Author.*

A study of Coronado's march from Mexico northwards and eastwards to the Arkansas river.

United States—Arizona. **Mindeleff.**

Cliff Ruins of Canyon de Chelly, Arizona. By Cosmos Mindeleff. Sixteenth Annual Report of the Bureau of American Ethnology, 1894–95. Washington, 1897. Pp. 79–198. *Maps and Illustrations.*

United States—Colorado. *Engineering Mag.* **14** (1898): 829–841. **Crafts.**

Peculiar Features of Irrigation Engineering in Colorado. By H. A. Crafts. *With Illustrations.*

United States—Kansas. **Hay.**

Department of the Interior. Bulletin of the United States Geological Survey. No. 137. The Geology of the Fort Riley Military Reservation and Vicinity, Kansas. By Robert Hay. Washington, 1896. Size 9 × 6, pp. 36. *Map and Illustrations. Presented by the Survey.*

CENTRAL AND SOUTH AMERICA.

Argentine—Aconcagua. *Alpine J.* **19** (1898): 1–4. **Fitz Gerald.**

The Expedition to Aconcagua. By Edward A. Fitz Gerald.

Bolivia and Paraguay. *Rev. Mensual, Rep. Paraguay* **2** (1897): 266–278. **Decoud.**

Diplomacia Paraguayo-Boliviana. Por José S. Decoud.

Brazil. *Petermanns M.* **44** (1898): 36–40. **Goeldi.**

Vorläufige Mitteilung über eine Forschungsreise nach dem Oberlauf des Rio Capim, Staat Pará. Von Dr. Emil A. Goeldi.

Brazil—Marajo Island. *Globus* **73** (1898): 69–73, 90–93. **Katzer.**

Eine Forschungsreise nach der Insel Marajó (Amazonas-Mündung). Von Dr. Friedrich Katzer. I.

The journey here described took place in November, 1896, and the paper describes the island itself, as well as the condition of the Amazon river.

Paraguay. *Globus* 73 (1898): 73-78. **Ehrenreich.**
Neue Mitteilungen über die Guayaki (Steinzeitmenschen) in Paraguay. Von Dr. P. Ehrenreich. *With Illustrations.*

Peru. *Science* 7 (1898): 133-136. **Ward.**
Climatic Contrasts along the Oroya Railway. By R. de C. Ward.

Salvador. *B. American G.S.* 29 (1897): 393-398. **Littlehales.**
Recent Survey of Jiquilisco Bay and El Triunfo, the New Port of Salvador. By G. W. Littlehales. *With Chart.*

An important piece of surveying, which opens a sheltered harbour to trade on the coast of Salvador. Notes are given of the resources of the surrounding country.

Venezuela. **Vincent and Humbert.**
B.S.G. Com. Bordeaux 20 (1897): 444-457; 21 (1898): 7-12.
Le Vénézuela; période des Welser (1528-1546). Par le Dr. L. Vincent et J. Humbert.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia—Handbook. ——
The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea): Shippers, Importers, and Professional Directory and Business Guide for 1898. London, etc.: Gordon & Gotch. Size 10 × 6½, pp. 650. *Maps, Plans, Plates.*

Australia. *J.R. United Service I.* 42 (1898): 128-158. **Gordon.**
The Federal Defence of Australia. By Colonel J. M. Gordon.

Australia—History. **Rusden.**
History of Australia. By G. W. Rusden. Second Edition. 3 vols. Melbourne: Melville, Mullen & Slade, 1897. Size 8½ × 5½, pp. (vol. i.) xxiv. and 626; (vol. ii.) xiv. and 688; (vol. iii.) x., 522, and xcii. *Presented by the Author.*

This will be specially noticed.

British New Guinea. **Thomson.**
Anniversary Address to the Royal Geographical Society of Australasia, Brisbane. By the President, J. P. Thomson. (Delivered at the Anniversary Meeting of the Royal Geographical Society of Australasia, Brisbane, July 29, 1897.) Size 8½ × 6, pp. 14.

Ellice Group. ——
Australian Museum, Sydney. Memoir III. The Atoll of Funafuti, Ellice Group: its Zoology, Botany, Ethnology, and General Structure based on Collections made by Mr. Charles Hedley. Part 5. Sydney: Published by order of the Trustees, 1897. Size 10 × 6½, pp. 305-345. *Plates. Presented by the Australian Museum.*

Fiji Islands. *American J. Sci.* 5 (1898): 113-123. **Agassiz.**
The Islands and Coral Reefs of the Fiji Group. By Alexander Agassiz.

New South Wales. **Coghlan.**
The Wealth and Progress of New South Wales, 1895-6. By T. A. Coghlan. Vol. ii. Sydney, 1897. Size 9 × 6, pp. 493-1030. *Presented by the Agent-General for New South Wales.*

This volume deals with population and social and economic statistics.

Queensland. **Jack.**
Queensland, Department of Mines. Geological Survey—Bulletin No. 6. Catalogue of the Exhibits in the Queensland Mining Court, Queensland International Exhibition, 1897. By R. L. Jack, Government Geologist. Second Edition. Brisbane, 1897. Size 9 × 5½, pp. 72.

Queensland. **Jack.**
Queensland. Notes on two traverses of the Bunya Bunya Range and a visit to Brovinia Gold Field. By Robert L. Jack, Government Geologist. Brisbane, 1896. Size 13½ × 8½, pp. 4.

Queensland. **Rands.**
Queensland. Croydon Gold Field. (Report by William H. Rands, on the.) Brisbane, 1896. Size 13½ × 8½, pp. 66. *Maps and Plates.*

Queensland. **Rands.**
Queensland. Report on the Horn Island Gold Field. (With a Geological Map.) [By Mr. William H. Rands.] Brisbane, 1896. Size 13½ × 8½, pp. 6.

South Pacific. ———

Search for Reported Dangers in South Pacific to the Northward of Fiji and for La Brillante Shoal and Melanie Rock. By H.M.S. *Penguin* (Captain A. M. Field); and H.M.S. *Waterwitch* (Lieut. and Commander J. W. Combe), 1895-96. With Lists of Soundings and Temperatures. Soundings between New South Wales and Fiji, the Ellice Group and Fiji, Fiji and New Zealand, and New Zealand and Tasmania. London: J. D. Potter, 1897. Size 13½ × 8½, pp. 44. *Price* 4s. 6d.

Western Australia. ———

Western Australia. Statistical Register for the year 1896, and previous years. Part ii. Public Finance. Perth, 1897. Size 13½ × 8½, pp. 42.

POLAR REGIONS.

Andrée's Expedition. **Lachambre and Machuron.**

Andrée. Au Pôle Nord en Ballon. Par Henri Lachambre et Alexis Machuron. Paris: Librairie Nilsson, [1898]. Size 7½ × 5, pp. 250. *Portraits and Illustrations. Price* 4 fr.

Andrée and his Balloon. By Henri Lachambre and Alexis Machuron. London: A. Constable & Co., 1898. Size 8 × 5½, pp. 306. *Portraits and Illustrations. Price* 6s. *Presented by the Publishers.*

Messrs. Andrée, Strindberg, and Frænkel left the north of Spitsbergen in the balloon *Ornen*, with the object of carrying out polar exploration, on July 11, 1897: the last news received was a letter by pigeon post, dated July 13, when the balloon was in 82° 2′ N., 15° 5′ E. This book, by the constructors of the balloon, describes all the preliminary arrangements and the departure of the expedition, with great detail and numerous illustrations.

Antarctic. *B.S.G. Italiana* 11 (1898): 27-34. **Faustini.**

Le "Appearances of land" nella zona polare antartica. Nota del socio prof. Arnaldo Faustini.

Also separate copy. *Presented by the Author.*

A note on this will be given.

Arctic—Franz Josef Land. **Jackson.**

Three Years' Exploration in Franz Josef Land. By Frederick G. Jackson. [From the *Geographical Journal* for February, 1898.] Size 10 × 6½, pp. 26. *Map and Illustrations.*

Arctic—Expedition. *Norske G.S. Aarbog* 8, 1896-97 (1897): 53-76. **Nansen.**

Prof. dr. Fridtjof Nansen: Den norske polarekspedition 1893-96. *With Map.*

Greenland. *National G. Mag.* 9 (1898): 1-11. **Stein.**

Three Weeks in Hubbard Bay, West Greenland. By Robert Stein. *With Maps and Illustrations.*

Greenland—Eskimo. *Die Natur* 47 (1898): 37-40. **Wächter.**

Der grönländische Eskimo. Von Ernst Wächter.

MATHEMATICAL GEOGRAPHY.

Cartography. *Globus* 73 (1898): 93-98. **Hammer.**

Die Karten von Wangen und von Lindau aus der ersten Hälfte des 17 Jahrhunderts. Von Prof. Dr. Hammer. *With Maps.*

Description of some of the famous maps of the seventeenth century with regard to the style of their execution.

Earth's Rotation. *Meteorolog. Z.* 14 (1897): 448-463. **Ekholm.**

Ueber die Einwirkung der vertikalen komponente der ablenkenden Kraft der Erdrotation auf die Luftbewegung. Von Nils Ekholm.

Longitudes. **Hills.**

On the Determination of Terrestrial Longitudes by Photography. By Captain E. H. Hills, R.E. [Reprinted from the *Memoirs of the Royal Astronomical Society*, vol. liii.] London: Royal Astronomical Society, 1897. Size 11½ × 9, pp. [24]. *Presented by the Author.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Ballooning. *C. Rd.* 126 (1898): 364-366. **Stelling.**

Sur la troisième ascension internationale des ballons-sondes. Note de M. Ed. Stelling.

Records of high ascents from St. Petersburg.

Forests and Rainfall. *Engineering Mag.* 14 (1898): 807–816. **Wilson.**
The Relation of Forestation to Water-Supply. By Herbert M. Wilson.

Geomorphology. *Knowledge* 21 (1898): 25–28. **Cole.**
The Floor of a Continent. By Grenville A. J. Cole. *With Illustrations.*

On the influence of the most ancient rocks in developing the features of a country.

Geomorphology. *Natural Sci.* 12 (1898): 117–122. **Gregory.**
Suess's Theories of Geographical Evolution. By J. W. Gregory, D.SC.

An able review and summary of the French translation of *Das Antlitz der Erde.*

Glacial action. *Alpine J.* 19 (1898): 29–40. **Bonney.**
The Kirchet and its Critics. By Prof. T. G. Bonney, D.SC., etc.

A reply to Dr. Russell Wallace's paper on the Aar glacier in the *Fortnightly Review* for August, 1896, contending that the excavatory powers of ice are far inferior to the work believed by Dr. Wallace to have been performed by it.

Land-sculpture. *Deutsche Rundschau G.* 20 (1898): 145–150, 205–210. **Lendenfeld.**
Die Nivellirung der Erdoberfläche. Von R. v. Lendenfeld.

On the part played by atmospheric erosion in forming the features of the Earth's surface.

Meteorology. **Mohn.**
Grundzüge der Meteorologie. Die Lehre von Wind und Wetter nach den neuesten Forschungen gemeinfasslich dargestellt von H. Mohn. Fünfte . . . Auflage. Berlin: D. Reimer, 1898. Size 9 × 6, pp. xii. and 420. *Maps.*

This important work has been revised and improved, many sections rewritten, and the climatological maps re-drawn so as to give effect to the most recent conclusions.

Oceanography. *C. Rd.* 126 (1898): 311–314. **Monaco.**
Sur la quatrième campagne de la *Princesse-Alice.* Par S. A. S. Albert I[er], Prince de Monaco.

On the cruise of June, 1897, with a chart of the Princesse Alice bank, in lat. 38° N., long. 34° W. The position of this bank was erroneously given in the *Journal,* vol. ix. (1897), p. 566.

Oceanography. *G.Z.* 4 (1898): 32–46, 91–102. **Schott.**
Die Ozeanographie in den Jahren 1895 und 1896, Ein zweiter Bericht über Meereskunde. Von Dr. Gerhard Schott.

Oceanography—Fauna. *C. Rd.* 126 (1898): 441–443. **Locard.**
Sur l'aire de dispersion de la faune malacologique des grands fonds de l'océan Atlantique boréal. Note de M. Arnould Locard.

Plant-Geography. *Rev. Scientifique* 8 (1897): 684–690. **Costantin.**
Les végétaux et les milieux cosmiques. Par M. J. Costantin.

On the influence of different climates on plants.

Plant-Geography. *Scottish G. Mag.* 14 (1898): 18–23. **Elliot.**
Primary conditions of Tropical Production. Being an Introduction to Economic Botany. By G. F. Scott Elliot, M.A.

River-Study. *Yezhegodnik Imp. Russian G.S.* 6 (1897): *Append.* 1–52. **Boguslavsky.**
Instruction for the Exploration and Description of Rivers. By N. A. Boguslavsky. Edited by A. A. Tillo. [In Russian.]

River-Study. **Penck.**
Potamology as a Branch of Physical Geography. By Prof. Albrecht Penck, PH.D. From the *Geographical Journal* for December, 1897. Size 10 × 6½, pp. 6.

Sedimentation. *Rev. G.* 41 (1897): 161–171, 256–265, 336–343. **Girard.**
La sédimentation comparée. Par J. Girard.

Seismology. *Math. u. Naturw. Berichte Ungarn* 13 (1897): 418–464. **Kövesligethy.**
Neue geometrische Theorie der seismischen Erscheinungen. Von Dr. R. v. Kövesligethy.

Mathematical treatment of seismical phenomena, based on such physical constants as mean density, rigidity, rotation-velocity, etc.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. *Rev. Scientifique* 9 (1898): 161–171. **Vignon.**
Les sociétés indigenes et le problème de la colonisation. Par M. Louis Vignon.

Anthropology. *Naturw. Wochenschrift* **13** (1898): 1–8. **Wilser.**
Menschenrassen und Weltgeschichte. Von Dr. Ludwig Wilser.

Commercial Geography. **Salesses.**
B. Comité l'Afrique Française **7** (1897): 291–306, 336–344, 377–388.
Les voies de pénétration dans les pays tropicaux. Par M. E. Salesses.

Commercial Geography—Coffee. *Kolonial Jahrb.* **10** (1897): 153–188. **Fesca.**
Ueber Kaffeekultur. Von Professor Dr. M. Fesca.

Commercial Geography—Communications. *G.Z.* **3** (1897): 624–634, 694–704. **Hettner.**
Der gegenwärtige Stand der Verkehrsgeographie. Von Alfred Hettner.

A full summary of the present position of the study of routes and means of transport, by land and sea, as a branch of geography.

Commercial Geography—Gold. *G.Z.* **3** (1897): 601–618; 657–680. **Elterlein.**
Das Vorkommen des Goldes in der Natur. Von Dr. A. von Elterlein.

On the distribution of gold in nature, and the annual production of the metal in different countries.

Historical—Map. **Christy.**
On an Early Chart of the North Atlantic, preserved in the Royal Library at Stockholm. By Miller Christy. London: Printed for the Author, 1897. Size 9 × 5½, pp. 24. *Chart. Presented by the Author.*

This will be specially noticed.

Historical—Maps. **Marcel.**
Note sur quelques acquisitions récentes de la Section des Cartes et collections géographiques de la Bibliothèque Nationale. Par Gabriel Marcel. Extrait des *Comptes Rendus de la Société de Géographie*, Nos. 16 et 17 (1897). Paris: Société de Géographie, 1898. Size 9 × 6, pp. 14. *Presented by the Author.*

A description of a number of ancient maps recently acquired by the National Library in Paris.

Historical—Rivers. **Stürenburg.**
Die Bezeichnung der Flussufer bei Griechen und Römern. Von Prof. Dr. Heinrich Stürenburg. Beigabe zum Jahresbericht des Gymnasiums z. heil. Kreuz zu Dresden über das Schuljahr 1896-97. Dresden: B. G. Teubner, 1897. Size 10 × 8½, pp. 46.

Historical—Silk route. **De la Blache.**
Note sur l'origine du commerce de la soie par voie de mer. Par M. Vidal de la Blache. Extrait des *Comptes rendus de l'Académie des inscriptions et belles-lettres*, 1897. Size 9 × 5½, pp. 8. *Presented by the Author.*

Italians Abroad. *Riv. G. Italiana* **4** (1897): 502–513, 545–553. **Marson.**
Gli italiani all' estero del del Prof. Luigi Marson.

A study of the condition of Italians in foreign countries, particularly in South America.

Political Geography. **Ratzel.**
Politische Geographie. Von Dr. Friedrich Ratzel. München und Leipzig: R. Oldenbourg, 1897. Size 10 × 7, pp. xx. and 716. *Price 16s.*

This will be the subject of special notice.

Tropical Diseases. *B.S. d'Études coloniales* **4** (1897): 434–450. **Dryepondt.**
Une Mission médicale au Congo. Par le docteur Dryepondt.

A discussion on tropical diseases, with special reference to the training of a medical man to be appointed by the Belgian Society of Colonial studies, to proceed to the Congo in order to investigate the diseases common there.

BIOGRAPHY.

Abbadie. *C. Rd.* **126** (1898): 173–181. **Hatt.**
Notice sur la vie et les travaux de M. d'Abbadie. Par M. Hatt.

M. Antoine Thomson d'Abbadie, born at Dublin in 1810, travelled extensively in Africa and elsewhere, and died in March, 1897, in Paris.

Alcock. *Blackwood's Mag.* **162** (1897): 834–852. ———
Sir Rutherford Alcock and the Far East.

An appreciation of the work of Sir Rutherford Alcock.

Becker. *Deutsche Rundschau G.* 20 (1897): 136-137. ——

Dr. Karl Becker. *With Portrait.*

A German statistician (1824-1896).

Bernhardi. *Naturw. Wochenschrift* 12 (1897): 481-486. **Hildebrandt.**

Reinhard Benhardi. Zum Gedächtniss eines deutschen Naturforschers, 1797. 11 October, 1897. Von Max Hildebrandt.

Bernhardi was particularly engaged in the study of the erratic blocks of the North European plain.

Biographical Dictionary. **Patrick and Groome.**

Chambers's Biographical Dictionary. The Great of all Times and Nations. Edited by David Patrick, LL.D., and Francis Hindes Groome. London and Edinburgh: W. & R. Chambers, 1897. Size $8\frac{1}{4} \times 6$, pp. 1002.

A compact book of reference.

Cabot. *Rev. G.* 41 (1897): 321-335. **Harrisse.**

Sébastien Cabot, pilote-major d'Espagne, considéré comme navigateur. Par H. Harrisse. *With Map.*

Charlevoix de Villers. **Grandjean.**

B.S.G. Commerc. Bordeaux 20 (1897): 341-354, 369-380.

Le baron Charlevoix de Villers. Par Ch. Grandjean.

A French engineer of the eighteenth century, who investigated the moving sands of the landes, and devised means of reclaiming land.

Dalorco. *Riv. G. Italiana* 4 (1897): 282-294, 361-369. **Magnaghi.**

Angellinus de Dalorco, cartografo Italiano della prima metà del secolo xiv. del Prof. Alberto Magnaghi.

On the fourteenth century cartographer, Angellinus de Dalorco, and his work.

German Geographers. *G.Z.* 3 (1897): 507-514, 557-566, 618-624. **Hantzsch.**

Die deutschen Geographen der Renaissance. Von Viktor Hantzsch.

Treats of German explorers, cosmographers, and cartographers of the period of the revival of geography.

Green. *P.R.S.* 62 (1897): v.-ix. ——

Alexander Henry Green, M.A., F.R.S., F.G.S., Professor of Geology in the University of Oxford.

Hubbard. *Science* 6 (1897): 974-977. ——

Gardiner Greene Hubbard.

Biographical notice of the late President of the National Geographic Society, Washington. See also *National G. Mag.* 8 (1897), 345.

GENERAL.

British Colonies. **Zimmermann.**

Die Europäischen Kolonien. Zweiter Band. Die Kolonialpolitik Grossbritanniens. Erster Theil. Von den Anfängen bis zum Abfall der Vereinigten Staaten, von Alfred Zimmermann. Berlin: E. S. Mittler und Sohn, 1898. Size $9\frac{1}{2} \times 6$, pp. xvi. and 480. *Maps.*

A careful historical study of the expansion of the British empire from the first voyage of Cabot to 1784.

Educational. *Scottish G. Mag.* 14 (1898): 81-88. **Herbertson.**

The Parlous Plight of Geography in Scottish Education. By A. J. Herbertson.

Educational—Pictures. **Dubois and Guy.**

Album Géographique. Par MM. Marcel Dubois et Camille Guy. Tome Premier. Aspects généraux de la nature. Paris: A. Colin et Cie., 1896. Size $11\frac{1}{4} \times 9$, pp. vi., xiv., and 248. *Illustrations. Price* 15*s.*

A collection of illustrations of unequal age and merit, but well grouped according to an excellent plan.

Educational—Textbook. **Lyde.**

A Geography of North America, including the West Indies. By Lionel W. Lyde. London: A. & C. Black, 1898. Size 7×5, pp. vi. and 116. *Price* 1*s.* *Presented by the Author.*

A school-book constructed on sound educational principles, not loaded with over-precise statistics, and for the most part well up to date. Scarcely sufficient prominence is given to the rapid development of the far west of Canada, and especially to the enormous strides being made in the Kootenay district. The book is an excellent attempt to supply a minimum of well-digested information.

Geographical Dictionary. **Garollo.**

Manuali Hoepli. Prof. G. Garollo. Dizionario Geografico Universale. Quarta Edizione. Milan: Ulrico Hoepli, 1898. Size 6¼ × 4¼, pp. x. and 1452. *Presented by the Publisher.*

A remarkable little book containing 114,000 place-names, with a few notes and statistics regarding each.

Geographical Speculation. ——

Zetetic Cosmogony; or Conclusive Evidence that the World is not a Rotating, Revolving Globe, but a Stationary Plane Circle. By Rectangle. Durban, 1897. Size 8 × 5½, pp. 46. *Presented by the Author.*

This is interesting, as bearing on the need for improvement in geographical education.

Geography as a Science. *Rev. G.* **42** (1898): 81-93. **Drapeyron.**

La co-ordination en géographie. Par L. Drapeyron.

M. Drapeyron demonstrates the part played by topography in unifying the science of geography.

Geography as a Science. *Die Natur* **47** (1898): 73-75. **Ule.**

Geographie eine Naturwissenschaft. Von Willi Ule.

A note on this appeared in the *Journal* for March, p. 303.

Geography—Recent Advances. **Günther**

Jahresb. Frankfurter Ver. G. u. Statistik **60** (1895-96 (1897)): 97-114.

Die Erdkunde in den letzten zehn Jahren. Festrede, bei der sechzigjährigen Jubelfeier des Vereins am 9 December 1896 gehalten von Prof. Dr. Siegmund Günther.

A supplement to Prof. Fischer's summary of the advances of geography in the half-century ending in 1886, published in the *Jahresbericht* for that year, p. 127. It deals mainly with German work, perhaps more even than the preponderance in number of German geographers demands.

German Colonies. **Luschan.**

Beiträge zur Völkerkunde der deutschen Schutzgebiete. Von Felix von Luschan. Erweiterte Sonderausgabe aus dem "Amtlichen Bericht über die Erste Deutsche Kolonial Ausstellung" in Treptow 1896. Berlin: D. Reimer, 1897. Size 14 × 10½, pp. 88. *Plates. Presented by the Publisher.*

A fine contribution to Ethnography, comprising very numerous portraits of natives of the various German possessions in Africa, illustrations of their utensils and weapons, and descriptive letterpress accompanied by statistical tables. The collections here described were exhibited at the German Colonial Exhibition held at Treptow in 1896.

German Colonies. ——

Kolonial-Handels-Adressbuch 1898. Herausgegeben von dem Kolonial-Wirtschaftlichen Komitee. Berlin: E. S. Mittler & Son. Size 11 × 7½, pp. 78. *Maps.*

A directory of the German colonies, giving the names and addresses of business firms in each colony, of the chief export-houses in Germany, and a variety of useful information and commercial maps.

List of Animal Genera. **Sherborn.**

Explanation of the Plan adopted for preparing an "Index Generum et Specierum Animalium." By C. Davies Sherborn. [From the *Proceedings* of the Zoological Society of London, June 2, 1896.] Size 9 × 6¼, pp. 6.

Mountain Ascents. *Alpine J.* **19** (1898): 48-54. **Freshfield.**

The Highest Climbs on Record. A Note by Douglas W. Freshfield.

Comments on Sir Martin Conway's article on Mountaineering in the 'Encyclopædia of Sport,' including a discussion of the ascent of Kabru by Mr. Graham to 23,*'*50 feet in 1883.

Petermanns Mitteilungen—Index. ——

Inhaltsverzeichnis von Petermanns *Geographischen Mitteilungen*, 1885-1894. (10 Jahresbände und 9 Ergänzungsbände.) Nebst 5 Karten. Gotha: Justus Perthes, 1897. Size 11 × 9½, pp. 130. *Price* 8*s.*

Phonetic Transcription. *J.R. Asiatic S.* (1898): 23-28. **Morris.**

Alphabet for Languages not yet reduced to Writing. By Henry Morris.

A suggestion for certain combinations of letters to reproduce sounds not yet reduced to writing. As in the R.G.S. system, no sign is given for *u* as in *fun*. With regard to both consonants and vowels, diacritical marks are freely used.

Place-Names. *Oesterreichische Monatsch. Orient* **23** (1897): 128-129. **Sax.**

Entstehung und Wanderungen des Namens "Rumelien" von C. v. Sax.

On the origin and changes of the name Rumelia.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since February 8, 1898.

1-inch—General Maps:—

England and Wales:—95, 282, 328, hills engraved in black or brown; also 30, 32, 44, 51, 73, 100 (revision), engraved in outline; and 261, 262, 356, 359 (revision), hills engraved in black or brown. 1*s.* each.

6-inch—County Maps (revision):—

England and Wales:—**Essex,** 10 N.E., S.W., S.E., 11 N.E., S.W., 13 S.E., 15 N.E., S.E., 23 S.W., 24 N.W., N.E., 25 S.E., 32 S.W., 35 N.W., S.W., S.E., 40 S.E., 42 N.W., 45 N.W., 52 N.W., S.E., 53 N.W., 57 S.W., 59 N.E., 60 S.W., S.E., 62 S.W., S.E., 63 S.W., 65 N.E., 66 N.W., S.W., 68 N.E., S.E., 69 S.W., 70 N.W., N.E., 71 N.W., N.E., S.W., S.E., 75 N.E., S.W., 76 S.W., 77 S.W., 78 N.W., 83 N.E., 84 S.W. **Hampshire,** 41 S.W., 50 S.W., 58 N.E., 63 S.W., 66 S.E., S.W., 68 N.E., 71 S.E. **Hertfordshire,** 41 S.W., 45 N.E. **Kent,** 8 S.E., 12 S.W., 16 N.E., 18 N.E., 20 S.E., 28 N.W., S.E., 29 S.W., 30 S.E., 39 N.W., N.E., 40 N.E., S.W., 41 N.E., S.W., 49 N.E. **Middlesex,** 2 S.W., 6 N.E., 13 S.W., 17 N.E., S.E., 22 N.E. **Northumberland,** 49 S.E., 50 N.W., 66 N.E., 78 S.E., 85 N.E., 86 N.E., S.E., 95 N.W., 101 S.W., 103 S.E., 104 N.W. **Surrey,** 11 N.E., 12 N.W., 13 N.E., 23 S.E., 24 S.E., 28 N.W., 31 S.E., 33 N.E., 34 N.W., S.W., S.E., 38 N.W., N.E., S.W., S.E., 45 N.W. **London,** 4 S.W., 7 N.E., S.E., 11 N.E., 14 N.E., 15 N.W.

25-inch—Parish Maps (revision):—

England and Wales:—**Cheshire,** XXIX. 7; LI. 5, 6. **Durham,** I. 11, 14, 15; II. 16; V. 10, 15; X. 13; XVI. 4; XVII. 4; XXII. 4; XLVA. 5; L. 8; LI. 2; LVI. 3, 4, 7, 12; LVII. 4; LVIII. 1, 5. **Essex,** XII. 3, 16; XIX. 2, 8; XX. 9; XXVII. 16; LXXXIII. 13; LXXXIX. 1. **Hampshire,** LXXV. 6; LXXVI. 15; LXXXIX. 15; XC. 2, 14, 15; XCI. 5, 9; XCIII. 2, 4, 6, 8, 12; XCIV. 2, 3, 5, 7; XCV. 3, 4, 7, 8. **Hertfordshire,** III. 12; IV. 13; VII. 4, 12, 16; VIII. 5, 7, 8, 10, 13, 15, 16; IX. 5, 9, 14; XI. 12, 16; XII. 8, 12, 14; XIII. 5, 6, 8, 9, 11, 13, 14; XIV. 3, 9, 12; XXI. 6, 9; XXII. 4, 16; XXIII. 9; XXX. 5; XXXI. 1; XXXV. 7, 8, 11, 12, 14; XXXVI. 3, 6, 7, 9, 13, 14; XLI. 2; XLV. 1. **Kent,** XIX. 4, 8, 13; XXIII. 9, 16; XXXV. 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14; LVI. 3, 4, 9, 10, 11, 13, 15, 16; LXV. 2, 5, 6, 10; LXVI. 3, 7, 8, 12, 14, 15, 16; LXXII. 7; LXXIII. 1, 5, 7, 8, 10, 11; LXXXIV. 14. **Middlesex,** XXV. 12 (this county is now published complete revised). **Northumberland,** VI. 6, 7, 10, 13, 14, 15; IX. 8, 12, 14; X. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14; XI. 1, 2, 3, 5, 6, 7, 10, 13; XIII. 3; XV. 8, 12, 16; XVI. 5, 8, 9, 10, 11, 12, 13, 14, 15; XVII. 1, 5, 10, 15, 9, 13; XX. 4; XXI. 1, 2, 3, 4; XXII. 1; CII. 10; CVI. 4, 8, 11, 16; CVII. 5, 10, 15. **Surrey,** XII. 3; XIV. 9; XXXVII. 11; XLIII. 2. **Sussex,** X. 5, 7, 10, 11, 12, 13, 15, 16; XX. 8, 12, 16; XXXIII. 4, 7, 8, 11, 15, 16; XXXVIII. 4; XXXIX. 3, 6, 9, 12; XLVII. 3, 4, 7, 8, 11, 12, 16; LII. 1, 4, 5, 6, 7; LIII. 1, 4, 10; LX. 4; LXI. 5, 6, 8; LXII. 5, 9, 15, 16; LXIII. 1, 15, 16; LXXIV. 4, 8; LXXV. 1, 3, 4.

(*E. Stanford, Agent.*)

England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 8, Liverpool and Manchester. J. Bartholomew & Co., Edinburgh, 1898. *Price* 2*s.*, mounted on cloth. *Presented by the Publishers.*

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme 1897. Sheets: 380, Iserlohn; 430, Köln; 457, Bonn. Scale 1 : 100,000 or 1·7 stat. miles to an inch. *Price* 1.50 *mark each sheet.*

Harrogate. **Bartholomew.**

Plan of Harrogate. Scale 1 : 7920 or 8 inches to a stat. mile. Environs of Harrogate. Scale 1 : 253,440 or 4 stat. miles to an inch. By J. Bartholomew, F.R.G.S. W. H. Smith & Sons, London, 1898. *Price* 1s., *mounted on cloth.*

Italy. **Istituto Geografico Militare, Firenze.**

Carta d'Italia. Scale 1 : 100,000 or 1·5 stat. mile to an inch. Sheet 28, Aosta. Istituto Geografico Militare, Firenze. *Price* 1 *li* 50 *centimes.*

ASIA.

China. **Petermanns Geographische Mitteilungen.**

Die Kian-Tschou Bucht und Umgebung. Nach einer japanischen Karte von Schantung und der englischen Seekarte. Scale 1 : 750,000 or 11·8 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 4. Gotha : Justus Perthes. *Presented by the Publishers.*

——— **Johnston.**

W. & A. K. Johnston's Map to illustrate the Chinese Question. Scale 1 : 9,504,000 or 150 stat. miles to an inch. W. & A. K. Johnston, Edinburgh, 1898. *Price* 1s., *coloured. Presented by the Publishers.*

Java. **Verbeek and Fennema.**

Geologische Uebersichts- und Vulkan-Karte von Java und Madura. Nach R. D. M. Verbeek u. R. Fennema. Scale 1 : 2,250,000 or 39·6 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1898, Tafel 3. Gotha : Justus Perthes. *Presented by the Publisher.*

AFRICA.

Africa. **Service Géographique de l'Armée, Paris.**

Carte de l'Afrique. Scale 1 : 2,000,000 or 31·1 stat. miles to an inch. Sheets: 7, Ben Ghâzi; 9, Sta Cruz de Tenerife; 55, Pretoria; 60, Pietermaritzburg. Service géographique de l'Armée, Paris. *Price* 1 *fr. each sheet.*

German East Africa. **Kiepert and Moisel.**

Karte von Deutsch-Ostafrika. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Sheets: D III. Kalula (Igonda); E IV. Iringa. Berlin: Geographische Verlagshandlung Dietrich Reimer (Ernst Vohsen). *Presented by the Publishers.*

These two sheets form part of Kiepert's large map of German East Africa. Sheet D III., Kalula, includes the country between lat. 5° 30′ S. and 7° 0′ S., and long. 32° to 34° E. Sheet E IV., Iringa, includes from lat. 7° to 8° 30′ S., and long. 34° to 36° E. Descriptive notes, travellers' routes, locations of tribes, etc., are given, and each sheet is accompanied by explanatory letterpress.

South Africa. **Bartholomew.**

Bartholomew's Tourist's Map of South Africa. Scale 1 : 2,500,000 or 39·4 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1898. *Price* 2s., *mounted on cloth. Presented by the Publishers.*

This map is orographically coloured in five shades, indicating height from sea-level to above 4000 feet. It has been specially constructed for the use of tourists, and all means of communication have been brought up to date. It includes all South Africa south of 22° south lat. A plan of the country in the neighbourhood of Cape Town is given, as an inset, on an enlarged scale.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte topographique de la Tunisie. Scale 1 : 50,000 or 1·6 stat. mile to an inch. Sheets: IX., Cape Bon; XVI., Kelibia; LXXXI., El Djem. *Dressé, gravé et publié au* Service géographique de l'Armée, Paris. *Price* 1 *fr.* 50 *c. each sheet.*

AMERICA.

Canada. **Johnston.**

W. & A. K. Johnston's Map of the Klondike Goldfields. Scale 1 : 2,851,200 or 45 stat. miles to an inch. W. & A. K. Johnston, Edinburgh, 1898. *Price* 1s., *coloured. Presented by the Publishers.*

GENERAL.

The World.

Andree.

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischen Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig: Verlag von Velhagen & Klasing, 1898. Part 1. *Price 50 pf.*

This is a new and enlarged edition of this well-known atlas. When completed, it will contain 126 principal maps, 136 smaller maps, and 186 insets, and will be furnished with an index. It will be published in fifty-six weekly parts, each of which will cost sixpence. The present issue contains maps of Eastern Asia and the north-east portion of the United States. In the map of Eastern Asia, the recent work of Prince Henri d'Orleans, in the region of the upper Mekong, has not been made use of.

PHOTOGRAPHS.

India.

Waddell.

Three photographs of Kánchanjangá, and the neighbouring ranges of Nepal, etc., taken by Surgeon-Major L. A. Waddell. (1) Westward panorama from Semo or Semarum pass, in Nepal; (2) Kang La pass, from the west; (3) View of Kánchanjangá range, from Darjiling. *Presented by Surgeon-Major L. A. Waddell.*

On these three photographs the donor has written notes by which the several peaks can be identified.

Novaya Zemlya, etc.

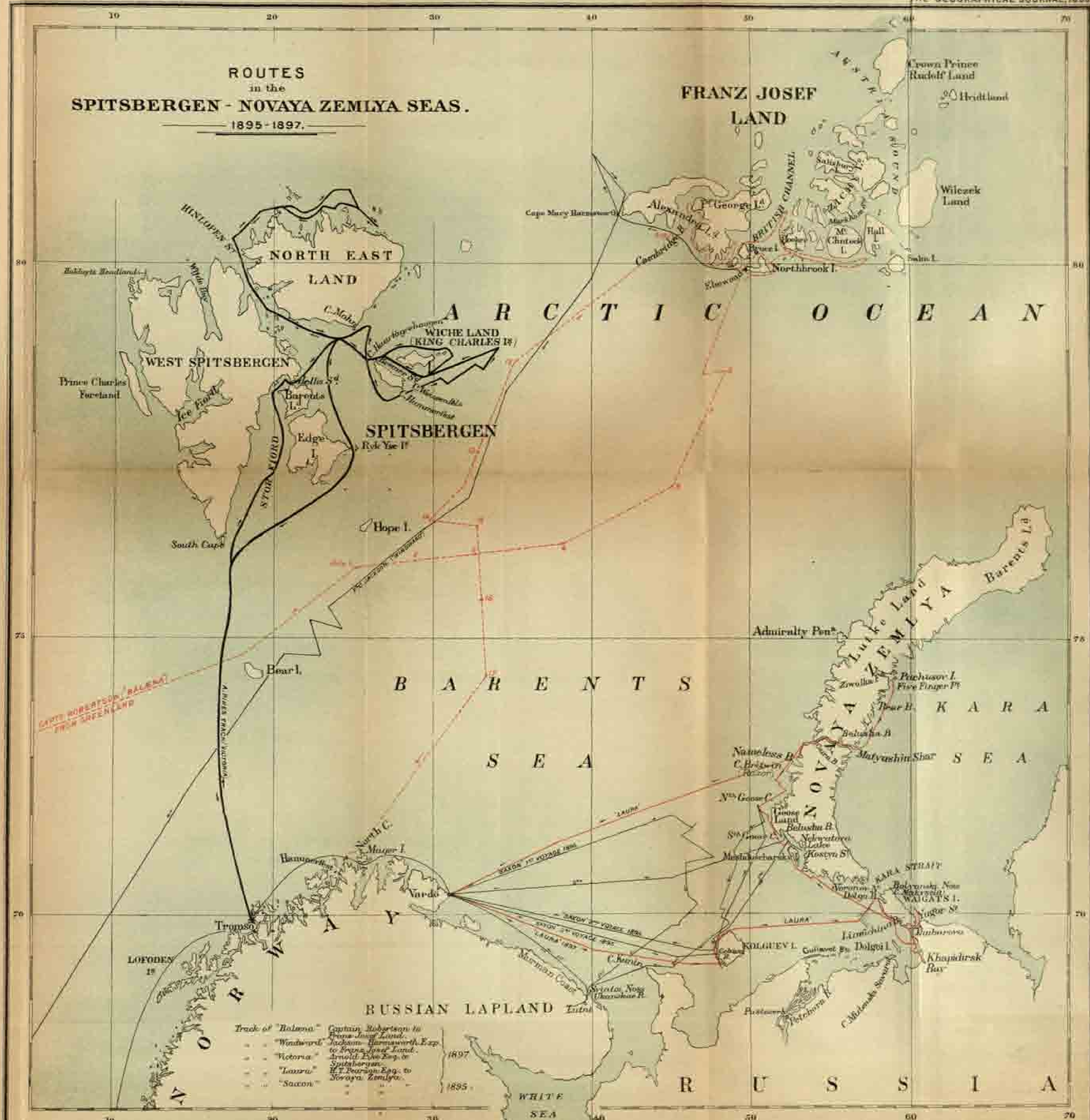
Pearson.

An Album containing fifty-nine photographs of Waigats, Dolgoi Island, and Novaya Zemlya, taken by Henry J. Pearson, Esq., 1897. *Presented by Henry J. Pearson, Esq.*

This album, in addition to views of scenery, as will be seen by the accompanying list, contains many photographs that will be of interest to botanists and naturalists.

(1) Ship in floating ice; (2) Ice in Dolga bay, from s.s. *Laura*, 2-5 a.m. on July 7, 1897; (3) Island in Dolga bay, Waigats, west side; (4) The same, centre; (5) The same, east side; (6) Ancient Samoyed holy place, Dolga bay; (7) Stint lake, 2 miles inland from Dolga bay; (8) Interior near Dolga bay, Waigats; (9) Cape Greben, Waigats; (10) The same, nearer view; (11) Ice-ground rock near Cape Greben; (12) Modern holy place, Cape Matiusela, Waigats; (13) Driftwood, Cape Matiusela; (14) Shore-lark's nest, Waigats; (15) Peregrine's nest, Waigats; (16) The same, nearer view; (17) Rough-legged buzzard, Waigats; (18) Dotteral's nest, Waigats; (19) Red-necked phalarope's nest, Waigats; (20) Little stint's nest, Dolgoi island; (21) Little stint on nest, Waigats; (22) Red-throated diver's nest, Dolgoi island; (23) Saxifraga, Waigats; (24) *Matricaria inodora*, Waigats; (25) Primula, Waigats; (26) Veratrium, Waigats; (27) Habarova; (28) Old church at Habarova; (29) New church at Habarova; (30) South-west coast of Dolgoi island; (31) Samoyed grave, Dolgoi island; (32) Samoyed grave, Dolgoi island; (33) Head of Belutchia bay, Novaya Zemlya; (34) Goose Land, Novaya Zemlya; (35) Nameless bay; (36) Brünnich's guillemots, Nameless bay; (37) North coast of Matochkin Shar, near Cairn bay; (38) Cairn bay; (39) Samoyed houses at Cairn bay; (40) Samoyeds at Cairn bay; (41) Novaya Zemlya, seen from elevation of 2000 feet on Lutkö Land across Matochkin Shar; (42) The same; view of glacier, ship, and Shar; (43) Pamasorva river, 1½ mile from sea, Matochkin Shar; (44) Pilot's grave, Rosmysloff's expedition, 1768; (45) Rosmysloff's winter house, Seal bay, 1768; (46) Rosmysloff's winter house, Wood cape, 1768; (47) Head board, believed to be that over pilot's grave, 1768; (48) Belushja bay; (49) Heap of *débris* 100 feet high, Belushja bay; (50) The same, nearer view; (51) *Silene acaulis*, Belushja bay; (52) Samoyed camp at mouth of Notschujew river, Matochkin Shar; (53) North-east part of Bear bay glacier; (54) Bear bay glacier on right, ancient moraine on left, river from upper glacier in centre; (55) Valley to north of Bear bay glacier, with glacier at its head; (56) This glacier from the sea; (57) Side view of this glacier, showing lateral moraine; (58) The same, nearer sea; (59) This glacier from s.s., face 50 feet above water.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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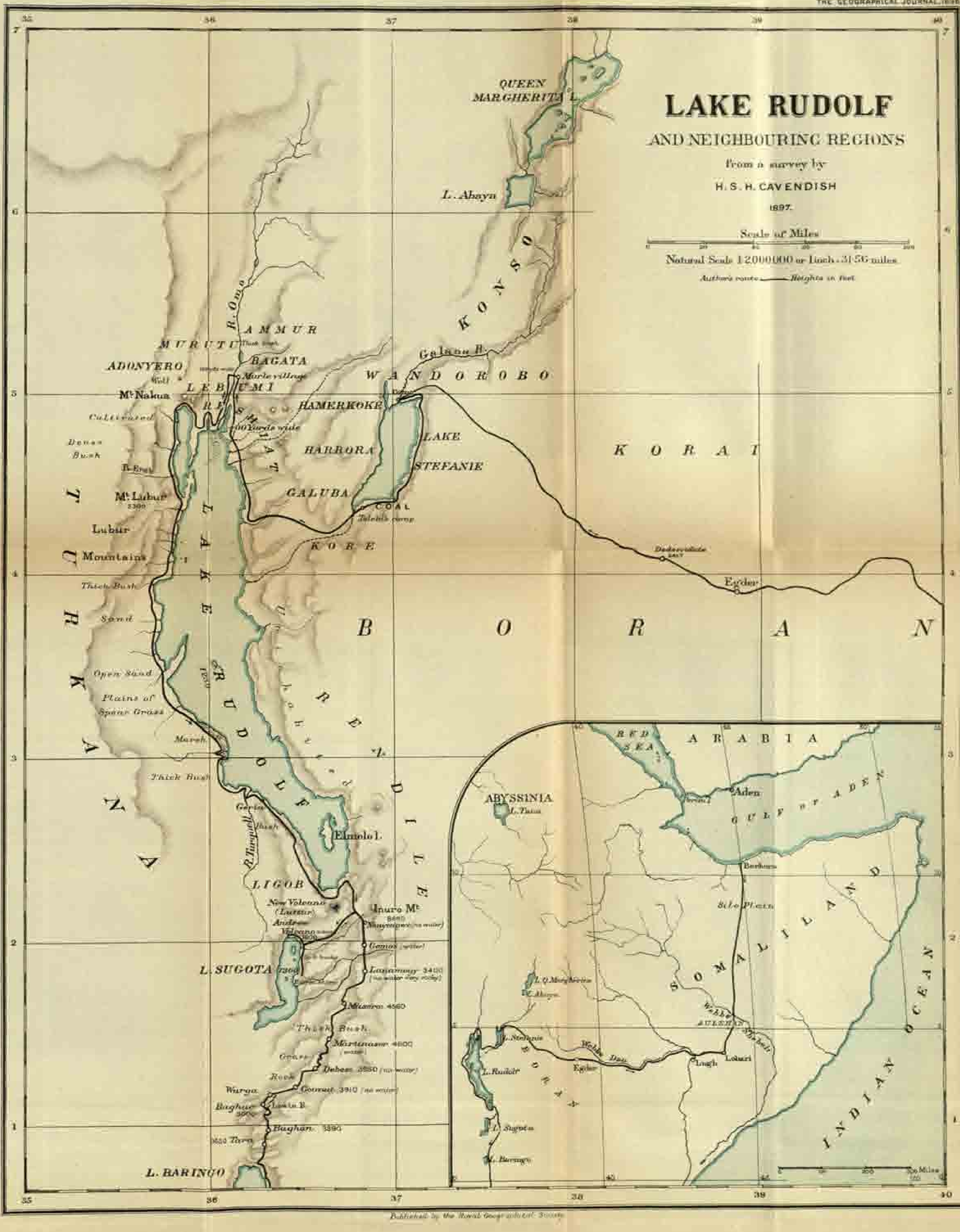
LAKE RUDOLF
AND NEIGHBOURING REGIONS
from a survey by
H. S. H. CAVENDISH
1897.
Scale of Miles
Natural Scale 1:2,000,000 or 1 inch = 31·56 miles
Author's route ——— Heights in feet
QUEEN MARGHERITA L.
L. Abaya
KONSO
R. Omo
AMMUR
MURUTU
BAGATA
ADONYERO
LEBUMI
Mt. Nakua
RESHIAT
HAMERKOKE
WANDOROBO
Galana R.
LAKE STEFANIE
BARRORA
GALUBA
KORE
KORAT
Cultivated
Dense Bush
Mt. Lubur
Lubur Mountains
Thick Bush
Sand
Open Sand
Plains of Spear Grass
Marsh
TURKANA
LAKE RUDOLF
BORAN
RENDILE
Egder
Elmolo I.
R. Turqwell
LIGOB
New Volcano (Luttur)
Andrew Volcano
Inuro Mt.
L. SUGOTA
Thick Bush
Grass
Rock
Wurga
Baghar
Baghan 3890
Tara
L. BARINGO
ABYSSINIA
L. Tsana
ARABIA
RED SEA
Aden
GULF OF ADEN
Berbera
SOMALILAND
INDIAN OCEAN
L. Q. Margherita
L. Abaya
L. Stefanie
L. Rudolf
L. Sugota
L. Baringo
Egder
Lugh
Lohari
Webbe Daua
BORAN
Webbe Shebeli
AULEHAN
Published by the Royal Geographical Society.

NEW MEXICO
International Boundary Line
El Paso
Deming
Florida Mts
LLANOS
Rio Grande del Norte
Rio Grande Sierra Madre & Pacific Railway
Mexican Central Railway
Laguna de Guzman
Casas Grandes
San Diego
Galeana
Guerrero
Chihuahua
Laguna Castillo
Bocoyna
Cusihuiriachic
Carretas
Uruachic
Chinipas
Urique
Batopilas
Morelos
Alamos
STATE OF SONORA
STATE OF CHIHUAHUA
STATE OF SINALOA
El Fuerte
Sinaloa
Ahome
Los Mochis
Agiabampo
Agiabampo Bay
Topolobampo B.
GULF OF CALIFORNIA
A SECTION OF NORTH MEXICO
Showing the Journeys of
J. GURDON L. STEPHENSON, F.R.G.S.
and
A. KRAUSS, F.R.G.S.
1897.
Scale
1 : 1,250,000 or 1 Inch = 19·7 Miles.
Route
Published by the Royal Geographical Society

The

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JOURNEYS IN THE SIAMESE EAST COAST STATES.*

By H. WARINGTON SMYTH, M.A.

This Society may be said to have almost circumnavigated the Malay peninsula, and to-night's paper is the completion of the journey. At various dates the Tenasserim provinces, the Siamese west coast provinces,† and the Malay states,‡ which are now federated under Great Britain, have been described. On the east coast Mr. Clifford has given a graphic account of Pahang, Tringkanu, and Kelantan; § and Prof. Henry Louis has ably treated of the group of small states immediately to the north, which, before the Siamese occupation, formed the once famous state of Patani.‖

In the summer of 1896 I had occasion to visit officially for the Siamese Government the chief tin-producing states on the east coast north of Singora.

Nearly the whole of the trade of these 600 miles of coast is carried on by junks; during the finer months, however, two small native-run steamboats visit some of the more important places. It was impossible to make their sailings fit in with the work before us, and, as the Government had not any vessel to place at our disposal, I hired a sailing-boat about 36 feet long, and fitted her out for the voyage. She had been originally built as a steam-launch, and consequently want of beam was her worst feature. At first she leaked like a basket, but by careful caulking we reduced the incoming of water to about eight buckets per diem in smooth sea. Of course we made much more in bad weather—that was generally. She was rigged with the China lug-sails of the

* Paper read at the Royal Geographical Society, January 17, 1898. Map, p. 580.

† *Geographical Journal*, vol. vi. Nos. 5, 6.

‡ *Proceedings R.G.S.*, vol. iv. No. 7.

§ *Geographical Journal*, vol. ix. No. 1.

‖ *Ibid.*, vol. iv. No. 3.

pattern usual in those seas—and very handy they are with a native crew, especially for quick reefing in the heavy squalls of the south-west monsoon, which we continually experienced. My companions were Nai Suk, the cheerful comrade of so many other journeys, and my two servants and two boatmen—all Siamese. They were amateurs at sea-work, but in ten days' time they were as smart a crew as one could wish to see, for the Siamese are watermen from their cradle.

We left Bangkok on June 23, in the height of the monsoon. We were thrashing steadily to windward for a fortnight against a strong northerly current and often a heavy sea, which necessitated my being at the helm on one occasion off Sam Roi Yawt for thirty-six hours at a

UNDER SAM ROI YAWT.

stretch. The ship was as wet below as on deck. The native craft did not like it, and were all in the little harbour along the coast, and it was only later on, when the weather fined up a bit, that we had company with us. If the weather is not fair, the native mind cannot see why any man should be so childish as to defy the decrees of fate by banging about outside, when he might be lying snugly at anchor, smoking.

The coast as far as Champawn is characterized by a number of wide bays stretching their spotless sand-beaches in scarcely perceptible curves to the horizon. Behind lies the sombre ever-piping jungle, relieved here and there by some jaggary or coccanut palms, and an occasional cottage roof. Detached masses of limestone occur at intervals on steep-sided islands or high-peaked promontories, their serrated ridges, sometimes 2000 feet in height, forming conspicuous landmarks to the seafaring people using the gulf, and affording here and there good harbours for small craft. In the intense clearness of the early morning atmospheres, we used to see Sam Roi Yawt like a distant island 45 miles off. This headland is the noblest of all, and dominates the gulf like a huge cathedral—and aptly is it named the three hundred peaks.

The relations of these various rock-masses to one another have been long ago lucidly set forth by Siamese geologists, and, what in geological matters is more remarkable, all the authorities are unanimously agreed upon the subject. It appears that one Mong Lai and his wife once inhabited the neighbourhood (they were giants), and each promised their daughter in marriage, unknown to the other, to a different suitor. At last the day of the nuptials arrived, and Chao Lai and the Lord of Muang Chin * both arrived to claim the bride. When the horrified father found how matters stood—having a regard for the value of a promise which is not too common in the East—he cut his daughter in half, that neither suitor should be disappointed. Chao Lai, in the mean time, on finding that he had a rival, committed suicide, and the peak of Chaolai is the remains of his body. The unfortunate bride is to be found in the islands off Sam Roi Yawt, the peaks of which are the remains of the gifts which were to be made to the holy man who was to solemnize the wedding; while Kaw Chang and Kaw Kong, on the east side of the gulf, are the elephant and buffalo cart in which the presents were brought.†

Inland the densely wooded granites of the main ridge, forming the divide between Siam and Tenasserim, tower up into the monsoon clouds. At no point are they very distant from the coast-line, and the streams which drain their eastern slopes are but short and rapid mountain torrents.

The shoulders of the hills in places jostle the north and south trail out on to the beach, and the land wind comes off them laden with jungle fever. Except behind the bolder headlands, there is scarcely any flat land available for padi culture. Between the rich plain of Petchaburi and that of Champawn, there is not more than one acre of cultivation to every square mile of forest. The villages are few and the population small. A group of houses generally nestles under each of the great headlands, and the people are mostly fishermen, who do a little gardening, and take an occasional cargo of jungle produce (rattans, horns, buffalo-skins, etc.) to Champawn, Petchaburi, or Bangkok. In the four provinces of Pran, Kuwi, Bangtapan, and Patiyu there are about 6000 people.

From Champawn southwards, a new phase of scenery is entered on. The great axial range retreats further westward, and the country is more productive and more populous. The low hills of the coast-line are comparatively bare of heavy timber, thanks to the heavy gales and the ever-advancing jungle fires. The people assume the distinctive

* China.

† All these stories bear striking evidence of the constant communication in early days between Indo-China and China.

peninsular type, Malay influences become observable, and the nasal twang and other peculiarities of dialect which had puzzled us so often on the west coast is very prominent.

As a rule, during the south-west monsoon the native sailing-boats rely on getting the wind somewhat off shore during the night—west or even north-west in direction. With this they make a long board seaward. Between 9 a.m. and noon they have a good offing, and as the wind generally shifts south or south-east during the day, for some hours they make a long leg down the coast on the other tack. Such a long spell of southerly winds and rough weather as we experienced only occurs now and then, and the majority of the boats let it blow over, lying patiently in some snug cove until it is finished.

LANGSUAN.—We anchored in the roads off Langsuan, inside the dangerous coral ridges which make the place so unpopular with seamen. As we should now have to leave the boat for some time, the first thing

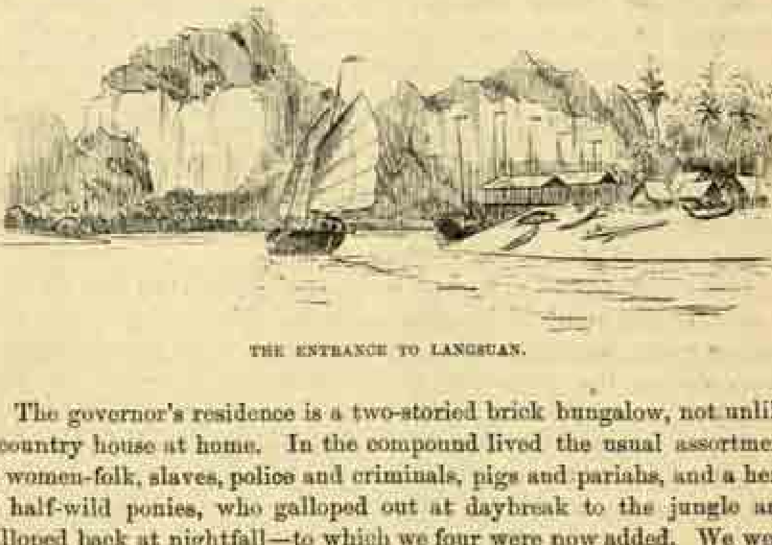
OUR ANCHORAGE AT KAW LAK.

was to get her into the river out of the exposed anchorage. Owing to the heavy rains, there was a 4-knot current coming out of the river across the bar, where there is only 6 feet at high water in the channel. We had to get in at night, when the wind was dead ahead, and the marks were completely hidden. Fortunately, a small junk went in at the same time, and we let her lead the way. As she had a Chinese crew, reinforced by some friends from the shore to assist in sweeping and quanting her in, she made an admirable pilot. Not only did every man shout continuously at the top of his voice, but great flares were continually made on the poop by the ignition of prayer-papers, burnt to propitiate the devil that was in that current. For once we thought there was some reason in Chinese superstitions. Several times the rush of water bore them away on to the shallow banks to the north of the channel, and the chorus ended in a melancholy howl, followed by a comic silence that made us all laugh. It necessitated two hours' ceaseless work at the quants and sweeps, and four or five successive attempts to get a distance of scarcely 400 yards to deep water inside.

Next day we equipped the skiff with a week's stores, and started up-river for the *muang*, or raja's residence, leaving two hands on board.

Langsuan literally means "the lower garden"—the garden of Lower Siam, as one may say—and the dense foliage along the river-banks, and the cold air laden with the scent of fruit which came off to us, showed how applicable is the name.

The *muang* lies about four hours' pull up-river from the sea. It was thus, like most of the *muangs* on the coast, well out of reach of the piratical junks which even twenty years ago were none too rare. If you know Henley reach, and indue it by the aid of your imagination with a rapid turbid current, and bold forest-clad hills along its banks, you will have a very fair idea of the scenery of the river. The town consists of a street of the wide-roofed, low-walled shanties affected by the Chinese in the peninsula, and some scattered houses of the usual Siamese type nestling under the dense durian orchards and palm plantations about the valley.



THE ENTRANCE TO LANGSUAN.

The governor's residence is a two-storied brick bungalow, not unlike a country house at home. In the compound lived the usual assortment of women-folk, slaves, police and criminals, pigs and pariahs, and a herd of half-wild ponies, who galloped out at daybreak to the jungle and galloped back at nightfall—to which we four were now added. We were given a couple of rooms in a house tenanted by a score of youngsters being trained to perform in the raja's private theatre. Their whole souls were wrapt up in the music, the repartee, and the attitudinizing necessary for the performances. They pounced upon us and our belongings like a swarm of flies, but their insatiable curiosity did not prevent their dinning theatrical "shop" into our ears by the hour together. Fortunately they rehearsed at night-time, and at some considerable distance, and from sunset to dawn one might catch the notes of a melancholy air floating through the mists, or the crash of a stirring Malay chorus.

The raja is a Chinaman, brother to the enlightened and successful rulers of Renawng and Trang upon the west coast, whose work has been already touched upon before this Society. He farms the state from the

Government for a given yearly sum. This is an old-fashioned Indo-Chinese method which has not always worked badly.

Langsuan is said to have a population of about sixteen thousand all told, of whom the greater part are Siamese, with a few Chinese and Malays. The state has been generally ignored altogether in maps. Its southern boundary lies a few miles south of the Muang, and the northern is formed by Klong Wisai, a stream emptying into Sawi bay, at the north-west corner; the northern end of the bay thus belongs to Champawn. On the south there is a considerable fishing population, largely Chinese, and in the bay itself their fish-traps, or *po*, may be seen scattered about its shallow waters. Southward there are few villages until Langsuan bay is reached, where again the *po* are conspicuous inside the reefs. At the time of our visit the fishery had been very unsuccessful, and the fish-bins, the salting-pits, and drying-stages were all empty, and a dozen *rue chalom*, the Chinese trading-boats, lay in the river waiting disconsolately for a cargo, while fresh arrivals came every day, unable to get freight at Pran Sawi or Champawn, and, for want of communication, ignorant of the state of affairs at Langsuan. Each *po* costs over £60,* and the upkeep of boat and crew is over £50† a year. In Champawn bay there were more than sixty, for it is a favourite place for the *pla tu*, the little herring-like fish for which they were all waiting; and in Langsuan there were another score of these traps, but not a fish in any of them. So no wonder the people were looking gloomy.

It is a curious, and, so far as I know, unexplained, fact that the *pla tu* is never caught south of Langsuan, although Bandon bight and other shallow water expanses in that direction seem to be exactly suited to them, during the prevalence of the south-west monsoon. A great number of large skate and shark are caught in seines along the beach.

The tin-mines of the state are chiefly situated along the edge of the granites of the main range which form the boundary between Langsuan and its eastern neighbour Renawng. The tin is all transported by elephant from the various mines to the river, and is then brought down in dug-out canoes. The mines are worked on the two systems known as *mueng kra* and *mueng sa*, which have been already described before the Society; but the latter, which are the ordinary open cast alluvial stream works, have been mostly worked out, and the greater part of the tin now comes from the *mueng kra*, or hill workings. The mining is, however, carried on in the same promiscuous manner as used to be the case with the old Cornish streamers. The Langsuan people, like the old men of Cornwall, are fishermen, husbandmen, and miners by turn, as the fancy takes them, or the season of the year suggests. When overtaken by a fit of industry, which is rare, or constrained by their own improvidence, which is more frequent, they go to the raja

* Ticals 1000. † Ticals 800.

and obtain an advance of money, which is then worked off by them in tin-streaming, the ore being sent down to the raja at a price previously agreed upon between them. The output of tin per month, or even per year, depending as it does on the amount of rainfall, the state of the communications, the prevalence of fever, and the labour of the people, who are probably the least industrious on the face of the Earth, is at best a fluctuating quantity. In a good year it probably amounts to 700 pikuls, or over 40 tons, and in a bad year to less.

Besides fish and tin, Langsuan produces large quantities of the various kinds of fruit which are common to most Malayan states—the durian, the fame of which you have doubtless heard, the invaluable papaya, the mangostin, mango, orange, jack-fruit, melon, banana, and many others. But the moist climate has some disadvantages, and the people at the mines, especially the unfortunate Chinese, were all soaked in malaria, and were suffering from abnormally congested spleens and livers. Surer death-traps than many of these places, sunk deep in the damp forest gloom, it would be impossible to find. Ticks, leeches, and blood-sucking flies, in countless numbers and of unequalled voracity, also conspire to vary the monotony of life.

There lives in the dense jungle a peculiar plant known to botanists,* but possibly not known to you, which is called by the Siamese *kalang-ton chang*, and which sets up great irritation in the skin of any person coming into contact with it. It has a large broad leaf, and the Siamese declare, after being badly stung by it, the only remedy is the heat of a fire; to bathe in a stream, which is the natural impulse, is considered absolutely fatal. A spot on the Kra-Champawn trail is known as *Burma-tai*, from the fact that a party of Burmese, coming across to harry their neighbours in the old fighting days, are said to have got into a thick growth of this plant, and to have bathed in the stream to allay the agony, with the result that they all died there. A second species,† called *samkao*, is supposed to be not so violent in its effect. We met the plant in many parts of the country, and our mahouts constantly warned us to beware of it as we brushed through the jungle.

The amount of padi grown in the state is, owing to the general absence of land suitable to it, insufficient for the population, and rice therefore forms the principal import, other articles imported being opium, and piece goods in small quantities.

On returning to the boat, some of us succumbed to the old enemy, fever, as a result of the drenchings from the rains which we had experienced inland, and the boat resumed the hospital-like aspect with which we used to be so familiar on the Me Kawng.

Our next destination was Chaiya, a day's sail to the southward

* The fever or devil nettle, *Urtica crenulata*.

† *Urtica heterophylla*.

The coast is a low sandy one, with a few grand limestone outcrops, and a fringe of wicked coral reefs some distance off it. Inland the big forest trees stand gaunt and dead, waving their bare arms over the dreary creeks and backwaters, which form the highways of the Malay fishermen.

Approaching the Bandon bight about ten at night, we were preparing to anchor close in under Lem Sai, when the suddenly shoaling water compelled us to run out from the land. In so doing we suddenly grounded on hard sand. Fortunately the wind was westerly and the water smooth, but all attempts to get off were unavailing, as the tide was falling. Lem Sai bore W. 5° S. 2 miles from us, and there was a wide channel between us and the point. The banks lay off half a mile further to the east-south-east in three ridges of hard sand. Though not marked on the chart, they may prove very dangerous to vessels making the bight from the north. We ascertained subsequently that all the banks on the coast undergo some considerable change every north-east monsoon season. During the four months from November to February, when it is at its height, a heavy sea runs perpetually on the coast, and the water is piled up along it, so that the depth on banks and the bars of the rivers is temporarily increased. The deposition of material, however, goes on with constant regularity, and further south has wrought remarkable changes in the configuration of the coast. Fortunately the wind remained light, and blew directly off shore. In the afternoon we got off with the flood-tide,* just as the wind began to freshen up from the south-west.

The charts of the Bandon bight show it to be a vast shallow expanse, with scarcely more than 2 feet of water at low water. We had, however, been informed that a channel exists by which Chaiya may be approached, and that the governor had placed marks along its southern edge. We picked up the outer one with some difficulty, and beat up against half a gale of wind. We found the channel to run north-east and south-west, and to be from 300 to 400 yards wide, and we found $1\frac{1}{2}$ fathom of water on the outer edge at low water, rapidly deepening to 3, 4, 5, and finally 6 fathoms. The anchorage is off a sandbank, which makes a splendid mark in all weathers, appearing of dazzling white colour, even at a distance of 6 or 7 miles; the mirage often makes it visible at a greater distance than otherwise would be possible. From here the entrance to Chaiya, or Pumriung, as it is locally known—the Pumring of Crawfurd—lies about 2 miles N. 23° W. There is 10 feet over the flats in the channel at high water, and $2\frac{1}{2}$ fathoms inside the

* In the Gulf of Siam, as in the Gulf of Tongkin, for the most part of the month the two diurnal tides are unequal, the inferior tide disappearing for some days almost entirely, with the result that until the new tide is born there is only one tide-wave in the twenty-four hours.

river, where a vessel may lie protected from all winds. It, however, took us a whole day to get in, as we had to sound and survey the channel first of all, which involved many hours' work in the skiff, and the sea on the flats when it is blowing hard is not in favour of taking bearings from a small boat.

The scenery of the bight is quite peculiar. At low water immense tracts of mud and sand are laid bare, for the edification of flocks of pelican, cormorants, and herons. As the tide comes in, the whole becomes a boiling mass of foam, and an uneasy little sea gets up, with a short, uncomfortable motion. The birds betake themselves to the far-off shores, and a few boats come out and cut across from creek to creek. As the water falls again it becomes smoother, and long fishing-canoes

IN CHAIYA CREEK.

come out, their Malay crews wading with their seine nets along the sands. Far to the southward dense masses of vapour condense about the summits of the Lakawn range, at a height of from 5000 to 6000 feet above the sea.

CHAIYA.—The *muang* lies a few hundred yards up a small creek west of the main stream, and we lay off the governor's landing, where stacks of firewood, boat-building and fishing sheds, rows of palms, neat paths, and charming grass-plots showed by their unusual tidiness that the governor must be no ordinary one. Praya Chaiya was away, but it was characteristic of him that, hearing of our arrival, he came across the Bandon flats in the most violent weather, and arrived unexpectedly with a couple of men late one night. A more excellent companion or a kinder-hearted friend I never met among the Siamese. He had a fund of information on the natural history, meteorology, and every subject connected with his charge; he had decided notions of the value of cleanliness in a town, and was a wise and energetic ruler, with a remedy or sensible experiment for every evil; and he was a keen yachtsman and a shrewd man of business. For many years he has been the lessee of the birds'-nest farm from the Government, and no industry is more full of excitement and adventure.

The edible bird's nest is formed by a swiftlet, known as Peale's swiftlet (*Collocalia spodiopygia*); Horsfield's swiftlet (*C. lichi*), *C. esculenta*, and *Hirundinapus Indicus* have also been credited with being the architects of these nests.

The birds build in great numbers on the precipices and in the caverns of the steep islands of the limestone series which form one of the characteristics of the gulf, and fragments of which occur at Mergui, on the west coast, in the Malay archipelago, and in Tongkin. Each of the islands under Praya Chaiya has a guard of men upon it, living in small cottages high up in some nook of the limestone rock, like a Norwegian hut, or down on the spotless sand of the single little cove, beneath a palm or two. The collecting of the nests is effected by these men three times in the year: in the hot season, and at the beginning and end of the rains. Great care has to be exercised that the nests should be taken at the moment when the birds have just finished building, and before any eggs are laid, for if this has happened the birds are said not to build again.

The collection of the nests is risky, owing to their inaccessibility, but it is profitable, owing to the high prices they fetch,* and not a little poaching is indulged in by the crews of the boats navigating the gulf. The consequence of this is that the guards are all armed, and open fire on any boat they see approaching their island nearer than 100 yards without further explanation being needed; and many a boat blown off the land, and sorely in need of shelter or fresh water, has to shear off again with a little extra ballast on board in the shape of buckshot or snider bullets.

The annual rent paid to the Government by the nest-farmer is over £2000, and the upkeep of the fleet of guard-boats costs over £1000 a year.

In Leale's time (1827) the population of the province was put at 19,000. It is now about 43,000, of whom nearly half are Malays, who retain their customs and a smattering of their religion, but have entirely lost their language. The Siamese still call them *Puek Malayu*, but, except in the build of their long low boats and their dislike of pork, they have few of the characteristics of their ancestors. They live in separate communities about the coast, and the men do the fishing and the women the weaving, the looms being beneath the houses, as in the Lao states. There are also a few hundred of the aboriginal negrito tribes inhabiting the dense forests inland. Praya Chaiya has done his best to overcome their extreme timidity by kind treatment, and has prevailed upon them to come in occasionally to the town to barter. Like many of the

* About 50s. a pound for white, and 25s. to 30s. for the inferior or red-coloured nests.

Ka tribes of the North Lao states, they wear little clothing, and suffer greatly from skin diseases, owing largely, doubtless, to poverty of diet. Cholera and Chinamen are almost unknown in Chaiya, one of the few places where these plagues are absent.

The province suffers from want of navigable streams, and neither tin nor timber can at present be brought out at a price which will pay, the experiments made by the governor with elephant transport having so far ended in dead loss.

During our stay at Chaiya, where we were obliged to wait some time to recover our sick men, I overheard a rather interesting conversation among the people who came round in the evening to see and talk to us. They were discussing among themselves these English, and comparing them to the French and Germans. They concluded that we were the worst drunkards, but the best traders of them all. One fellow drew a series of rough plans in the dust, and pointed out how shrewd was our occupation of such points as Gibraltar, Malta, Aden, Singapore, and Hongkong. He dilated on the greatness of India, and he questioned the wisdom of allowing France a free hand in Madagascar, on the flank of South Africa. His knowledge of the colonizing enterprises in which the European powers were engaged in various parts of the world, and the success they have met with, was most remarkable, and I asked him next day where he got his information, for he was a mere peasant, and had hardly ever been outside the province. "Oh," said he, "I found an old book of maps at Chao Kun's (the governor's), and learnt from that;" and he had actually taught himself to read English from an atlas. "Oh yes," remarked Nai Suk, who was listening, "geography teaches every kind of knowledge." I did not, of course, tell them what struggles the President and Council of this Society have had to persuade educational bodies in this country of the same fact; their respect for our education would have received too severe a shock.

Bandon.—Bandon, the next province southward across the bight, was long a part of the powerful state of Lakawn, but for very sound reasons the Siamese Government has, for administrative purposes, restored it to complete independence of that state, in the same manner as on the west coast it has removed several small districts from its rule.

The population numbers about half that of Chaiya, and is composed for the most part of Chinese from Hainan, Hokien, and other places, many of them imported direct by junk. They are engaged in exporting jungle produce, such as rattans, skins, and horns, and quite a fleet of junks sail out of Bandon in this trade. Although, owing to the shallows, the Bandon river is difficult of access for vessels drawing more than 6 feet, the river itself forms a magnificent waterway, which should play a great part in the future development of the country. Looking at the map, you will see that the main axial range of the peninsula, which comes down from the Shan states, is at this point very far over to the west, and is dwindling to a comparatively insignificant altitude, until it disappears at the southern end of Junk Ceylon, or Puket island. In the mean time, a fresh, almost parallel ridge of granite begins to appear in the islands of Kaw Pungunn and Kaw Samui to the eastward, and is continued southward by the Lakawn range, which henceforward becomes the backbone of the peninsula. It is the whole of the intervening space between these two ranges, constituting Bandon and a large part of Lakawn, which the Bandon river drains to the sea. Of the two main branches of the river, the right or eastern takes its rise within comparatively few miles of the Bay of Bengal, where the watershed is so low that it is stated by the people a four-*chau*, or four-oar, boat can be taken right across with a very short portage to the upper waters of the Trang river, the total distance to Trang being 170 miles. Certain it is that the old trans-peninsula route, mentioned by Crawfurd and others, lay across the watershed from Pang Nga* and the Paklao stream to the Bandon, and down to Punpin, which is on a creek on the borders of Chaiya and Bandon, and a favourite residence for the governor, who is from there able to direct affairs in both provinces.

On leaving Chaiya, strong winds carried us to the passage between the archipelago and the northern termination of the Lakawn range on the mainland. There are two quite distinct groups of islands, the western or Angtawng group being a continuation of the distorted limestone outcrops on the flanks of the granites; and the eastern, comprising the important islands of Kaw Samui and Kaw Pungunn, being the true extension of the granites of the Lakawn range. The western group being the breeding-place of large numbers of swiftlets, comes under the nest-farmer. Kaw Pungunn belongs to Chaiya, Kaw Samui to Lakawn. The former is inhabited by Siamese fishermen, and has in its day produced a little gold and tin. The latter is inhabited by some hundred Chinese, who cultivate the coconut palm and rear large numbers of pig and buffalo. The trade of the island is entirely in the hands of the Bandon junks. There is some tin in the hills, but, owing to lack of sufficient water-supply, it has not been worked with success. The ranges cut the island effectually in two, running from the north-west corner to the south-east at a mean elevation of about 2000 feet, and are clothed with dense forest, which render communication between the two coasts impossible except at one or two points, and consequently the villagers generally communicate along the coast. It is curious that fever is very prevalent, and cholera by no means rare.

Under the lee of the Lakawn range we had calms and light airs and squalls. When nearing Lakawn bight we stood out to sea, to clear the shoals off Lem Kolam Puk. We were now among completely new surroundings; the *rua pet* and *rua chalom* of Siamese waters were no

* The Phoonga of some authors.

longer to be seen, and the long low Malay types of craft became common. The banks off this headland, as well as the shoals and mud flats within its embrace, are silting up rapidly.

In his book on Siam,* Mr. F. A. Neale gives a distinct account of his passage "through the channel between Ligor (*i.e.* Lakawn) and the island of Pulo Tantalem" in the *Victory*, a frigate of 1400 tons, across what is now known as the Tale Sap, or inland sea, past Patalung to Sungkla, or Singora. Now, fifty years later, no boat drawing more than 2 feet can cross the Lakawn bight or navigate the waterway known as Klong Ranawt, which communicates with the Tale Sap. From Lakawn to Singora the coast-line stretches its unbroken barrier of spotless sand, and behind it the reeds and grasses of the vast swamp land known as *Tung Ranawt* whisper in the wind to the far horizon. In old maps this piece of country figures as Pulo Tantalem, but the name is unknown locally, and the wide waterway generally depicted between it and the mainland does not exist. The view across the Tung Ranawt from the top of the sand-dunes thrown up by the monsoon is most peculiar, and wild and dreary in the extreme. The plain is inhabited by a small breed of elephants known as *chang deng*, owing to the reddish colour of the bristles. These animals, largely owing, no doubt, to their peculiar diet and the brackish character of the water they drink, seldom grow to a greater height than 8 feet, and have unusually small heads and large bodies. They are very wild, and much given to marauding expeditions on their neighbours; they have "let in the jungle" on all would-be settlers with such success that hardly a house is to be seen. None have ever been successfully tamed, owing to the fact that the change of water incidental to removal to the neighbourhood of Lakawn or Patalung seems to affect their health, and they do not long survive. Both men and animals in Siam are, so far as I have observed, very susceptible to a change in the water. The plain-dweller absorbs with immunity what he amiably terms "water," whatever its consistency and flavour, and drinking the cold clear mountain streams of the hill country is as fatal to him as the viscous fluid of the plains is to the mountaineer or the foreigner.

SINGORA.—It was with no small pleasure that we rattled down the anchor in Sungkla, the furthest point in our voyage, and contemplated the beautiful hill-girdled harbour that lay before us. In coming south we had set back the seasons, and the rains had not yet commenced; the shore party returned from market laden with fruits which were long ago over in Bangkok. The hot blue sky was reflected in the water, and junks and Malay luggers came and went to the light sea-breeze. Occasionally, to clear the air and test our cables, a furious squall swept down upon us from the hills. Junks went adrift and

* 'Narrative of a Residence in Siam.' By F. A. Neale. London, 1852.

drove on shore, or mowed down whole rows of fishing-stakes, and their crews shouted at one another, and looked on, as is the helpful way of the Celestial. We watched the anxious skipper hesitatingly suggest orders in his most persuasive tones, and we saw the crew, who had been busily wrangling together, turn like one man upon him with a howl of execration; truly the experiences of a junk captain must be exciting and peculiar.

Singora was seized at the beginning of the century by a party of Chinese from Amoy. They were long-sighted enough to immediately place themselves under the protection of the Court of Bangkok, which for various reasons found it convenient and desirable to have a Chinese colony situated alongside the powerful state of Patani. The lustre of both 'Tani and Lakawn has gradually been dimmed,

ENTRANCE TO SINGORA.

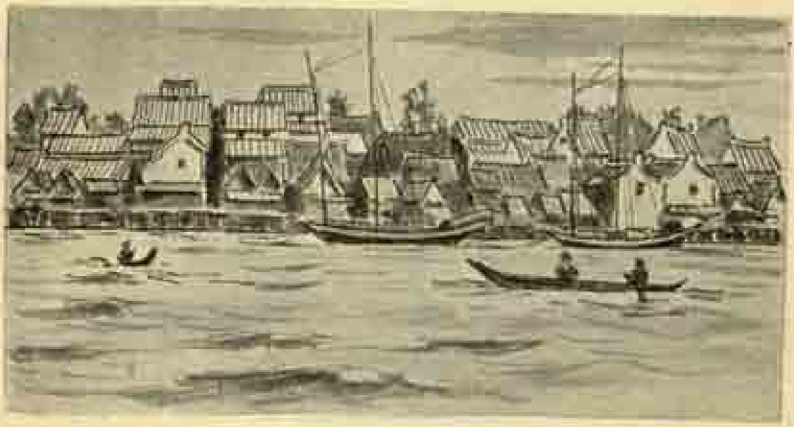
and Singora, happily situated as it is on the only really protected harbour on the coast, and at the entrance to the inland waterway of the Tale Sap, has attained the position of the most important centre on the whole east coast. The population of the town, and suburbs across the water, is over 10,000, partly Siamese and partly Malay. It is curious that, although the government and trade are entirely in the hands of Chinese, and their influence is evident at every turn—in the craft in harbour, and in the houses and the architecture of the walls ashore—there is yet no Chinese coolie class.

There are some 60,000 people in the province, scattered in small communities along the coast-line about the shores of the Tale Sap, and in the jungle of the interior. The chief exports are rice, tin, fish, and skins and horns, and the trade is sufficient to keep a considerable fleet of junks trading with Singapore and Bangkok, and a number of Malay craft sailing to the Malay states on the south.

Before going up to the mines we had to wait a few days in Singora, owing to the fact that the king was expected to call in on his way back from Java. When he arrived he came on shore, and walked round the town in his brisk way, noting the various improvements instituted by the commissioner, and recognized many old friends among the people. His Majesty professed to think our craft small for going long distances, but I believe he would have dearly loved to sail back to Bangkok in her himself.

Pra Vichit, who will be remembered by many in this room as having been for some years at the Siamese Legation in London, was at the time commissioner in Singora, and, although he had only been there about a year, the changes he had wrought, and the popularity he enjoyed among the people, showed that he had devoted himself to the difficulties of his task with ability and success.

The tin-mines lie in the hill ranges south and west of the town. I need not weary you with many details, for they are worked in much the



SINGORA, HARBOUR SIDE.

same fashion as at Langsuan, and with much the same results, namely, a small and ever-varying output of tin, at the expense of much sickness to the miners. I obtained some of the most beautiful crystals of cassiterite I have ever found: the men regard them with some awe, and take sufficient interest in them to keep a few as curiosities. Mining is, unfortunately, seriously interfered with in some districts by the spirits. We came upon one very rich hill-working where the men had been served with a summary notice to quit in the shape of the death of eight men from fever in three days.

The agricultural people of the province are all Siamese, and a finer, healthier-looking set of peasants I have not met in any part of the country.

The dialect of this neighbourhood is often almost unintelligible to those accustomed to Bangkok modes of speech. The nasal twang noticeable on the west coast is very pronounced, but perhaps the most curious feature is the tendency to abbreviation. Here we have the disintegration of words which has given rise to the monosyllabic languages in actual process of development, e.g. *'Sau*, for *Kao sau*, padi; *'Lung* for *Patalung*, the name of the town; and instances might be multiplied.

Among the hills the last fires of the *rai* clearings still smouldered, and the heavy brown smoke caused atmospheric effects which were very charming and homelike. The intense clearness of the air, which is the usual condition of things, makes one of the chief characteristics of the tropics, and the contrast was grateful. The destruction caused by the indiscriminate burning of the forest is, however, very great. After two or three crops the ground is forsaken in favour of a new clearing, and the bamboos and long grasses immediately spring up, choking down the valuable seedlings, which have no chance of life. The result is

SINGORA STRAIT.

that in many parts of the province the place of the large timber has been entirely usurped by bamboo, or *lallang* grass, which it will be almost impossible for the planter of the future to eradicate.

The red loam of many parts of Singora is admirably adapted to both pepper and coffee, but the absence of any labour laws, and the impossibility of getting or controlling labour, have so far told against success. It is very desirable that the Siamese Government should give its attention to these matters.

Our camps were disturbed considerably by one of our elephants, who was a bad sleeper: if he found no comfortable undulation for his pillow at night, he slept not at all, and became very crusty in consequence.

It is somewhat interesting to compare the weights carried by elephants in the tin-producing districts of the Malay peninsula with those used in the long journeys and mountainous country of the Lao states. In the peninsula the distances are seldom more than at most three or four days' march, and the elephant is expected to carry as much as 900 to 1000 lbs. besides his mahout and howda. The latter is often a mere brace of panniers, slung together so as to rest one on each side of the backbone, and covered sometimes with a light barrel-roof of bark. A good tusker carrying his $9\frac{1}{2}$ cwt. will fetch about £56, and a female which can bear 8 cwt. is worth about £45. In the Lao states, where journeys of ten days or three weeks are frequent, the average weight hardly exceeds 300 lbs., or one-third of what is usual in the peninsula. The prices in various parts of the country vary considerably. When we were on the Me Kawng and in Muang Nan in 1893, a good tusker could be had for £32, and a female for £24; at Chieng Mai, where good teak-hauling elephants are in great demand, a tusker may fetch £150, and a female anything from £50 to £100, according to her strength and ability.

In the Siamese Malay states there are probably about 1000 domesticated elephants, all told, and in the Lao country probably over 2500 animals are working at the present moment. That these animals breed in captivity in Siam is due to the fact that a large number of them spend the greater part of their time holiday-making in the jungle. When there is no work for his beast, the mahout takes him out to a nice cool green bit of forest, and leaves him there to enjoy himself. There is no expense connected with his upkeep, for he looks after himself. He has a hobble of rattan round his feet to dissuade him from wandering too far, and a wooden bell round his neck, by the tone of which the mahout or his little boy can always find him, when they go out once a month to look him up, and give him some bananas.

The Inland Sea.—On our return from this trip we started for Patalung. We had one of the long dug-outs which are generally used for navigating the Tale Sap, and a crew of so-called Malays. Like the people of Malay origin in Chaiya, they have lost their language and most of the best qualities of the true Malay. They had a most unseamanlike love of dry land, and when it was time to start every man appeared to possess a dead or dying relative whom it was imperative to attend. The very high death rate was, as I suspected, due to the gale of wind that was blowing. Where the mere Western lamely pleads a "previous engagement," the Oriental revels in a harrowing and wholly imaginary account of disease and death, which has the advantage that, while no one believes it, it provides a field for the exercise of his unequalled powers of invention, and an excuse for a display of a little flowery rhetoric. When, later on, we set out from Patalung to return under somewhat similar conditions, reference to their dead and dying relations had no power to entice them on board, and we had to begin to get under way without them before any of the crew could be induced to overcome their dislike of wind and water.

In the open water of the Rat Pumi at the southern end, the tidal influence coming through Singora strait is felt, and with a strong wind a lake boat may have a roughish time. At Pak-raw, however, there begins a system of intricate waterways winding between long jungled islands, known as Kaw Yuen, Kaw Nung Kumm, and Kaw Mak. Two main channels lead northward to the inner portion of the great lake, that to the west being the narrower and deeper, with, at this season of the year, little more than two fathoms. At Pak-cha, and at Pak-payun, where the lake once more opens out, a few villages are passed, standing on piles above the surrounding water. Like the harbour at Singora, the surface is everywhere dotted by fishing stakes and traps of mysterious and intricate design, as troublesome often to the guileless mariner as to the unsophisticated fish.

Pak-payun is a pretty strait between low hill ridges, and on the northern horizon of the open water the lofty outlines of the limestone islands stand up abruptly. This group is known as Kaw Si Kaw Ha,

ON THE ISLAND SEA.

and is a favourite building-place for the swiftlets, although, owing to its comparatively small size, the production of edible nests from there is not as large as that from the Angtawng group.

There is a statement in Prof. Keane's 'Eastern Geography,' apparently on the authority of some travellers whose names are given, that the islands of the lake are inhabited by a tribe of troglodytes, or cave-dwellers, who live by collecting the nests in their rocky dwellings. We made studious inquiries on the subject, and I can only presume that the popular belief in the existence of *nats*, or spirits, which are supposed to inhabit these islands, as they are every stream, hill, and tree, was in some way so mistranslated to the travellers that, coupled with some facts about the people employed by the nest-farmer on the islands, it took in their minds this highly sensational form. It is a thousand pities to destroy so pretty an illusion, and we felt distinctly the poorer mortals for not being able to retain it.

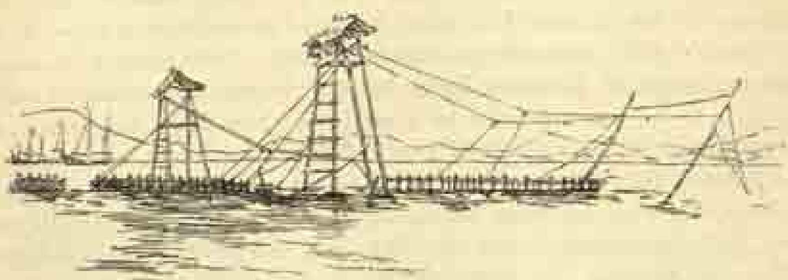
On reaching Patalung, we were able in some measure to judge of the rapidity with which land is making in the neighbourhood. Where Neale notices "a fine creek or river off Talung," there is a reedy promontory standing out a quarter of a mile into the lake, through which trickle a couple of sluggish streamlets too shallow to float a boat drawing a foot of water. The lake is 2 feet deep for a mile out, and with the addition of the flood waters of November, December, and January, the depth scarcely exceeds 9 feet anywhere, even in the channels.

Patalung was a great emporium in the days of old, with deep water approaches right in. Now it is a small agricultural village, completely retired from the world, where there are no vehicles, no transport animals, and no Chinamen, and where no decent-sized boat can approach. No wonder the natives have curtailed the name to a single syllable. There are probably under 40,000 people in the province, but it is a great fruit and rice growing country, and should have a future before it.

The great barrier bank of Kaw Yai and Tung Ranawt may be supposed by the unlearned to have been cast up and formed as we now find them by the slow and painstaking efforts of the forces of nature. But the people of Patalung know better. In the days when it still lay open to the sea, protected by a sand-bar where Kaw Yai is now, a virtuous and holy couple lived here. They had one boy, who one day disappeared, it was supposed as a stowaway on board one of the big junks which went and came continually. Years after, a great Chinese junk, gilded and flagged, put into Patalung, and in the great mandarin who came on shore the aged couple recognized their long-lost son. But he, in the pride of his heart, cast them off disdainfully, and would have nought to say to them. The two old people fell on their knees and prayed that ruin should fall on him that he might learn humility. And it became very dark and a great storm arose, and the ship went down with all on board, and the chests and trunks of valuables were washed hither and thither, and now remain as the banks and islands which form the Tale Sap—a warning to all undutiful sons. Parents here may find the story useful. This tradition bears out the evidence afforded by history, and by a consideration of the physical geography and geology of the district, of the comparatively recent date of the formation of the present barrier-bank, and the rapid silting up of the salt-water lake, which is now going on at the rate of some 2 inches a year abreast of Patalung. The story no doubt had its origin in some specially violent cyclonic storm, such as visits these seas three or four times in a century, or in some unusually violent monsoon season, which may have left traces of a very permanent character in the configuration of the banks. Such an event would be very likely to be chronicled in a legend of this kind. The coast is out of the general track of the cyclonic disturbances in the China sea; but within the century three or four such storms have visited different parts of the shores between the fifth and eleventh parallels, and every north-east monsoon season effects changes in the outlying banks of the river-mouths, as mariners relying on the '74 charts find to their cost.

While the rivers are bringing down their vast burden of sediment with each rainy season, which is able to work effectively on the largely decomposed granites of the interior, the violence of the north-east monsoon, impinging directly on the coast, prevents the dissipation of the material over a large area, and forces it back and piles it up at the various points of discharge. This process is going on all the way from Patani to Chaolai, and will probably result in the creation at no very distant period of salt-water lakes in both the Lakawn and Bandon bights, similar to that already formed off Patalung.

The drenchings we had met with in Singora had brought out again the jungle fever with which we were saturated, and some of our party were unable to walk. We had still Lakawn to visit, so, having trans-



SINGORA FISHING STAKES.

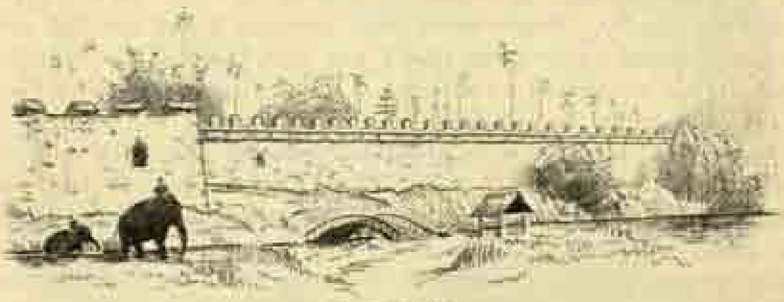
acted our little business with the governor, we returned to Singora, and in a few hours after our arrival were under way once more.

LAKAWN.—Arrived in Lakawn road, we anchored, and, leaving two hands on board, started in the skiff up-river for the city with a week's stores. I felt somewhat nervous at leaving the boat in such an exposed anchorage. There is only 2 or 3 feet in the bight, and so it is impossible to get a boat into any of the creeks there, and there is no shelter, as the map shows you, for 60 miles in any direction. However, the squalls under the lee of the mountains in the south-west monsoon are nearly always westerly, and to guard against damage from the north-west squalls the junks have a confiding habit of anchoring on the mud in 3 feet of water, relying on the pacifying influence which the mud bottom exercises on the sea. It is a charmingly Oriental kind of seamanship, but, like most things Oriental, not without reason.

Lakawn is, in its way, the most striking state in the peninsula. Here are the remains of an old Hindu influence which at one time dominated all the surrounding states. Where our boat now scrapes across the sand bottom of the tortuous stream, the ribs of old junks that once went up and down the river lie embedded in the bank. Hamilton * mentions the vast numbers of the pagodas in the town, and the Dutch factory which stood below; but he was before the time of Alawng Pra,

* 'A New Account of the East Indies.' London, 1744.

and Harris, who came after him, comments on the destruction wrought to the town and province by the Burmese wars.* He found that about 12,000 men only were borne on the conscription rolls. Now there are 133,000. It is, in fact, the most populous, the largest, and the richest of the Siamese states of the peninsula. And yet, owing to the exposed character of the road and the insignificance of the shallow winding stream which forms the only approach from the sea, it has been very little visited. It is a five hours' pull to the city landing, and for the last few miles the stream is about half the width of this table.† If you look at the map, you will understand how it is that when one enters Lakawn one finds one's self completely outside the influence of the modern world. The province has practically no outlets, and whereas the west coast, and places like Chaiya and Singora, are occasionally visited by



LAKAWN WALLS.

steamers, the people of Lakawn have only heard uncertain rumours of their existence.

In the old days Lakawn held sway over Krabi, Kiriwong, and Bandon, thus touching the sea on the west coast and on the Bandon bight. At neither point are the harbours very serviceable. The east coast, as already pointed out, is either an exposed sand beach or a series of shallow mosquito-clouded mud swamps. The province is cut in twain by the lofty range of hills referred to above, and by far the greater part of the population and of the arable land lies behind that barrier. There are four possible outlets for its produce—north by the Bandon river, west to the magnificent harbour of Kopa, south to the Trang river, or east across a low pass to Lakawn. The last is very unsatisfactory, as it is itself hardly get-atable, and in the north-east monsoon the coast is practically closed to navigation. When I was at Singora, Pra Vichit was considering two schemes—one for dredging the Klong Ranawt so as to keep open communication with the sheltered waters of the Tale Sap

* 'Account of an Overland Journey from Ligor to Bankok.' Madras, 1854.

† About 15 feet. The fishermen estimate the rate of deposition on the bar of the river to average 2 to 3 inches a year.

and Singora during the winter season; the other for opening up the old overland route to Trang, which is mentioned by Captain Low.* On the whole, the latter will probably be the most feasible and the most useful to both portions of Lakawn.

The governors of Lakawn have ever been very independent gentlemen. Harris says, "There are three or four commissioners sent to Ligor by the Siamese court, but the chief treats them with very little consideration, and they exercise, except on occasion of his absence, no authority whatever." † Relying on the inaccessibility of their capital, they have treated Bangkok authority with a high disdain, which has resulted in their being left too much alone. At the time of our visit we found the governor in every way maintained the traditions of his ancestors.

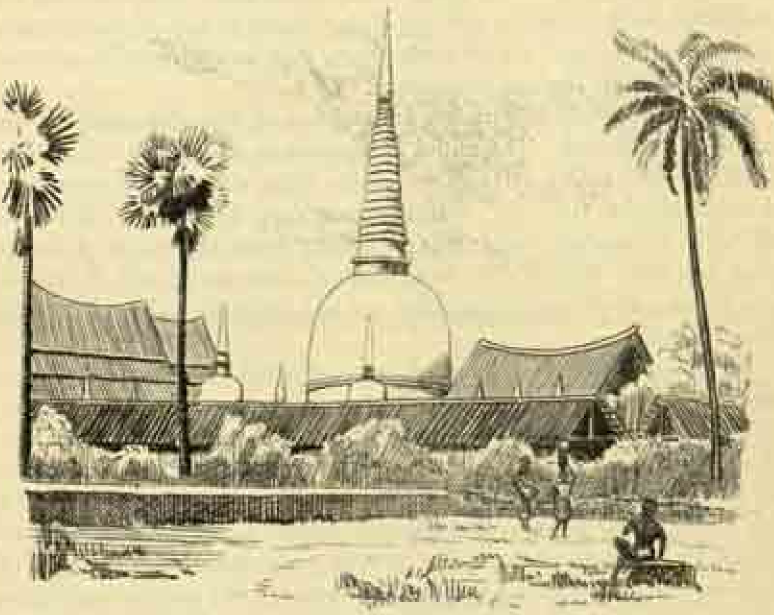
It would, however, ill become me to abuse the chief; he was affable and even friendly. Nearly every other governor I had met had more or less betrayed a conviction that I was mad, based on the fact that they did not understand travelling in a seven-tonner. Whatever Praya Lakawn thought, he refrained from all comments. It was also to his credit that he knew more about his state, its geography and products, than any other chief except Praya Chaiya whom we had met; and while, of course, concealing a good deal which we were not desired to know, he gave us much interesting information. Information, whether geographical, commercial, or of any other kind, is, in a state like this, less easily obtained than you would suppose. First of all, there are no statistics. Then the chief, to whom you naturally appeal, intends that you should know as little as possible, and he has even given strict orders to his subordinates that he alone is to give you information. The consequence is that you leave his house with an accurate knowledge of the habits and failings of all his neighbours, and a hazy idea that he is the most just and most able ruler in the world. The subordinates bring you presents and tell you where the snipe lie or the *sambur* feed, but the moment you ask them anything about the export of deers' horns, they find they must be gone. You pump the Chinese traders, but they have been told by the governor that all you are after is to set up a business in the place—and they become mute as only Chinese can. The Malays discuss their fishing prospects with gusto, but when you ask about freights, or the depth on the bar, their answers range over a long list of possible figures in that royally vague manner which so becomes the Eastern. The Siamese know their chief too well to say a word more than the laconic "don't know," which is next to the more frequent "cannot," the most irritating dissyllable in the Siamese language. It would take too long to tell

* *Jour. Asiatic Soc. Beng.*, vol. vii. part ii., 1838.

† 'Overland Journey from Ligor to Bankok.'

you how one by one Nai Suk, the boys, and I walked about the country, and dropped in here, or drank tea there, smoked in the *sala*, or gossipped in the market, and how we put our notes together and compared and averaged our total. Yet such often was the way, and even our official passport did not always obtain more for us than fitting civility from the chief.

The approach to the city down a long avenue of banyans and peepul trees, which flourish about the spacious enclosures of endless ruined *wats* and pagodas, is distinctly impressive, and reminds one far more of India than of Siam. This effect is heightened by the local



THE LAKAWN PAGODA.

custom of carrying loads upon the head instead of slung across the shoulder. In Siam generally the head is regarded with a certain veneration, and no loads are ever placed upon it, nor is the hand allowed to rest upon it in blessing, as may be done with children in the West. Yet in Singora and Lakawn country folk bring in their market produce piled in innumerable baskets on the head to a height of sometimes three feet. In this manner even women and children carry weights of 80 lbs. for many miles. A group of these people, who are generally taller and slightly darker and better looking than their sisters in Upper Siam, forms a very striking picture.

The features of the city are the massive red-brick walls which encircle it, and the great pagoda, the resort of thousands of pilgrims, which has the miraculous power of casting no shadow. The interior of the walls is slightly disappointing—ruined pagodas divide the space with palm plantations, beneath which the usual bamboo dwellings nestle. The governor's house is larger, but little cleaner than the rest; the market-place is a small clearing in the centre of the town, where a few hundred sociably disposed persons congregate in the cool of the morning. For the rest of the day the by-ways are given over to goats and elephants, who, whenever they meet, stampede in various directions in mutual fear of one another.

There is a considerable population of Malays in Lakawn, who, unlike those at Chaiya and Singora, retain not only their speech, but the *kriss*, and with it their pride of race. They maintain constant sea communication with Kelantan and the Malay states to the south, and are a fine lot of people, and handle their boats, men and women, in a manner which excited our highest admiration.

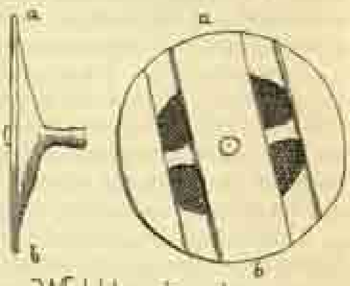
The Chinese form the traders and miners of the state, and are very jealous of Europeans. The mines at present in work are all situated in the Bang Ron valley at the foot of the hills, about a day's journey to the south-west of the city. Harris states that the tin was in his day said to be exhausted, yet in the last sixty years the whole of the Ron valley has been turned over to a depth of between 30 and 40 feet, and many thousands of tons of tin taken out and exported to Bangkok for the China market.

We found some four hundred men at work in the valley, which presented a curious scene with its white, shining mountains of tailings, tumbled in wildest confusion in all directions. Only two spots stand above the surrounding waste—one a grove of palms about a *wat*, or monastery, and the other a lonely spot where stands a tall gaunt forest tree or two. This belongs to a very ill-tempered landlord, who has persistently refused to sanction work on his ground on any terms whatever. He has been offered a high rent and untold bribes; but sacrifices, offerings, and prayers have had no effect, and the last gang of men, who thought they had come to terms with him, were turned out summarily after losing half their number by death. He is the spirit who inhabits one of the trees, and he is spoken of in whispers even down in the village.

The tin sand in the valley seems now to be very nearly worked out, and efforts are being made to open up new districts along the hills further north. The mortality in the uncleared jungle is, however, so heavy that, with the present high royalty of over 16 per cent. demanded by the Siamese Government, the *taukes*, or headmen, declare they cannot make them pay; and there seems every likelihood, if the royalty is not lowered, that this industry will dwindle to very small proportions.

The coolies are the wildest possible creatures imported by junk direct from Kwang-tung and Hainan in China. Great crowds came to see me as a curiosity; they were astonishingly friendly, but their manners were most uncouth and barbarous, and contrasted strangely with the refined bearing of many of the Siamese of Lakawn. I was much struck with the simplicity and lack of guile among the latter. They have seen less of the *Farang* than many of their countrymen in Upper Siam, and have not, therefore, reached that point of their existence when they must become acquainted with the vices of the West—the most dangerous ordeal through which a native race has to pass.

It is remarkable that in a state so largely agricultural there should be absolutely no kind of vehicle in use. The *kwien*, or jungle cart, of Upper Siam is unknown; not even sledges are used. The only beast of burden is the elephant; even the buffalo is only used for ploughing and threshing out the corn. One would naturally infer that the people were unusually uncivilized, yet in their architecture they have in the past known no small skill and taste. The only exception to this absence of vehicles is in the carts used by the Chinese tin merchants to carry the tin slabs from the smelting-house to the water-side. They are of so primitive a kind, however, that an up-country Siamese would be ashamed to use them, and it is not surprising that they have not been more adopted.



Wheel Lakawn tin cart

With our return voyage I need not trouble you. We had heavy squalls in the Bandon bight, and called in at Chaiya for mails. We experienced a gale of wind off Champawn, and the tempest-breeding peaks of Sam Roi Yawt did not spare us. And then at last, one wild lurid morning, as the sun struggled up upon the monsoon-laden horizon, the big following seas bade us farewell, as they broke in roars under our little ship and hurried us on their foaming summits into the smoother water of our old friend the Menam Chao Praya, or Bangkok river.

Before the reading of the paper, the PRESIDENT said: The paper this evening will be on the journeys in the Siamese East Coast States by Mr. Warington Smyth. We have already had in this room two very interesting papers from Mr. Warington Smyth, one about four years ago, when he described to us the upper Mekong and his visit to the sapphire mines; the second one when he gave us an account of his descent of the Tenasserim river, of the pearl fisheries, and the Kra peninsula and its tin works. On both occasions the meetings were large, the papers were listened to with great interest, and there were most valuable discussions, in which Mr. George Curzon, Lord Lamington, Sir Dietrich Brandis, Mr. Annan Bryce, and others joined. We have now the great pleasure of welcoming Mr. Warington Smyth in person. We are honoured this evening by the presence of His Royal Highness the Crown Prince of Siam and his brothers, and I am quite sure that they will find that the paper is most interesting. It will be illustrated by a number of slides. I now call upon Mr. Warington Smyth to read his paper.

After the reading of the paper, the following discussion took place:—

Sir FREDERICK VERNEY: It has been my good fortune to be connected with the Siamese for nearly fifteen years, and I can say for Mr. Warington Smyth what he cannot say for himself—that of all the Englishmen who have ever gone out there, I do not believe that any man has more faithfully served that Government than Mr. Smyth; and I think we all agree with this, that when an Englishman goes out and serves a foreign Government well, he deserves well of his own country as well as the country he serves. Mr. Smyth has not only undertaken these journeys of which he has given us so faithful, intelligent, and pleasant an account; he has also undertaken for the country of Siam an extremely important work, for which these journeys were performed, and I am sure we all of us are glad to welcome him back to England. In his paper he has omitted the perils and dangers of the journey, and made the most of the pleasant and agreeable.

He possesses some of those qualities which are excellent for the Englishman who travels abroad. He has wide sympathies, undaunted energy, and he combines with that a tact and a sympathy which are very rarely found. I am extremely glad he has come before us to-night—and I for one, and I hope many more, wish him a full return of his health and strength, that he may do good work in the years to come in Siam and perhaps in other countries.

I believe that Mr. Arthur Balfour the other day in a speech stated that English interests in China were not territorial, but only commercial, or at any rate in the account I read he made that distinction between territorial and commercial interests. That is a distinction which Englishmen will never make in regard to Siam. We have seen that England's interest in Siam is territorial, and I hope it may long remain so. I hope, and I believe other people hold who know anything about Siam, that the integrity and independence of that country are certainly for the interests of ours. We have seen England and France meeting and shaking hands in an amicable way over the guarantee over the central and most vital portion of that country, and we hope that friendly feeling may be shown still further, and that Siam may long remain in the forefront of powerful if small progressive countries. The Siamese have a good right to be proud of the King of Siam, who has made himself known to Englishmen as well as many people in Europe by his intelligence and his progressive spirit, and his keen observation of manners and things during his recent voyages. Of one thing we have a proof to-night—of his confidence in Englishmen and England, and his sympathy with our country, for what greater confidence can a man show than to send his eldest son to be educated and trained in England, and many of his family?

Mr. ANNAN BRYCE: I am sorry that my experience of Siam does not extend to the regions which Mr. Smyth has told us of in his paper. The region of Siam I know is to the north of Bangkok, which has very few characteristics in common with the region which Mr. Warington Smyth has told us of to-night. There are one or two points I should have been glad if Mr. Smyth could have found time to describe, viz. the ethnological relations of these regions to the main body of the peninsula, but it would no doubt have taken him rather long and into regions rather technical, but if he could in reply tell us something about the ethnological relations of these regions, it would be of interest for a number of us.

Mr. WARINGTON SMYTH: In reply to the question Mr. Bryce has put to us, I would say the people among whom we travelled consist of regular Siamese, of Malays of a type which is, you may say, almost Siamese, and of the aborigines of whom I have said a few words. Of the latter there are two tribes in the southern part of the peninsula; as these have been carefully described in a paper, I think, by Mr. Daly some years ago, and elsewhere, I need not say anything further of them. The Malays north of lat. 7° appear to have lost most of the characteristics of their race; to a large extent they have adopted the Siamese and have lost their own language, but they have preserved a certain number of their traditions and customs. They will not eat pork, and they prefer the sea to anything else, and so forth. One sees their relationship to their neighbours at Kelantan, but in most respects they are very unlike the *pukka* Malay; they have not the pluck and hardly the energy of the true Malay. Those who live among the Malays say they are the idlest of men; those who best know the Burmans say that the Burmans are the idlest of men. However that may be, the Malay of Singora must run them very close. The Siamese there, and at Lakawn, are true Siamese, very little mixed with the Chinese, as one often finds in the north. They preserve many old customs and traditions, now being lost near Bangkok. Their language differs slightly; the local peculiarity and the twang are difficult to understand, and puzzle all people from the capital. The Mons, Karens, and other races which we know in the north and down as far as Pechaburi are altogether absent, to the best of my knowledge, south of that; the Mons, or Talains, have been discussed before by Mr. Holt Hallett and Mr. Annan Bryce, and I need not say anything further of them, as they do not come within the scope of this paper. I believe that the Malay never really extended further north than the Kra isthmus, as above that they are not met with. North of Langsuan there are only Siamese, and a few Burmans who come across the frontier to do a little trading.

The President: I am sure a vote of thanks will be passed to Mr. Warington Smyth by acclamation. He has many rare gifts as a traveller. In this particular expedition he proved himself to be a most intrepid and daring sailor. It is no joke, in such weather as he encountered, to be in a little seven-ton boat with two or three landsmen, for they were no better. I forget whether he told you that he was on his beam-ends and battened down for several hours, and that he was at the helm for upwards of thirty hours at a stretch. Without that intrepidity and skill we should not have had the paper we have heard this evening, for he would have been unable in any other conveyance to visit these provinces. He has described them admirably, for, as Mr. Verney has pointed out, and we all feel, Mr. Warington Smyth has almost magnetic sympathy for all things that live—man, beast, or bird; he also has rare powers of description. Geographically, I think the most important part of his paper was his description of the way in which parts of the coast are gradually being filled up, not only by means of sediment which is worked down from the cliffs and mountains of the interior range, but also by the action of the north-east monsoon, which prevents any of that sediment from escaping away to sea, and thus forms islands and shoals, which, of course, eventually will be entirely reclaimed land. This takes place from many different causes in other parts of the world. I am reminded of the site of that naval battle under King Edward III. at Sluys, which is now a large tract of pasture land covered with cows, with a few villages dotted about what was once the sea and the large important commercial port of Sluys. In historical times Mr. Smyth tells us that what was once a large emporium of commerce is now a small agricultural village, and there can be no doubt that no more useful work can be done than to collect information as to the previous condition of such a country, and the causes which have led to this silting and drying up of large tracts formerly parts of the sea. This is only one out of many points of great interest which Mr. Warington Smyth has brought before us. We have to thank him also for the admirable sketches which he has made and which have illustrated his paper, and in the next room you will find a great number of most interesting photographs, sketches, and curiosities he has kindly brought to show us. It now only remains for me to move a vote of thanks, and to convey to Mr. Warington Smyth that vote which has been passed by acclamation.

Mr. H. W. Smyth's Map of the Malay Peninsula.—The coast line is taken from the Admiralty Charts; the interior partly from the same source, and partly from the Siamese Government Surveys. Some details in the Bandon bight and the Inland sea are from prismatic compass surveys by Mr. Smyth. The boundaries of the states are in several cases from native sources.

STUDIES AMONG THE DRIFT-ICE OF THE POLAR SEAS

(With Reference to the Construction of Floating Breakwaters).

To the President of the Royal Geographical Society.

Sir,—

In my numerous arctic voyages I have been enabled to gain considerable experience with regard to the influence of floating bodies on the breaking and swell of the waves. Year after year I have had opportunities of making observations on a large scale in this direction, and I have endeavoured to study the phenomena thoroughly, in order to unravel the true reasons for the astonishing effects which many others before me, as well as myself, have observed.

I began my arctic work in the year 1858. I then accompanied Prof. Otto Forell to Spitsbergen. We had at our disposal a small fishing-smack of, I think, some thirty or forty tons. In her we started from Hammerfest, and sailed to Spitsbergen. There was a fairly heavy swell outside the Norwegian islands, but when we approached Bear island the swell suddenly went down, evidently in consequence of pieces of drift ice scattered over the surface of the sea.

We lowered a boat and started seal-shooting, as many of these animals love to bask on the ice. But it is well known that the landing on a rock or the boarding of a vessel in the open sea can seldom be accomplished without considerable difficulty. I myself have had some experience in the matter. Once, when I thought that the sea was perfectly calm, I tried to land on a skerry south of Iceland, formerly known as a rookery for great auks (*Alca impennis*). But though there was no perceptible swell on board the vessel, yet on coming to the skerry the breakers were so tremendous that we had great difficulty in escaping being swamped. Our voyage to Spitsbergen in 1858, in the small smack, which was a bad sailer, was troublesome in the open sea, so when possible we sailed close to, or rather within, the ice-belt, and it was then that I was able to see and to examine critically the astonishing phenomena in question. The same observations were made by me during the expedition of 1861, on the schooner *Æolus*. We anchored in lat. 80°, and organized excursions by boat to the Seven islands.

During these trips I had many opportunities of noticing the enormous difference it made whether we were in open water, or whether we were protected by a narrow belt of small fragments of ice. I noticed this phenomenon on a somewhat larger scale during the expedition of 1864, when the circumstances were greatly in favour of observations of this kind. I went to Spitsbergen then on a schooner-rigged gunboat of twenty-five tons burthen, a very small craft indeed. The object of the expedition was to complete the survey of the measurement of a degree of latitude which was to pass over Spitsbergen from north to south, a work which was begun as early as 1861. For this work it was necessary to touch at as many places as possible on the coast—there was no archipelago off these shores, so that when the sea was quite open, it was very difficult to land; but when we met with a place where the seaboard was hemmed in by scattered fragments of ice, there was no difficulty at all in landing, and the small vessel sailed on in a sea that was almost perfectly calm whenever it could get within a belt of ice. In 1868 I made observations again on this subject, but they were of another kind. I then wished to proceed northwards from north-west Spitsbergen, from about the spot where Andrée's balloon-house is. Our vessel was stationed there. I wanted to go further north in September or October, because the polar-basin ice was supposed to be less closely packed at that time than during the summer. Several attempts were made to penetrate further north from this anchorage, even after it was evident that at that time of the year there was but little prospect of getting very far.

We had plenty of coal, and our vessel was a small steamer well known in Sweden, but at present belonging to Finland, and still sound and seaworthy. This little boat, the *Sophia*, has gone through many vicissitudes. As a soldier feels pride in the wounds he has received in defence of his country, so we can say of the *Sophia* that she can pride herself on the many adventures she has undertaken, and in which she has always escaped foundering, thanks mainly to the excellent material of her hull, which is made of first-rate Swedish iron. We steamed northwards several times from lat. 80°, or, more correctly, lat. 79° 40′.

During the first 30 or 40 miles the water was free from ice, and the swell often very heavy; but when once in the ice, or, at any rate, after passing the border of the drift-ice, the sea became less rough, until at last there was a complete calm. These excursions were long favoured by good fortune, but on October 4 we had the misfortune to collide—north of the 81st degree—with an iceberg, which knocked a hole in the ship's side, and we had a very narrow escape indeed.

This calamity, however, was most interesting from a scientific point of view. The ship was just within the ice-belt, where heavy seas broke, and therefore made it very unpleasant; but had we gone only a few cable-lengths further on, we should have been in perfectly smooth water.

In 1870 I undertook a voyage to Greenland, and was then able to make similar observations, though under very different circumstances. I went to Greenland on a Danish merchantman, the *Whale*. The passage was a very slow one, so that my time for work was but short. On being landed at Godthaab, I spent that part of the summer which remained at my disposal mostly in a boat, sometimes a whale-boat, and sometimes an Eskimo skin-boat, called "umiak." These may have many excellent qualities, but are not particularly seaworthy. The coast is very open here, and the sea often very rough if the fairway is not sheltered, either by stranded icebergs or else by drift-ice. During my trips in these waters this often proved to be the case; so these excursions were most agreeable, and I could land where I wished. At last I made land excursions in the daytime, sleeping at night in the "umiak," when the Eskimo rowed me further along the shore—which could be done without the least difficulty, as the sea was quite calm, in consequence of the ice drifting along the coast.

Then came a new expedition in 1875, this time undertaken in a small Norwegian whaler, the *Proven*, which was of the measurement of about forty-three tons. We sailed first to Novaya Zemlya, then passed along the coast of this island, and finally sailed over the Kara sea to the Yenisei. Along the west coast of Novaya Zemlya there is no archipelago, only a skerry here and there, so that it was very difficult to land where the sea was open; but if an ice-belt lay outside, the sea was perfectly calm. The southern part of the Kara sea was pretty free from ice, as was also the middle part, consequently the seas were very heavy; so, as often as opportunity allowed, we went inside under the lee of the ice-belts we encountered, and invariably found smooth water. I experienced precisely the same conditions in my voyage of 1876. That the sea can be very rough in these waters, or, at any rate, for such small craft as I sailed in, I experienced in 1875, when I went up the Yenisei. A heavy sea set in up the river from the mouth, which was free from ice, and caused us much difficulty in landing by boat.

Then in 1878 came the *Vega* expedition. However, we then passed for the most part through tightly packed masses of ice, so I cannot say that I have any important observations bearing on this subject from this voyage—at least, as far as I can remember at present.

In 1883 I again went with the *Sophia* to Greenland, and again I had an opportunity of making observations in the same direction, and even of another kind than those I had previously made. I passed along the north-west coast of Greenland, and anchored in one of the deep fiords which have penetrated far into the land. While I made an excursion on the inland ice, the *Sophia* with part of the expedition was despatched still further north to Cape York. An English whaler was crushed to pieces by the ice on her way, but the *Sophia* reached her destination and returned unharmed. Later on, the *Sophia* had hazardous adventures in the long fiords that intersect the west coast and the southern extremity of Greenland. I then proceeded in the direction of Iceland. As is well known, some northern colonies existed since the tenth century in Greenland, though discussions have arisen as to their exact position. I myself, at any rate, hold in this matter a different opinion from most other investigators of Greenland. At first it was considered that these colonies lay opposite Iceland. At the close of the sixteenth century, the Danish kings wished to regain their old lost colonies, and therefore despatched expeditions from Iceland to the east coast of Greenland, of which the first set off in 1579. It was unsuccessful, and so were the numerous expeditions, often equipped with the greatest care—numbering, if I remember rightly, eighteen in all—which during the three subsequent centuries were despatched to these waters, chiefly from Denmark. Of these I will only mention the very latest—the French expedition in the frigate *La Lilloise* under the command of Blosseville, which was lost with all hands; Sir Leopold McClintock's in the *Bulldog*, and Sir Allen Young's in the *Fox*, both returning with damaged vessels without being able to reach the coast of Greenland opposite Iceland. Their failure was caused by the difficulty of breaking through the mighty barrier of drift-ice and icebergs which surrounds this part of the coast of Greenland. There is a constant swell at the edge of the ice-belt; huge icebergs roll up against mighty stretches of bank-ice, and thus form an ice-mill that no vessel had been able to penetrate for three hundred years. A few years before my voyage in the *Sophia*, a celebrated Danish arctic navigator had declared in print that the passage was utterly impossible, and both Sir Leopold McClintock and Sir Allen Young sent me warnings when they heard that I intended trying my luck at this spot. Relying, however, on smooth water being reached immediately within the outer fringe of the ice-barrier, and that all danger would soon be passed if only the vessel steamed boldly ahead, I hazarded the experiment with my small craft, and succeeded. Where the conditions were favourable, I steamed right ahead. When in among the rolling icebergs and ice-fields, it seemed at moments that all was lost and destruction certain; but immediately after, when the outer belt was duly passed, everything was calm and still, and all danger was over. Over the pretty considerable expanse that intervened before land was reached, we sailed on through ice-fields which were driven along the coast in a southerly direction. Now and again a huge iceberg, owing to the influence of under-currents, went its own peculiar way, driving away the enormous ice-fields like froth, and leaving broad lanes in which there was no trace of swell, and in which the *Sophia* could calmly steam along to a very pretty haven which lay on the east coast of Greenland opposite Iceland, and which I christened King Oscar's haven. After a short stay there I again steamed away, and had the same agreeable and calm sea until we sailed into the outer fringe of the ice-belt. There a very violent and dangerous rolling occurred among the icebergs and floes, when the deck-house was damaged by being nipped between two tossing ice-floes. The vessel, however, suffered no further injury.

Thus, during my farewell visit to the arctic seas, I was enabled to observe on the very largest scale the lulling effect of floating masses of ice on a heavy sea.

Once more I must lay stress on the fact in question having been observed a long time ago, as also on its having been the direct cause of attempts being made to use floating breakwaters for the protection of harbours. The literature concerning projects in this direction is very difficult of access. A Bluebook issued by the English Government is the best I know of. The House of Lords appointed in August, 1860, a committee to investigate "how far it may be practicable to afford better shelter for shipping upon our coasts than is at present afforded, by the adoption of some plan for the construction of breakwaters and harbours less costly and better adapted for certain localities than the system of solid masonry hitherto in use." The committee consisted of a duke, four earls, and eight other members of the House. Some of them were certainly sailors, and, at all events, the committee performed its duty in a most praiseworthy manner. Various persons who had experience in the matter were called before the committee and questioned. Their separate testimony is entered fully on the minutes, so that a precise idea is obtained as to the opinion and vote of each person on the matter. Among those examined were the most celebrated seamen and harbour constructors, as well as others, who evidently were no great specialists, but, on that account, perhaps, richer in imagination. From the report of this committee, it seems that in some places—more especially at one spot in France—experiments have really been made with floating breakwaters, but have led to no satisfactory results. This is, in my opinion, owing to the fact that they have disregarded the manner in which the sea acts, and have made attempts to protect the harbours by a few gigantic breakwaters. These have been anchored in suitable spots outside the harbour with the intention of thus affording the desired shelter. However, the difficulty has been that no chains ever yet made have held. When these huge masses have been anchored for a time, the chains break at last through the constant tension to which they are subjected. Attempts have been made to replace one strong chain by several smaller ones, but this also has proved a failure, as the chains snapped one after another, and, owing to this, these floating breakwaters presented a real danger, but no practical shelter to the harbour.

Let me further call to mind that similar breakwaters on a smaller scale have also been utilized in the northern countries. As a specialist has observed, we in Sweden have employed weather-rafts, which have been placed with the view of sheltering a boat or an anchorage. However, here again there were difficulties to be encountered in anchoring the probably enormous rafts. This is a great disadvantage, and, from what I have been told, they do not seem to give any really satisfactory shelter. Any one, however, who has had the opportunity of closely observing how the floating pieces of ice, in spite of their insignificant size, affect the sea, must feel that this effect is not caused by the momentum of the fragments of ice, nor yet by their size, but that their effect consists in disturbing the waves and causing a change in them, both as regards their length, height, and direction. Now, when several such waves, which differ in their nature and direction, meet, their momenta destroy each other, and there arises what is called in physics "interference." The fundamental reason why these loose fragments of ice so completely calm the movements of the waves must accordingly not be sought in the fact that the power of the wave is absorbed, but in the circumstance that the waves are irregularly deviated in different directions, and then interference arises. Should this take place under very favourable circumstances, two waves, even though of enormous size, can neutralize each other. The same thing is observed in optics, where, under certain conditions, two waves of light do not increase, but diminish or destroy each other. If these observations are correct, it is evident that fresh attempts should be made to give shelter to a harbour by laying out, not a few large, but a number of small, floating breakwaters. Probably a large number would be needed, but a harbour is an expensive piece of work, and is well worth a considerable outlay. When a certain harbour was in course of construction here in Sweden, I made a proposal that an experiment should be allowed in this direction. I came too late that time, but I shall try to raise the question again, so that experiments may be made on a small scale at one of our harbours, in order to ascertain whether, by surrounding the harbours with a large number of small floating breakwaters, a satisfactory shelter can be obtained for vessels or for the moles of the harbour. On our coasts, where our skerries are a natural protection against sea and storm, a harbour of refuge such as I have proposed is needed in but few places. Few countries, however, are in this respect so fortunate as Sweden and Norway. The coasts of other countries are generally open to the sea, so that a shelter for vessels on the above-mentioned principles might prove of inestimable value.

A. E. Nordenskiöld.

A JOURNEY THROUGH THE KHINGAN MOUNTAINS.*

By Dr. A. DONALDSON SMITH.

When we started north from Peking on May 19, 1897, *en route* to Mongolia and Siberia, it was our intention to travel through that part of the Khingan range which lies between Dolon Nor and the upper branches of the Nonni river, and to eventually reach the Amur. We were successful in this, and although we were disappointed in not getting much shooting, we managed to collect over a hundred different varieties of moths and butterflies, besides many birds and other natural history specimens. For the reason that the journey was undertaken for pleasure, I did not attempt to make a minute survey of the country, so that the map which I have presented to the Society, and which is based on rough compass work, is subject to errors in regard to the exact positions of the places I have marked on it. The Europeans of the party consisted of Mr. J. E. Farnum, Mr. G. L. Farnum, and myself.

At first our journey led us through the flat basin lands which have been formed to a great extent by the alluvia brought down by the tributaries of the Pai Ho, and which are under a high state of cultivation. Villages, consisting of about thirty houses each, occurred at intervals of two miles, besides the occasional larger towns of a thousand or more inhabitants. In and about the villages grew clusters of tall elms, pine trees, and willows, but with these exceptions scarcely a tree was visible. A strong wind blew constantly from the north-west, laden with the finest dust that the Mongolian plains can boast of, and this, together with a scorching sun, had a tendency to reduce the length of our marches at first. As Dolon Nor, or Lama Miao, is a large trading centre between China and Mongolia, inns are to be found 12 miles apart, where eggs and plenty of fresh vegetables can be procured for strings of cash or copper coin. On our second march we crossed a small stream called Sha Ho, and later a tributary of the Pai Ho near the large market town Nu Lan Chan. The Pai Ho is only about 50 yards wide here, but it is subject to enormous floods, as are all the tributaries of the great river at Tien-tsin. The following day the mules had hard work dragging the carts along a sandy path by the side of the Pai Ho, but later the road swung away from the stream, and we found ourselves approaching the base of the great mountain system which forms an escarpment to the almost boundless plains of Mongolia.

We passed two quaint old towns called Mi Yuen Chan and Shi-Hia, both of them surrounded by well-preserved walls, relics of the Ming dynasty, but now almost deserted and very dilapidated in the main part. Entering a broad valley, we were now delighted at the change of scenery from the monotonous, cultivated, and dusty plains. The

* Map, p. 589.

valley was surrounded on three sides by mountains 2000 feet high, presenting very fine rugged lines, and green to their summit. There were a few clumps of trees about the defiles, but the mountains were in other respects more free from wood than the hills of Scotland, covered with a low shrub only a foot high, and luxuriant grass that affords nourishment to vast flocks of sheep and goats. A rough stony road at the end of the valley led up almost to the top of the mountains, and through a very

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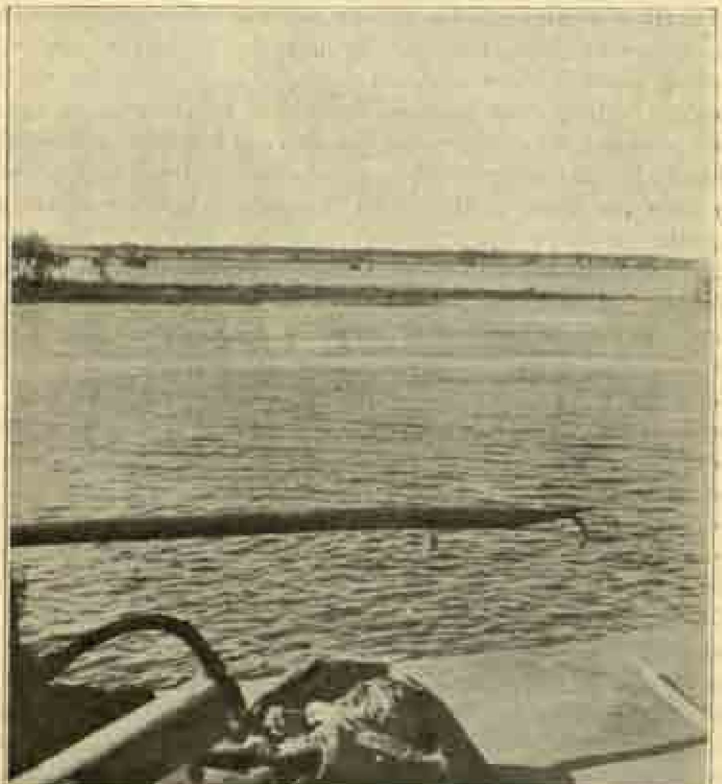
ornate and massive gateway called "Nan Tien Men," or "South Gate of Heaven." Descending one or two turns of the road, we now entered the town Ko Pi Kau, where we found ourselves surrounded on all sides by the Great Wall with its numerous ramifications, which extended like the arms of a giant octopus over mountain and valleys as far as the eye could follow them. Leaving the Great Wall on May 24, we wound in and out of the mountains and along a broad river-bed, to the busy town of Lu Hai Kau. From here those that were mounted set out ahead of the carts, riding first over one pass 2000 feet high, and then over another of about the same height, each pass surmounted by a quaint Josh temple.

The next day's march (27 miles) afforded us beautiful mountain scenery. We crossed one pass, 2411 feet high, that reminded me much of the Stelvio, on account of the numerous windings of the road which could be traced from the summit deep down to the bottom of a narrow and rugged valley. From here on, till we reached Siberia, we heard much of robbers, and occasionally caught sight of a few; but we did not fear them, as they are not eager to rob Europeans, and especially a party as well armed as we were. The brigands, however, are a source of constant dread to the inhabitants and to caravans, since they are well armed with Mauser rifles, and have strong swift ponies. Passing down through the narrow gorges, we came to the river Hang, which wound its way through a broad fertile valley, in which lay the town of Lu Chia Yang, where we found a good inn to stop at for the night.

On May 27 we climbed gradually through beautiful valleys, following the windings of the Hang Ho, or "Dry river," and had the pleasure of meeting Dr. Eugen von Cholnoky, professor of geography in the University of Budapest, who had made a journey to Khalgan and Dolon Nor, and who was now on his way back to Peking. He reported very cold weather at Dolon Nor. We were now enjoying very comfortable weather, the mercury usually falling as low as 45° Fahr. at night, and rarely rising above 75° in the daytime. The second march after this we came to a small village 6 miles beyond Ku Chia Tuen, where a path diverges a little towards the left, and afterwards meets the main road 10 miles further on. Hearing that this path lead to a lama temple, Mr. J. E. Farnum and I left the caravan and followed it. We reached the temple, which is called San Ti Ying, and discovered that the buildings were not very large, although picturesque. Leaving the temple, we rode a little west of north over a very steep pass, till we joined the main road again and caught up with the caravan, which was having difficulty in negotiating a bad bit of marshy ground. Although a long time on the road, we only covered a distance of 14 miles on this march, stopping at Pan Pi Shan for the night; but we made up for this the next day by travelling all the way to the large town of Ku Men Tzu, which is situated 40 miles beyond Pan Pi Shan, and 30 miles south-east of Dolon Nor (distances are given in English miles by road). On the last day of May we climbed to the high plateau of Mongolia, trotted rapidly for a few miles over a plain as flat as a billiard-table, and then entered the large town of Dolon Nor, where we were destined to spend ten days. Leaving Dolon Nor on June 10, we made three short marches to a little village called San Lao Ho Tzu (37 miles), in the outer imperial hunting-park. The valleys were broad, and intersected only by low ranges of hills about 1000 feet high, and not a tree or bush even was visible. The inhabitants numbered scarcely forty to every 10 square miles, and these were poor and thriftless, consisting of petty farmers or sheep, cattle, and pig drivers. The only fuel we could get was the dried refuse of cattle or camel stalls, which gave our cook much trouble, until he caught the trick from the Mongols of digging a slanting trough in the ground, in which a fire can be made with *bois de vache* hot enough to melt silver. On June 18 we started off at a very slow pace. A day of hard rain had made the road muddy, and the cart was a source of much annoyance. All our servants, excepting No. 1 boy, were slow



THE FLOODED NONNI.

lazy, and discontented. It took them two hours to load the camels every morning, a job that my Somali boys used to accomplish in Africa in twenty minutes. After a 6-mile march we came to an encampment of Chinese, who were tending some thousand or more camels for the summer. Their camp presented a busy scene, for they were covering the camels with tar-oil from head to foot, at the rate of one in every five minutes, and pulling away the few remaining masses of last year's wool that still clung to some of the beasts. Camels are worked in this part of the world nine months of the year, and they are then allowed to rest for three months, after having been given a coat of tar to heal their sores. They are at their worst in June, when their holiday season begins; and, although ours were in exceptionally good condition, they showed nevertheless the result of a long winter's work, when they had to labour many hours daily with 400 or 500 lbs. on their backs. Yang Shon Pai is a little police-station, situated on a high plateau near the top of the Khingan range. The main range runs directly south-west from the Amur river, until it merges within the eastern extension of the Nan Shan chain north of Peking; but it throws out many flying buttresses, as it were—mountain chains that run far away to the east, so that a man travelling through these offshoots might mistake them for the main watershed. The plateau lands are situated at an elevation of approximately 5000 feet, while the peaks rise to 6500 feet, and occasionally to 7000 feet; but the mountains do not seem very high to one approaching them from the west, as they form the eastern bulwark of the great Mongolian plateau, which is in itself more than 4000 feet above the sea-level. On our next march we crossed an almost flat bit of country at an elevation of 5000 feet, passing several little springs and rivulets flowing south-east into branches of the Pei Ho, and then after 15 miles the road led us through a narrow valley between high mountain peaks to a small settlement of Mongols and Chinese, called Hai Mu Ku. The valleys were here covered with trees, as well as the northern slopes of the mountains, and in consequence of this there was considerable game about, in the shape of the small barking deer, called "pause" by the natives; the larger spotted deer; the Manchurian wapiti, or "lou;" and wolves and wild cats. The forests were composed of spruce, birch, larches, and a few maple trees.

On June 25 we made a short march of 9 miles to the middle of a broad grassy undulating plateau, 6102 feet high, where there was a small pond of rain-water. The next march took us over a pass on the eastern side of the range, to the village of Chang Ku Tai, where there is a stream 50 yards wide, and a good road running eastward along it. After this there was a low stony pass to cross to a narrow valley, in which was situated the little village of Tsao Hu Ku. The mountain peaks on either side of the valley were very jagged and bare, and differed much from the broad rounded mountain-tops we had seen ever since we left Dolon Nor, although they were geologically the same, being of ancient volcanic origin. At the end of the valley there arose a little stream that gradually widened as it flowed north into the Shi La Mu river, and about this brook hovered myriads of beautiful butterflies and moths. They were remarkable, not only on account of their numbers, but also by reason of the great variety of species they represented. Until we arrived on the eastern slope of the mountain range we saw few butterflies, but now we were kept very busy with our hand-nets till we reached the end of our journey. It was different with the birds, for, although we shot about forty different varieties between Peking and Dolon Nor, we were only able to increase our collection by a dozen more species before reaching the Amur. Of flowering plants there was an infinite variety throughout the entire length of our journey, but these were especially beautiful on the high plateaus, where they made a display such as I have never before witnessed. Warm weather was in

THE RIVER TSHOR AT PU LA SU KU. LAMASERY IN THE DISTANCE.

store for us as we gradually descended to lower levels. The mercury rarely fell below 63° at night, while the maximum for the daytime was 90°, and during the whole month of June we only experienced three days of hard rain, besides half a dozen light showers.

A couple of marches now brought us to the confluence of the Shi La Mu river and the Pao Li Ku Ho, two streams each about 30 yards broad and 3 feet deep in the dry season, but which often rise in the spring and autumn with wonderful rapidity, overflow their broad sandy beds, and cause death and destruction throughout the country a long way inland.

After following the Pao Li Ku Ho for 10 miles, we came to the large town called Ching Pong, which is situated at the foot of a low range of hills where two valleys meet. The inhabitants numbered about 5000, and are mostly Chinese. There is a lamasery, containing one hundred priests, on the outskirts of the town, but with this exception one sees very few Mongols. Vegetables, such as beans, onions, pumpkins, peas, spinach, radishes, and carrots, are raised near the town, and many acres are planted in maize, sorghum, millet, wheat, and oats. Most of the things in daily use among the Chinese, as well as among the Mongols, are manufactured here, and there is also a considerable trade with Dolon Nor and Jehol. There were many apricots in the markets, imported from the latter place, and a fish resembling perch, salted and brought from the fresh-water lake Talka, which lies to the west beyond the mountains.

We rested three days at Ching Pong, and then made two marches north-north-east, passing many villages with a mixed population of Chinese and Mongols, to the small town called Long Shan, where there was a hot sulphur spring. On this march we followed the river Pao Li Ku to its sources, 14 miles from Ching Pong, and then, crossing a low pass, came to a little stream flowing north. The supreme prince of eleven provinces of Mongolia, Mau Nau Hang Wang, was camped at Long Shan with his nephew and a guard of fifty soldiers. It was his custom to spend twenty-one days of each year of the spring to take the sulphur baths, camping close to a number of lama temples, in which there were tubs reserved for nobles. Immediately upon our arrival the prince sent word that he would like us to stop the next day and visit him, accompanying the message with a present of a sheep. Accordingly, the following morning we rode over to the Mongol camp, and were received by the prince and his nephew in a most courteous and hospitable manner. The royal tent was rectangular in shape, and had a top that resembled much the roof of an ordinary Chinese house—flat in the centre, and curving gracefully towards the sides and corners. It struck me that the Chinese may have got the design for the pretty lines of their roofs from tents like the one I have described.

Prince Nau Hang Wang is a slender man, forty years of age, with very bright, intelligent eyes and aquiline features. He is descended from a long line of noble ancestors, and on this account, as well as on account of his being suzerain to eleven other princes of Mongolia, he is held in high esteem at the court of Peking. He seemed very desirous of having a large army under his command, and he has lately sent two agents to Europe to purchase the most improved modern rifles. He asked me if I could not suggest some means of increasing the efficiency of his troops in keeping down the robbers, to which I replied, that the first step to be taken in that direction would be to pay the soldiers sufficiently that their existence should not depend upon bribery. No more questions were asked after this regarding the constituted forms of Chinese government, but several hours were spent in pleasant conversation on general subjects, the prince paying us a long visit in our tents in the afternoon, and bringing presents of oily sweetmeats.

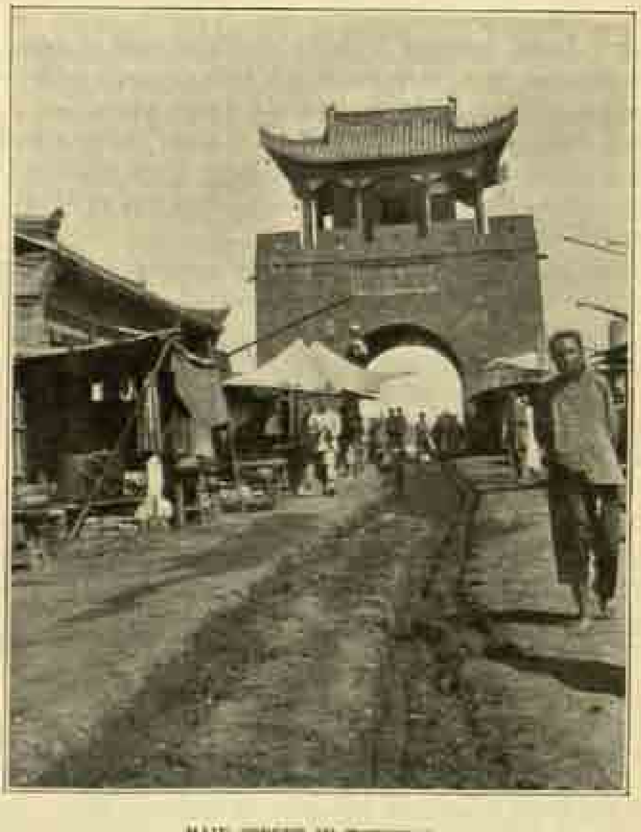
Leaving Long Shan, we made three marches in an eastwardly direction to the village of Sa Pa La Lai, crossing several valleys and fording

AT THE JUNCTION OF THE AMUR AND SUNGARI RIVERS.

three small streams. We were now in the province of Parin, and near our camp was a military parade ground and a tower, from the top of which the prince of Parin was supposed to review his troops. We stopped at Sa Pa La Lai more than a day, and made a little side trip to a group of mountains, 6000 feet high, which lay immediately to the south of us.

Our next two marches were through an uninhabited country as far as the little Mongol village called Hu Pu. Here there were no Chinese whatever, and the round latticed tent of the Mongol took the place of mud houses. We were destined to meet no more Chinese now for several marches, and we were glad of the change, for the Mongol is a much more agreeable person to deal with than his almond-eyed neighbour. We were treated with much hospitality whenever we visited a Mongol's camp, being offered anything there was in the tents to eat or to drink. The native food is repulsive to European palates, consisting of very sour cheese, spirit made from milk, hot bread, and cakes composed of millet or poor wheat flour, sour milk, and a concoction which is called "tea" by the Mongols, but which is nothing but boiled sour milk flavoured slightly with tea.

Ever since the Mongols were conquered by the Chinese, it has been the plan of the latter to keep their neighbours in the north as much under their thumbs as possible. These are not allowed to cultivate the rich soil of their valleys. A little less than half the male population is obliged to take priestly orders, and in the event of war in China many of the remaining adult males are drafted into the imperial service. Every facility is offered to the Chinese to emigrate to Mongolia, and these are spreading northwards so rapidly, that in a few years it will be difficult to find a Mongol in Eastern Mongolia. The rich and luxurious princes and barons are only too willing to bow down to the Chinese authority, that they may continue their easy existence. The land is the property of the nobles, and on this the poor Mongol is allowed to exist under sufferance, as it were. The Mongols whom we saw could scarcely be called nomads. Many of them do not move their tents at all, while the others merely change their quarters from one side of the valley to another according to the season; perhaps camping on the side of a hill to avoid the swarms of flies in July and August, and in winter-time choosing some spot which is sheltered from the north-west winds. Every tent is guarded by three or four savage dogs, which make it very unpleasant for the passer-by, and, indeed, dangerous to any one approaching them unarmed. The villagers are rich in ponies and cattle, and also raise a few sheep and goats. After leaving Hu Pu, we travelled 16 miles to a village situated at the edge of a "hunting-park," which marks the boundary between Parin and Wu Chu Men Ching provinces. Just below the village two streams unite, the larger of which is the Cha Hau Mu Lun, and at their junction a tall white tower rises about 50 feet in the air, built of stone and plastered; but all the natives could tell me about this was, that it had been built several generations ago to the memory of a deceased lama. From here a road leads across the mountain range to the desert on the western side, and then turns north. This is used by the salt caravans coming from the north-west, and from the reports furnished me, that the mountains can be crossed in one day's march at this point, I believed there was a considerable gap in the latter. Here also the most northern branch of the Great Wall, composed principally of mud, with a few stones indiscriminately mixed, and only 10 feet high, winds its way across the mountains. I was informed that this structure, which we crossed again a little further on, is connected with the wall dividing Korea and Manchuria, and that it is projected all the way to Tibet. Immediately to the north of Pai Lu Tzu, a tall chain of mountains, much broken in places, stretches far to the east, and the road which we now followed took us over a pass through these mountains



MAIN STREET IN TSITSIHAR.

at the height of 5400 feet. On reaching this elevation, we stopped for nearly two days in a valley by the side of mountains 7000 feet high. This part of the country was very thinly populated, camps consisting of half a dozen tents occurring at intervals of every 20 miles, and there were many robbers about. We saw some of these gentlemen occasionally, but they did not trouble us in the slightest degree. The only things to annoy us now were the flies and mosquitoes, which made their appearance in ever-increasing swarms, and which continued to be our constant companions till we reached the Nonni river. In the so-called "hunting-park" we saw, for the second time on our journey, a number of well-wooded valleys, and we were told that there were argali in the mountains; but we failed to find any signs of either wild sheep or goats, our bag consisting of only one spotted deer. The mountain streams contained several varieties of small fish, which we collected for scientific purposes, but none of them afforded us any sport excepting the ubiquitous chub. It surprised me that we found no trout, either in the streams flowing into the Yellow sea or in those emptying into the Nonni.

On July 14 we marched 23 miles to the village of Lung Ku La, which is situated in a very broad flat valley near a large lamasery. There was a festival in progress at the latter place, and it was an interesting sight to see the Mongol girls, their features and figures resembling German peasants, but clad in green blouses and red trousers, dashing about the plain like circus riders, often two or three together sitting astride of the same pony.

The next four marches took us through a country much cut up by low mountain chains and grassy round-topped hills, our course now changing more and more towards the east. The valleys were usually broad and flat, and contained villages of comparatively large size; that is to say, they consisted of groups of fifteen tents. Leaving a village which rejoices in the name of Ta Lai Hu Shu on July 19, we made three marches, one of them at night through an altogether uninhabited valley to the large settlement of Ho Yen Ko La. A journey of a couple of days more brought us to a village in the hunting part of Cha Se Tu province, where there were a few mountains sparsely covered with trees and apricot bushes. The natives grind the stones of the apricots, which grow wild in many parts of this country, into powder and use this as food. Just before reaching the village, and again soon after leaving it, we crossed the Great Wall, which here forms a loop.

On April 6 we arrived at a village on the Guileli river, where, besides a few Mongol tents, there were houses built of clay, and where we met the first Chinese we had seen for eighteen days. Each house was surrounded by a garden, in which grew cucumbers, beans, and maize, but there were no cattle or ponies. Many of the inhabitants earn a living by cutting down the small trees which are plentiful on the mountains, and selling the poles and carts which they make from them, while the remainder hunt wild pigs and deer. The mountains here began to disappear, and the valleys broadened out into great plains. Another march brought us to the village of Tu Ye, on the Tu Ye Ho, or river "Torre," as it is called near its junction with the Nonni. The river divides into three parts at Tu Ye, each outer branch being 35 yards wide, and from 2 to 4 feet deep. We managed to ford these streams without the use of a boat, but in times of flood everything must be taken across in "dug-out" canoes.

On July 29 we had another larger river to cross, the Chau Ye Hö, called the "Chor" in the south. Where we encountered it, at the village of Hu Ku Li, it was split into four branches. After three more marches we reached another large river, the Ya Li, which we crossed by boat; and then there lay before us a great treeless plain, marshy in places, and intersected by a small river, the Ko Li Er. We passed several thriving Chinese villages on our journey across this basin of the Nonni river, and saw considerable land under cultivation. On August 5 we arrived at the banks of the Nonni, and camped near some villages lying opposite to the town of Tsitsihar. The latter place is called by the natives "Bu Kui," and the name "Tsitsihar" is given by them to a town, which I was informed lay 3 miles to the north of us, on the western bank of the river Nonni. The Nonni, which is usually only half a mile wide, was nearly 10 miles wide when we reached it. Although we experienced only five rainy days during the month of July, heavy rains must have fallen in the mountains to the north of Tsitsihar. We stopped four days before the ferry boats dared to take us across the flooded river; and then, when on August 9 we got all our animals and baggage aboard one of the large flat-bottomed boats, resembling a canal boat, we were obliged to spend eight hours in poling and rowing before we reached Tsitsihar. I will pass over the rest of our journey, since we had now reached a town where there are telegraph stations.

THE CENTRAL ANGONILAND DISTRICT OF THE BRITISH CENTRAL AFRICA PROTECTORATE.

By ROBERT CODRINGTON, Collector of Central Angoniland, B.C. Africa Protectorate.

The Central Angoniland District of the British Central Africa Protectorate * comprises an area of about 6500 square miles, and is bounded on the east by Lake Nyasa; on the south by the Portuguese territory north of the Zambezi; on the west by the country of the Angoni-Zulu people, owing allegiance to Mpeseni and falling under the influence of the British South Africa Company; on the north by a line forming an ethnographical boundary with the Marimbe district of the Protectorate. The boundaries to the south and west are determined by the watershed of Lake Nyasa, all of which falls within the Protectorate.

The part of the coast of Lake Nyasa which forms the eastern boundary of Central Angoniland is well provided with roadsteads, of which Domira bay is the safest and most convenient; very serviceable

* Long. 34° E., lat. 14° S.

anchorages are also found at Kajulu, Rifu, Leopard bay, Maganga's, and Kachinda-Moto's. Except at Rifu, where there are three isolated hills, the lake-shore presents a low sandy beach bordering a fertile and somewhat marshy plain, sloping gently for from 15 to 20 miles to the foothills of the Kirk range, where the land rises abruptly from 1600 feet to a plateau averaging 4000 feet above the level of the sea, studded with granite peaks rising to 6000 and 7000 feet. The higher part of the plateau, which lies to the south and south-west, is a rolling fertile plain, somewhat deforested by the requirements of a dense population; the lower part, which lies to the north, is almost entirely deforested, of a less fertile character, and much more uneven. To the west the plateau runs down to the sources of the Bua river, becoming less rugged and more fertile. Belts of valuable timber exist, especially in the foothills of the Kirk range. The country is drained by several rivers of considerable volume, several of which, converging at various points, subsequently, under the name of Lintipi, flow into Lake Nyasa. This river if only navigable for canoes for about 15 miles from its mouth when swollen with the rains.

There is no monotony in the landscape, which, indeed, presents many picturesque features. The austerity of the granite peaks of the plateau is pleasingly relieved by green-edged mountain rivulets, and native huts perched wherever foothold can be found. From the Kirk range is displayed a magnificent panorama of Lake Nyasa, and from the lake-shore the wall of mountains, often cloud-capped, rears itself on the one hand, whilst the broad expanse of the lake stretches to the islands and headlands on the other.

Big game is abundant in the less populous parts, and many elephants are killed every year towards the Bua river. The kudu, water-buck, and impala are commonly met with, and more rarely the buffalo, eland, and sable antelope. Lions and leopards are very numerous and cause considerable loss of life, as do the crocodiles and hippopotami in the rivers and lake.

Large herds of cattle, sheep, and goats are owned by the Angoni, and are noticeably free from disease, although the herds on the plateau undoubtedly thrive better than those of the lowlands. Horses have not yet been introduced, but it is probable that they would do well if carefully brought up through the Shire valley. I have noticed tsetse fly in only one narrow forest belt between Lake Nyasa and Chewere's country.

The principal agricultural produce of the country consists of maize, sorghum, casava, rice, millet, sweet potatoes, varieties of beans and peas, cotton, oil-seeds, and tobacco.

Alluvial gold has been reported to exist at the sources of the Bua river, and a gold-bearing quartz in the Lintipi valley. Lead and graphite have been found; iron is generally abundant.

Good roads have been constructed connecting the residences of the various Europeans with one another and with the port of entry on Lake Nyasa. Some of the native chiefs are making and repairing roads through their territories in order to facilitate communication with the Administration stations, to which they are accustomed to come for redress of grievances and to pay visits of ceremony. The value of roads for the convenience of both European and native travel, and for the quick movement of troops should occasion arise, can hardly be overestimated. The African Transcontinental Telegraph Company's line is in course of erection, and will shortly serve for direct communication with the Government headquarters at Zomba.

ANGONI VILLAGE.

The Dutch Reformed Church of the Cape Colony have three mission stations in the district, with a staff of about ten Europeans. Their schools are everywhere well attended, but the instruction of natives in industrial work is not, unfortunately, a feature of their teaching.

As yet the cultivation of coffee successfully carried on in the Shire highlands has only reached the experimental stage in the country under review, but there is no reason to doubt that the foothills of the Kirk range are suitable for planting, whilst the advantage of cheap and abundant local labour will probably outweigh the disadvantage of more expensive carriage to the coast.

No systematic observations of climatic conditions have as yet been recorded, but I hope on my return to make arrangements for regular and accurate observations. On the plateau the months of June and

July are unpleasantly cold, and those of January and February unpleasantly damp. During the remainder of the year the climate may be truthfully described as delightful.

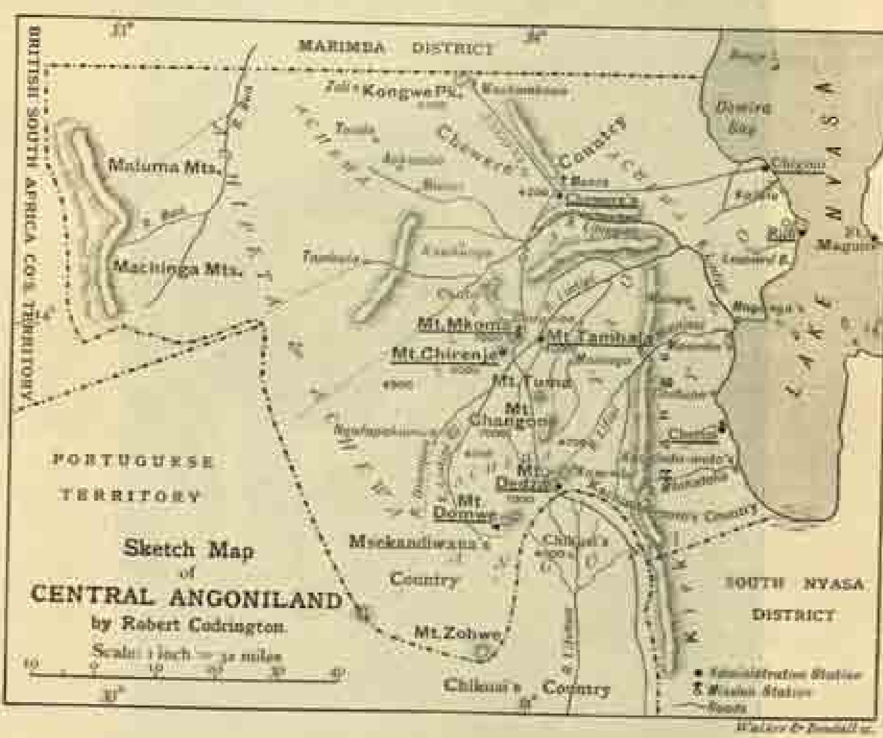
The few Europeans resident in the district, all of whom are engaged in missionary work and remain for the most part at their stations in the high country, have enjoyed as much immunity from African fever as can be expected in any part of the Protectorate. One death, however, from blackwater fever occurring after fourteen months' continuous residence on the plateau, seems to point out that exemption from this, the only desperately dangerous type of the disease, is not to be reckoned on even at an altitude of 5000 feet. It is not improbable that European settlers will be found, at a later date, willing to take up land for agricultural purposes on the healthier parts of the plateau, although the present difficulties and expenses of reaching the country, together with the absence of any available market for their produce, must, apart from the question of health, preclude any development in this direction for many years.

The native population of the district numbers approximately 250,000, of whom 20,000 are of the Yao race, and the remainder Angoni and Manyanja. The Angoni * are descendants of a Zulu tribe which migrated from Zululand and crossed the Zambezi about the year 1825, the majority of whom formed a Zulu kingdom south-east of Lake Tanganyika. Some of their number remained, as far as can be gathered, in the high country to the south of Mount Dedza, constituting a tribe ruled by a chief bearing the name of Chikusi. Some years later the Tanganyika country was abandoned, the several powerful chiefs composing the Angoni nation migrating to the high country west of Lake Nyasa, of which they forcibly possessed themselves and formed the separate kingdoms of Mombrera, Chewere, and Mpeseni. A tribe now inhabiting the country to the east of the Livingstone range, and known as Magwangwara, was also formed about this time. There are to-day three independent tribes of Angoni inhabiting the country of which I am writing, governed by chiefs bearing the names of Chewere, Msekandiwana, and Kachinda-Moto, the territories owing allegiance to each of whom I have depicted on the accompanying map.

To the first generation of Angoni born of the women of the conquered country, the language, dress, and customs of their Zulu progenitors have been handed down in a slightly modified form, although their language of everyday intercourse is purely that of their mothers. This class, which now forms the aristocracy of a nation which has embraced a great part of the original natives of the country, is being perpetuated almost entirely among themselves. Their dress is composed of a sporran of cat-tails, which is considered to meet the requirements

* Agoni, Abangoni.

of decency: whilst for purposes of warmth and display, a large sheet of cotton cloth, either of native or European manufacture, is thrown over the left shoulder, falling in folds around the body and leaving the right arm and shoulder exposed. When engaged in war and war-like ceremonials, kilts of cat-tails and skins are worn around the waist and sometimes over the left shoulder, together with a head-dress of raven's and cock's feathers. Their weapons are stabbing assegais, the shafts ornamented with the skin of a long-haired goat, and clubs or knobkerries. A shield of antelope or cowhide, exactly similar to that of the



Zulu and Matabele, is also carried. Their system of warfare is a survival of the Zulu customs, but the reputation for courage which they have acquired is probably beyond their deserts, which may be accounted for by the fact of their hostilities having seldom met with any determined resistance on the part of the timid people whom they have subjugated. Personal ornaments are much affected: strips of hide with the long hair hanging down are fastened on the leg below the knee and round the upper arm; armlets of the horny substance of the elephant's foot are worn, as are ivory bracelets by persons of distinction. Charms, sometimes in shells, or cases covered with beadwork, sometimes contained in the horns of a small antelope, are worn suspended from the neck or waist. Amongst the older people the Zulu head-ring of plaited hair and wax, in an exaggerated form, still survives, but is seldom seen in the younger generation. Holes are invariably bored through the lobes of the ears, and are often distended by blocks of polished wood or ivory. Ordinarily of an upright and independent carriage, they assume, on salutation of a superior, an obsequious demeanour, gently clapping their hands and calling out the word "Master," or, where such exists, the name

YAO WOMAN POUNDING MEALIES.

of the totem of the person addressed. Their chief wealth consists of herds of cattle appertaining to the chieftainship, and of flocks of sheep and goats, the property of individuals.

Their villages are large, and are composed entirely of circular wattle and daub houses, surrounded by compounds fenced in with reeds. The chiefs are possessed of arbitrary power, but in practice the advice of a numerous body of councillors is invariably sought in all matters of importance. These councillors, or indunas, are in turn responsible to the chief for the conduct of affairs in the various districts in which they exercise authority.

Their religious ideas take the form of worshipping the spirits of immediate ancestors, who require to be propitiated from time to time. The chief is, by virtue of his office, high priest, whilst a class of recognized medicine-men and witch-doctors are also possessed of degrees of priestly authority. The burial-place of the chief is beneath the dung of his principal cattle kraal, which is afterwards reduced in size, but

ANGONI WARRIOR.

continues to shelter a few head of his more valuable cattle. The propitiation of his spirit takes place at a tree or rock at some secluded spot in the vicinity of his village, which is in some manner dedicated to or identified with him.

The history of the Yao * people in Central Africa has, until now, been the history of the slave-trade. From their country, lying between the East Coast of Africa and Lake Nyasa, and on and about the Lujenda and

* Wa-Yao, Yaws, Ajawa.

Ruvuma rivers, they invaded and conquered the greater part of the Shire highlands, and although they in their turn were much harassed by Angoni and Magwangwara raids, they have, for the last forty years, occupied the country lying to the south and south-east of Lake Nyasa as far as the Blantyre and Mlanje provinces. They also obtained possession of much of the east coast of Nyasa, especially points advantageous for the working of the slave-dhows, which were built under the instruction of the Arabs, and in course of time villages were established on the west coast of the lake, whence the more enterprising penetrated some 30 miles into the interior.

The Arab slave-trader found in the Yao a willing and capable agent. Of splendid physique and ready intelligence, the Nyasaland Yaos were continually engaged with the Swahili-Arab coastmen in this traffic, until the decisive and final overthrow of both Yao and Arab power by the forces of the Protectorate, under Sir Harry Johnston's Administration in 1896. The form of civilization presented by the Swahili-Arab slave-traders is much appreciated by the Yao, who has readily acquired Mohammedanism. Although little understood and very imperfectly practised, the leading principles of the teaching of Mohammed serve to develop in his followers the virtues of sobriety, cleanliness, and self-respect. The perpetuation of this faith, which is, however, distinctly antagonistic to British influence and control, is a matter which receives considerable attention from the chiefs and headmen of the tribe. Schools for the instruction of their youth in reading and writing Swahili in Arabic characters are established in nearly every village, where also prayers are made at regular intervals during the day. Fasts and feasts are also observed. Consequently, the Nyasaland Yao is not at all inclined at present to embrace the teaching of the Christian missionary. Mohammedanism, however, although at present increasing, must eventually exercise less influence over the people as they come in closer contact with Europeans and have less intercourse with the Arab, whose mission on Lake Nyasa may be said to have terminated.

The dress of the Yao consists entirely of cotton cloth tied round the waist and reaching almost to the ankles, with the exception of Mohammedans, who affect the costume of the Swahili. Their weapons are the muzzle-loading trade musket, and knives with ivory handles fashioned by themselves. Personal ornaments, with the exception of ivory or metal bracelets, are not much worn by the men, who, however, like to cover their heads and shoulders with gaily-coloured calico. The women make and wear a considerable quantity of beadwork, in girdles and combs; coils of heavy brass wire are often worn on the arm below the elbow, and sometimes heavy brass anklets. The hideous lip-ring is seen rarely, but the ivory or leaden nose-pin fixed through one ala of the nose is very common.

The authority of the chief is seldom exercised without the approval of his advisers, and is generally respected. Flocks and herds are not extensively owned by the Yaos, who, however, cultivate, in addition to the crops common to all parts of the country, rice of excellent quality, introduced from the East. Since we have demonstrated our ability and determination to control them, the Yaos are rapidly asserting themselves as valuable material for soldiers, police, and artisans.

The Achewa people, including the Achipeta, Achikamtunda, and other divisions of the same race, are of the Wanyasa or Manyanja stock,

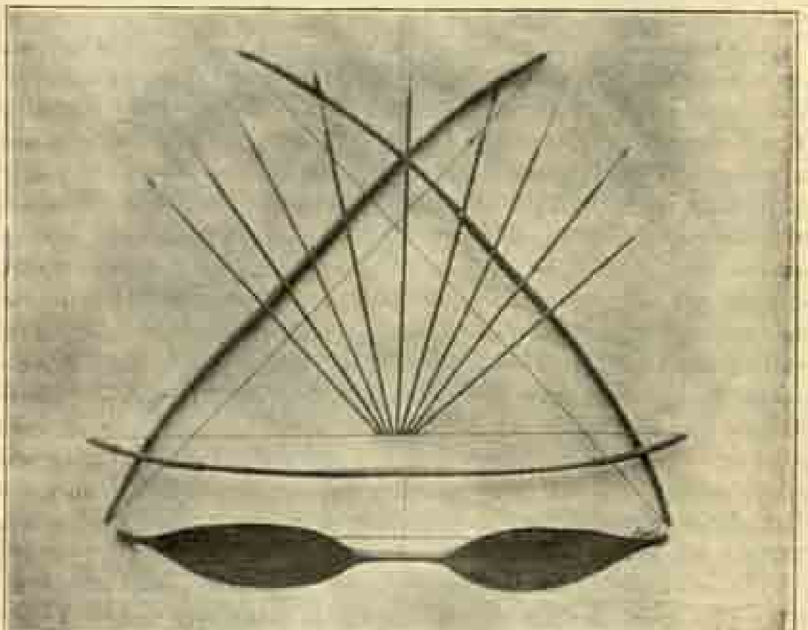
YAO WARRIOR.

and were the owners of the country before the advent of the Angoni, at which time large numbers of them were enslaved, and now form a portion of the Angoni nation. Those who escaped death or captivity at the hands of their enemies were forced to take refuge in the almost inaccessible strongholds of their mountains, where they were in some measure able to defend themselves, although their ungarnered crops were always at the mercy of their opponents. In consequence of this continual sense of insecurity, the majority of these people have never travelled more than a few miles from their strongholds, and are entirely ignorant of outside matters, and of the conditions which prevail under British protection. Their general character is marked by timidity, suspicion, and distrust, as yet little abated by the remarkable amelioration of their condition brought about by our repression of their Angoni and Yao enemies.

The Achipeta, who have still preserved their virtual independence of the Angoni, inhabit the plateau to the west, where they live strongly fortified, surrounding their villages by a series of ditches, mud walls, and palisades with entrances very few, low, and narrow, admitting only one man at a time in a stooping position. Consequently, when Angoni raiders, by force of numbers, have effected a breach in the stockades, the inhabitants, unable quickly to escape, fall a prey to their enemies. On these occasions, however, they offer so desperate a resistance, that the Angoni do not rashly engage them, preferring to harass them and capture their women and children. Their weapons are bows and arrows, the latter unfeathered, with iron or wooden points smeared with a virulent poison decocted from the strophanthus plant. They are apt in setting snares for their enemies, as by pitfalls, by fixing poisoned spikes in the paths, or by deserting an outlying village and leaving pots of poisoned beer. Their dress, which is scanty in both sexes, is composed of roughly dressed goatskins for the men, and native-woven cotton cloth for the women. They are an industrious agricultural people, and are skilled in the smelting and working of iron. They have suffered much at the hands of Yao and Angoni, and have furnished the majority of the slave-caravans passing over Nyasa to the ocean.

The government of the country under review is in the hands of the Collector of the district, who is immediately responsible for the conduct of affairs to her Majesty's Commissioner and Consul-General for the British Central Africa Protectorate. Government stations have been established at convenient places, each of which has its complement of native police. Each of these stations is visited by the Collector from time to time, when the affairs appertaining to each division are discussed and disposed of. The immediate control of the people is left, for the most part, in the hands of the native chiefs, and great pains are taken to enforce obedience to the very simple and lenient laws of the Administration in a firm but reasonable manner.

Justice is administered by means of native courts, which are in serious cases presided over by the Collector of the district. In all minor cases the recognized native chief dispenses justice to his own people, who, however, thoroughly understand that they can appeal if aggrieved to the higher authority. The justice thus meted out is not found to err on the side of severity. Almost any offence can be settled by the payment of cattle, cloth, or grain; but the old system of enslaving some or all of the defendant's family to the complainant is, of course, disallowed. There are, no doubt, cases of injustice which do not come to our notice, but I consider such to be extremely rare—infinitely rarer than when the native chiefs administered justice unchecked, and rarer than they are when cases involving details of native life are decided by a European, necessarily imperfectly acquainted with the language and customs. A small native police force, composed of men recruited from the remoter parts of the Protectorate, is maintained to uphold the authority of the Government; but, except under



BOWS AND ARROWS OF THE ACHEWA.

extraordinary circumstances, they are not allowed to act on their own initiative.

A hut-tax of three shillings a year is levied in the more settled parts of the district, but until the country is more developed it is difficult for the natives to earn the money required of them, and equally difficult for the Administration to dispose of any large quantity of native produce received instead. At present a very small percentage of houses are required to pay taxes, which are generally arranged for by the younger men going to work in the Shire highlands. The villagers along the lake-shore are enabled to pay theirs by supplying grain to the military garrison at Fort Maguire. Taxation, even when rigidly enforced, cannot be said to be oppressive, and is in every case a lesser burden than that imposed on the people by their chiefs before the administration of the country was established. The receipts issued on payment of taxes are much appreciated, and their meaning thoroughly understood; but it would be going too far to say that the native pays his tax willingly to assist in maintaining a Government under which he enjoys peace and security, for the simple reason that he does not estimate these blessings at their proper value. On the other hand, the fair dealing which the natives have experienced at the hands of Government officials and missionaries has aroused a certain sense of satisfaction in spite of our, to them, inexplicable abhorrence of slavery and unnecessary bloodshed.

The improvement in the condition of the people during the last two years has been very marked. The downfall of Tambala, a turbulent Yao chief, early in 1896 was immediately followed by the submission of all neighbouring Yaos; later the breaking of Chikusi's power furnished a salutary lesson to the Angoni. Since then peace, formerly continually disturbed by intertribal raids, has been firmly established, with the result that, as confidence in the security of life and property has increased, an impetus has been given to agriculture and other thrifty occupations, and the Achewa are descending from their barren hills and are spreading out and taking up unoccupied land, instead of herding together for mutual protection. Prevented under our protection from preying upon one another, and shielded from the tyranny of their own chiefs, the people yet require defence against their own blind superstitions, which have in the past wrought perhaps more real misery amongst them than the slave-trade. It is satisfactory to know that, although dying hard, the inhuman branches of the art of witchcraft are not so extensively practised as formerly.

The ordeal by poison,* which formerly claimed hundreds of victims every year, especially among the Angoni, is now rarely practised; but is not likely to become extinct for at least another generation. It is an oracle which settles very definitely any vexed question, not only of the guilt or innocence of an accused person, but of the expediency of any course of action, in which latter case an animal, generally a dog, is now selected for the experiment. The efficiency of the ordeal is thoroughly believed in by every native, and in the extreme willingness with which accused persons submit themselves to it lies the chief difficulty in suppressing it.

The future of the native races herein alluded to is distinctly hopeful. The British Government, having assumed protection, has assumed at the same time obligations which can only be discharged by the most careful and judicious action on the part of the officials entrusted with

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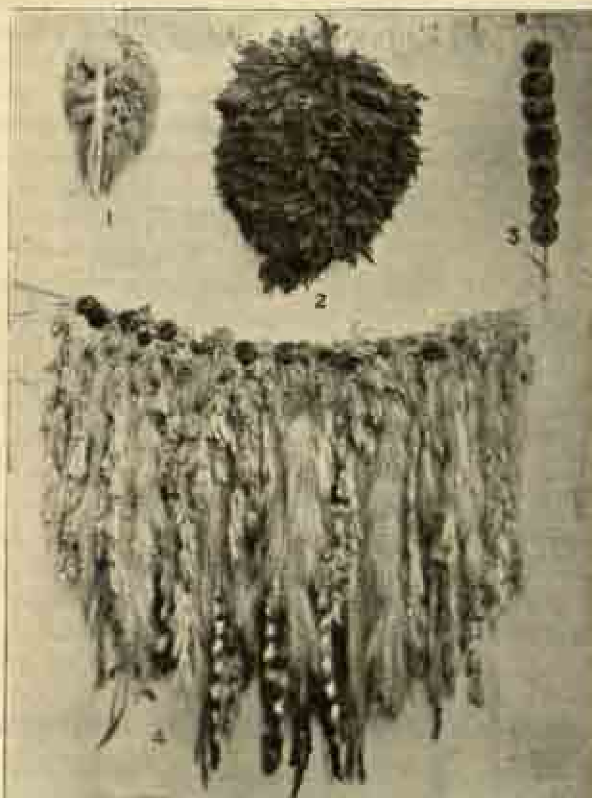
* A decoction prepared from the bark of a tree (*Erythrophlœum Guineense*, Johnston), which when drunk acts, so the natives believe, as a fatal poison or simply as an emetic according to the guilt or innocence of the accused.

administrative authority. It lies with us, in the first place, to foster the spirit of industry and thrift of which the natives have, under great disadvantages, undoubtedly shown some indications. The requirements of native life, which are imperfectly provided from his own resources, are practically confined to cloth, beads, and brass wire, considerable quantities of which were formerly obtained by the slave traffic and by a limited sale of ivory and native produce.



DRESS OF ANGONI WARRIOR: 1. SPORRAN; 2. HEAD-DRESS; 3. BROW-BAND; 4. KILT.

The first of these sources of supply being now exhausted, the constant and increasing demand for labour in the Shire highlands has been in some measure satisfied, and it is certain that, as native ideas expand and wants increase, the supply of labour from Angoniland will grow larger every year, to the mutual benefit of the white man and the black. At the same time the interests of the native will require consideration. The treatment which he has received hitherto at the hands of his employers leaves little to be desired, and it should not be difficult to frame regulations which, whilst ensuring to the native all necessary protection, cause no real inconvenience or vexation to his employer.

It is to be hoped that, as the revenue of the district increases, provision will be made for the intelligent expenditure of small sums for the maintenance of public schools and hospitals, and perhaps for the improvement of agricultural methods, principally by the introduction of suitable seeds and plants. A careful and generous consideration of native interest is likely to render abortive any incitement to insurrection of which Africa has lately furnished some unlooked-for instances, involving the loss of valuable lives and prestige, as well as a considerable expenditure of money.

The following observations have been recorded by Rev. T. C. v. B. Vlok, of the Livingstonia Mission at Mkomo Mountain:—

1897.	Thermometer.	
	Maximum.	Minimum.
January	80°	65°
February	77°	65°
March	77°	62°
April	76°	62°
May	Not observed.	Not observed.
June	" "	51°
July	" "	Not observed.
August	" "	" "
September	" "	" "
October	" "	" "
November	87°	66°
December	85°	64°

Rainfall at Mkoma, 1897, 22·34 inches.

PROFESSOR RÜCKER ON TERRESTRIAL MAGNETISM.*

When we attempt to apply theory to explain the actual magnetic condition of the Earth, progress is at once checked by difficulties, many of which have hitherto proved insuperable. We have no real knowledge of why the Earth is a magnet, no real knowledge as to why its magnetic state is continually changing, and thus we are compelled to spend long periods of time in collecting facts which, numerous as they are, are still insufficient to answer some of the simplest questions. We have a certain grasp of the facts, but have not yet found the thread of theory which binds them together. Yet attempts are being made to find such a thread, and I propose to bring forward some of the theories and speculations which are now attracting attention. The fundamental

* Abstract of 'Rede Lecture,' by Prof. A. W. Rücker, F.R.S.

facts with regard to the magnetic state of the surface of the Earth are expressed in the general result that the magnetic needle points approximately north and south, and dips from the horizon towards the magnetic poles of the Earth. The attempt to explain this result on the hypothesis of the Earth containing one or even two powerful simple magnets which control the needles on the surface fails to account for the complications of the actual facts. But, leaving this out of account, it is possible to answer some questions as to the magnetic state of the Earth without forming a clear mental picture of the causes to which that state is due.

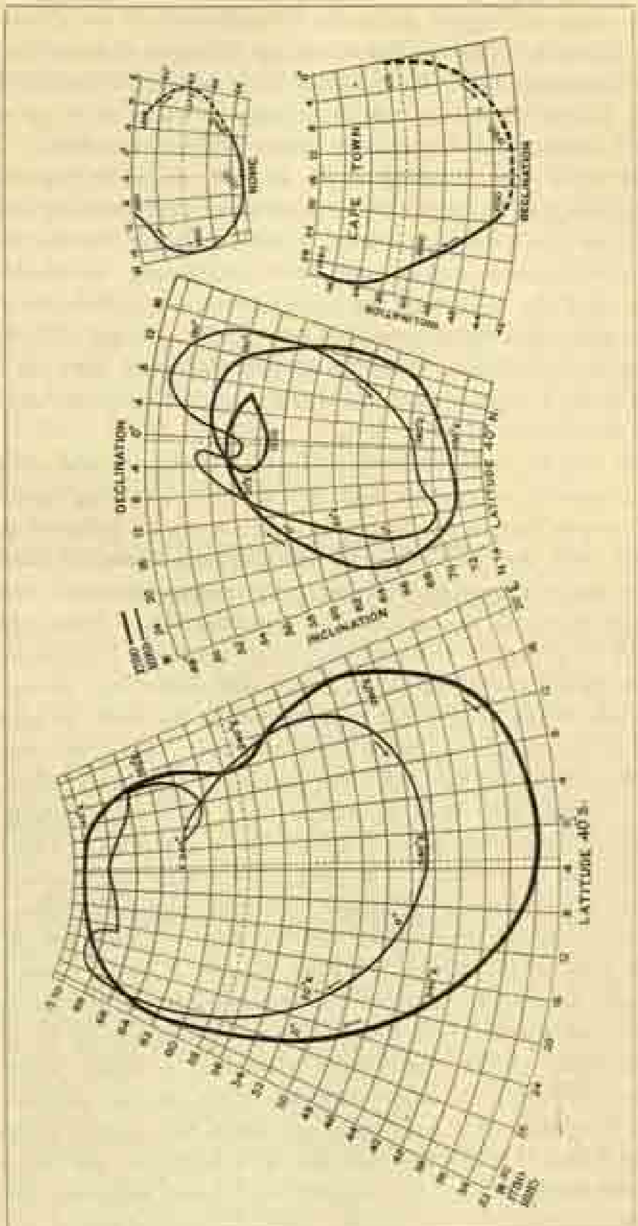
Magnetic forces can only be produced by magnetized matter or by electric currents either within or without the substance of the globe. The first important question then is, Are the forces which act upon the compass produced within or without the globe? and, if the magnetic forces are in part due to electric currents, are all these currents wholly internal or wholly external, or do some of them flow in part within and in part without the Earth?

The great mathematician Gauss devised a method of determining the relative proportions of those parts of the force which are wholly external and wholly internal respectively. Dr. A. Schmidt has recently further attempted to discover whether, in addition to these, currents from earth to air or from air to earth also exist. He finds that about one-fortieth of the magnetic force is due to causes wholly external to the Earth, and that a slightly larger fraction is produced by vertical currents; the origin of the remaining thirty-eight fortieths being traced to internal causes only. The result of the calculations of Dr. Schmidt and of Dr. Bauer shows that near the equator currents pass from earth to air; in somewhat higher latitudes, from air to earth; and beyond 43° N. and 40° S., from earth to air again. Careful experiments carried out in 1895 by Dr. Carlheim-Gyllenskiöld in Sweden failed to establish definite proof of such vertical currents. Dr. Thorpe and I carried out magnetic surveys of the United Kingdom in 1886 and again in 1891, and maps have been prepared for each period, showing the vertical current for each degree-square. These maps agree in showing the strongest currents near the coasts, and that the current is from below upwards over the south-west of England, the south of Ireland, and the north of Scotland, and from above downward in the central region. In spite of this agreement, the extreme minuteness of the quantities dealt with (about one-hundredth of an ampère per square kilometre), the great variations of local magnetism due to different causes, and the individual discordance of the observations justify the assertion that there is no evidence that can be relied upon as to the existence of any flow of electric currents through the surface of the British Isles, whether from below to above or from above to below. Dr. van Rijckevorsel has lately found an upward flow through Holland of about one-tenth of an ampère per square kilometre, but in so small an area local disturbances bulk too largely to allow of the result being satisfactory. In any case the measured currents would be much less in amount than Dr. Schmidt's theory demands. I should myself be sorry to pronounce a final opinion as to whether the theory is or is not true for the Earth as a whole, but I certainly consider that the balance of evidence is at present opposed to the physical reality of the vertical currents.

With regard to the varying elements of terrestrial magnetism, Dr. Bauer has recently suggested an interesting method of representation. He constructs a diagram of the conjoint secular variation of declination and dip by means of combined co-ordinates. He imagines the observer, with life prolonged for centuries, to be stationed at the central point of a magnet poised so that it can turn freely in any direction. Such an observer would observe, as the ages went on, that the north pole of the needle described a curve, turning now to the east, now to the west, and simultaneously rising or falling. This curve might be supposed to be registered on a vertical sheet of paper held at right angles to the geographical meridian. At most of the stations where observations have been made for more than a century, the pole of the magnet would always appear to perform its orbit in the direction of the hands of a watch, but there are a few exceptions to this rule. Although in no case have the observations been continued long enough to complete an orbit, they clearly show that the sweep of the orbit is greatest near the equator, and greater in southern than in northern latitudes, and while in Europe and Africa the curve is roughly circular, a less range in declination gives to it a more elliptical form in America. The curves for Rome and Cape Town representing corresponding north and south latitudes are reproduced in the accompanying figure. These curves embody all our knowledge as to secular change, but their diversity does not lead us to hope for definite information from them as to the duration of a complete cycle, although the calculation has been hazarded that the magnetic pole would perform an orbit round the pole of the Earth in 960 years. By a second ingenious device, Dr. Bauer points out that a needle carried round the Earth along a parallel might be supposed, on an assumed theory of the cause of terrestrial magnetism, to describe a curve identical with the complete secular cycle. The curves drawn on this assumption, though much larger, are strikingly like the observed curves in their lower parts, which correspond with the past; but in the upper parts, representing what is still the future, they exhibit curious loops and eccentricities. Two of these curves, for both the northern and southern hemisphere, in latitude 40°, are shown in the figure, side by side with the actual curves for places in similar situations.

It is interesting to compare with this speculation (which assumed a fixed and a revolving magnetic system within the Earth), Commander

Creake's induction from the comparison of Sabine's magnetic maps with those drawn by himself from the *Challenger* data. He inferred that the



CURVES OF MAGNETIC DECLINATION AND INCLINATION IN VARIOUS LATITUDES.

magnetic poles were stationary, but that at certain points on the Earth's surface the magnetic forces were increasing or diminishing.

The small diurnal variations of magnetic conditions may be studied by means of orbital diagrams in the same way as the great secular changes, but in their case the sudden and relatively large disturbances known as magnetic storms, make the determination of the normal daily orbit very difficult. The method of taking the mean of every day in the year is too laborious, but it has recently been suggested that five quiet days each month, when the conditions may be assumed to be normal, should be selected for treatment; these days are selected by the astronomer royal and observed at all English magnetic observatories. The results obtained by Dr. Chree at Kew show that the elliptical orbit described (the horizontal being much greater than the vertical displacement) is not a closed curve; and it is interesting to consider the suggestion that the failure of the needle to return quite to its original position at the end of the day is due to its secular change. Though the evidence is not conclusive, it points to the conclusion that the secular change is checked or even reversed during magnetic storms, and is consequently accelerated on quiet days.

The last subject to be referred to in this lecture is the connection between terrestrial magnetism and geology. It has long been known that local inequalities in the magnetic forces occur in different parts of the country, and the minuteness of the magnetic survey of the British Islands has made it possible to deduce the normal magnetic conditions, and so to estimate the amount of the irregularities. When these are represented on a map, it is found that there are large districts in which the disturbing horizontal forces act in the same direction; in one region the north pole of the needle will be deflected to the west, in another to the east, and, passing from one of these districts to the other, we always find that the downward vertical force acquires a maximum value at the boundary. Lines may thus be drawn on a map representing places towards which the north pole of the needle is attracted. This can be done readily and accurately. The phenomenon may be explained by the presence of large masses of basalt or other magnetic rocks, which, magnetized by the induction of the Earth's magnetic field, would attract the north pole of the needle. Where masses of basalt occur on the surface, as in Antrim, the Scottish coalfields, and North Wales, the north pole of the needle is deflected towards them at distances up to 50 miles. There are other places where local attraction is found without any appearance of basalt or other magnetic rock on the surface. It is reasonable to suppose that such rocks are there, but buried under other strata, and if this is really the case, the lines drawn on the map as those to which the north pole of the magnet is attracted represent the ridge-lines of concealed masses of magnetic rock of the existence of which the geologist may obtain no other evidence. As a rule, also, when rocks of carboniferous or pre-carboniferous nature project through newer strata and crop out on the surface, the north pole of the magnet is deflected towards them. A striking instance of this occurs in the Pennine chain, where the denuded crest of an anticline exposes a mass of millstone grit (carboniferous) along the summit, while the flanks are covered with much younger rocks. A well-marked magnetic ridge-line runs along the chain. Similarly, in the neighbourhood of Birmingham, the Dudley and Nuneaton coalfields are surrounded by more modern deposits. A curious horseshoe-shaped ridge-line connects these two, and then runs south to Reading, which is, magnetically speaking, one of the most important towns in the kingdom. East and west from Dover to Milford Haven, and thence to Wexford, there lies a palæozoic ridge in many places deeply covered with newer deposits, and bearing the South Wales, Forest of Dean, and Dover coalfields. A magnetic ridge-line closely follows this direction, passing through Reading. Another magnetic ridge-line runs from near Reading and enters the Channel near Chichester; and the continuation of this line has been traced by M. Moureaux from the coast near Dieppe across Northern France to a point about 50 miles south of Paris. It may be hoped that such magnetic ridge-lines will be recognized as physical features of the country as permanent as the hills themselves.

CORBETT'S LIFE OF DRAKE.*

In the Elizabethan age, it was the training acquired in a life of exploration and discovery which enabled the Drakes and Frobishers, and many others, to save their country as naval officers when the time of trial came. Nor were the results of such training less important in subsequent ages, as was shown by Shovel and Keppel, Nelson and Riou, Sherard Osborn and Hamilton. The neglect of such training is one of the gravest mistakes that is made by our present naval authorities.

The life of Sir Francis Drake is one of the best illustrations of the enormous importance to the efficiency of our navy, of continuing to give our naval officers opportunities of winning distinction as explorers. For this reason we rejoice at the publication of a thoroughly good biography of our great circumnavigator, written by the light of all the new materials which have been brought to our knowledge in recent years, by Laughton, Duro, Peralta, and the Historical MSS. Commission.

Mr. Corbett has taken great pains to give his readers the most accurate account of Drake's early life that is now attainable, and has cleared away numerous mistakes of former biographers. It is a pleasant picture he enables us to fill in, of the lives of the young brothers on board the old hulk in the Medway. Mr. Corbett also furnishes us with the clearest and most correct account that has yet appeared, of the

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* 'Drake and the Tudor Navy, with a History of the Rise of England as a Maritime Power.' By Julian S. Corbett. 2 vols. Longmans: 1898.

Spanish treachery at the San Juan de Ulua, an event which was long made puzzling and obscure by the blunders of his predecessors. But our gratitude is chiefly due to Mr. Corbett for showing that the 'Sir Francis Drake revived' is an authentic work, in spite of Mr. Froude's harsh and erroneous judgment. Mr. Corbett has found that the main statements contained in it are corroborated by Spanish reports. This is important, because 'Sir Francis Drake revived' is almost the sole authority for the most romantic part of the illustrious explorer's career. Mr. Corbett also clears up a great deal that was obscure in the Doughty business; and his arguments are quite conclusive respecting the discovery of the Cape Horn route. He very properly makes full use of the Zarate letter, which throws so much light on the internal economy of Drake's ship. We are indebted for the discovery of this letter, in the Seville Archives, to our good friend, Señor Peralta, who has also done so much excellent work connected with the history and anthropology of Central America.

Geographers will welcome the first volume of Mr. Corbett's important work as the best and most valuable biography of our illustrious circumnavigator, during the period that he was doing able and memorable service for geography.

The second volume is devoted to Sir Francis Drake's naval career, and here Mr. Corbett has done good service to the history of cartography, by the reproduction of the maps which were engraved to illustrate the 'Summary and True Discourse,' and of Adams's charts of the various actions in the channel with the Spanish fleet. The latter were published in the 'Discourse concerning the Spanish Fleet invading England' (1590), and are exceedingly interesting. Their execution reminds us of some of the work of engravers employed on Saxton's atlas, who were, no doubt, also employed to execute the Adams charts.

ON SEA-BEACHES AND SANDBANKS.*

By VAUGHAN CORNISH, M.Sc. (Vict. Univ.), F.C.S., F.R.G.S.

§ 1. Scope of the Investigation.

This paper is the sequel to one on "The Formation of Sand-dunes" in the *Geographical Journal*, March, 1897. It embodies a research upon the processes which distribute the detritus which enters the sea at its margin, and upon the behaviour of the material distributed. I have again given special attention to the peculiarities of mixed multitudes, some of which provided a key to much that was obscure in the behaviour of sand-dunes. As the research progresses this aspect of the phenomena acquires an increasing interest, and I hope to apply the results obtained in the study of dunes and beaches to other aggregates.

I have to acknowledge many valuable suggestions received during the preparation of the present paper from Dr. H. R. Mill, F.R.S.E., and Mr. Clement Reid, F.G.S.

* Paper read at the Royal Geographical Society, March 16, 1898.

I have also to thank Prof. G. H. Darwin, F.R.S., for information upon tides; Mr. F. E. Lacey, M.I.C.E., for the section of the Bournemouth beach; and Prof. J. Walther, of Jena, and Mr. W. Whitaker, F.R.S., for references to literature.

§ 2. The Motions of the Bottom Water of the Sea.

(*For Breakers, see* § 5; *and for further discussion of the Tides, see* § 14.)

(*a*) Circulation.—From the western tropical coasts of Africa and America the persistent south-east and north-east trade winds cause a surface drift towards the eastern coasts of America and Asia respectively. The southern is the watery hemisphere, and the shores of the Atlantic and of the Pacific converge in northern latitudes, the continents widening, and the oceans contracting. Wholly or partly on account of this circumstance, the surface drift of the south-east trades pours over into the region of the north-east trades, and the resulting surface drift of these co-operating winds is on the whole northerly—markedly so in the Atlantic. The waters of the Atlantic are piled up before the wind on the east coasts of the Americas, while under the west coast of Africa the water is constantly renewed, partly by coastal currents, and partly by a welling-up of water from below under the windward shore.* Such welling-up from below in off-shore winds has been repeatedly demonstrated by observations of saltness and temperature.† On the other hand, the driving of a surface current against a lee shore raises the level of the sea there to such an extent that gravity causes the lower layers of water, where the drag of the wind is slight, to flow back from the shore. Such is probably the cause of flow of the Gulf Stream in the earlier part of its course. This kind of reverse current may be compared to the effects of polarization in electrolytic phenomena. The great north-easterly drift across the Atlantic, which still goes by the name of Gulf Stream, is probably of mixed origin, being partly the reverse (polarization) current flowing on by its momentum, and partly a surface drift due to the south-westerly winds which prevail in these latitudes. Such surface drift before westerly winds, when piled up against the western shores of Europe, is capable of producing a reverse bottom current or undertow flowing off-shore.

When the area over which a wind acts is small relatively to the size of the sheet of water, or when a part of the water is sheltered, *e.g.* by a headland, the return current may principally flow by the side of the drift instead of underneath. There is, besides the polarization current due to gravity, a second sort of reverse current, viz. the *induction currents* (induced by viscosity), which, with eddies interposed as friction wheels, flow parallel with and in the opposite sense to the primary ocean currents.

The great drifts of surface water which flow from the more open to the narrower parts of the oceans, and from the southern and equatorial to the northern latitudes, are for the most part broad rivers between banks of water in the open ocean, whilst the induction currents which flow in the reverse sense often hug the shore. Here, therefore, as in the case of the polarization currents, *the motion which affects the sea bottom has the reverse direction to the main drift of the surface water.* In the case of along-shore winds, however, acting on the shallow water within the breaker-line, the bottom drag is in the direction of the wind, and there are other particular cases in which this is so (see § 8).

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* See J. Y. Buchanan on "The Guinea and Equatorial Currents" (*Geographical Journal*, March, 1896).

† See, for example, F. L. Ekman on "The Causes of Ocean Currents" (Royal Soc. of Upsala, May 3rd, 1876); and H. R. Mill on "The Clyde Sea-area" (*Trans. Roy. Soc. Ed.*, vol. xxxvi.).

A river flowing into the sea as a surface current of light water creates an induction current* of sea-water which flows landwards under the outflowing water, so that in this case there is a bottom motion in a sense opposite to the surface current. Another important case is that illustrated by the exchange of waters between the Atlantic and the Mediterranean. There is a flow of surface water from the Atlantic to the Mediterranean, but evaporation has made the Mediterranean water salter and heavier than that of the Atlantic, and at greater depths the pressure of the Mediterranean column appears to be more than sufficient to counterbalance that of the column of Atlantic water. The bottom current flows from the enclosed sea towards the open ocean in a strong stream, the flow of which is perhaps assisted by an induction (as of rivers). In the North Sea, on the other hand, the waters of which are lighter than those of the Atlantic, the latter encroach or recede under the varying conditions; but it is important to note that an encroachment of Atlantic water, commencing as a surface drift, becomes an undercurrent by the gradual sinking of the heavier water, which pushes its way as a submerged wedge.† This is still more marked in the case of the encroachment of salter water into the Baltic. The lighter water escapes as a surface current.

From a region of cold and condensation (as the north polar sea), the outflowing water may escape in a current which extends from top to bottom of the sea, for the bottom layers are dense owing to the low temperature and concentration of salt, and the surface waters, although fresher, slope downwards towards the areas of evaporation.

The surface current of a *frozen* sea and the current of a debouching river are two cases in which the surface waters are directly concerned in the transport of detritus. The general character of the observed surface flow of oceanic water, as well as the observations of deep-sea temperature in equatorial regions, afford evidence of a slow creep of bottom water from the polar to the equatorial and trade-wind seas, where it ascends to supply the water lost by evaporation. From our present point of view (that of transport of marginal detritus) we are not much concerned to discriminate between water which flows to the pole as surface drift before the poleward winds and that which reaches the poles by distillation.

From the above considerations, it appears that, on the whole, *the quantity of motion of the bottom water of the sea is greater off-shore and oceanwards than in the reverse direction, especially within the limits where wave-action reaches the sea-bottom, but a local exception to this general rule occurs beneath those river waters which flow seawards as a surface current.*

It is solely for the sake of this proposition that the discussion of ocean currents has been introduced here; the author makes no claim to have added anything to the knowledge of ocean currents.

(*b*) THE OSCILLATION OF THE SEA. *Tides.*—The action of the sun and moon in creating tidal agitation is chiefly effective in the broad oceans, particularly in the encircling waters of the southern hemisphere. Tidal agitation in the narrow seas is chiefly due to the push originating in a difference of level, and transmitted by the agency of the Earth's gravity. Tidal agitation is supposed to be equal from the surface to the bottom, and to be transmitted as a "long wave" in which, practically, all the motion takes place in the direction of transmission, so that, except for the effects of friction and viscosity, the energy of each swing is perfectly transmitted. Thus the violence or intensity of the movement of water is increased in

* See, for example, the researches of Ekman, Mill, and Petterson.

† See H. N. Dickson, Reports, Fishery Board of Scotland.

proportion to the diminution of the quantity available for the transmission of this energy. Consequently, the oscillating currents become swifter where the waterway is contracted by converging coasts or by a submarine ledge.

Where the waterway is stopped, as for instance at the head of an inlet, the water continues to pile itself up against the coast until the *head* counterbalances the momentum of the oncoming current.* This piling up may cause an undercurrent off shore before the time of high tide. The waters of a bay at low tide are, however, often comparatively fresh, owing to the outletting of river waters; the incoming salter waters of the flood will therefore, in such cases, tend to burrow under in the form of a wedge, and the distribution of pressure may be such that, if water escapes during the incoming tide, it will rather be as a surface current.

The undisturbed run of a tidal current is a simple harmonic motion of twelve hours' period, but at any locality to which the tidal push is transmitted by two different paths, the movement of the waters is compounded of two simple harmonic motions of equal period, but generally differing in amplitude, and which may have any difference of phase. The most usual character of the resulting motion is rotation in an ellipse. Such rotation is produced where the straight run of the tides in a channel compounds with the on-and-off-shore swing in and out of a bay. The well-known longer-period oscillation combines in some localities to create a very great difference, and in others but a slight difference, to the range of the spring and neap tides respectively. The most rapid tidal currents run along shore (particularly off headlands), the on-and-off-shore currents being comparatively slow. The on-shore current during rising tide is generally more rapid than the off-shore current of the ebb, the latter lasting a longer time. The extreme case of this difference of intensity is reached in the bore of rivers.

To sum up, *the bottom agitation due to tides is greater near the shore, and in channels and in narrow seas, but probably extends, though with diminished force, to the bottom of the deep oceans. This variation of force as we proceed oceanwards is not, however, uniform, but is interrupted by nodes and loops* (see § 14).

Waves (outside the Breaker-line).—The oscillation of the water due to waves raised by wind decreases in geometrical progression as the depth below the surface increases in arithmetical progression (which is the usual law of decrease for cases of radiation), so that the agitation of even the largest recorded waves only disturbs the bottom water appreciably within a depth of about 150 fathoms. The movement of the surface water in a ground-swell is uniform rotation in a circle, which is equivalent to two equal harmonic motions, the first forwards and backwards in the direction in which the wave travels, the second an up-and-down motion. The forward motion takes place on the higher level, so that at each revolution half the energy of motion is transmitted forwards.† Not far from the bottom the motion corresponding to this surface movement is (nearly) a simple harmonic horizontal oscillation. The complicated movements quite close to a rough bottom are dealt with in the next subsection. When the swell reaches the shallows of the shore, the depth being small compared with the wave-length, it is easily observed that the front of the wave becomes steeper and the back flatter. In proportion as the form of the surface departs from the symmetrical curve of sines, which is the form of the ground-swell in deep water, so does the motion of the water near the bottom depart from the

* See, *e.g.*, O. J. Lodge, Brit. Assoc., 'Handbook to Liverpool' (1896), p. 161.

† Osborne Reynolds, *Nature*, vol. xvi., 1877, p. 343: "On the Rate of Progression of Groups of Waves."

perfect balance of the harmonic oscillation. The forward motion is sharp and short, and the water is brought back to its former position by a slower motion lasting a longer time. The retardation of the wave-front in shallow water causes the swell to advance almost dead on shore; consequently the strongest oscillating bottom currents caused by the swell are on-and-off-shore, not along-shore, as in the case of the strongest tide-currents. It is to be noted that the bottom action of the waves becomes more intense the nearer we approach the shore. Again, since the depth to which wave-agitation extends depends primarily upon the wave-length, and only to a secondary degree upon the amplitude, long flat swells * (the dying waves of an ocean storm often almost invisible at sea) will stir the water at depths which would remain unaffected by high but short waves raised not far from the coast by an off-shore wind. Thus it is the oscillation due to the waves travelling shorewards which chiefly affects the motion of the water near the bottom. Similarly, the deeper waters of a channel (such as the English Channel) are more affected by a long swell from the ocean than by shorter waves running oceanwards from, *e.g.*, the North Sea, even if the latter be somewhat higher.

If the margin of the sea be a cliff of rigid rock rising out of deep water, the energy transmitted shorewards by the swell is reflected back upon its path, and the difference of character between the on-shore and off-shore movement of the water is to a great extent obliterated, whilst the intensity of the agitation is increased.

To sum up, *the bottom oscillation of the sea due to the waves, decreases very rapidly from the shore seawards, and ceases altogether near the summit of the continental slope; near the coasts the oscillation is mainly on and-off shore, and the shoreward component of the oscillation is short and sharp, the seaward longer and slower.*

Seasonal Oscillation.—In addition to tides and waves, there is a third kind of periodical reversible disturbance to which the waters of the sea are subject, corresponding to the annual cycle of the seasons. This long-period disturbance superposes a noticeable twelve-monthly oscillation upon the circulation of some parts of the sea, *e.g.* in the regions of monsoons, and where the waters of the sea, or even those of the rivers only, freeze in winter.

(c) ON THE MOTION OF WATER NEAR A ROUGH BOTTOM.—When the velocity of a current is being retarded by the roughness of the bottom, bodies of swirling water continually rise from the bottom, especially from the lee side of obstructions. There is thus a constant upward motion of the bottom layer, *the buoyancy of which is increased, whilst its speed is diminished.*

The conditions where water is retarded by roughness of bottom are similar to those which obtain when a tidal current is gaining strength. In a succeeding portion with a smooth bottom there is a continuous settlement of water, and this corresponds to the conditions when tidal current is slackening. When the main body of water is agitated by an harmonic motion, such as nearly corresponds to the agitation communicated to the depths by the swell, the layer of water close to the rough bottom divides itself into regular segments, in which the water has alternately a motion with an upward component and a motion with a downward component; † in the latter the water settles, and in the former it is constantly pumped up, the balance being of course maintained by other currents. An important feature in the character of the bottom motion of water thus agitated is the high intensity momentarily obtained by the *upward* swirls. This is readily seen by the dance of the sand-grains when a glass trough containing water over a layer of sand is rocked to and fro.

* See Sir G. Stokes, 'Memorandum on Waves.'

† See G. H. Darwin, "On Ripple Mark" (*Proc. Roy. Soc.*, 1883).

§ 3. Mud Flats of the Deep Sea.

A regular oscillation or an indiscriminate agitation which rolls or drags a heavy body alternately uphill and downhill results in a downhill travel of the body, owing to the action of gravity. It is well known that mud travels persistently from the shore seawards, and that it forms the bottom over vast tracts beneath deep-sea water, *e.g.* at the foot of the continental slope, and in such positions as the depths of the Mediterranean, and the holes or pockets in the Baltic. Mud, however, settles with such extreme slowness, that wherever the bottom is disturbed by waves (say, to the edge of the continental shelf) it cannot anchor itself upon the bottom even during the slack water of the tides, so that the above-described action of gravity is effectually cheated. This leads to the conclusion that *the transit of mud down the slope from the shore is not due to the action of gravity.* That mud rests and accumulates at the foot of the continental slope, for instance, is due to the fact that the increased depth has removed the bottom from the disturbance of wave-action. Here at length gravity becomes effective, and brings down the mud. Were the waves of the sea to originate from the bottom, as do the standing waves of stony brooks, and to decrease in intensity towards the surface, gravity would oppose scarcely any resistance to the transport of the mud from the foot to the top even of the continental slope, and it would be in the still water on the top that the mud would settle. In like manner, the activity of a housemaid raises the dust from the floor of one's study to settle quietly upon the tops of pictures and bookcases.

It appears, then, that *the principal factor determining the well-known direction of mud-transport is the diminution of intensity of bottom agitation from the shallows to the depths.* The effects of diminishing intensity must be exemplified further in this place, for there are cases where the reverse effect is produced, the finest material seeking the positions of greatest agitation.* Such cases are the wake of dust which follows a railway train, and the cloud of lycopodium powder which, unable to disentangle itself from the swirling air above a metal plate which has been set in vibration, deposits at the positions where the agitation has been greatest. These are instances of agitation with intervals of complete quiescence. When, on the contrary (as *e.g.* within the limits of wave-action), the agitation is practically incessant, dust slowly shifts away from the area of agitation, as in the winnowing of chaff from a heap of grain.

The mud which is transported from the shore, and that which is produced on the bottom of the sea, is not restricted to a thin layer close to the bottom. Presumably, the sea within the area where wave-action extends to the bottom, bears throughout its whole depth, though in greatest quantity near the bottom, a haze of dancing dust such as a sunbeam reveals in the air. Conversely, the agitated water bearing this flying haze never covers a muddy bottom, except where the mud is being produced upon the spot, *e.g.* by the disintegration of a clayey rock; † or, occasionally, where water is stilled beneath an entanglement of waving seaweed.‡

The prevailing off-shore movement of the bottom water of the sea renders it probable that terrigenous mud is slowly transported oceanwards from the foot of the continental slope. The limit of transport is likely to be considerably beyond the limit to which the materials have been traced, for where the material is in but small proportion its presence is masked.

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* See Faraday (*Phil. Trans.*, 1831) on "Acoustic Figures."

† See Delesse, 'Lithologie des Fonds des Mers,' p. 285.

‡ See Ch. Barrois in *An. Soc. Geol. du Nord*, t. xxiv., December 2, 1896, pp. 196, 197.

§ 4. The Sorting of Sand from Shingle and from Mud.

Let the velocities of water required to move shingle (pebble) and sand be respectively—

Velocity for shingle (V_p)
Velocity for sand (V_s)

To fix our ideas, we may suppose for the moment that $V_p = 48$ inches per second, and $V_s = 12$ inches per second.* If we take a simultaneous view of the various modes of motion of the waters of the sea described in § 2, we shall see that *the usual condition of sea-water is one of oscillation* which is not quite symmetrical in amount (*i.e.* there is often a prevailing set in one direction), and *which is scarcely ever symmetrical in intensity, a short quick motion one way being balanced, as far as the movement of the water itself is concerned, by a long slow motion in the reverse direction.* Taking the later case, where there is no drift of the water, *let the maximum shoreward velocity be V_p, and the maximum seaward velocity be V_s, then the sand will be moved to and fro, but the shingle will travel in one direction only,* viz. shoreward, its progress being by a series of jerks.

If the duration of the backward swing at maximum velocity V_s *be increased*, so that there is a general drift of the water seaward, *the sand will travel seaward, whilst the shingle continues to travel shoreward.* Simultaneous transport in opposite directions is achieved without any drift of water when the sea-bottom slopes in the direction of the smaller velocity (in this case seaward). Shingle of 2 inches diameter sinks at the rate of about 24 inches per second, sand at about 2 inches per second. As, also, the shingle is generally only raised a small height from the bottom by the movement of the water, gravity has a much longer time to act on the sand. It follows that gravity has much more influence upon the rate of transport of sand than upon that of shingle. In the above case, the only effect of gravity on the motion of the shingle is to cause its (shoreward) path to be very slightly shorter. The sand, if the velocity of the onshore swing and the rate of reversal permit it to come to anchor between the two parts of the oscillation, will have its shoreward path appreciably shortened, and its seaward path appreciably lengthened. Thus *suitable oscillation on a seaward slope will set shingle travelling shoreward, and sand simultaneously travelling seaward.* If the velocity on the seaward half-swing of an oscillation be as great as V_p, the shingle is moved both ways, and is liable to travel seaward if the bottom slope from the shore.

The condition of the transport of shingle (great intensity of motion) keeps most of it close against the shore, often in a bank or beach; while the inability of mud to settle except where the water is quiet causes it, as we have seen, to accumulate in mud flats beyond the limits of wave-action. The accumulations of sand are of greater variety, for, although the mean term in size, it possesses a greater *independence of motion*, or persistence, or effective inertia, than either of the extreme terms. Mud (by which I intend throughout such characteristic marine mud as the well-known "blue mud") obeys each slightest swirl of the water; it follows almost exactly the stream-lines; and it is only in the slow settlement of the mud in still water that muddy water behaves otherwise than as an emulsion. Shingle, again, is not raised to any great height from the bottom, and sinks so swiftly that it does not take a long free flight in water. Hence, when it is moving it follows almost precisely the direction of the momentary movement of the water. Sand, on the other hand, is frequently churned up to a considerable height from the bottom, and

* See, for example, Wheeler, 'Tidal Rivers,' pp. 67, 68, quoting T. Logan for nearly similar figures. Also see Rankine, 'Manual of Civil Engineering' (1862), p. 708 (on the authority of Dubuat).

often has a long free path; and when the stream-lines of the water are suddenly deflected, whether vertically or horizontally, inertia carries the sand on, the stream lines of the sand being deflected less than those of the water. Similarly, when the current slackens the sand flings itself forwards, as is so noticeable in the rippling of sand by waves. *It is owing to its persistent motion that sea-sand accumulates in vast Banks where it is flung by the sudden bending or checking of currents* (e.g. *at tidal nodes*), *or where it is dropped during tumultuous mixing of waters.*

§ 5. The Making of a Shingle Beach.

(*a*) The Breaker.—If waves be transmitted without breaking (*e.g.* oily waves) towards a sloping shore formed of hard, impervious rock, the oily sea will wash up and down the slope of the shore between two lines, which are near the respective levels of the trough and the crest of the waves. If sand or pebble be placed upon the slope, this oscillation will enable gravity to bring such sand or pebble down to the foot of the slope. The wash of the sea is, however, complicated by the breaking of the wave. The water in the front of the breaker rises slowly. The water of the cusp, at the moment when it trembles to its fall, is moving somewhat rapidly forwards. The fall of the water is that of a body falling freely, and the downward velocity increases so that the last part of the fall of a large breaker is at a fairly high speed, probably not very different from what might be calculated n the ordinary way from the height of fall. The water is also moving forwards. The angle at which the water comes down varies according as the wind is off-shore (steeper), onshore (more sloping), and with other conditions. On a steep coast, this water often falls on the bare shore; it has then considerable power to push forward loose material. On a gently sloping shore, the breaker generally falls upon a cushion of water, which is, moreover, at this moment frequently moving seawards. The position of most intense motion in the breaker is usually not the falling front, but just behind, where, as the front falls, the water is swirled upward and forward with a surprising intensity of motion, which extends to the very bottom, and brings a rush of water over the fallen front. In point of fact, the breaker is usually, as it is sometimes called, a roller. In the transport of material, both the push of the fallen front and the jerk of the rising back act shoreward. That which we have just described is the whole *of the breaker proper: the bottom action is wholly shoreward*, and the intensity of motion which is attained at the critical moment is probably greater than any intensity of bottom motion attained in the sea except in tide-races.

(*b*) The Wash of the Waves.—The breaker flings and drives materials forward into the wash. On a sloping platform of impervious rock, the wash treats these materials as has been described above, viz. shakes them down again into the sea. The only marked difference is that occasionally the momentum of a flying pebble carries it further than the wash of the water. On the rocky platform at the base of a hard cliff, the boulders, when reduced to such size that the sea can roll them, are removed from the foreshore. This action is assisted at high tides by the resurging of the wash from the cliff foot.

Where the foreshore is composed of shingle, the proper work of the breaker continues as above, viz. the casting up of shingle, etc., for the wash to deal with; but the action of the wash is entirely different owing to *percolation*.* The rise and fall of water without breakers on a shingle beach would be simply a welling up and a sinking down through the shingle. But the advance of the sea upon the

* Compare A. R. Hunt, F.G.S., "On the Action of Waves on Sea-Beaches and Sea-Bottoms" (*Proc. Roy. Soc. Dublin*, vol. iv. part vi. p. 267).

beach taking place, not by the welling up of water, but by the discharge of a breaker, the on-wash runs over the surface of the beach, the water gradually filling up the interstices as it goes *and depositing its burden of shingle*, for, this being the same kind of material as that of which the beach is composed, the water cannot carry it down through the interstices. So much for what happens during rise of level. When the momentum of the on-wash is exhausted (the level of the sea at the breaker-line being also, as a rule, lowered so that the wash-water is no longer supported hydrostatically), the wash-water flows back in the following manner: viz. a considerable part sinks down through the shingle, and can thus no more carry back the new material from the surface than the liquid which trickles through any other filter can carry a precipitate with it; the remainder of the water runs back over the stony surface. The quantity of water flowing back over the surface being thus diminished by percolation, its impulse is correspondingly diminished, and *the depth of the stream being decreased, the resistance of those pebbles which are not wholly immersed is greatly increased.*

Thus the wash of the waves, owing to percolation, piles up the pebbles thrown forward by the breaker, forming a bank, or ridge, or Full, and this is the action proper to the sea on a shore of shingle.

(c) The Shingle *Full*.—The piling up of the ridge goes on, its height and steepness increasing, until the wash can reach no higher, and the steepness of the ridge at each point is such that the assistance which gravity gives to the down-flowing surface stream counterbalances the loss of transporting power due to percolation at that level.* This is the equilibrium profile or regimen of the *Full*. Now, *the greater the volume of water flung forward by the breaker, the greater is the depth of the back-flowing surface stream, and thus for the same size of beach material the carrying power of the back-wash is more nearly equal to that of the on-wash. Consequently, in a given locality, the regimen slope of beach proper to a rough sea is not so steep as that for a quiet sea.* Hence (partly) the common observation that the first effect of larger waves is to "cut into the beach," an operation which consists in flattening and lengthening the slope of so much of the existing beach ridge, or *Full*, as the waves at the time are able to get at. If the stronger waves continue for a sufficient time, it will be found that their action is not different in kind from that of the gentler waves, for, after trimming down the seaward face of the old *Full*, they will proceed to construct a *Full* for themselves, at the top of which accumulation will proceed by percolation, until the *Full* has attained the maximum height to which the wash can reach. The sea face of this *Full* is longer and flatter than that given by a calmer sea. Practically, as heavy seas on our coasts do not continue for long, the equilibrium form due to such seas is comparatively seldom seen, and the initial stage of cutting into a steep beach-ridge is often mistaken for a real change from on-shore to off-shore action.

There is, however, a real removal of the beach by storms, as well as the mere temporary effect above described, due to the fact that the wind is more or less on-shore. The breaker is modified by the hurrying forward of the crest and by the undertow. The waves break further out, and the crest falls upon a cushion of water, and hence has less power to push shingle before it; the shoreward motion of the water at the foot of the falling breaker is less, or in extreme cases the motion

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* Compare A. R. Hunt (*loc. cit.*), as follows: "It will be noted that the absorptive power of the shingle increases gradually from the margin of repose, where it is *nil*, owing to the shingle being saturated, to the point of furthest reach, where it may be perfect; and that absorption alone would suffice to account for a gradually increasing curve in the profile of a beach above the margin of repose."

here may actually be seaward,* consequently less shingle is brought by the breaker than would otherwise be the case. These modifications diminish the amount of material deposited on the beach by the on-wash, whilst the work of the back-wash is assisted by the undertow.† As we proceed seaward the intensity of the bottom agitation diminishes, and at length the rate of the undertow, added to the rate due to the wave-motion propagated from the surface, no longer produces a seaward current equal to the critical velocity which we have called V_p, and the shingle gets no further seaward. Indeed, it seems that this action usually takes the shingle only a little way out, and that it is soon brought back again during off-shore winds, or even by the unaided operation of a moderate swell. Even in light on-shore wind, when the sea is only slightly agitated, shingle may be restored to the beach, for, the maximum velocity attained on the seaward swing of the wave just outside the breaker-line being less than the critical velocity V_p, the shingle will be fed into the breaker instead of being abstracted, and by it will be flung upon the beach.

When storms are accompanied by very high water (*e.g.* as with south-westerly winds in the English Channel at spring tides, or during north-westerly winds on the east coast of England), shingle in many localities may be removed from the beach whether the wind be somewhat on-shore, as in the former, or somewhat off-shore, as in the latter case. This is frequently due, not to the proper mode of action of the sea upon the shingle bottom, but to the circumstance that at such time the sea in many localities reaches some wall or obstruction from which the wash surges back. Where, however, there is no such obstruction to the proper action of the sea, much of the shingle removed from the seaward face of the shingle barrier is flung over the top, and the barrier is increased in height and pushed shorewards. In this way shingle swept from the foot of cliffs protects the neighbouring flat coasts.

(*d*) ON THE ACTION OF SEA DEFENCES UPON SHINGLE.—Although a natural barrier of shingle is capable of providing a defence against the flooding of low-lying land, this is conditional upon the shingle being free to travel shoreward in stormy weather. Moreover, at such times the erosion of the sea-bottom seaward of the beach, which is really a slow waste of the land, pushes landward the proper and stable position of the beach. Thus, unless shingle be supplied in such quantity as to produce a shingle Ness or foreland, the barrier is not fixed in position, although it be stable. Now, the first step taken in the "development" of an English watering-place on a lowlying coast, is usually the erection of a row of houses on the sea-front, with a parade abutting upon the beach. Thus having fixed for all time the line of the coast, the community is presently compelled to erect a sea-wall to stop the advance of the sea and its natural moving barrier of shingle. The consequence is, in many cases, that the beach, which contributes so much to the natural charm of the spot, is swept away by the back-wash from the wall, and the town is then situated on a small and mean artificial cliff, which is constantly being undermined. Unsightly groynes are then erected to hinder the removal of the shingle, and now it often becomes impossible even to take a walk upon the strand owing to the difference in level of the shingle on the two sides of the groynes, or, in other cases, owing to the groyne having failed altogether of its purpose, and having no bank of shingle against it on either side.

On a sandy coast, the consequences of building too close to the shore are scarcely

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* See G. B. Airy, "Tides and Waves" ('Encycl. Metropolitana')

† The backward wash is sometimes spoken of as "the undertow." For distinctness it should be mentioned here that in what follows about undertow, I am referring to a seaward motion from the back of the breaker. Seaward motion on the land side of this I refer to as the backwash.

less disastrous to those natural beauties which are so important an element in the prosperity of a watering-place. As almost every promising spot on the English coasts is already either a watering-place or destined by the owners of land to become one, it may not be amiss to point out that a lengthened preservation of the present natural beauties is only to be attained by fixing the building front as far from the shore-line as is consistent with a good view of and ready access to the sea. Moreover, when a watering-place has developed into a populous and closely built town, the benefit of pure sea-air can only be obtained on the strip in front of the first-built row of houses. This strip should therefore be as wide as possible.

§ 6. On the Ridge-and-Furrow Structure of a Shingle Ness.

Where the surplus income of shingle exceeds the loss by attrition, the shingle tract grows seaward. The surface of this tract is usually laid down in ridge and furrow ranged parallel to the sea-front. The greater the tidal range, and the more marked the difference between the levels reached at neap tide and at spring tide, the more distinctly will a seaward-growing beach show the ridge-and-furrow structure. Thus during neap tide there may be formed a *Full* so large that at the succeeding higher tides it is only rolled a short distance shorewards, not far enough to amalgamate it with the last spring tide *Full*. Similar conditions apply to the aggregated bank called the summer *Full*, and its amalgamation, or non-amalgamation, with the *Full* of the previous winter. The larger the *Full* the slower it travels; its condition of stability may be defined much in the same way as those of a desert dune. An embryo *Full*, as an embryo dune, may (1) be destroyed; (2) may be hurried into coalescence with an older, larger, and slower-moving *Full*; or (3) may in rare instances grow until it possesses the permanence and immobility which size alone can give to an aggregate of incoherent material. Thus, instead of coalescing, the larger *Fulls* remain isolated from one another, and we have the ridge-and-furrow structure (which is shown, *e.g.*, on the map of Dungeness, Sheet 4, Geological Survey, reproduced in Dr. Gulliver's paper in *Geographical Journal*, May, 1897, p. 541). It has been observed at Orford Ness,* and Dungeness, and at Langley Point,† that there is a rise in the level of the shingle towards the present shore-line. It is unnecessary to invoke upheaval or subsidence to account for such difference of level, for as a Ness grows out into the tideway it offers increased obstruction to the coastal currents, the momentum of which will consequently bank up the water to a higher level, and the elevation attained by successive Fulls will therefore continually increase.

§ 7. The Along-shore Drift of Beach Shingle.

(*a*) The Action of Oblique Breakers.—On a steep shore, obliquely running waves break before they have time to swing round so as completely to face the shore, so that along-shore wind gives obliquely acting breakers. On a gently sloping shore, and with an ocean swell, the wave swings round almost parallel to the shore before breaking, and the line of action is therefore at right angles to the shore, or nearly so. But although one wave cannot give a very oblique breaker on a shallow shore, *two* waves can. With the wind along-shore there are generally two principal sets of waves running, viz. the set which runs straight for the shore, coming in from the offing, and the set which travels nearly parallel to the shore, running before the wind. In deep water the waves of these two sets pass through each other, their interference being momentary

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* Redman, *Min. Proc. Inst. C.E.*, 1865, vol. 23.

† Topley, 'Mem. Geol. Survey,' Weald, p. 314.

and not in any way hindering the transmission by each of its proper impulse in the direct line of its motion. But the depth in which water breaks depends upon the height of the billow; consequently, when these two sets of waves are running, the combined billow formed by the coincidence of the two *crests* breaks before the time proper to the along-shore wave, and therefore before it can swing round to face the shore. The depths in the combined troughs being correspondingly diminished, the water there does not break. At the moment of breaking of the combined crests, the water simultaneously receives two impulses, one directly on-shore, and the other very oblique to the shore. There is no longer sufficient depth of water in front to transmit these two impulses, and instead there is a projection of the water in the direction of their mechanical resultant. The result is the rapid succession of the *short* breaker in the direction shown in Fig. 1. Under a sheltering headland the lateral waves which run before the wind are small, and only serve to serrate the crest of the wave which comes from the offing.

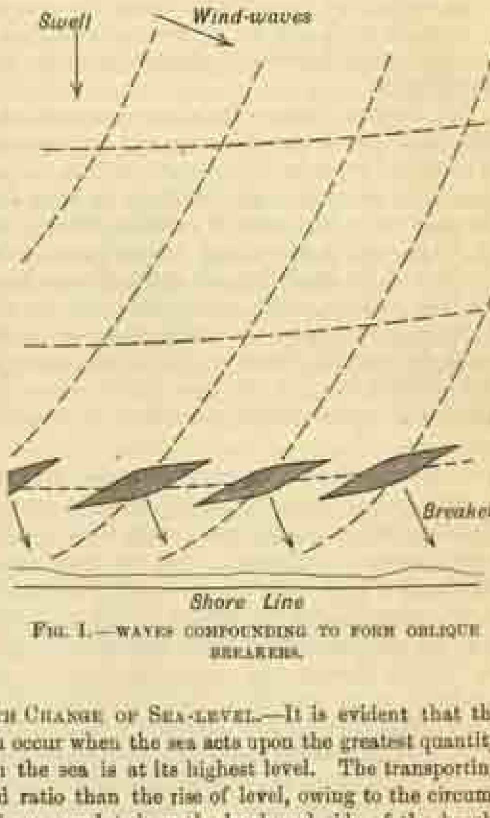

FIG. 1.—WAVES COMPOUNDING TO FORM OBLIQUE BREAKERS.

(*b*) THE DRAG OF THE WIND.—The drag exercised by wind upon the sea bottom is nowhere else so strong as in the shallow wash of the waves* with a breeze blowing along-shore, where its power is beautifully illustrated by the rippling of the froth which floats within the breaker-line. The swing given by wind to the water of the wash is easily seen. The bottom drag of the along-shore wind is also considerable at the small depth where the waves break. Here incessant agitation keeps the shingle constantly on the move, buoyed by upward swirls, so that the drift of the water before the wind can influence its motion.

(*c*) WIND CO-OPERATING WITH CHANGE OF SEA-LEVEL.—It is evident that the greatest amount of transport can occur when the sea acts upon the greatest quantity of shingle—that is to say, when the sea is at its highest level. The transporting power increases in a more rapid ratio than the rise of level, owing to the circumstance that most of the shingle is accumulated on the landward side of the beach, where its thickness is greatest. It follows that a wind blowing in the direction of the flood tide will have an advantage in shingle-transport over the wind which blows with the ebb, for the former, by opposing the turn of the tide, tends to increase the duration of tidal high water, and to diminish the duration of tidal low water. *Thus, although the forces of currents may be equal and opposite in the two cases,*

* Compare remarks by Sir George Nares, *Min. Proc. Inst. C.E.*, cxxv., 1895-6, pt. iii. p. 36.

the opportunities of action on shingle are greater when the wind blows with the flood tide. Again, the waves break most violently on the steep beach near high-tide mark, which further increases the effect of prolonged high water in promoting transport. The along-shore wind which is accompanied by a low barometer has a corresponding advantage of opportunity over the along-shore wind which is accompanied by a high barometer, and the wind along-shore which blows from the greater expanse of water over the wind which blows from the less.

It is necessary to guard against the assumption that the greatest amount of shingle transport is, at every point of the coast, in the direction of action of the more potent forces. For let us consider the case where a beach receives a large supply of detritus of a certain kind at, say, the north end, and a small supply of the same kind of detritus at the south end. Between these ends the tide ebbs and flows, and the winds are sometimes north and sometimes south. Let the forces acting from the south be slightly the more potent; then, *since the difference of forces is small and the difference of quantities is great, there may be a greater transport in the direction of action of the smaller force, since the motion of the water is oscillatory.*

(*d*) Shingle Spits.—The along-shore drift of beach shingle often extends a shore beach as a shingle spit projecting between sea and calm water at the entrance of rivers and estuaries. The permanence of these spits may well excite surprise, considering their apparent liability to be swept bodily away. Their safety is in the opportunity they enjoy of receding before a storm, the shingle being pushed by the percolating water,* and material scoured from the face being flung over to the back of the bank into still water, whence it does not return. The velocity of the tidal currents at the point continually increases as the spit lengthens. The flood-tide (coming from the quarter which brings waves) is, from this circumstance, much the more effective in moving shingle, hence the curvature increases near the end of the spit. The curvature of the stream-lines at the end of the spit has practically no effect during ebb-tide, for it is against the waves.

§ 8. On the Travel of Shingle across the Bays of the English Channel.

The velocity of tide currents in the bays of the English Channel † is in many cases insufficient to make shingle shift; but, as Sir George Stokes has shown,‡ the tidal current in co-operation with the long Atlantic swell is sufficient to move shingle at a depth even greater than is attained in these bays. Therefore, with such a swell running, the shingle in the bays will travel backwards and forwards with the tide; but during winds from the Atlantic, there is a flow of water through the English Channel from west to east,§ and the bottom current must be in this direction, for the wind blows from the salter to the fresher water. When the west wind subsides, an equal, or perhaps a smaller, quantity of water finds its way back down channel; but the waves have now subsided, the bottom water is therefore but slightly agitated in the deeper parts of the bays, and consequently the shingle does not travel westwards. The waves from the east in the English Channel are, it is generally allowed, of less amplitude than those from the west, and, which is of more importance, they are of much smaller wave-length. From such data as

* This action is very marked in the case of the Chesil beach, and (as has been pointed out to me) aids the encroachment of the Fleet upon the opposite shore.

† Consult, for instance, King's 'Pilots' Handbook for the English Channel,' 12th edition, revised by Commander T. A. Hull.

‡ *Trans. Devon. Assoc.*, vol. xix. pp. 512-515.

§ Compare Mr. H. N. Dickson's salinity maps in *Geographical Journal*, March, 1896.

I have, I reckon that they would move shingle at 10 fathoms, hardly at all at 20 fathoms, and probably not at 30 fathoms, which is about the greatest depth in these bays. But even at 10 fathoms, the movement of shingle must be little more than an oscillation with the tide, for there can be but little bottom drag in the direction of a wind blowing off the continent from fresher towards salter water. I conclude, therefore, that the shingle swept past the headlands of our south coast can work its way, in the course of the seasons, eastwards across the bays. When in this manner it is once more brought to shallow water, the sharper shoreward impulse of the swell which has "felt the bottom" jerks it in, until it once more reaches the breaker and is thrown upon the beach.

§ 9. On the Growth and Diminution of a Shingle Ness.

The coast-line recedes before the sea at any part (not suffering upheaval) where the removal of detritus (by littoral drift and off-shore movement) is not compensated by an equal or greater amount brought by the sea. The direct local supply of detritus, by waste of the coast, obviously cannot cause that part of the coast to advance. Shingle is chiefly derived from the waste of cliffs;* under cliffs of compact rock littoral drift is accelerated, and shingle beaches form to "leeward." At any part of a shingly shore *where supply exceeds loss* (*e.g.* on account of checking of current), *the beach grows seaward. This increases the total length of the shingly coast, and the supply of shingle per yard frontage therefore decreases, until it only just suffices to compensate the loss. The Ness has then reached its maximum growth* under the given conditions. Such growth may commence, for instance, when a wasting chalk hill slopes seawards, so that the height of the cliff and the supply of flints which feeds the beach are increasing. Conversely, the Ness may diminish when the receding hill which supplies it slopes landwards. Dungeness is supplied, not directly from the waste of cliffs, but indirectly through an intermediate deposit which encroaches, after the manner described under "Shingle Spits," upon the river Rother. The point of Dungeness tends, therefore, to preserve a constant bearing and distance from the extremity of this accumulation of shingle, and therefore, of necessity, a constant distance and bearing from the mouth of the Rother, the position of which is controlled by that of the shingle bank to the westward. An accumulation such as Dungeness is less subject to alternate growth and diminution than a Ness which is fed directly from a wasting cliff, for the annual supply depends upon the outgoings from the intermediate store-house for shingle. This is determined by the length of its sea-front, which is not appreciably affected by the removal of several layers of the shingle. Thus the fluctuations of the cliff-supply are diminished.

§ 10. The Grading of Beach Shingle.

(*a*) The Laws of the Grading of Beach Shingle.—No stony particle of less than a certain critical size can remain permanently on a beach, but is ultimately swept out to sea. This critical size is greater on a coarse-grained than on a fine-grained beach, for the *regimen* slope of the former is steeper, and gravity therefore gives greater assistance to the back-wash. It is well known that every particle upon the surface of a beach suffers attrition, whence the conclusion has been too hastily drawn that the grain of an isolated beach naturally becomes finer as the distance increases from the extremity where the beach is fed with detritus. Now, it is to be noted that *whereas the attrition of the particles tends to lower the average size of the shingle, and hence to make the grain of the beach finer, the removal of particles of less than the critical size raises the average dimension of the shingle.* Hence we may

* Except where mountain torrents rush straight to sea, as, *e.g.*, on the Riviera.

deduce the following *laws of grading of beach shingle applicable to a beach fed entirely at one extremity, whence the material travels along the beach*:—

Law 1. If the material be of uniform size, the grain of the beach becomes finer as we recede from the source of supply.

Law 2. If the material be mostly fine stuff, with a small admixture of coarse stuff, then (unless the coarse stuff be very friable, and the fine stuff very durable) the grain of the beach will become coarser as we recede from the source of supply, for the average size is more affected by the removal of a large number of fine grains than by the attrition of a small number of coarse grains. This increase in coarseness will continue until the beach material is brought to a uniform size, when the grading proceeds as in 1.

Law 3. If the material be mostly coarse stuff, with a small admixture of fine stuff, then, as we recede from the source of supply, the grain of the beach will become finer, for the attrition of a great number of large particles has a greater effect upon the average size of the material than the removal of a small number of fine particles.

By combining 2 and 3 we can deduce the following *corollaries applicable to a beach fed from both extremities*:—

Cor. i. If the material fed in at one extremity be mostly fine, and at the other mostly coarse, the grain of the beach increases in size from the former to the latter extremity, the two modes of grading co-operating.

Cor. ii. If the material fed in at both extremities be mostly fine, the grain of the beach will be coarser in the middle.

Cor. iii. If the material fed in at both extremities be mostly coarse, the grain of the beach will be finer in the middle.

Law 4. The grain of the beach is (*cæteris paribus*) coarser where the beach is exposed to the heaviest breakers. This law follows from what has been said on the action of the back-wash, and on a "critical size" of beach material. We may add to the italics of § 5 (c) that the *deeper* back-flowing stream *floats* out the smaller shingle.

Law 5. The grain of the beach is (*cæteris paribus*) coarser near the "weather" end of a promontory. Thus, if west be the weather side, and the end of a long beach be protected from the east by a headland at the eastern extremity, then both large and small pebbles will travel eastward along the beach in a westerly wind, but only the small ones are carried back from the promontory during an east wind, so that the proportion of large pebbles to small is increased as we near the promontory from the west. This is, in fact, similar to the case of the sorting of sand from shingle by unsymmetrical oscillation, as described in § 4.

Grading by Groynes.—When groynes are erected to check the drift of shingle, we find that the shingle is coarse where it is piled up near the seaward extremity or point of each groyne (A, A′, A″, Fig. 2), and relatively fine at the base of the groynes (B, B′, B″). This grading is effected as follows: At the points (A) the breakers beat most strongly, and from these positions the next step in advance can only be made by sweeping out shingle round the end of the groyne; thus, as we go from the A to the B positions, the *ratio* of the rate of removal of fine shingle to the rate of removal of coarse shingle increases, the proportion of coarse shingle present is therefore correspondingly increased at the A positions, and the grain of the beach at these positions is consequently large.

(*b*) On the Diffusibility of Shingle.—It appears that the grading of shingle and the phenomena of long-shore drift of shingle must of necessity be influenced by a peculiar process, which, from its physical analogies, I term a process of diffusion.

In virtue of the property termed "diffusibility," the particles of contiguous masses of liquids or gas intermix somewhat slowly, not only without the assistance of external agency, but even against such agency, the process being termed "diffusion." If an aggregate of stones be exposed to an *absolutely steady current*, there is no motion of individual particles up-stream, but *when, as is usual on beaches, the main drift of the material is in the direction of the more potent of two alternating motions of water, there may be a true diffusion of shingle against the drift.* In order to fix our ideas, let us suppose that the main drift due to the motion of the water is eastwards. Now, since it is only the top layers of a beach which move, such shingle as happens at any time to be buried escapes transport until again uncovered. *Among an indefinitely large number of cases, it must happen that some pebbles driven westwards are always buried when the easterly drift succeeds, and are uncovered during the next westerly drift, and hence go westwards again, working their way against the main drift.* The chances are against any selected pebble working its way against the drift, and experiments with a moderate number of selected pebbles

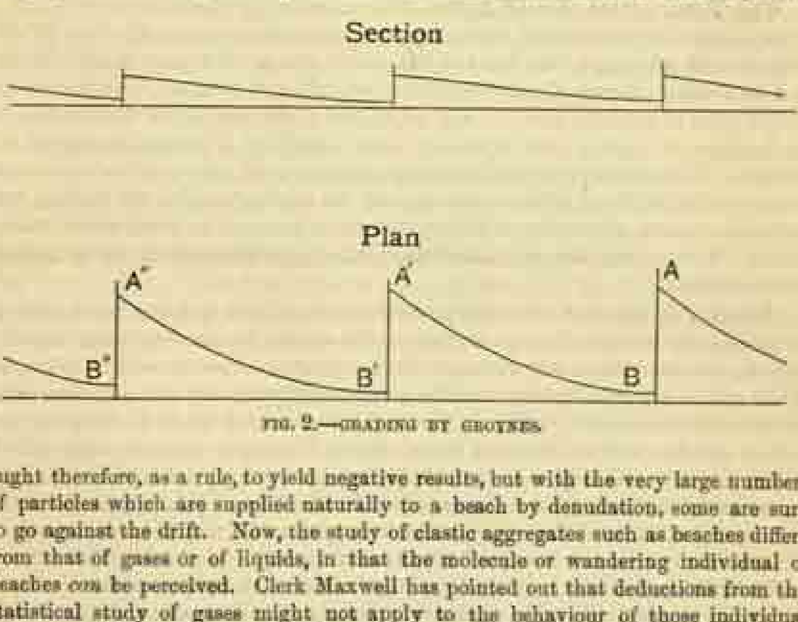

FIG. 2.—GRADING BY GROYNES

ought therefore, as a rule, to yield negative results, but with the very large numbers of particles which are supplied naturally to a beach by denudation, some are sure to go against the drift. Now, the study of clastic aggregates such as beaches differs from that of gases or of liquids, in that the molecule or wandering individual of beaches *can* be perceived. Clerk Maxwell has pointed out that deductions from the statistical study of gases might not apply to the behaviour of those individual molecules which sharpened faculties would enable a man to study. Conversely, if we recognize one or two travelled pebbles of a conspicuous kind, we must not straightway conclude that the main drift of the shingle is from the direction whence these pebbles come. Due account must be taken of diffusibility.

(*c*) A Beach Survey.—What is now wanted for the further study of grading and drift of shingle and sand, is a simultaneous survey of a complete coast-line, preferably the whole coast-line of Great Britain. The samples should be collected between the high tides of the same day, and should be taken just below the last high-water mark. If practicable, the survey should be made in duplicate at six months' interval. The Coastguard provides the requisite organization; the cost and trouble would be but small if the Admiralty give the order. In addition to serving the special purpose which I have indicated, the collection would be a permanent work of reference for the geologist and the civil engineer.

(*To be continued.*)

THE MONTHLY RECORD.

EUROPE.

The London Geological Field Class.—We have received from Prof. H. G. Seeley the syllabus for 1898 of the London Geological Field Class, which has now carried on its useful operations for twelve years, having been established in 1886. Its object is the teaching of physical geography in the presence of the geological structures on which that science is based, the instruction being given during Saturday afternoon excursions between the end of April and the middle of July. During the present season a variety of strata in the neighbourhood of London will be examined, and a study made of the relation of the surface features to the folding and mineral character of the strata, and to the denuding forces by which the surface has been shaped.

The Ports of the Sea of Azov.—The *Annalen der Hydrographie* (No. IX. 1897) contains a paper setting forth the latest information obtainable from official sources with reference to the ports of the Sea of Azov. The ports dealt with are five in number—Kertch, Genichesk, Eisk, Temrjuk, and Anapa. A short description is given of each, its position and population; and the nature and amount of its foreign and coasting trade, statistics being added for a number of years where possible. There are also descriptions of the harbours, the nature of the anchorage, the prevailing winds at different seasons, and the accommodation for loading and unloading vessels, with notice of improvements in progress or about to be undertaken. We commend the paper, short as it is, to those interested in the commerce of this region.

Travels in Spain.*—Dr. Gadow's volume supplies a pleasant proof that it is unnecessary to leave Europe to find subject-matter for an interesting book of travels, but that there still remain secluded spots not overrun with tourists, in which native life and character may be studied comparatively uncontaminated by contact with the outside world. It describes two extended journeys made by the author and his wife in Northern Spain, during the course of which many of the wilder districts of Galicia and other northern provinces were traversed, and many opportunities enjoyed of becoming acquainted with the unsophisticated life of the country districts, as well as that of the somewhat more civilized town-dwellers. To those who remember George Borrow's vivid descriptions of the wilds of Spain in the earlier part of the century, Dr. Gadow's pleasantly written narrative will be of special interest. In spite of the introduction of railways, and even of such appliances of civilization as the electric light, many of the towns appear to have little changed since Borrow's day, and in some cases even to have retrograded. Thus we are told of Pajares, formerly a prosperous place with a large traffic across the pass between Leon and the Asturias, that "all this has been changed for the worse by the railway, which to the villagers is of no use whatever." The most "dead-alive" of towns, however, such as Villafranca del Vierzo, have a wealth of historical associations, and notes on these are freely interspersed in the narrative and heighten its interest. Many fascinating pictures of natural scenes are drawn, and are brought vividly before the reader by the help of the many excellent illustrations.

ASIA.

Captain Deasy in Central Asia.—Captain Deasy writes from Yarkand

* 'In Northern Spain.' By Hans Gadow, M.A., PH.D., F.R.S. Map and Illustrations. London: A. & C. Black. 1897.

under date January 23, giving some details of his work during the past winter. He had reached Yarkand from the Taghdumbash Pamir *viâ* Raskam, Bazar Dara, Kulan Arik, making *en route* an important discovery with respect to the Yarkand river. Its true course proved to be different from that shown on the Society's map of the Pamirs published under Mr. Curzon's direction. The great bend of the river shown on that map was based on the work of Captain Grombchefski, the only traveller who had then visited that part of the country, but the greater part of its course was merely shown hypothetically. Younghusband, in the map accompanying his book, 'The Heart of a Continent,' omits the bend entirely. Captain Deasy hoped, as soon as the sick members of his party (including the sub-surveyor who accompanies him) should be well enough to travel, to ascend the Yarkand river southwards to near Raskam, and obtain more particulars as to the geography of this little-known region. He has already carried out a triangulation, during the course of which he had to camp close to the top of the Kukalung pass, about 16,500 feet above the sea, a few days before Christmas. He has also devoted much attention to astronomical observations, though much hampered by cloudy weather. He hopes to be joined in May by Lieut. Stothert, and, if the journey is successful, will probably not return to civilization until next year.

Explorations in Indo-China.*—Of late years the details of French exploration in Indo-China have been but little known to English readers, and it is, therefore, matter for satisfaction that the account of one of the latest and most successful of the numerous French journeys in that region should have been presented to the British public by the recent translation of Prince Henri of Orléans' narrative. The journey of which it tells was remarkable, as piercing for the first time the "iron wall that separates British India from the Chinese frontier," as the excessively difficult country about the sources of the Irawadi was well termed by the late Sir H. Yule. Although some regret is unavoidable that this exploit—the accomplishment of which was the ardent desire, over a quarter of a century ago, of that daring explorer, Mr. T. T. Cooper—was not the work of a British traveller, it is impossible not to admire the dauntless spirit which carried Prince Henri and his companions through the many difficulties which beset their path, difficulties of which a vivid idea may be gathered from the Prince's pages. The country traversed presents a surpassing interest from the striking character of its physical features—its great rivers running in parallel courses between precipitous mountain walls, its trackless forests (tropical or coniferous according to altitude), its rushing streams liable to sudden floods—and we hear much of the dangers arising from slippery mountain paths, and the frail and quavering bridges to which the traveller must trust himself for the crossing of unfordable rivers. Of geographical results, the journey was decidedly fruitful. Apart from the elucidation of the problem of the Irawadi sources, much new light was thrown on the borderland of Tonkin and Yunnan between the Red river and Sumao, whilst the section of the Mekong explored had been previously almost unknown to Europeans, except at the crossing of the great Yunnan-Burma road. In this part the river bears a great variety of names, generally derived from the places at which crossings are effected. It is interesting to notice that one of D'Anville's names for this part of the stream—Kin-lan Kiang—was found to be in use, as well as the more generally applied name Lan-tsang-Kiang (also given by D'Anville). The stream is throughout turbid, confined, and rapid, and is spanned at several points by chain bridges, though none exists between the

* 'From Tonkin to India.' By Prince Henri of Orléans. Translated by Hamley Bent, M.A. London: Methuen. 1898.

latitude of Tali-fu and Tsiamdo on the Pekin-Lhasa road. Some valuable information was likewise obtained with respect to the upper Salwen, which, near the latitude of Tali-fu, gave the impression of "a large river coming from afar." Its low-lying valley was found to bear the same reputation for unhealthiness as was noted by Captain Gill. It too bore a variety of names: that of Lu-kiang was said by the native interpreter, Joseph, to signify "Wrath river," and would thus appear not to be derived from the Lu-tse tribe, as is generally stated. In fact, the Lu-tse of one section of the river are said to be called so *from* the fact of their living on the river, and not *vice versâ*. The name Nong-kiang recalls the A-nong of the Abbé Desgodins, said by him to be the true name of the Lu-tse. Of special interest is the information with regard to this and other aboriginal tribes, who in a limited degree own the supremacy of the Chinese, and who hardly bore out the reputation for ferocity given them by their neighbours. Though the men were dirty and repulsive, the women were often much more pleasing. Prince Henri speaks in high terms of the work of his compatriots of the Tibet mission, one of whom had, during twenty-eight years, seen only one other traveller—Cooper. The book is provided with a large number of illustrations, but many of these are evidently rather fanciful. The French spelling of place-names—which is not only clumsy at times, but actually misleading to English readers—has unfortunately been retained both in the text and the map. Thus we find Lhaça, Choueli, for Lhasa, Shweli. Some useful geographical appendices by M. Roux complete the volume.

The Persian Gulf.—We have received from the author a copy of an inaugural dissertation by Herr Siegfried Genthe on the Persian gulf. The first part of the paper is occupied with a discussion of the commercial history of the gulf in relation to its geographical position; a fairly comprehensive summary is given of the most important works on the subject, oriental and otherwise, and there is some rather futile speculation as to the *rôle* of the Persian gulf in a future overland route to India. The second half is devoted to the physical geography of the region. A new map, based almost entirely on the Admiralty charts, shows the contour lines, and an attempt is made to estimate the rate of formation of the delta of the Shat-el-Arab by comparison with Dalrymple's charts of date 1786. Planimetric measurements of the new map give smaller results, both for surface area and mean depth, than those usually accepted. Herr Genthe admits, however, that the scientific exploration of the region is not sufficiently advanced to allow of satisfactory conclusions being drawn. We entirely agree with him that it is one of great hydrographical and geological interest, well worthy of a careful survey like that carried out by the *Pola* in the Red sea.

The Southern Chin Hills.—A lately issued report by Captain G. C. Rigby (Rangoon, 1897), on the military operations carried out in 1896–97 in the little-known hilly districts on the frontier between the Northern Arakan hill tracts and the Pakokku district in Upper Burma, contains some valuable information with respect to the general nature of the country and its inhabitants. These operations, in which Captain Rigby took part as intelligence officer, were rendered necessary by the raids committed by some of the Chin tribes on certain villages and posts on the Burmese side, and during their course advantage was taken of the opportunity afforded to survey and generally obtain a more accurate knowledge of the country traversed. The backbone of the whole region is the Arakan Yoma range (6000 to 7000 feet), which divides the streams flowing westwards to the Gulf of Akyab and eastwards to the Irawadi. West of it is a series of dense jungle-covered ranges running north and south, drained by the Lemru and Kaladan rivers. To the east an important spur branches off in a south-east direction, known as the Kunumchung range. It is higher than the main range, and culminates in Mount Victoria (10,000 feet), the highest peak in Burma. Between it and the Yoma range flows the Mon river, which, after a course of 160 miles, joins the Irawadi a little north of Minbu. Its course within the Chin hills is not shown at all on most of our maps. Long spurs run eastward from the Mount Victoria range, making travelling exceedingly difficult from north to south, but comparatively easy from east to west. Most of the tracks possible for mules (roads exist only on the eastern edge of the district) follow the crests of these ridges. Towards Arakan, on the contrary, communication is easier in a north and south direction. The climate is cold and bracing in the higher parts; the rainfall is apparently of a drizzly nature, as there are no signs of a heavy flood rise in the larger streams. Economically, the country is described as worthless, and food-supplies are very limited. Millets form the staple crop. The main Yoma range is densely jungle covered, principally with oaks of various kinds, and rhododendrons are also met with. To the west the hills are covered with dense thickets of small bamboo. Elephants and rhinoceros have now disappeared to the east of the watershed, but black bear, bison, sambhur, barking deer, etc., occur in large numbers. Several sites suitable for sanitaria are mentioned by Captain Rigby, and he bears witness to the great natural advantages of the Mount Victoria range, the air being most exhilarating. In addition to minute topographical details, illustrated by route and other maps and sketches, the report contains notes on the various sections of the Chins. Their villages are nearly always built on the steep hillsides, the houses being placed one above the other on platforms dug out of the hill. One section of the Chins is known as that of the "Cane-bellies," from the coils of split cane which they wear round the waist.* They are a superior race, of fine physique, and proved friendly and honest.

Journeys in China and Manchuria.—Prof. L. v. Lóczy has sent to *Petermanns Mitteilungen* (March) a note on the journeys so far made by Dr. Eugen v. Cholnoky, Assistant in Geography at the University of Budapest. Starting from Shanghai in February, 1897, the explorer traversed the network of canals to the south-east of the Tai-hu till he reached the sea-dyke on Hangchau bay, which he then followed to Hang-chau, passing Tsa-pu and Hai-ning-hsien. At the last-mentioned place he made careful observations of the bore of the Tsien-tang, and photographed this phenomenon in its various phases. Various other journeys were made on the southern borders of the great plain and on the lower Yangtse-kiang, the distribution of laterite and alluvial deposits being special subjects of investigation. In May and June he made an excursion in Northern China and Mongolia (by Kalgan and Lama-miao), during which he made observations on the subaerial and alluvial deposits of that region, and then, acting on behalf of a French mining syndicate, he betook himself in August to Nagasaki, and thence to Vladivostok and Possiet bay, in order to reach the mining colony of Tian-pau-shan by way of Hunchun. Having completed his examination of those mines, he spent the period from October to December in traversing Southern Manchuria by way of Womosu, Kirin (Girin), and Mukden, finally arriving at Shanhaikwan, the terminal station of the Chinese railway. A continuous route-map on the scale of 1 : 100,000, several astronomical observations for latitude, and an insight into the geotectonic structure of the region traversed, are the results of this journey. His astronomical observations appear to show that Hunchun and the northernmost point of Korea are half a league further south than now shown on maps. A large number of

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* This remarkable girdle appears to be similar to that shown in photographs of the Andamanese, and also to that recently noticed among the aborigines of Formosa (*ante*, p. 68)

volcanic cones and an extensive lava-field were observed on the journey from Hunchun to Kirin.

AFRICA.

Surveys by Major Macdonald's Expedition.—In a letter written from Banda, 10 miles south of Lake Ibrahim, on February 2 of the present year, Major Macdonald informs us that, although his expedition has been diverted from its intended course by the Sudanese mutiny in Uganda, a certain amount of geographical work has been accomplished by various members of his party. Thus Lieut. Hobart has filled in some of the blanks in our maps in the east of Ankole, where he has discovered a lake some 12 miles by 3. During the pursuit of Mwanga's army, Captain Kirkpatrick did some work to the north-west of Koki, discovering another lake. Major Macdonald himself has added to our knowledge of the little-known country north of Chagwe and east of Bulamwezi. Captain Austin, during his march from Baringo to Save, north of Mount Elgon, was enabled to correct mistakes in older maps, besides adding fresh information. It appears that the crater of Mount Elgon is further north than was formerly supposed, Mr. Hobley's position being about right. Lieut. Hanbury Tracey, too, has explored the country for some distance north of the mountain. Major Macdonald remarks that the Luajali and Lake Ibrahim are shown on the old maps some 8 or 10 miles too far east, and that the shifting of their position involved by his recent work harmonizes with that brought about by the railway survey in respect of the Ripon falls, and by Lieut. Vandeleur's observations in respect of Foweira.

Hydrography of the Upper Nile Region.—M. E. de Martonne, whose studies of the social and political condition of the tribes of the upper Nile region have already been referred to in our pages (*Journal*, vol. x. p. 95), supplies a useful summary of our present knowledge of the hydrography of that region in the *Zeitschrift* of the Berlin Geographical Society (1897, No. 5). It, of course, does not present any new information, but full use has been made of the voluminous literature of the subject, and copious references to authorities are given throughout, while the facts are presented concisely and clearly. The paper is accompanied by maps and sections, the former showing (1) the oro-hydrographical features of the region, (2) its rainfall. In the first map, the contours of altitude are shown, six gradations of tint being employed, while the nature of the various streams—their permanence or temporary character, the swampy portions of their courses, and the position of the falls and rapids which impede navigation—is shown by a distinctive method of delineation. The limits of the upper Nile basin—a subject to which special attention is devoted in the text—are shown by a continuous line where accurately known, by a dotted line where more or less hypothetical; and the large use made of the latter, especially in the central basin of the river, shows clearly how much remains to be done before the complete system of the Nile can be said to be fully known. Not only in the direction of the Shari basin and of Lake Rudolf,* but even in Kordofan and the region between the Blue and White Niles, the exact limits of the basin are still undefined. The diagrams include profiles of the upper Nile region from south to north, and from west to east, and of the course of the Nile itself from its headwaters to Fashoda; also a graphic representation of the distribution of rainfall through the year. The rainfall map, though it cannot, of course, lay claim to minute accuracy, is based on all the available material, a summary of which is given in a table embodying the results at thirty-six different places.

Tunis since the French Protectorate.—An exhaustive report on the present

* The data for the map are brought down to July, 1897, so that account has not been taken of the results of Captain Bottego's last expedition, which had not then been published.

condition of the Regency of Tunis, and the progress it has made since the establishment of the French Protectorate, has been made to the Foreign Office by Sir Harry Johnston, now British Consul-General in that country. It contains a large amount of valuable information on the government and administration of Tunis, its commerce and resources, its system of communication, and so forth, as well as details useful to the tourist, and a discussion of the prospects of British trade with the Regency under the new customs tariff. Having visited the country in 1880, before the French occupation, Sir Harry Johnston is well qualified to speak of the results attained after seventeen years of settled government; and the comparison he draws between the dangers incurred by European travellers at the time of his first visit, and the present security both of life and property, is a striking testimony to the benefits which have been brought to the country by French rule. Improvements are to be noted in all directions. Roads and railways have been constructed; the ruthless destruction of forests has been stopped; wells have been sunk, manufactures encouraged, and useful public works set on foot. Of the numerous agricultural resources possessed by Tunis, the olive tree promises, Sir H. Johnston thinks, to become its most important asset in the future. The export of *halfa*, or esparto grass, has recently much diminished; but the demand for it will probably go up, now that it has been shown that paper made of wood-pulp crumbles to pieces after a few years. The fisheries are of singular wealth, and the live stock includes horses, mules, donkeys, camels, oxen, sheep, and goats. Tunis is, in Sir H. Johnston's opinion, as certain to become a white man's country as is Cape Colony. Rome, through her daughter France, will resume her sway, and the damage done by the Mohammedan invasion of the seventh century will be repaired. As regards British trade, the total value of which for 1897 Sir H. Johnston puts at £680,000, we had, he thinks, little reason but to be satisfied with the results of French protection down to the end of that year, and even under the differential treatment now accorded to French commerce, a considerable future may be anticipated for British trade. The demand for British cotton goods shows a tendency to increase, and those already sent seem to meet the local taste exactly. But here, as elsewhere, in spite of the excellence of our goods, they are in many cases losing their hold on the people, through the little effort made to push them.

Uhehe as a Field for German Colonization.—The attention of those interested in the future of German East Africa has of late been increasingly turned to Uhehe as a possible field for *Colonization* by Europeans as distinguished from the mere establishment of plantations under European control. From various quarters come testimonies to the suitability of the region for that purpose. We have already referred (*Journal*, vol. x. p. 638) to a paper by Herr von Bruchhausen on the Uchungwe mountains in Uhehe as a field for colonization, and this is now followed by an article in *Globus* (1898, No. 3) by Count von Pfeil, on a somewhat broader aspect of the question. He points out that on his first visit to Uhehe, in 1886, he was much struck with the fact that it was, to use Mr. Rhodes' expression, "a white man's country," and comparable to the Orange Free State in South Africa. At that time, however, the general attention was so taken up with plantation projects in Usambara and elsewhere, that his ideas attracted little notice. He is now able to point with satisfaction to the similar views lately expressed by Lieut.-Colonel Liebert, and he devotes his article to an examination of the grounds on which this opinion is based. Having shown that the country contains a sufficient area of an average elevation of 6000 feet to offer an independent means of livelihood to a considerable number of settlers, and to secure the future of the whole German sphere, he inquires whether the physical conditions of the country are such as permit prolonged residence for Europeans without detriment to health.

This leads him to a comprehensive sketch of the climate and soil of the district, its natural productions, etc., and the result is to show that an experiment in colonization is decidedly to be recommended. Count von Pfeil draws an attractive picture of the country, in which existence is a delight, and which he never could leave without regret. The illustrations, from his own sketches, which accompany the paper, fully bear out his description of the romantic scenery of Uhehe. In two papers printed in Nos. 6 and 11 of the *Deutsche Kolonialzeitung* for the present year, Dr. Arning takes a similar view as to the capabilities of Uhehe. The conditions there are, he considers, so favourable, that the settlement of the country might form a turning-point in the development of German East Africa. It is unfortunate that this favoured country should, according to recent reports, have been the scene of a serious rising against the German authorities.

Proposed African Expeditions.—An important Belgian expedition has just started to complete the scientific exploration of the southern parts of the Congo basin. Its leader is Lieut. Lemaire, who is accompanied by five Europeans. The expedition will start from the east coast, and reach Lake Mweru by the Nyasa route, continuing its route westwards to the Kasai and lower Congo. It is also announced (*Petermanns Mitteilungen*, No. 2) that Dr. Holub, the well-known South African explorer, is to return once more to the scene of his labours. He does not propose, however, to start until next year.

Journey to Lake Rukwa.—In connection with the report of Captain Langheld (*ante*, p. 68), that Lake Rukwa has almost entirely dried up within the last few years, the account of a journey lately made to the southern shore of the lake by Governor von Elpons (*Deutsches Kolonialblatt*, February 15) is of interest. Starting from Mirambo, on the Songwe, towards the end of September last, Herr von Elpons passed through the districts of Buntali, Unyika, Inyamwanga, and Wuanda, and along the Saisi to the village of Samangombe, on the lake-shore. Here there was hardly any water in the Saisi, while the lake was not visible, the country consisting of a vast dry grassy plain, abounding in antelopes and zebras. The lake was apparently reached a little to the east of the Saisi, but the water, as already reported by Mr. Nutt in 1894 (*Journal*, vol. vii. p. 427), was extremely shallow near the south shore. The area occupied by the water is not stated, so that it does not appear whether it was more or less extensive than at the time of Captain Langheld's visit. The districts passed through on the way to the lake were mostly well peopled, and their inhabitants friendly. Buntali is said to be astonishingly fertile, and its elevated position and protection by ranges of hills from the fever-bringing winds give it a great advantage over Konde. In many parts the people showed themselves ready to go as labourers to the German stations. Jumba-Wuanda, the chief place of the district of Wanda, showed evidences of considerable trade activity, though due perhaps in part only to transit trade to Uwemba. Muniwungu, at the south-east end of the lake, visited by Johnston in 1889, is also said to do a considerable trade with the coast. Herr von Elpons does not think favourably of the prospects of training the zebra as a riding animal, the possibility of which has lately been discussed in the German colonial press.

The Headstreams of the Kagera.—Besides the journeys of Captain Ramsay already referred to (*ante*, p. 299), those of Colonel von Trotha, of which a short account has lately been published, have thrown some light on the little-known region at the sources of the Kagera. According to a note in *Petermanns Mitteilungen* (1898, No. 2), Colonel von Trotha is inclined to consider the Nyavarongo as the principal headstream of the river. He also considers that, according to the agreement of 1884, the whole of the basin of Lake Kivu and the Rusizi properly falls to Germany, and that the Congo State has occupied this district without a legitimate title. Colonel von Trotha's journey, during which he paid particular attention to the topography of the country passed through, was carried out in 1896 and 1897. The earlier part of it has already been referred to in the *Journal* (vol. ix. p. 90). We learn from the *Mouvement Géographique* (1898, No. 8) that a private German expedition under Dr. Kandt set out in June last to complete the exploration of Urundi and Ruanda.

Captain von Carnap's Journey from the Cameroons to the Congo.—We have already alluded (*Journal*, vol. x. p. 638) to the exploration in the interior of the Cameroons undertaken by Captain von Carnap. We now learn from the *Mouvement Géographique* (Nos. 12, 13) that that officer has brought his journey to a successful conclusion, reaching the Lower Congo by way of the Sanga, and thus for the first time effecting a direct communication by land between the Cameroons and the Congo. Starting in September last from the Yaunde station, with a caravan of 200 men and one European companion, Captain von Carnap set out in an easterly direction towards the waterparting which separates the upper branches of the Nyong from the affluents of the Goko, one of the principal branches of the Sanga. The passage of this line of high ground offered no serious difficulties, though the considerable altitude attained caused the porters to suffer much from cold. Meeting with resistance on the part of the natives, who had never before seen a white man, the expedition deviated towards the north, reaching the town of Kunde, just within French territory. After obtaining permission from the French authorities to proceed with his armed force through the French sphere, Captain von Carnap made his way to Carnotville, and thence down the Sanga to the Congo, reaching Matadi by railway on February 11. According to a note by Herr Staudinger in the *Deutsche Kolonialzeitung* for March 31, Captain von Carnap found a Dutch firm already established for purposes of trade in the south-east corner of the Cameroons territory. Herr Staudinger urges the need of the opening up, by the German authorities, of this corner of their sphere, pointing out the value of Captain von Carnap's journey in this direction.

The Population of the Congo Basin.—In No. 8 of the *Mouvement Géographique* for the current year, M. Wauters recurs to the subject of the density and distribution of population in the Congo basin, a subject which has previously been dealt with from time to time in that journal. After noticing some of the estimates hitherto made of the total population of the Congo basin, from the 28 millions of Stanley to the 11 millions of Dr. Vierkandt (*Journal*, vol. vi. p. 183), M. Wauters calls attention to the great differences as regards density which exist between various parts of the basin, and shows how difficult it is, in the present state of our knowledge, to come to any accurate conclusion on the subject. He considers that the facts noticed on the river-banks, which form the best-known part of the basin, probably give an inadequate idea of the general density, the riverine villages being often mere dependencies of the large interior centres. M. Wauters quotes data from various travellers, showing how great is the population in certain districts, and comes to the conclusion that Dr. Vierkandt's estimate is far too low. That of Stanley, which gives a mean of twelve inhabitants to the square kilometre (between four and five to the square mile), is probably not far from the truth.

Completion of the Congo Railway.—After eight years of arduous labour, the great work of uniting the navigable portions of the upper and lower Congo by means of a railway has at length been virtually completed. A despatch was received in Brussels on March 27, announcing the arrival of the first locomotive at Dolo, on Stanley Pool. The Belgian company which has carried the undertaking through to this successful issue is to be congratulated on the achievement of a work which is likely to have so important an influence on the opening up of Central Africa. The *Mouvement Géographique* devotes its fourteenth number to a succinct review of the history of the undertaking, showing by a striking diagram the network of navigable waterways by it thrown open to the trade of the world.

The Ambaca Railway in Angola.—The fifth number of the *Mouvement Géographique* for the current year contains some extracts from the report of the company which is constructing the Ambaca railway, showing the progress made with the works, and the receipts during each year since traffic was inaugurated. Progress during 1896–97 had been slower than had been hoped, owing to sickness among the workmen and the difficulties encountered in the construction of the important viaducts between the 309th and 316th kilometres (192 and 196 miles). It was hoped, however, that locomotives would reach the terminus of the first section of the line (Lucalla) in August, 1898, there remaining only 35 miles to complete. The gross receipts of the line per kilometre open rose steadily from $234 in 1890–91 to $691 in 1896–97, but the increase during the last year was comparatively small, owing to depression of trade. A contract was signed in 1897 for the extension of the line as far as Malanje.

AMERICA.

Submerged Valleys off the West Coast of North America.—The *Proceedings* of the California Academy of Sciences contains an important paper by Dr. George Davidson on the submerged valleys off the coast of California, U.S.A., and of Lower California, Mexico. The first of these valleys, now known as the Hueneme valley, was discovered by the U.S. Coast Survey in 1855, and others have come to light from time to time in the course of surveys required for navigation. All those at present known lie south of Cape Mendocino, when the coast ranges from the south and south-east seem to end abruptly on the ocean front. Dr. Davidson has given attention to the subject for a number of years, and his paper is a condensed description, illustrated by nine plates of carefully drawn contour charts, of all the submerged valleys which have been surveyed up to the present. It would serve no useful purpose to attempt to summarize the contents; we need only draw attention to what is a valuable contribution to the literature of physical geography, as well as of navigation and of submarine telegraphy.

The True Route of Coronado's March.—This subject has been discussed by Mr. F. S. Dellenbaugh in a paper read before the American Geographical Society, and printed in the *Bulletin* for December, 1897 (also as separate pamphlet). The paper was originally read before the appearance of Mr. Winship's work, lately noticed in our pages (*ante*, p. 71), but before publication it has been to some extent revised in the light of Castañeda's text printed by Mr. Winship. The author considers that previous commentators have gone wrong in the determination of Coronado's route through not accepting Castañeda's statement that the expedition, after leaving Culiacan, the last European outpost, "kept the north on the left hand"—in other words, that the route was east of north. Owing to the difficulty in laying down the route in a north-easterly direction from the modern town of Culiacan, the course, as hitherto traced, has followed the coast for a long distance north-west before turning north, even then trending rather to the west than to the east of that quarter. Mr. Dellenbaugh evades the difficulty by supposing that the Culiacan of Coronado's time—a mere outpost—was not on the site of the modern San Miguel de Culiacan, but further up the coast near its intersection by the 109th meridian, where is a small town now called San Miguel. Tracing the route in a north-north-east direction from this point, he is able to offer very plausible identifications of most of the points touched at, especially Chichilticale, where, according to Castañeda, the country ceased to be covered with spiney trees and changed its aspect, the mountains ceasing and the desert beginning. This description would exactly apply to the neighbourhood of Cuesta Grande, near the pass of Canetas in the Sierra Madre, as described by Mr. Bandelier. Mr. Dellenbaugh does not bring the expedition at all to Zuni, supposed to be the site of "Cibola," but considers that a position near the Florida mountains, quite in the south of New Mexico, agrees better with the statements of the chroniclers, and especially with the length of time taken by Cárdenas on his march to the cañon of the Colorado, and with the apparent position of Cibola relatively to the Rio Grande (river of Tiguex). On the positions thus assigned to the chief pueblos visited, Mr. Dellenbaugh bases his determination of the further route across the Buffalo plains, taking the expedition to the Arkansas near its junction with the Canadian river, and possibly beyond. His theory has this in its favour, that it enables him to keep strictly to the statements of the chroniclers: its weak point is the assumption with regard to the starting-point, on which the whole elucidation rests, each separate identification depending more or less on those that have preceded it.

The Mexican Snow-peaks.—The eighteenth publication of the Field Columbian Museum (Geological Series, vol. i. No. 2) consists of observations by Dr. O. C. Farrington on Mounts Popocatepetl and Ixtaccihuatl, from a geographical and geological point of view. Although much has been already written on the subject, Dr. Farrington's paper is of value, both as embodying the personal observations of a professed geologist on many debatable points respecting the physical features of the mountains, and as supplying a concise summary of our knowledge as derived from the work of previous observers. It is provided with excellent photographic illustrations, which enable the features of the peaks to be clearly comprehended. The writer's visit was made in February, 1896, Popocatepetl being ascended to its summit, whilst on Ixtaccihuatl the point aimed at was the glacier which descends the western side of the mountain to the level of 14,500 feet. During the ascent of the former, which was made from the north by way of the ranch of Tlamacas (about 12,800 feet), the symptoms of mountain sickness were felt to a considerable degree, especially during the first hour or two after passing the ranch. It being the dry season, the snow-line was not encountered until several hundred feet above the point known as La Cruz (14,100 feet), whereas in the wet season the snow and ice descend nearly to the ranch of Tlamacas. The depth of the snow was rarely more than a few feet—a fact to be accounted for, according to Dr. Farrington, by the regular slope of the cone and the permeability and dark colour of the underlying ash-bed, which melts the snow and constantly drains away the water. There is no accumulation sufficient to form a glacier, nor is anything like a crevasse to be seen. On the eastern and southern slopes the snow sometimes disappears entirely, the cause assigned being the warm air rising from the valleys of Puebla and Cuautla, and not, as suggested by Heilprin (*Journal*, vol. ix. p. 100), the warm vapours which flow from the lip of the crater. A graphic description of the latter is given, and the nature of its wall is well shown by a photograph, the layers of lava of which the cone is made up being plainly visible. Fumes were escaping by six vents at the time of the visit, but the number and position of these seem to be variable. Although less known, Ixtaccihuatl, in Dr. Farrington's opinion, far surpasses its companion from a scenic point of view, its sharp rugged outlines, precipitous escarpments, and deep narrow valleys giving it a wild and imposing appearance. As regards its height, about which much difference of opinion prevails, the writer is inclined to accept, as more nearly correct, the higher estimate (fully 17,000 feet). He is also inclined to agree with Mr. Howarth (*Journal*, vol. iii. p. 140), that the mountain is not, strictly speaking, a volcano, whilst, unlike some observers, he considers the flora much richer than that of Popocatepetl. His investigations led him to conclude that at least one true glacier (that of Porfirio Diaz) exists on the western slope of the mountain, and that this had formerly a much greater extent than now. A full description is given, illustrated by several views of the glacier itself and its old moraines.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Harvard Geographical Models.—In a recent volume of the *Proceedings* of the Boston Society of Natural History, Prof. W. M. Davis explains the series of geographical models designed by him for use in his classes and geographical laboratory in Harvard University. He points out that the larger the scale of relief models of portions of the Earth's surface, the smaller is the necessary vertical exaggeration, and the more useful the model as an illustration of geographical forms. The models photographed in the paper are of the same type as Prof. Heim's, *i.e.* devoted to the delineation of typical geographical forms, not places which actually exist. They were modelled in wax, the fine detail being produced afterwards by carving-tools, and ultimately cast in plaster. In some cases the plaster models are further worked upon to produce new types. The models measure 24 by 18 inches horizontally, and their greatest elevation is about 2 inches above their sea-level. They may be taken as on the true scale of 1 inch to the mile. Every detail of form is copied from large-scale maps and photographs, and while some are unusual, none are impossible in nature. The first model figured represents a mountainous district bordering the sea, showing the effects of atmospheric, glacial, river, and sea erosion in its different parts, and bringing out clearly the contrast between submarine and subaërial contours. The model is used in teaching, in order to show how population would be distributed in such a region, where the towns and villages would lie, and how the roads would run; while the geological conditions that allowed of the particular forms being produced may also be discussed. The second model shows a region where the hills descend to a smooth coastal plain, sloping gently to the sea; the whole being of such a kind as might have been produced by the gentle uplift of the first model and the ordinary slow process of land-waste. The contrast of the hilly old-land in the background, and the new-land of the plain, seamed by its shallow river-valleys, is very clearly brought out, and can be discussed in its geological and in its anthropogeographical bearings as for the first model, the different conditions leading to a quite different distribution of population. The third model shows a mountainous region descending directly into the sea, with an irregular and highly developed coast-line of fiords and headlands. The whole represents conditions which could have been derived from the first model, if instead of uplift there had occurred subsidence admitting the sea into the mountain valleys. The beautiful photographs of the reliefs enables the reader to follow Professor Davis' most instructive geographical discussion of the models, and to realize what a vast aid the models themselves must render to the intelligent teacher who works out the principles laid down to their logical results. It is possible, in this way, to see how the forms of the land produced by the action of climatic agents on geological structures are in themselves determining causes of human development, and how some slight change in the forms of a country may account for a large final difference in the national interests of neighbouring peoples.

Age-terms for the Geographical Description of Land-surfaces.—Prof. W. M. Davis has a short note in *Science* (February 11, 1898) on the use of age-terms suggestive of systematic changes in the form of the land with the passage of time. He points out that such terms as young, mature, and old, have been very generally used to describe the stages reached in the development of a land-surface, but not always consistently. For instance, the well-dissected hills of Wisconsin have had the term "topographic old age" applied to them, while on the other hand the equally thoroughly dissected Alps have been termed young. Both of these should, according to Prof. Davis, be termed mature, the epithets "young" and "old" being reserved for such forms as the moderately denuded Jura and for plains of complete denudation respectively. With the help of qualifying adverbs, the three terms should, he thinks, be sufficient at least for elementary descriptions.

GENERAL.

The Russian Geographical Society.—At the annual meeting, which took place on February 2, the yearly report was read. It appears that the Society has 1104 members: 18 of the imperial family, 24 honorary members (6 foreign), 23 members who have made larger gifts to the Society, 833 active members, and 206 contributor-members, as also 209 correspondents. The total yearly expenditure amounted to £2500. The Society has sustained many heavy losses, among others, Lieutenant-general I. S. Stebnitsky, who was chief of the cartographic work in Caucasia, and belonged to the Society for 37 years; State Secretary Groth, who was for years treasurer to the Society, and shortly before his death had given the Society £500 for investigating whether the island of Sakhalin is really suitable for colonization; Th. S. Sludsky, one of the best authorities in higher geodesy; the two great historians, Bestuzheff-Ryumin and Th. Buslaeff; Count Delyanoff, and many others. In view of the extraordinary importance of Nansen's discoveries, the Society departed from its fifty years' practice of awarding its Constantine medal to Russian explorers only, and awarded a special medal of this name to Dr. Nansen. The usual Constantine medal was awarded to V. I. Roborovsky, chief of the Tibet expedition, for his explorations of Central Asia. Count Lütke's medal was awarded to I. I. Strelbitzky, for his journeys in Persia and Manchuria; and the Semenoff medal, newly established in commemoration of his twenty-five years' presidency of the Society, to Sven Hedin for his three years' explorations in Central Asia. The great gold medal of the Society was awarded to I. N. Zhdanoff for his various ethnographical researches, and especially for his work, 'The Russian Epic Poetry'; and small gold medals to Th. Th. Witram, for his pendulum measurements in the Far East; to F. F. Sperck, for a large work, 'The Climate of the Astrakhan Region'; to S. G. Rybakoff, for his collection of musical texts of songs amongst the natives of the Ural plains; and to S. O. Gulishambaroff for his large work, 'The World's Trade in the Nineteenth Century, and Russia's part in it.' A number of silver medals were awarded, namely, to A. V. Pastukhoff, for his communication on the ascension of the Elbruz; to G. Th. Abels, for hypsometrical measurements in the Urals; to B. A. Fedchenko, for his journey in the Talas Alatau; to V. E. Timonoff, for his paper on the water-communications in the Amur region; to V. V. Sapozhnikoff, for his communications on the glaciers of the Altai; to A. M. Kovanko and V. A. Semkovskiy, for the part they took in the organization of the international simultaneous balloon ascensions in 1894, in which the Society participated, and the ascensions of the exploring unmounted balloons; to Lieutenants Prince Obolensky, Tomilovskiy, and Utyesheff, for the daily observations they made for the Society on the velocity and direction of movements of the clouds during the year 1896–97, when these observations were made internationally. Three bronze medals were awarded for services rendered by different persons to the Society's expeditions. The secretary announced that, January 29 having been the twenty-fifth anniversary of P. P. Semenoff's first election as Vice-President of the Society—a position which he still occupies—the Council of the Society has established a gold medal in his name, and has obtained from the Government the permission to open all over Russia a subscription for that purpose. A brilliant ovation was made to V. I. Roborovsky.

OBITUARY.

Colonel Henry C. B. Tanner, Indian Staff Corps.

By Colonel Sir Henry R. Thuillier, K.C.I.E.

Colonel H. C. B. Tanner, of the Indian Staff Corps, and late of the Indian Survey Department, died at Bath on March 16 from pneumonia, after a brief illness of three days. The son of William Tanner, Esq., of Lockeridge, Wiltshire, one of the earliest colonists in Western Australia, Henry Tanner was born in Van Diemen's Land in June, 1835, and came to England when he was about nine years old. He was educated for the army, and obtained his commission from Addiscombe College in the Bombay Artillery in 1854, and went to India towards the end of that year. As a subaltern in a light field battery, he accompanied the Persian Expeditionary Force of 1856–57, and was present at the landing at Halila bay, at the taking of the forts of Reshire and Bushire, and in the action of Kushab, for which services he received the medal with clasp. After serving with a field battery for a few years, Lieut. Tanner obtained his "jacket," and was the *beau ideal* of a horse-artillery officer.

In October, 1862, he was transferred to the Bombay Staff Corps and appointed to the Survey of India Department, in which he remained during the rest of his career in India. He was first employed on various revenue surveys in Sind and in the Central Provinces, and was promoted to be captain in 1866. In 1871–72 Captain Tanner served as survey officer with the Lushai expedition, and accompanied Sir Charles Brownlow's column. He was mentioned in despatches, and received the thanks of the Government of India for his services therewith, and obtained a clasp. On return from the Lushai expedition, he was placed in charge of the topographical party employed in the western Ghâts of the Bombay Presidency; and from that time onwards his duties were connected with topographical surveying and exploring, for which his skill in drawing and delineating ground specially fitted him. In 1874 he was promoted to the rank of major.

On the outbreak of the Afghan war in November, 1878, Major Tanner was attached as survey officer to the Khyber column under Sir Samuel Browne, which advanced from Jamrud on Ali Masjid at the commencement of the campaign. He carried a continuous route-survey from Ali Masjid to Jalalabad and thence to Gandamak, reconnoitring the ground on each side as far as was practicable. He also measured base-lines and executed triangulations, combined with astronomical determinations of latitude and azmuth, at Dakka and Jalalabad. He took a number of observations to the peaks of the surrounding hill ranges both north and south of the Kabul rivers, and soon discovered, fortunately, that several of his points were identical with points which had been fixed several years before by survey officers in the course of the operations of the Great Trigonometrical Survey on the trans-Indus frontier. Thus these points became a basis for the survey operations, enabling them to rest everywhere on triangulations, and be made independent of further astronomical observations. Tanner subsequently took part in the expedition to the Laghman valley; and in May, 1879, having made the acquaintance of a native chieftain, the head of an important district lying between Jalalabad and the southern frontier of Kafiristan, he undertook with his aid an exploration into Kafiristan through the Kunar valley and Chuganistan. After several perilous adventures, he got into one of the Kafir villages, but there, owing to the hardships and exposure incident to such an undertaking, his health failed, and, prostrated by fever, he was compelled to abandon his design, and, disguised as a native, he was carried back to Jalalabad under great risk through the hostile tribes by the friendly aid of the Chugani chief. For his services in the Afghan campaign, Major Tanner received the medal with clasp and the brevet rank of lieut.-colonel.

On the conclusion of the campaign in July, 1879, Colonel Tanner was sent up to Gilgit with the idea that he might be able to proceed thence to Kafiristan by a more easy and accessible route through Chitral, and also with the view of extending the operations of the Kashmir survey into Gilgit, which country could not be entered at the time the Kashmir survey was carried out some twenty years previously, owing to the hostile attitude of the people. At this time, however, the Gilgit country had quieted down, and a British officer resided at Gilgit as British agent on the frontier. Thus Tanner was able to proceed there without difficulty and commence making a survey of the country, getting to the peaks beyond, and fixing as much as he could see of the great ranges to the north. In 1881 he had completed field work, and was returning to headquarters to bring up his mapping, and had arrived at Lahore, when information was received that the tribes round Gilgit had broken into revolt and surrounded the British agent, Colonel Biddulph, who was in a very critical position. Colonel Tanner was immediately directed to return to Gilgit in command of a detachment of the troops of the Maharajah of Kashmir, and he relieved Colonel Biddulph in a very satisfactory manner. During the period that Colonel Tanner had thus been located in Gilgit, he mapped, with the aid of two native surveyors, an area of about 4000 square miles of this most interesting region, which had previously been almost a *terra incognita*. The survey of Gilgit was completed, and extended into the Astor valley towards the chief passes which lead into the Indus valley on the one hand and into Kashmir on the other. The whole region is a wild mass of lofty mountains, and the hardships and dangers involved in surveying such a tract of snow-clad peaks and glaciers are necessarily very great. In one part, Colonel Tanner visited eight survey stations, varying from 15,000 to 17,500 feet above the sea. To give an idea of what the country is like and what he went through, the following extract is taken from one of his reports: "I must not omit to mention the most interesting point in all this wild mountain region, which in September last, after two unsuccessful attempts, I was able to reach. I had long wished to obtain a near view of the northern slopes of Nangaparbat and of its glacier valleys which join the Indus opposite the independent settlement of Gor, and after a most perilous passage over a narrow rugged ridge surrounded by enormous precipices which tried my nerves to the utmost, I found myself confronted by what is probably the most magnificent snow view on the globe, embracing as it does a slope of nearly 24,000 feet (vertical measurement), with its glaciers, snow-fields, ice-cliffs, and jagged needles of naked rock extending from the summit of this king of mountains down to the Indus, which flows in a deep channel at its base. My feeble pen is unequal to the task of giving any adequate description of this superb and impressive view, which I contemplated from the edge of a tremendous precipice whose summit is 16,000 feet above the sea, and which rises sheer and unbroken from the forests and vineyards of Gor, situated an immense depth below me."

Colonel Tanner returned from Gilgit in April, 1882, and, after a few months' absence on leave to England, was posted in November, 1882, to the charge of the Darjeeling party, which was engaged in the surveys of independent Sikkim and of the Nepal boundary, in the Eastern Himalayas. He was engaged on these operations for the next three years, and there his work was of an entirely different kind, for he was no longer able to go about through the mountains from point to point, but was obliged to remain on or outside the frontier, and from there fix the peaks of the Nepal ranges, making sketches, and getting such topographical information as he could. Advantage was taken, however, of every opportunity of extending our knowledge in this part of the Himalayas by means of trained explorers, who were sent into Western Nepal, Bhutan, and Tibet, and much valuable information was thus obtained. Tanner himself managed to cross the Lipu Lak pass, at the north-east corner of Kumaun, and get into Tibet through some most interesting country, reaching a spot about 1½ mile from Takla Khár, where he was stopped and ordered back by the governor of that place. He was promoted to be colonel in June, 1884.

In November, 1885, the *locale* of operations of the party was changed to what may be called the Central Himalayas, and the surveys of Kangra, Kulu, Lahaul, and the native states about Simla were commenced. Colonel Tanner superintended these operations till October, 1890, when, though full of vigour and work, he was forced to retire from the Survey Department under the inexorable age rule. During his long and arduous labours in that department, of which the last twelve years had been spent—almost without a break—in the higher Himalayas, Colonel Tanner rendered very valuable service, and added materially to our knowledge of those mountain ranges and to the maps of those regions. No one, probably, was better acquainted with the characteristics of their principal features, for he had been employed on the extreme western ranges, those round Gilgit, and in the vicinity of the peak K_2, which is the second highest mountain known; from there he went into the Eastern Himalayas beyond Nepal and British territory, where he was in the vicinity of Kinchinjunga and Mount Everest, the highest peak yet determined; and, finally, he was in the Central Himalayas, in Kangra, Kulu, and Lahaul.

Colonel Tanner was an accomplished landscape painter, and during his travels through the Himalayas, he made good use of his talent in depicting the magnificent scenery he met with. His snow views, in black and white especially, are unsurpassed in beauty and skill; and his sketches, of which he had made a large collection, are works of art.

On his return to England, Colonel Tanner became a Fellow of this Society in 1891, and was a member of the Council from 1892 to 1894. In April, 1891, he contributed a very interesting paper on "Our Present Knowledge of the Himalayas," and subsequently papers on "Bar Sub-tense Survey" and "Photography as a Means of Surveying."

Of good physique and active habits, fond of adventure, careless of creature comforts, with great powers of endurance, and an intrepid mountaineer, Henry Tanner possessed all the qualities essential for arduous services in high altitudes. Kindly hearted, unselfish, and generous, he was a boon companion; and his genial and cheery manner endeared him to a host of friends, by whom his loss will long be felt.

Colonel Tanner was married in India, in 1859, to Minnie, daughter of Colonel C. R. Hogg, Bombay Fusiliers. His widow survives him, and he leaves five daughters to mourn his loss.

Commander Crawford A. D. Pasco, R.N.

The death of Commander Crawford Pasco, well known in Australia as a warm supporter of geographical enterprise in that quarter of the globe, has lately been announced from Melbourne. Commander Pasco entered the navy in 1830, and a few years later, when serving as mate of the *Britomart* under Captain Owen Stanley, took part in the foundation of the settlement of Port Essington, in North Australia. In August, 1839, he exchanged into the *Beagle*, then visiting Port Essington during the survey of the coasts of Australia carried out by that ship between 1837 and 1843, in the latter of which years he obtained his commission as lieutenant. He subsequently took part in the naval operations on the coast of Borneo and in the Canton river, as well as in various other surveys. In 1845 he had received a commission under Sir John Franklin for the expedition in the *Erebus* and *Terror*, and it was only owing to an accident that he did not join his ship. Retiring with the rank of commander in 1866, he spent the latter years of his life in Australia, and was one of the founders (and subsequently Member of Council) of the Victorian Branch of the Geographical Society of Australasia. He entered warmly into the scheme of antarctic exploration set on foot in Australia in 1886, and presided over the joint committee of the Royal Society of Victoria and the Victorian Branch of the Geographical Society, appointed in furtherance of the scheme. In 1897 Commander Pasco published a work entitled 'A Roving Commission—Naval Reminiscences.' He became a member of our Society in 1873.

CORRESPONDENCE.

Sand-Dunes.

My friend Mr. E. A. Floyer, writing from Cairo, December 11, 1897, has sent me the accompanying notes on sand-dunes, which he kindly placed at my disposal. I have added a few notes, in square brackets. I think Mr. Floyer's observations cannot fail to be of interest.

Vaughan Cornish.

Branksome Cliff, Branksome Park, Bournemouth, March 14, 1898.

NOTES ON MR. VAUGHAN CORNISH'S PAPER ON "THE FORMATION OF SAND-DUNES." (*Geogr. Jour.*, March, 1897.)

By E. A. Floyer, F.G.S.

From observations on the dunes between Kuntara and El Arish of six consecutive waves measuring from east to west:—

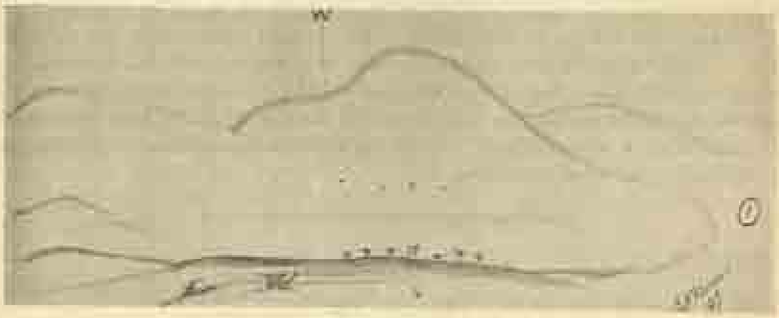
	Height.	Length.	Length. / Height.
First wave	6·0 inches ...	118 inches ...	19·6
Second "	6·0 " ...	118 " ...	19·6
Third "	6·0 " ...	118 " ...	19·6
Fourth "	10·6 " ...	145 " ...	13·7
Fifth "	7·8 " ...	135·8 " ...	17·4
Sixth "	7·4 " ...	118 " ...	16·0

[The following are the measurements of ripples of blown sand at Branksome, Dorset, which were published in my paper. The agreement in the ratio $\frac{\text{length}}{\text{height}}$ is particularly interesting, in view of the different nature of the sand.]

Height.	Length.	Ratio.
1/16 inches	1¼	20
1/16 "	1⅛	17
⅛ "	2⅛	17
⅛ "	2½	20
¼ "	4¼	17
⅜ "	6	16
½ "	7	14

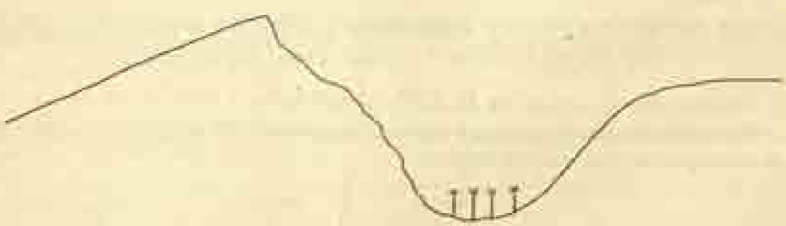
The windward slope was mosaiced, if the word be allowed, with the coarse sand in bottle No. 1. [The samples of sand will be placed for inspection in the Map-room at the Society's House.]

The dominant wind is, at El Arish west, and at Kuntara west-south-west. It appears to curve from west-south-west to west. It is markedly dominant, and would appear, at the first glance, to have brought the sand from the deserts west



of the Nile and to be pouring it into the Mediterranean. The sand is moving over a flat hard surface, a vast sandy plain.

The district may be divided into half by a well called Bir el Abd. There are in the western half isolated dunes and masses of dunes. There are no fulges. There are no accurately shaped barchanes. One characteristic of a dune is that it holds



the water like a sponge. The steep leeward cliff often shelters a clump of date trees, some of which, but rarely, are smothered.

Sketch 1. We are looking west. The band of almost perpendicular sand, which is a characteristic of all these dunes, gives an appearance of a cowl. I think the suggestion would occur to others besides myself that these dunes resemble great sphinxes, over whose features a veil of sand is poured.

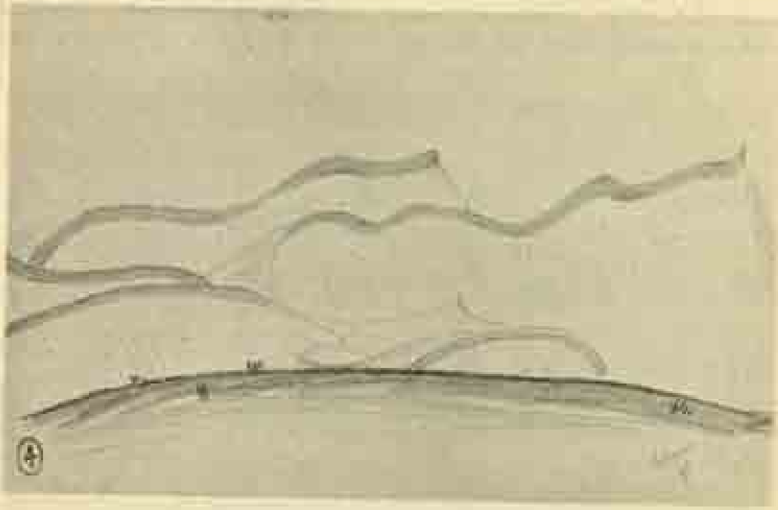
Sketches 2 and 3 are an approximate section of the dune and a plan of the date grove.

Sketch 4 emphasizes the cowl-like appearance. We were riding over a mass of dunes and looking north-west.

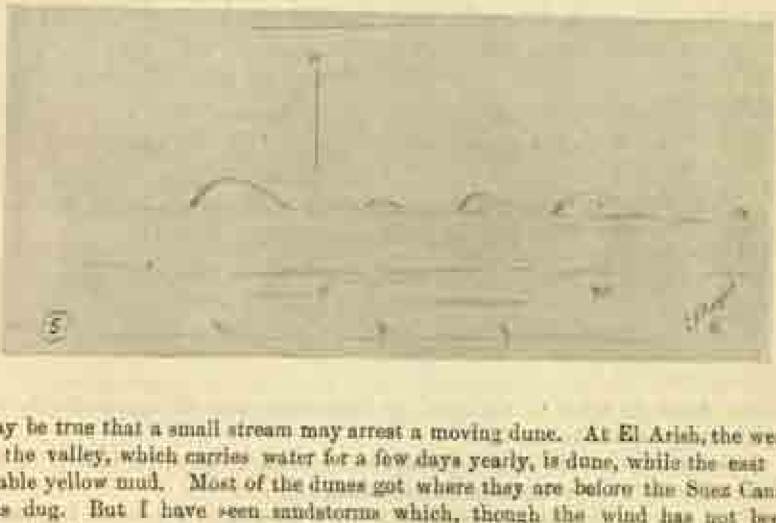
Sketch 5 shows the cowl-like appearance, and also that, west of Bir el Abd, the wind is west-south-west. We are looking west. We were standing at Katia and beholding, at a distance of 4 or 5 miles, the mass of dunes which we were about to cross, and which are shown in Sketch 4.

Sketch 6 shows a typical small cluster of dunes.

Sketch 7 is a theoretical, roughly sketched, ground plan of the dune shown in Sketch 6.



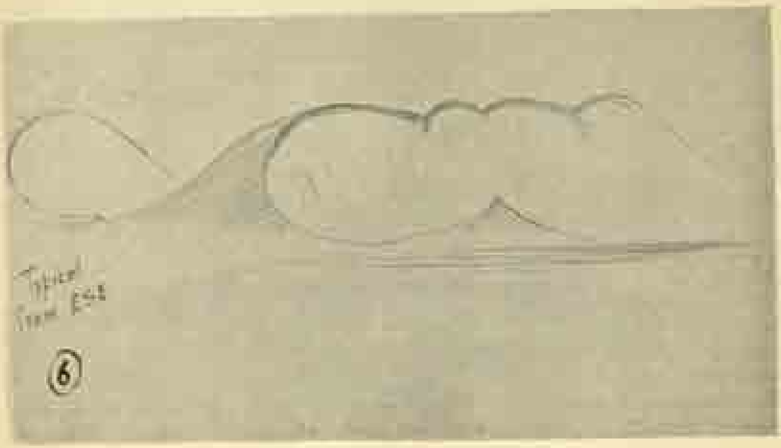
Sketch 8 is a view to our right as we march west. I have made no observations as to the strength of the wind, but I have often been surprised to find the sand motionless in a wind that seemed very high. Often the sand will be moving on one dune, and quiet on all the neighbouring dunes. [Dr. Blandford has pointed out that electrification is probably an important factor in the mobility of sand.] It



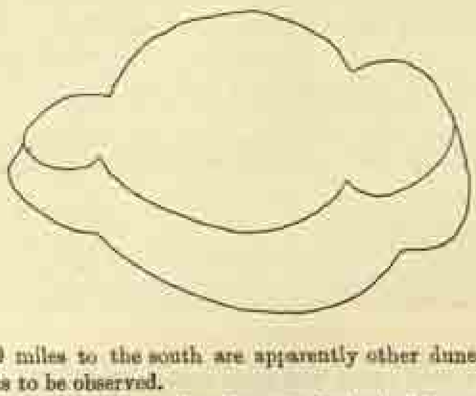
may be true that a small stream may arrest a moving dune. At El Arish, the west of the valley, which carries water for a few days yearly, is dune, while the east is friable yellow mud. Most of the dunes got where they are before the Suez Canal was dug. But I have seen sandstorms which, though the wind has not been excessive, have carried a great deal of very coarse sand across the canal.

Between Halfa and Assuan a violent west wind is common. While it blows, the golden sand may be seen pouring into the Nile. But at low Nile much of this resumes its journey eastward. The Egyptians have a rhyme saying, "We suffer, on the west, from the sand encroachments; on the east, from the marauders."

Starting from Kuntara, you march over a salt plain sprinkled with sand and studded with bushes, striated west-south-west and east-south-east. You then cross a large mass of dunes, and regain similar plains at Katia. Thence the dunes



are lower, and generally fixed. They run in broad east-and-west ridge and furrow. When fixed by bushes, the steep leeward cliff becomes less steep. Grazing camels tread it down, and it is ploughed and sown with barley. Marching east, the dunes get nearer the coast. At El Arish they are near the sea, and beyond El Arish they form, on the edge of the sea, a long east-and-west range, with a copious supply of fresh water on the north, and on the south are large and fertile plains sown with



barley. Some 20 miles to the south are apparently other dunes, too distant for any characteristics to be observed.

I do not find myself able to imagine any obstacle being permanent in the desert. Stones, trees, everything becomes sand.

When approaching from the east, and about 2 miles from the dunes, I collected some sand. The upper layer, rather coarse, is bottle No. 2. The under layer is bottle No. 3. The sand from the leeward side of the dune is bottle No. 4.

[Mr. Floyer's *sand-cowl* I take to be a form imparted by erosion. Since receiving the above notes, I have seen in operation the process by which, I think, it is produced. This was at the sandhills at the entrance to Poole Haven. A cowl, which culminated in a slightly overhanging cornice, was being carved by

the sweep of the wind from a small dune of unbound but compacted sand. The dune had then been built about twelve months, and pressure, moisture, and so forth, had given coherence to the mass, whilst leaving the sand-grains discreet. When in such condition, sand-structures are readily modelled to the swirling eddies of the wind.]

Mrs. Bishop's 'Korea.'

April 17, 1898.

From Mr. Chisholm's statement in his review of 'Korea and her Neighbours,' corroborated by a communication from the Rev. L. O. Warner, formerly of "Bishop Corfe's Mission," in answer to a question which I addressed to him with regard to his Korean journeys, I learn with much regret and vexation that, owing to a mistake, which had a very simple origin, I have unwittingly deprived him of the distinction of being the first European to get up the south branch of the Han, as far as Tan Yang. On learning this fact, I am anxious that the missionary traveller should receive full credit for his journey.

I. L. Bishop.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897-98.

Special Meeting, March 23, 1898.—Sir Clements Markham, K.C.B., President, in the Chair.

The Paper read was:—

"The Geography and Resources of the Klondike Region." By William Ogilvie, of the Canadian Geological Survey.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Andorra. *Rev. Française* **23** (1898): 129-146. **Douchet.**
La Principauté d'Andorre et la question Andorrane. Par H. Douchet. *With Map and Illustration.*

Austria. ———
Az ausztriai császári czim fölvételéről. Székfoglaló Értekezés.—Értekezések a Társadalmi Tudományok Köréből. XII. Kötet. 2. Szám. Budapest. 1897. Size 9½ × 6½, pp. 40.

Austria-Hungary. *Nineteenth Century* **43** (1898): 466-480. **Reich.**
Austria-Hungary and the Ausgleich. By Dr. Emil Reich.

Denmark. *B.S.G. Com. Paris* **19** (1897): 807-812. **Castonnet des Fosses.**
Une excursion en Danemark. Le peuple danois. Par M. H. Castonnet des Fosses.

Europe—Political. *G.Z.* **4** (1898): 143-156. **Ratzel.**
Politisch-geographische Rückblicke. I. Allgemeines—Mittel Europa mit Frankreichs. Von Friedrich Ratzel.

A study of the relative power of the three states of Central Europe—France, Germany, and Austria-Hungary—not from the military, but from the social and geographical standpoint. Stress is laid on the rapid increase of population in Germany, its stationary character in France, and on the great areas of land awaiting development in Austria-Hungary.

France *Spelunca* **3** (1897): 164-178. **Albe.**
"Glanures" Spéléologiques sur le Causse de Gramat (Lot). Par M. l'abbé Albe. *With Illustrations.*

France. *Spelunca* **3** (1897): 155-163. ———
Utilisation de Vaucluse et des sources des régions calcaires. Par M. X——.

France. *C. Rd.* **126** (1898): 554-557. **Kilian and Haug.**
Sur l'origine des nappes de recouvrement de la région de l'Ubaye. Note de MM. W. Kilian et E. Haug.

France. *A travers le Monde, Tour du Monde* **4** (1898): 65-68. ———
Monuments mégalithiques du Haut-Bourbonnais et d'Auvergne. Coupelles et Pierres à sacrifices. Par Gabriel G——r. *With Illustrations.*

France—Jura. *Spelunca* **3** (1897): 189-193. **Viré.**
Le Gouffre de la Pissière près Arbois (Jura). Par M. Armand Viré.

France—Muron. *B.S.G. Rochefort* **19** (1897): 225-235. **Arnaud.**
Muron et ses environs. Par M. Frédéric Arnaud. *With Map.*
Muron is a town about 10 miles from Rochefort.

Germany. *Questions Diplomat. et Colon.* 2 (1898): 275–292. **Blondel.**
L'essor industriel et commercial du Peuple Allemand. Par Prof. Georges Blondel.

Germany—Northern lakes. **Ule.**
Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Elfter Band. Heft 2. Beitrag zur physikalischen Erforschung der Baltischen Seeen. Von Dr. Willi Ule. Stuttgart: J. Engelhorn, 1898. Size 9½ × 6½, pp. [50]. *Plates.*

This will be noticed along with other limnological works.

Germany—Saxony. *Z. k. Sächs. Statist. Bureaus* 43 (1897): 142–155. **Ganzenmüller.**
Die Fruchtbarkeits- und Sterblichkeitsverhältnisse in sämmtlichen Städten Sachsens während des Jahrfünfts 1891 bis 1895. Von Dr. Konrad Ganzenmüller.

Germany—Schleswig. *Aus allen Weltteilen* 29 (1898): 189–194. **Petersen.**
Die Ansiedelung deutscher Landleute in der Nordmark. Von Rektor Petersen. *With Map and Illustrations.*

With special reference to the settlement of German-speaking people in the neighbourhood of Rödding, close to the Danish frontier.

Germany—Thuringia. *Die Natur* 47 (1898): 127–129. **Reischel.**
Deutsche Landschaften. Abriss der Entwickelungsgeschichte Thüringens. Von Gustav Reischel.

Germany—Thuringia. **Walther.**
Thüringer Landschaftsformen erläutert aus ihrem geologischen Bau. Von Prof. Dr. Johannes Walther.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 210–224.

Greece. **Frazer.**
Pausanias's Description of Greece. Translated with a Commentary by J. G. Frazer. In six volumes. London: Macmillan & Co., 1898. Size 9 × 6, pp. (vol. i.) xcvi. and 616; (vol. ii.) viii. and 582; (vol. iii.) x. and 652; (vol. iv.) viii. and 448; (vol. v.) 638; (vol. vi.) 200. *Maps, Plans, and Illustrations. Price £6 6s.*

A work of such magnitude and research as this is rarely published, and it will form the subject of a special article. Vol. i. contains an introduction, and a translation of the text of Pausanias; vols. ii. to v. contain Mr. Frazer's monumental "notes" on the text, copiously illustrated by maps; and vol. vi. is a full index to the whole.

Greece—Athens. *B.S.R.G. d'Anvers* 21 (1898): 313–341. **Hautteceur.**
Athènes. Par M. H. Hautteceur.

Hungary—Transylvania. ——
Monumenta Comitialia Regni Transylvaniæ. Erdélyi Országgyülési Emlékek. XIX. Kötet (1686–1688.) Budapest, 1896. Size 10 × 6½, pp. 534.

Italy—Lago di Garda. *Petermanns M.* 44 (1898): 17–21. **Fischer.**
Das Moränen-Amphitheater des Garda-Sees. Von Prof. Dr. Theobald Fischer. *With Profile.*

Italy—Tuscany. *Riv. G. Italiana* 5 (1898): 38–49. **Mori.**
L'aumento della popolazione in Toscana negli ultimi secoli. Di Attilio Mori.

Mediterranean. *Deutsche Rundschau G.* 20 (1897–98): 1, 66, 103, 159. **Radde.**
Zwei Fahrten in das Mittelmeer in den Jahren 1895 und 1897 auf den kaiserl. russischen Yachten "Polarstern," und "Sarniza." Von Dr. G. Radde. *With Illustrations.*

Mediterranean—Crete. *Blackwood's Mag.* 163 (1898): 165–179. **Bennett.**
Amongst the Cretan Insurgents. By Ernest N. Bennett.

Mediterranean—Lampedusa. *Rev. G.* 42 (1898): 94–100. **Brunet.**
Un projet de colonisation Russe dans la Méditerranée au XVIII^e siècle. Par L. Brunet.

About 1785 Potemkin, minister of Catherine II., entertained the project of establishing a station for the Russian fleet on Lampedusa, a small island between Sicily and the African coast.

Mediterranean—Lampedusa. **Magistris.**
La pesca delle spugne nel Mar di Lampedusa. L. F. de Magistris. (Estratto dal *Giornale Italiano di pesca e acquicoltura.* N. 1–2, 1897.) Size 10 × 7, pp. 12.

Mediterranean—Malta. *J.R. United Service I.* 42 (1898): 115–127. **Bedford.**
The Great Siege of Malta, 1565. By the Rev. W. K. R. Bedford. *With Illustrations.*

The illustrations include copies of four of the engravings from paintings made in 1601, of the chief events of the great siege of 1565.

Mediterranean—Samos. *B.S.G. Commerc. Paris* 19 (1897): 599–609. **Bourge.**
L'Ile de Samos. Par Georges Bourge.

Norway. ———
Winter Life in Norway descriptive of Sports and Pastimes on Ice and Snow, edited by the Norwegian Winter Tourist Association. 1898. Christiania: Printed by W. C. Fabritius & Sønner. Size $5\frac{1}{4} \times 8$, pp. 86. *Map and Illustrations.*

Norway—Christiania. *Norske G.S. Aarbog* 8, 1896–97 (1897): 77–113. **Bjørlykke.**
Cand. real. K. O. Bjørlykke: Geologiske billeder fra Kristiania by. *With Illustrations.*

Norway—Historical. *Norske G.S. Aarbog* 8, 1896–97 (1897): 37–52. **Storm.**
Prof. dr. Gustav Storm: Venetianerne paa Røst i 1432. *With Map.*

On a voyage of the Venetians to 67° 31′ N. on the coast of Norway in 1432.

Pyrenees. *Questions Diplomat. et Colon.* 2 (1898): 236–239. **Contenson.**
Le percement des Pyrénées centrales. Par M. le Comte G. de Contenson.

On the proposed Pyrenean tunnel under the Col du Somport, the advantage of which is stated to be all on the side of Spain, and not on that of France.

Pyrenees—Val d'Aran. *B.S. Languedoc. G.* 19 (1896): 494–504. **Viala.**
Le val d'Aran et les sources de la Garonne. Par L. Fernand Viala.

The Val d'Aran is the Spanish valley on the northern slope of the Pyrenees, in which the Garonne takes its rise.

Russia. *G.Z.* 4 (1898): 133–143. **Credner.**
Reiseskizzen aus dem Ural und dem Kaukasus. Zwei Vorträge von Prof. Dr. Hermann Credner in Leipzig.

Description of a tour through the Ural and the Ossete country of the Caucasus.

Russia. *Questions Diplomat. et Colon.* 2 (1898): 212–215. ———
La Russie dans l'Océan Glacial Arctique. Le port Catherine. Par un ingénieur Russe. *With Map.*

A description of the new Russian port of St. Catherine (Jekaterinskaya Gavanzh), on the Murman coast, in lat. 69° 15′ N., long. 33° 30′ E.

Russia. *B.S.G. Marseille* 21 (1897): 231–253. **Saint-Yves.**
De la Volga à la frontière Sibérienne, l'Oural méridional. Par M. G. Saint-Yves.

Russia—Agriculture. *Rev. Scientifique* 8 (1897): 744–748. **Zograf.**
Les problèmes de l'acclimatation en Russie. Par M. Nicolas Zograf.

On the introduction of new plants and animals of economic value in Russia, both European and Asiatic.

Russia—Baltic Coast. ———
Description of Lighthouses, Beacons, and Landmarks of the Russian Empire along the Baltic Coast. Published by the Hydrographical Department, Ministry of Marine. St. Petersburg, 1897. Size 9×6, pp. 533. [In Russian.]

ASIA.

Asia Minor. *Travel* 2 (1898): 494–498. **Ramsay.**
Through the Cilician Gates to Tarsus. By Mrs. W. M. Ramsay. *With Illustrations.*

Asia Minor. **Zimmerer.**
Deutsche Forschung in Kleinasien. Von Dr. Heinrich Zimmerer. Verhandlungen des Zwölften Deutschen Geographentages Jena, 1897. Berlin: D. Reimer, 1897. Pp. 30–54.

Asiatic Turkey. **Oberhummer.**
Reise durch Syrien und Kleinasien im Jahr 1896. Von Roman Oberhummer, jr. Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 55–68.

Assyrian Geography. *Z. Deutsch Morgenländ. Ges.* 51 (1897): 555–568. **Belck.**
Hanigalbat und Melitene. Von W. Belck.

Central Asia. *C. Rd. S.G. Paris* (1898): 14–38. **Hedin.**
Séance extraordinaire.—Réception du Dr. Sven Hedin, explorateur dans l'Asie centrale.

China and Japan. *Contemporary Rev.* 73 (1898): 403–414. **Mitchell-Innes**
The Dragon and the Chrysanthemum. By N. G. Mitchell-Innes.

A contrast between China and Japan, with the object of confuting the not uncommon error that the people of both countries are very much alike.

China—Kiau-Chou. *Deutsche Rundschau G.* 20 (1898): 266–268. ———
Eine deutsche Beschreibung Kiao-tschaus. *With Map.*

Reproduction from a Shanghai paper of an article describing Kiau-Chou, by a German resident in the far East.

China—Manchuria. *B.S.G. Com. Paris* 19 (1897): 822–830. **Pozdéieff-Raffalovich.**
Description de la Mandchourie rédigée par M. Pozdéieff, sous la direction de M. Romanoff. (Analyse de M. A. Raffalovich.) *With Map.*

China—Manchuria. *Nineteenth Century* 43 (1898): 481–493. **Younghusband.**
The Future of Manchuria. By Captain F. E. Younghusband.

Chinese Empire. *B.S.G. Com. Paris* 19 (1897): 801–806. **Bonin.**
Les grandes voies commerciales de l'Asie centrale. Par M. Ch.-E. Bonin.

On routes in Tibet and Mongolia.

Cochin-China. *Questions Diplomat. et Colon.* 2 (1898): 129–136. **Vilers.**
Une colonie française de la fin du XIX^e^ siècle. Par Le Myre de Vilers.

An account of the progress and present state of the French colony of Lower Cochin-China.

India. *Fortnightly Rev.* 63 (1898): 390–400. ———
The Tirah Campaign. By an Eye-witness. *With Map.*

While the article is to a large extent critical of the military operations, it includes an account, with a map, of the engagements of October 18 and 20, 1897, on the Samana hills.

India—Baluchistan. *Scottish G. Mag.* 14 (1898): 137–149. **Yates.**
Chaman. By Major A. C. Yates. *With Illustrations.*

India—Burma. *C. Rd. S.G. Paris* (1898): 5–10. **Gallois.**
La Birmanie: les pagodes et les monastères; le cours de l'Irraouaddy. Par E. Gallois. *With Illustration.*

Report of a lecture describing a visit to Mandalay.

India—Burma. *Mem. Geolog. Surv. India* 27 (1897): 1–226. **Noetling.**
The occurrence of Petroleum in Burma, and its technical exploitation. By Dr. Fritz Noetling. *With Map and Plates.*

India—Gazetteer. **Bartholomew and Burgess.**
Constable's Hand-Gazetteer of India. Compiled under the direction of J. G. Bartholomew. Edited with additions by Jas. Burgess. London: A. Constable & Co., 1898. Size $7\frac{1}{2} \times 5$, pp. 400. *Price 10s. 6d. Presented by the Publishers.*

A useful and accurate index of Indian places. Each entry has from one to three lines of information, giving position, statistics, and occasionally some important historical or industrial fact.

India—Jammu and Kashmir. **Bourbel.**
Routes in Jammu and Kashmir arranged topographically, with descriptions of Routes, Distances by Stages, and Information as to Supplies and Transport. Compiled . . . by Major-General le Marquis de Bourbel. Calcutta: Thacker, Spink & Co., 1897. Size $10 \times 6\frac{1}{2}$, pp. xvi. and 306. *Presented by the Author.*

This will be specially noticed.

India—Kashmir. **Darrah.**
Sport in the Highlands of Kashmir, being a Narrative of an Eight Months' Trip in Baltistan and Ladak, and a Lady's Experiences in the latter Country; together with Hints for the guidance of Sportsmen. By Henry Zouch Darrah. London: Rowland Ward, 1898. Size $9\frac{1}{2} \times 7$, pp. xviii. and 506. *Maps and Illustrations. Price 21s. Presented by the Publisher.*

This fine work will be specially noticed.

India—North-West Frontier. ———
Military Operations on the North-West Frontiers of India. Papers regarding British Relations with the Neighbouring Tribes on the North-West Frontier of

India, and the Military Operations undertaken against them during the year 1897-1898. 2 vols. London: Eyre & Spottiswoode, 1898. Size 13 × 8½, pp. (vol. i.) viii. and 176; (vol. ii.) x. and 182. *Price* (vol. i.) 1s. 10½d.; (vol. ii.) 2s.

Japan. *B.S.G. Com. Havre* **14** (1897): 109-117, 131-138, 214-223. **Franconie.**
Le développement économique du Japon depuis la guerre contre la Chine. Par J. Franconie. (Extrait des *Annales de l'Ecole libre des sciences politiques.*)

Malay Archipelago—Amboina. **Wichmann.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **15** (1898): 1-20.
Der Wawani auf Amboina und seine angeblichen Ausbrüche. Von Arthur Wichmann. *With Map.*

A criticism of the recorded eruptions of Wawani from 1672 to 1824, with extracts from the description of each outbreak, in order to show that these records do not prove that Wawani is a volcano.

Malay Archipelago—Borneo. *Petermanns M.* **44** (1898): 9-13. **Nieuwenhuis.**
Die Durchquerung Borneos durch die niederländische Expedition 1896-1897. Von Dr. A. W. Nieuwenhuis. *With Map.*

Malay Archipelago—Celebes. **Kruijt.**
Tijds. K. Ned. Aard. Genoots. Amsterdam **15** (1898): 46-52.
De opsporing van het Lindoe-meer op Celebes. Door Alb. C. Kruijt.

On the exploration of Lake Lindoe, in Celebes.

Malay Archipelago—Java. *Naturw. Wochenschrift* **13** (1898): 112-113. **Fürst.**
Der Vulcan Lamongan. Von Dr. E. Fürst.

Lamongan is stated to be one of the smallest but most active volcanoes in Java; it rises in two symmetrical cones 5238 feet high, and is situated in the province of Probolinggo.

Russia—Caucasus. *Materials Topog. Ethnolog. Caucasus* **22** (1897): Pt. 1, 1-49. ——
Description of mounds in Kurdzhinskaya and Gabukai villages, Gov. Kuban. *Plan and Illustrations.* [In Russian.]

Russia—Caucasus. *Iz. Imp. Russian G.S.* **32** (1897): 1-33. **Bush.**
Preliminary Report on a Journey in North-Western Caucasus, 1896, for the investigation of its Flora and Glaciers. By N. A. Bush. [In Russian.]

Russia—Caucasus. **Dzhorbenadze.**
Materials Topog. Ethnolog. Caucasus **22** (1897): Pt. 2, 239-247.
The Negoiti Village and its Inhabitants, Gov. Kutais. By C. Dzhorbenadze. [In Russian.]

Russia—Caucasus. **Dzhanashvali.**
Material Topog. Ethnolog. Caucasus **22** (1897): Pt. 1, 1-206.
Georgian Annals and Historians on the Northern Caucasus and Russia. By M. Dzhanashvali. [In Russian.]

Russia—Caucasus. **Kereselidze.**
Materials Topog. Ethnolog. Caucasus **22** (1897): Pt. 2, 210-238.
The Gebi Village and its Inhabitants, Gov. Kutais. By D. Kereselidze. [In Russian.]

Russia—Caucasus. **Leontiyeff.**
Materials Topog. Ethnolog. Caucasus **22** (1897): Pt. 2, 119-162.
A Journey to the Baksan Glacier. By I. Leontiyeff. [In Russian.]

Russia—Caucasus. *Mem. Comité Géologique, Russia* **14** (1896): No. 1. **Mushketoff.**
Geological Sketch of the Glacier Region of the Teberda and the Chkhalta in the Caucasus. By Prof. I. V. Mushketoff. *With Geological Map and Sections.* [In Russian.]

Russia—Eastern Siberia. *Ann. G.* **6** (1897): 385-407; **7** (1898): 1-13. **Woeikof.**
Le climat de la Sibérie orientale comparé à celui de l'Amérique boréale. Par M. A. Woeikof.

A note on this paper appeared in the *Journal* for March, p. 296.

AFRICA.

Africa—Colonisation. *B.S. Languedoc. G.* **20** (1897): 103-144. **Duponchel.**
La Colonisation africaine et le chemin de fer de Madagascar. Par M. A. Duponchel.

The introduction deals with the general subject of the aid afforded by railways to colonisation, and the main subject of the memoir is the special advantages likely to be secured by the construction of railways in Madagascar.

Africa—Travels. **Decle.**
Three Years in Savage Africa. By Lionel Decle. With an Introduction by H. M. Stanley, M.P. London: Methuen & Co., 1898. Size $9\frac{1}{2} \times 6$, pp. xxxii. and 594. *Maps and Illustrations. Price 21s. Presented by the Publishers.*

This description of a journey from the Cape to Uganda overland will be referred to along with other books on Africa.

Africa—Travels. **Vandeleur.**
Campaigning on the Upper Nile and Niger. By Lieut. Seymour Vandeleur. With an Introduction by Sir George T. Goldie, K.C.M.G., etc. London: Methuen & Co., 1898. Size $8\frac{1}{2} \times 6$, pp. xxviii. and 320. *Portrait, Maps, Plans, and Illustrations. Price 10s. Presented by the Publishers.*

This will be noticed along with other recent books on Africa.

Algeria. *Questions Diplomat. et Colon.* **2** (1898): 137–182. **Mandeville.**
L'Algérie Méridionale et le Touat. Par — Mandeville. *With Maps.*

British East Africa—Uganda. *Miss. Catholiques* **30** (1898): 61–65. ——
Les derniers événements de l'Ouganda.

Congo State. *Mouvement G.* **15** (1898): 130–133. **Cornet.**
Les travaux de M. Jules Cornet sur le Congo.

A summary of M. Cornet's geological researches.

East Africa. *Fortnightly Rev.* **63** (1898): 362–377. **Edwards.**
The French on the Nile. By F. A. Edwards. *With Map.*

A careful study of recent movements in the upper Nile valley, remarkable for the command of contemporary sources of information, and the number of references with which the discussion is fortified.

Egypt. *B. American G.S.* **30** (1898): 15–27. **Eaton.**
From Cairo to Beni-Hassan. By D. Cady Eaton.

Refers largely to Egyptian inscriptions.

Egypt—Census. **Boinet Bey.**
Recensement Général de l'Égypte. 1^er^ Juin, 1897—1^er^ Moharrem 1315. Rapport préliminaire. Size 13×10, pp. 54. *Presented by the Société Khédiviale de Géographie.*

In 1897 the population of Egypt to Wadi Halfa was ascertained as 9,734,405. Of these 107,050 were Europeans, the countries most largely represented being—Greeks, about 38,000; Italians, 24,000; British, 20,000; French, 14,000. Of the whole population over 92 per cent. were Mussulmans, and $7\frac{1}{2}$ per cent. Christians.

Madagascar. *Antananarivo Annual* **6** (1897): 94–100. **Foster.**
Early Notices of Madagascar from the Old Voyagers. Part vi. The Narrative of John Dean as to the Wreck of the *Sussex* Indiaman, 1738. By William Foster. *With Portrait.*

Madagascar. *B.S.R.G. d'Anvers* **21** (1898): 290–311. **Locamus.**
Madagascar et l'alimentation Européenne. Par M. P. Locamus.

Madagascar. *Antananarivo Annual* **6** (1897): 53–69. **Pearse.**
From Fianarantsoa to Masindrano (or Mananjara). By Rev. J. Pearse.

A journey in 1896 from Fianarantsoa, the capital of the Betsileo province, to the rising seaport Masindrano, which, however, has no harbour, the freight and passengers having to be transferred between the ship and the shore in native surf-boats. The writer throughout refers in the most favourable manner to the French soldiers and officials in the island.

Madagascar. *Antananarivo Annual* **6** (1897): 22–31. **Roblet.**
The History of a Map: Adventures and Experiences in Surveying in Madagascar. Translated from the French of Rev. D. Roblet, S.J., by Rev. J. Sibree.

It is pleasant to see this tribute rendered by an English Protestant missionary in Madagascar to the labours of a French Roman Catholic missionary, whose production of a map of a large part of the country, under circumstances which were often dangerous and always trying, is here described.

South Africa. **Worsfold.**
The Story of South Africa. By W. Basil Worsfold. (The Story of the Empire Series.) London: H. Marshall & Son, [1898]. Size 7 × 4½, pp. 176. *Price* 1s. 6d. *Presented by the Publishers.*

A brief but well-balanced epitome of the growth of European predominance in South Africa from the voyage of Vasco da Gama.

South Africa—Rainfall. **Buchan.**
Cape of Good Hope. Meteorological Commission. A Discussion of the Rainfall of South Africa during the ten years 1885–94. [With sixteen explanatory Maps.] By Alexander Buchan. Cape Town, 1897. Size 13¼ × 8¼, pp. 34. *Presented by Dr. Morris.*

This will be specially noticed.

South Africa—Transvaal. *Engineering Mag.* **14** (1898): 733–751. **Hammond.**
The Gold Mines of the Witwatersrand, South Africa. By John Hays Hammond. *With Illustrations.*

South and East Coasts of Africa. **Horsey.**
The Africa Pilot. Part iii. South and East Coasts of Africa, from the Cape of Good Hope to Ras Asir (Cape Guardafui), including the Comoro Islands. Originally compiled by Captain Algernon F. R. de Horsey. Sixth Edition. London: J. D. Potter, 1897. Size 9½ × 6, pp. xxiv. and 634. *Index charts. Price* 4s. *Presented by the Hydrographic Office, Admiralty.*

South-West Africa. **Schwabe.**
Illustrirte Beilage Deutsch. Kolonialzeitung (1898): 35–36.
Von der südwestafrikanischen Eisenbahn. Von Premier-Lieut. Schwabe. II. *With Sketch-Map and Illustrations.*

NORTH AMERICA.

Alaska—Kuskokwim River. *National G. Mag.* **9** (1898): 85–92. **Hallock.**
Two Hundred Miles up the Kuskokwim. By Charles Hallock. *With Illustrations.*

The Kuskokwim is an Alaskan river 800 miles long.

Canada. *Nineteenth Century* **43** (1898): 494–514. **Kropotkin.**
Some of the Resources of Canada. By Prince Kropotkin.

Canada—Newfoundland and Labrador Pilot. **Maxwell.**
The Newfoundland and Labrador Pilot, comprising also the Strait of Belle-Isle, the North-east and part of the North coast of Labrador. Originally compiled by Staff Commander W. F. Maxwell, R.N. Third Edition. London: J. D. Potter. 1897. Size 9½ × 6, pp. xxiv. and 782. *Index-Charts. Presented by the Hydrographer, Admiralty.*

Canada—Yukon District. *B.S.R.G. d'Anvers* **21** (1898): 342–364. **Richet.**
Au Klondyke (Notes de route). Par M. Étienne Richet.

Mexico—Yucatan. *B.S.G. Com. Havre* **14** (1897): 208–219. **Saumery.**
Au Yucatan. Par D. de Saumery.

A popular account of a visit to Yucatan.

United States—Dakota. *American J. Sci.* **5** (1898): 161–168. **Darton.**
Geothermal Data from Deep Artesian Wells in the Dakotas. By N. H. Darton. *With Maps.*

An interesting study of the increase of temperature downwards in deep artesian wells distributed over a considerable area in Dakota. The rate of increase from 1° Fahr. in 45 feet to 1° in less than 20 feet, and there is a distinct regional distribution of this increase of rate of rise of temperature, the greatest rate occurring along or immediately to the west of the Missouri river from Yankton to Pierre.

United States—Magnetic Declination. **Gannett.**
Magnetic Declination in the United States. By Henry Gannett. Seventeenth Annual Report of the United States Geological Survey . . ., 1895–96. Part i. Pp. 211–440. *Diagrams.* Washington, 1896. Size 12 × 8.

United States—Massachusetts. **Abbott.**
The Vital Statistics of Massachusetts, 1856–95. By Samuel W. Abbott, M.D. [From the Twenty-Eighth Annual Report of the State Board of Health of Massachusetts for 1896.] Size 9½ × 6, pp. 713–844. *Diagrams.*

United States—Michigan. **Van Hise, Bayley, Smyth.**

Department of the Interior. Monographs of the United States Geological Survey. Vol. xxviii. The Marquette Iron-bearing District of Michigan, with Atlas. By Charles Richard Van Hise and William Shirley Bayley, including a chapter on the Republic Trough, by Henry Lloyd Smyth. Washington, 1897. Size 12 × 9 (Atlas 21½ × 18¼, 1896), pp. xxviii. and 608. *Maps and Plates. Presented by the Survey.*

United States—Mississippi. *National G. Mag.* **9** (1898): 24-27. **McGee.**

The Modern Mississippi Problem. By W. J. McGee.

A note on this paper will appear in the Monthly Record.

CENTRAL AND SOUTH AMERICA.

Barbados. **Fraser.**

The Barbados Diamond Jubilee Directory and General West Indian Advertiser. Compiled from latest official and other sources. By S. J. Fraser. Barbados: T. E. King & Co. Size 7½ × 5, pp. xxxii. and 260. *Maps and Plates. Presented by the Compiler.*

Bolivia. **Ballivián.**

Relaciones Geográficas de Bolivia existentes en el Archivo de la Oficina Nacional de Inmigración, Estadística y Propaganda Geográfica. Relación y Descripción de las Misiones y conversiones de Infieles. La Paz, 1898. Size 8½ × 6½, pp. iv. and 40. *Presented by the Author.*

Bolivia. ——

Ministerio de Instruccion Publica y Fomento. Revista de la Oficina Nacional de Inmigracion, Estadistica y Propaganda Geografica. Año 1897. No. 1. La Paz. Size 9 × 6, pp. iv. and 246. *Map.*

British Guiana. *Timehri* **11** (1897): 284-293. **Bellairs.**

Our Peasant Population—Their Past Condition and Future Prospects. By Seaforth M. Bellairs.

On the economic condition of the labouring classes in British Guiana. All interested in the admirable work carried out by the conductors of *Timehri* will rejoice to hear that the magazine will not be discontinued, but will continue to appear, though somewhat reduced in size.

French Guiana and Brazil. *Questions Diplomat. et Colon* **2** (1898): 273-274. ——

Le Contesté Franco-Brésilien. Par X——. *With Map.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Mammalian Fauna. **Semon.**

Die Säugetier-Fauna Australiens. Von Prof. Dr. Richard Semon.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 167-180.

German New Guinea. ——

Nachrichten über Kaiser Wilhelms-Land und den Bismarck-Archipel. Herausgegeben von der Neu Guinea Compagnie zu Berlin. Berlin: A. Asher & Co., 1897. Size 9½ × 6½, pp. 102.

The annual report of the German New Guinea Company.

New South Wales. *Records Australian Museum* **2** (1893): 46-54. **Etheridge.**

Geological and Ethnological Observations made in the Valley of the Wollondilly River, at its Junction with the Nattai River, Counties Camden and Westmoreland. By R. Etheridge, junr. *With Plates.*

New Zealand. *T. Edinburgh Geolog. S.* **7** (1897): 183-200. **Cadell.**

A Visit to the New Zealand Volcanic Zone. By Henry M. Cadell. *With Maps and Illustrations.*

This visit was paid in 1895.

Queensland. **Hogan.**

The Gladstone Colony, an Unwritten Chapter of Australian History. By James Francis Hogan, M.P. London: T. Fisher Unwin, 1898. Size 9 × 6, pp. vi. and 278. *Price 7s. 6d. Presented by the Publisher.*

A summary of the curious history contained in this book will appear as a note

POLAR REGIONS.

Antarctic. **Neumayer.**

Thätigkeitsbericht der Deutschen Kommission für die Südpolar-Forschung. Von Prof. Dr. Neumayer.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 15-29.

Antarctic Expedition. *Nature* 57 (1898): 420-427. **Murray and others.**

Scientific Advantages of an Antarctic Expedition. Addresses by Dr. John Murray, F.R.S.; the Duke of Argyll; Sir Joseph Hooker, G.C.S.I., F.R.S.; Dr. Nansen; Prof. Dr. Neumayer; Sir Clements Markham, K.C.B., F.R.S.; Dr. Alexander Buchan; Sir Archibald Geikie, F.R.S.; Dr. P. L. Sclater, F.R.S.; and Prof. d'Arcy Thompson.

A full report of the meeting at the Royal Society on February 23, a more condensed account of which appears in the *Journal* for April, p. 416.

Antarctic Research. *Nature* 57 (1898): 413-416. **Mill.**

Antarctic Research. By Dr. Hugh Robert Mill. *With Chart.*

Gives the history of the present movement for antarctic explorations, and lays stress on the historical aspect of the question of the motive for polar research.

Greenland. **Drygalski.**

Grönland-Expedition der Gesellschaft für Erdkunde zu Berlin, 1891-1893. Unter Leitung von Erich von Drygalski. 2 vols. Berlin: W. H. Kühl, 1897. Size 12¼ × 8, pp. [vol. i.] xx. and 556; [vol. ii.] x. 572. *Maps and Illustrations. Presented by the Gesellschaft für Erdkunde, Berlin.*

These splendid volumes will be separately noticed.

Polar Problems. *G.Z.* 4 (1898): 121-133. **Drygalski.**

Die Aufgaben der Forschung am Nordpol und Südpol, 1898. Von Dr. Erich von Drygalski.

Treats of the problems now remaining to be solved in the polar regions, north and south.

MATHEMATICAL GEOGRAPHY.

Circular Measurement. **Tilmant.**

Mémoire contre la division du cercle en 400 grades et en faveur de l'adoption du système de 240 degrés. Présenté à la Société de Géographie de Lille. Par M. V. Tilmant. Lille: Imp. L. Danel, 1898. Size 10 × 6½, pp. 32. *Presented by the Author.*

The circle has always been divided by all civilized nations into 360 degrees. It was divided, when the metric system was introduced, into 100 degrees; this was a failure: 400 degrees were proposed recently, and the author proves that this is impracticable, while 240 degrees, he considers, presents many advantages.

Cross-staff. *G.Z.* 4 (1898): 157-167. **Günther.**

Der Jakobstab als Hilfsmittel geographischer Ortsbestimmung. Von S. Günther. *With Illustrations.*

An account of the cross-staff in history, from its earliest mention early in the fourteenth to its latest use in the eighteenth century, with references to the geographers and discoverers who used it in determining positions.

Latitude Variations. **Albrecht.**

Centralbureau der Internationalen Erdmessung. Bericht über den Stand der Erforschung der Breitenvariation im December 1897. Von Th. Albrecht. Berlin: G. Reimer, 1898. Size 12 × 9, pp. 36. *Plate.*

Positions at Sea. **Johnson.**

A Hand-Book for Star Double-Altitudes: with directions for selecting the stars, and showing how a single observer may take both the altitudes. By A. C. Johnson, R.N. London: J. D. Potter, 1898. Size 10 × 6½, pp. 32. *Price 2s. 6d. Presented by the Publisher.*

The Tides. **Moxly.**

A Suggested Improvement of the Current Theories of the Tides. By J. H. S. Moxly. London: Rivingtons, 1898. Size 8½ × 5½, pp. 44. *Price 3s. 6d. Presented by the Author.*

Mr. Moxly puts forward a theory of the cause of the tides which, he states, accords better with observed facts than the theory commonly held.

Time and Angles. **Rey-Pailhade.**

L'extension du système décimal aux mesures du Temps et des Angles. Théorie et applications scientifiques et industrielles. Par J. de Rey-Pailhade. Paris: Gauthier-Villars & Fils, 1897. Size 9½ × 6, pp. 44. *Map and Plate. Presented by the Author.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Atolls. *Natural Science* **12** (1898): 174–178. **Hedley.**

The Broadening of Atoll-Islets. By Charles Hedley.

Earth—Interior. *J. Geology* **6** (1898): 65-78. **Slichter.**

Note on the Pressure within the Earth. By C. S. Slichter.

Geological Theories. *J. Geology* **6** (1898): 1-9. **Powell.**

An Hypothesis to account for the Movement in the Crust of the Earth. By J. W. Powell.

Geomorphology. *J. Geology* **6** (1898): 10-64. **Van Hise.**

Estimates and Causes of Crustal Shortening. By C. R. Van Hise.

Meteorology—Weather Forecasts. *Ann Hydrographie* **26** (1898): 63–70. **Bebber.**

Einiges über Wettervorhersage insbesondere über das Sturmwarnungswesen an der deutschen Küste. Von Prof. Dr. W. J. van Bebber.

Mountains and Sunlight. **Peucker.**

Der Bergschatten. Die Einschränkung solarklimatischer Faktoren durch ein Bergprofil, und ihre graphische Ermittelung. Von Dr. Karl Peucker.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 225-252. *Plates.*

Oceanography. *Abrégé B.S. Hongroise G.* **25** (1897): 5–23. **Luksch.**

Die oceanographischen Forschungen der Neuzeit und Oesterreich-Ungarns Antheil an denselben. Von J. Luksch.

Oceanography—Skagerak. **Pettersson and Ekman.**

K. Svensk. Vetens.-A. Handlingar **29** (1897): 1–126.

De Hydrografiska Förändringarne inom Nordsjöns och Östersjöns område under tiden 1893-1897. Af Otto Pettersson och Gustaf Ekman. *With Plates.*

River-action. *C. Rd.* **126** (1898): 557-560. **Brunhes.**

Sur quelques phénomènes d'érosion et de corrosion fluviales. Note de M. Jean Brunhes.

Sand-dunes. *T. Edinburgh Geolog. S.* 7 (1897): 298-311. **Mackie.**

On the Laws that Govern the Rounding of Particles of Sand. By Wm. Mackie, M.A., M.D. *With Plates.*

A study of sand-particles, with reference to the dunes of the Culbin sands, west of the mouth of the Findhorn.

Seismology. **Gerland.**

Ueber den heutigen Stand der Erdbebenforschung. Von Prof. Dr. G. Gerland.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 99–117.

Seismology. **Supan.**

Vorschläge zur systematischen Erdbebenforschung in den einzelnen Ländern. Von Prof. Dr. A. Supan.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 118-123.

Seismology. ——

British Association for the Advancement of Science. Toronto Meeting, 1897. Second Report on Seismological Investigations. London: Offices of the Association. Size 8½ × 5½, pp. 78. *Diagrams.*

Seismology. *Nature* **57** (1898): 246-249, 272-276. **Milne.**

Recent Seismology. By Prof. J. Milne, F.R.S. *With Illustrations.*

Soil Temperature. **Callendar and McLeod.**

McGill University. Papers from the Department of Physics. No. 4. Observations of Soil Temperatures with Electrical Resistance Thermometers. By Hugh L. Callendar and C. H. McLeod. With Four Plates. [Reprinted from the

Transactions of the Royal Society of Canada, Second Series, 1896-97, vol. ii. section iii. pp. 109-117.] Montreal, 1897. Size 10 × 7.

Speleology—Bibliography. *Mém. S. Spéléologie* 1 (1897): 1-70. **Martel.**
Bibliographie spéléologique, 1895-1897. Par M. E.-A. Martel. *With Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Körösy.**
Le recensement séculaire du Monde en 1900. Mémoire adressé à la session de St.-Pétersbourg de l'Institut International de Statistique. Par le Dr. Joseph de Körösy. Paris: Lib. Guillaumin et Cie., 1898. Size 10½ × 7½, pp. 34. *Presented by the Author.*

A plea for a universal census in 1900, with plans of schedules adapted for the purpose of giving strictly comparable data for all countries. The proposal was duly discussed at the St. Petersburg Statistical Congress, and reported on as impracticable, although eminently desirable.

Colonization. *Kolon. Jahrb.* 10 (1897): 243-269. ——
Der Togovertrag, extensive und wirthschaftliche Kolonialpolitik.

A discussion of the principles of colonisation, with particular reference to the delimitation of the German West African colony of Togo.

Commercial Geography. **Hahn.**
Die Transporttiere in ihrer Verbreitung und in ihrer Abhängigkeit von geographischen Bedingungen. Von Dr. Eduard Hahn.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Berlin: D. Reimer, 1897. Pp. 181-196.

Historical—Discovery of America. *National G. Mag.* 9 (1898): 73-84. **Horsford.**
Dwellings of the Saga-Time in Iceland, Greenland, and Vineland. By Cornelia Horsford. *With Illustrations.*

With numerous illustrations of early Scandinavian dwellings and certain remains supposed to represent similar buildings in Massachusetts.

BIOGRAPHY.

Bòttego. *Riv. G. Italiana* 5 (1898): 1-23. **Giuliani.**
Vittorio Bòttego. Dal Prof. Carlo Giuliani. *With Portrait.*

Drake. **Corbett.**
Drake and the Tudor Navy. With a History of the Rise of England as a Maritime Power. By Julian S. Corbett. 2 vols. London: Longmans & Co., 1898. Size 9 × 6, pp. (vol. i.) xvi. and 436; (vol. ii.) viii. and 488. *Portrait, Charts, and Illustrations. Price 36s. Presented by the Publishers.*

This is specially noticed on p. 527.

Gesner. *B. Nat. Hist. S. New Brunswick* 15 (1897): 3-48. **Matthew.**
Abraham Gesner. A Review of his Scientific Work. By G. F. Matthew, D.SC. *With Maps.*

Gesner was concerned with the first investigations into the geology of the maritime provinces of Canada.

Gauthiot. *Deutsche Rundschau G.* 20 (1898): 277-280. **Paulitschke.**
Charles Gauthiot. Von Ph. Paulitschke. *With Portrait.*

Hedin. *Deutsche Rundschau G.* 20 (1898): 228-229. ——
Dr. Sven Hedin. *With Portrait.*

The portrait is not characteristic.

Hubbard. *National G. Mag.* 9 (1898): 33-70. ——
Gardiner Greene Hubbard. *With Portrait.*

The whole number is devoted to obituary notices of Mr. Hubbard, the late President of the National Geographic Society.

Lüddecke. *Deutsche Rundschau G.* 20 (1898): 280. ——
Richard Lüddecke. *With Portrait.* [Also *Petermanns Mitteilungen*, 44 (1898): 24.]

Dr. Lüddecke, born in 1859, died on January 14, 1898, was one of the accomplished cartographers on the staff of Herr Justus Perthes at Gotha.

Miller. *T. Edinburgh Geolog. S.* 7 (1897): 132–138. **Horne.**
Obituary Notice of Hugh Miller. By J. Horne. *With Portrait.*

Mr. Hugh Miller, son of the famous geologist, was born in 1850, and died in 1895. He was on the staff of the Geological Survey of Scotland, and was the author of many papers on the physical geography of the regions which he studied geologically.

Necrology of 1896 and 1897. **Wolkenhauer.**
Geographische Nekrologie für die Jahre 1896 und 1897. Von Dr. W. Wolkenhauer. Size 8½ × 6, pp. [28].

GENERAL.

Ballooning. **Claparède.**
Arthur de Claparède. De Genève à Cercier en Ballon. Notes d'un touriste dans l'espace. Genève: Georg & Co., 1898. Size 9 × 6, pp. 40. *Presented by the Author.*

British Colonies. **Greswell.**
The Growth and Administration of the British Colonies, 1837–1897. By Rev. William Parr Greswell, M.A. London: Blackie & Son, 1898. Size 7½ × 5, pp. 254. *Price 2s. 6d. Presented by the Publishers.*

Preliminary chapters are devoted to the British colonial system, and to pioneers of colonial progress and reform from Wakefield to Sir John Seeley. Then follow chapters on the growth of the North American, South African, and Australasian colonies, and of their constitutions. The author confines himself to the discussion of colonies in the true sense of the word.

British Empire—Trade. *J.R. Colonial I.* **29** (1898): 226–260. **Birchenough.**
Some Aspects of our Imperial Trade. By Henry Birchenough, M.A.

Educational Journeys. **Sievers.**
Ueber grössere geographische Unterrichtsreisen mit Studierenden. Von Prof. Dr. W. Sievers.—Verhandlungen des Zwölften Deutschen Geographentages Jena 1897. Pp. 93–96.

Educational—Methods. *J. School G.* **2** (1898): 92–96. **Dodge.**
First Steps in the Geography of the World. By Richard E. Dodge.

Hints as to practical methods of linking the geography of the world to the personal experience and observations of young children.

Educational—Methods. **Dryer.**
Geography as a University Study. By Charles R. Dryer. From the *Inland Educator*, 6, 1898. Size 11 × 7½, pp. [8].

Prof. Dryer gives a statement of the historical development and actual position of geography as a science, and then contrasts the developed state of geographical instruction (especially of a university order) in the countries of continental Europe with the disgraceful neglect in the universities of the English-speaking world.

Educational—Methods. **Fischer.**
Zur äusseren Lage des Geographie-Unterrichtes in Preussen. Von Oberlehrer H. Fischer.—Verhandlungen des Zwölften Deutschen Geographentages Jena, 1897. Berlin: D. Reimer, 1897. Pp. 69–92. *Plate.*

Educational—Textbook. **Lyde.**
A Geography of Europe. By Lionel W. Lyde. London: A. & C. Black, 1897. Size 7 × 5, pp. vi. and 120. *Price 1s. Presented by the Publisher.*

A clearly arranged school-book, divided into Lessons and subdivided into short numbered paragraphs.

Geographical Distances. *P.R. Artillery I.* **25** (1898): 133–145. **Cleeve.**
A System of comparing Geographical Distances. By Captain F. J. S. Cleeve.

The substance of this lecture was published in the *Geographical Journal* for September, 1897, vol. x. p. 334.

Geography. *Petermanns M.* **44** (1898): 14–17. **Kahle.**
Die Geographie auf der 69. Versammlung deutscher Naturforscher und Ärzte in Braunschweig, 1897. Von P. Kahle.

German Colonies. ———
Weissbuch. Achtzehnter Theil. Berlin: C. Heymann, 1898. Size 13 × 9½, pp. 156.

Annual reports on the German Colonies in Africa, and on the Marshall islands.

Irrigation. *B. American G.S.* **30** (1898): 1–14. **Wilson.**
Relations of Irrigation to Geography. By Herbert M. Wilson.

On the characteristics of a region which requires irrigation for agriculture.

Mohammedanism. **Robinson.**
Mohammedanism, has it any future? By the Rev. Charles H. Robinson, M.A. With an Introduction by the Right Rev. W. Boyd Carpenter, D.D. London: Gardner, Darton & Co. [1897]. Size 7½ × 5, pp. vi. and 84. *Presented by the Author.*

Portuguese Colonies. **Vasconcellos.**
As Colonias Portuguezas, geographia physica, politica e economica. Por Ernesto J. de C. E. Vasconcellos. Lisboa, 1896. Size 7½ × 5, pp. 144. *Presented by the Author.*

This was noticed in the *Journal* for August, vol. x. (1897), p. 178.

Routes to India. *Aus allen Weltteilen* **29** (1897): 155–160. **Ichenhäuser.**
Nach Ostindien über Deutschland. Von Dr. Justus Ichenhäuser.

This is noticed in the *Journal* for February, p. 175.

Royal Society—Year-Book. ——
Year-Book of the Royal Society of London, 1897–98. London: Harrison & Sons, 1898. Size 8½ × 5½, pp. 172. *Price 5s. Presented by the Royal Society.*

The second issue of this useful record of the activity of the Royal Society.

Scientific Progress. *P. American A. Arts and Sci.* **33** (1897): 31–42. **Livermore.**
Suggestions for the Development of the Arts and Sciences. By W. R. Livermore.

Refers incidentally to geography and the use of maps.

Second Italian Geographical Congress. **Magistris.**
L. F. de Magistris. Gli "Atti del Secondo Congresso Geografico Italiano." Roma, 1896. Size 9½ × 6, pp. 48. *Presented by the Author.*

Sixth International Geographical Congress. **Stern.**
Jahresb. Frankfurter Ver. G. u. Statistik **60** (1895–96), (1897): 115–133.
Der VI. Internationale Geographen-Kongress in London im Jahre 1895. Von Rudolf Stern.

One of the best general accounts of the Congress which has appeared, very happily characterizing the various features of the meeting, scientific and social. It is perhaps the highest compliment to the smoothness of the proceedings that the writer has not even had occasion to refer to the existence of secretaries of the Congress.

Time Signals. ——
List of Time Signals, established in various parts of the World. Fifth Edition, 1898. Compiled for the use of seamen, as an aid for ascertaining the errors and rates of chronometers. [Prepared from Official Sources to December 31, 1897.] London: J. D. Potter. Size 10 × 6½, pp. 68. *Price 1s. Presented by the Hydrographer of the Admiralty.*

Travel. **Hill.**
A Run round the Empire. Being the Log of Two Young People who circumnavigated the Globe. Written out by their Father, Alex Hill, M.A., M.D. London: Sonnenschein & Co., 1897. Size 7½ × 5½, pp. viii. and 286. *Illustrations. Price 3s. 6d. Presented by the Publishers.*

Dr. Hill made a journey round the world, by the Suez Canal to Australia, thence to New Zealand, across the Pacific and home by the Canadian Pacific railway and the Atlantic, the incidents of which are here recorded in a concise manner likely to interest young people. Dr. Hill believes that travel can be put to the best educational use by seeing the places first and reading about them afterwards. The book contains a number of fair illustrations, but no map.

Upsala University. **Geijer.**
Upsala Universitet, 1872–1897. Festskrift med anledning af Konung Oscar II.: sstjugofemårs regerings jubileum den 18 September 1897. Enligt det Stора Akademiska Konsistoriets Uppdrag, utgifven af Reinhold Geijer. Upsala, 1897. Size 12½ × 9½, pp. iv., 280, 360, and 104. *Portrait and Illustrations.*

The history of Upsala University during the reign of King Oscar II.

Water-Supply. *J. R. Agricultural S.* 8 (1897): 233–249. **Morley.**

The Use of Wind-Power in Village Water Supply. By A. L. Y. Morley. *With Illustrations.*

An account of the system of water-supply lately inaugurated at Great and Little Brington, Northamptonshire.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since March 8, 1898.

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ENGLAND AND WALES (revision):—232, 244, engraved in outline; 247, hills engraved in black or brown. 1*s.* each.

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25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Cheshire**, IV. 8; XI. 3; XVIII. 8, 14; XIX. 5, 7, 8, 11, 12, 13, 14; XX. 5, 7, 9; XXVII. 6, 11, 14, 15, 16; XXVIII. 11; XXXV. 2, 3, 4, 6, 12, 14; XXXVI. 1; XLII. 2, 3, 7, 11, 15; L. 2, 15. **Durham**, I. 12; II. 15; III. 13; IV. 1; V. 14; IX. 15, 16; XI. 5, 6, 9, 13; XVI. 3; LI. 4; LVI. 6, 15. **Essex**, XIII. 14; XIX. 7; XXI. 10, 14; XXII. 2, 11; LXXXVIII. 4. **Hampshire**, LXXV. 9, 13, 14; LXXXII. 8, 12; LXXXIII. 1; LXXXIV. 2, 5, 7, 11, 14, 15; LXXXVIII. 13, 14; LXXXIX. 14; XC. 13; XCI. 13; XCIII. 7, 10, 14, 16; XCIV. 1, 4, 6, 8, 10, 14, 15; XCV. 1, 6, 8, 11; XCVI. 1, 5, 7, 12. **Hertfordshire**, III. 8, 16; VII. 8; IX. 6, 10, 15; XI. 11; XII. 4, 7, 9, 10, 11; XIII. 10, 15, 16; XIX. 4, 8, 12; XX. 1, 2, 6, 7, 8, 9, 10, 11, 12; XXI. 1, 2, 3, 7, 8, 10, 11, 12, 13; XXII. 1, 5, 9, 13; XXVIII. 2, 6, 7, 10, 11, 15; XXXIV. 3, 15; XXXV. 3, 6, 15, 16; XXXVI. 11; XL. 1; XLI. 1, 6; XLV. 2, 8. **Kent**, V. 10, 11, 14; XIX. 6, 10, 11, 14, 15; XXI. 14; XXIII. 7, 11, 10, 13, 14, 15; XXIV. 13; XXXV. 1, 15, 16; XLVI. 1, 5; XLVII. 1, 3, 5, 6, 7, 8, 9, 11, 13, 14, 15, 16; LVII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16; LXV. 9; LXVI. 13; LXVII. 1, 2, 3, 5, 6, 7; LXXII. 1, 3, 4, 5, 9, 10, 11, 12, 14, 15, 16; LXXIII. 2, 3, 4, 6, 9, 12, 13, 14, 15, 16; LXXXIV. 13; LXXXVI. 1, 2, 5, 6. **Northumberland**, VI. 8, 11, 12, 16; VII. 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16; VIII. 9, 13; X. 1; XI. 8, 12, 16; XII. 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15; XV. 4; XVI. 1, 2, 3, 4, 6, 7, 16; LXXXIX. 12; CVI. 7, 15; CVII. 9, 11, 13, 14; CX. 3, 4, 8; CXI. 1, 2, 5, 7. **Surrey**, XII. 4; XXII. 13; XXIX. 8; XXX. 9; XXXVII. 1; XLVI. 10. **Sussex**, III. 5; IV. 3, 7; IX. 16; X. 3, 9, 14; XI. 2, 3, 4, 6, 7, 8; XII. 1, 2, 3; XX. 15; XXXIII. 6, 10, 14; XLVII. 2, 10; LII. 9, 13; LX. 8, 12; LXI. 9, 10, 12, 13, 15; LXII. 14; LXIII. 14; LXIV. 1, 2, 3, 4, 5, 6, 7, 16; LXXII. 4; LXXIII. 1, 2; LXXIV. 3; LXXV. 2; LXXVI. 2. **Westmorland**, XLII. 5, 6; XLIII. 5; XLVI. 13. Tyneside, comprising the town on both sides of the river Tyne between Newcastle and Tynemouth, is now complete in 27 sheets, with houses ruled. 3*s.* each.

(*E. Stanford, Agent.*)

England and Wales. **Geikie.**

Geological Map of England and Wales. Scale 1 : 633,600 or 10 stat. miles to an inch. By Sir A. Geikie, D.SC., LL.D., F.R.S. J. Bartholomew & Co., Edinburgh, 1898. *Price* 12*s.* 6*d.*, mounted on cloth. *Presented by the Publishers.*

The topographical basis of this map is Bartholomew's reduction from the Ordnance Survey, on the scale of 10 miles to an inch. The geological colouring is taken from the published maps of the Geological Survey of England and Wales under the direction of Sir Archibald Geikie. For the scale of the map, it contains a large amount of detailed information, the colours are well chosen, and the registering good. Sections have been placed round the border of the map to explain the geological structure of the country. To the student of the physical geography of the country the map will be found of the greatest use.

Historical Geography. **Poole.**

Historical Atlas of Modern Europe, from the decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Lecturer in Diplomatic in the University of Oxford. Part xvi. Oxford: The Clarendon Press; London, Edinburgh, and Glasgow: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston, 1897. *Price* 3*s.* 6*d.* *Presented by the Clarendon Press.*

This part contains the following maps: No. 10, Europe in the Eighteenth Century prior to the French Revolution, by Walter E. Rhodes, M.A.; No. 16, England and Wales before the Norman Conquest, by W. H. Stevenson, M.A.; No. 85, European Explorations and Colonies, from the Fifteenth Century to the Seventeenth Century, by Hugh E. Egerton, M.A. Each map is accompanied by explanatory letterpress. With regard to the map of European explorations, none of the discoveries in the Arctic Regions are shown.

Switzerland. **Swiss Federal Staff.**

Topographischer Atlas der Schweiz im Masstab der Original-Aufnahmen nach dem Bundesgesetze vom 18. Dezember 1868 durch das eidg. topogr. Büreau gemäss den Direktionen vom Oberst Siegfried veröffentlicht. XLVII. Lieferung: Nº 5bis Winkel; 21bis Lauchringen; 250bis Speer; 251, Alt St. Johann; 253, Walenstadt; 256, Berschis; 364, Schwarzsee; 450, Vernier; 450bis Bernex; 477bis Chamossaire; 499, Cerentino; 522bis Chiesa. *Price* 1 *mark each sheet.* *Presented by the Swiss Federal Staff.*

ASIA.

Indian Government Surveys. **Surveyor-General's Office, Calcutta.**

Indian Atlas, Quarter-sheets, 4 miles to an inch. Sheets: No. 2 S.W., parts of district Hyderabad and Native State of Khairpur (Sind, Bombay Presidency); 10 S.E., part of district Thar and Parkar (Sind, Bombay Presidency); 71 S.E., parts of districts Seoni, Mandla, Narsinghpur, Jubbulpore, and Balaghat (Central Provinces); 91 S.E., parts of districts Raipur, Sambalpur, and Native State of Patna (Central Provinces).—India, showing railways with stations, accompaniment to alphabetical list of stations on Indian railways, corrected to December 31, 1896, 64 miles to an inch, 2 sheets.—Central India and Rajputana Survey, 1 inch to 2 miles. Sheets: Nos. 159, 160, 192, 193, parts of Jodhpore, Bickaneer, and Shaikhawati (Rajputana Agency), Season 1876–77.—Bombay Survey, 1 inch to a mile. Sheet 349, district Bijapur, Seasons 1894-95-96.—Bengal Survey, 1 inch to a mile. Sheet No. 138 (Preliminary edition), district Puri, Seasons 1890-91 and 1894-95; No. 246, district Balasore, Season 1893-94.—South-Eastern Frontier, 8 miles to an inch. Sheet No. 10, parts of district Mergui (*Lower Burma*) and of Siam, Seasons 1865-67 and 1889-93.—Indus Riverain Survey, 1 inch to a mile. Sheets Nos. 50 and 52, district Karachi and Hyderabad, Season 1894-95.—Skeleton Map of the Punjab and surrounding countries, 32 miles to an inch. Additions and corrections to railways, etc., to July, 1897.—Province of Assam, 16 miles to an inch, with additions and corrections to 1897.—District Rájsháhi, Bengal, 4 miles to an inch, with additions to 1897.—Mysore and Coorg, 16 miles to an inch, September, 1897.—District Lahore, Punjab, 8 miles to an inch, 1897.—District Peshâwar, Punjab, 8 miles to an inch, 1897.—District Nagpur, Central Provinces, 8 miles to an inch, December, 1897.—District Bilâspur, Central Provinces, 16 miles to an inch, 1897.—District Sonthál Parganas, Bengal, 10 miles to an inch, 1890.—District Darbhanga, Bengal, 8 miles to an inch, 1891.—Districts Bhamo and Myitkyina, Upper Burma, 8 miles to an inch. Additions and corrections to 1896.—Survey of India Department, Charts of Triangulation, 2 miles to an inch. No. 14 Party (Central Provinces), Seasons 1894-95 and 1895-96. Sheets 61, 62, 65, 66, 81, 85 (Central Provinces). No. 18 Party (Himalaya). Sheet 314 (Punjab), Season 1888–89.—Map of Tenasserim, compiled by Arthur H. Bagge, Lieut. R.E., Her Britannic Majesty's Commissioner for the settlement of the boundary between the Kingdom of Siam and the British Province of Tenasserim. In 6 sheets, 4 miles to an inch, with additions to boundaries to 1897.—Part of North-West Frontier, 16 miles to an inch, September, 1897.—Map of portion of Tibet explored by Captain H. H. P. Deasy, 16th Lancers, in 1896, 8 miles to an inch, 2 sheets, July, 1897.

(*E. Stanford, Agent.*)

AFRICA.

Niger and Nile Regions. **Johnston.**

W. & A. K. Johnston's Maps to illustrate the Niger and Upper Nile Questions. Four maps on one sheet. W. & A. K. Johnston, Edinburgh, 1898. *Price 2s. Presented by the Publishers.*

These maps, and the accompanying notes, will be found useful for reference with regard to the questions at issue at the present time, in the Niger territory and the upper Nile.

Somaliland. **Ghika.**

Expédition Ghika au Pays des Somalis. (Du mois d'Octobre 1895 jusqu'en Mars 1896) fait d'apres les relevés du prince Démètre Ghika par le Prof. Dr. Philippe Paulitschke. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. Th. Bannwarth, Vienna. With Prince Nicholas Ghika's book, 'Cinq Mois au Pays des Somalis.'

———— **Wickenburg.**

Reiseroute des Grafen Eduard Wickenburg im Somâllande Juli bis Oktober 1897. Nach den Aufnahmen den Reisenden bearbeitet von Prof. Dr. Philipp Paulitschke. Scale 1 : 1,000,000 or 15·7 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrgang 1898, Tafel 5. Gotha: J. Perthes. *Presented by the Publisher.*

AUSTRALIA.

Western Australia. **Carnegie.**

Map showing routes of the Exploring and Prospecting Expedition, between Coolgardie and Kimberley, equipped and led by the Hon. David W. Carnegie, 1896–97. Scale 1 : 1,013,760 or 16 stat. miles to an inch. *Presented by the Hon. David W. Carnegie.*

The explorations shown on this map, being in a north and south direction, are mainly important from the fact that Mr. Carnegie's routes connect those followed by other expeditions, which have generally been from east to west. The map contains considerable detail along the routes followed, and descriptive notes, together with sketches showing the character of the country.

GENERAL.

History of Early Cartography. **Nordenskiöld.**

A. E. Nordenskiöld: Periplus, an Essay on the Early History of Charts and Sailing Directions. Translated from the Swedish original by Francis A. Bather. With numerous reproductions of old charts and maps. Stockholm: P. A. Norstedt and Sons, 1897. *Price* £10.

A special notice of this important atlas will appear in the *Journal.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during January and February, 1898. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches	
2548 m	= 1·4	Spain, west coast:—Vigo and Pontevedra bays. 2s.
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No.	Inches.	
1510	m = 8·0	Plans in the Si-kiang or west river:—Samshui reach, Tak-hing, Wu-chau-fu. 1s. 6d.
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631		Smyth channel:—Plan added, Burgoyne bay.
825		Andaman islands:—Plan added, Barren island anchorage.
840		Nicobar islands:—Plan added, Laful anchorage.
766		Ellice islands, south-eastern group:—New plan, Nukulaihai; Plan added, Nukulailai anchorage.

(*J. D. Potter, Agent.*)

Charts that have received Important Corrections.

No. A. to P., Index charts (16 sheets). 2302, Gulf of Bothnia:—Tome point to Tauvö. 2365, Germany:—Rostock to Arkona light. 2366, Germany:—Arkona to Dievenow river. 1343, France, west coast:—Adour river. 1492, Adriatic sea:—Brindisi harbour. 1315, Bermuda:—The Narrows. 490, Lake Erie, west end. 2020, Bay of Fundy:—Campobello island. 21, Magellan strait:—Second narrows to Cape Pillar. 877, Chile:—Guia narrows to Concepcion channel. 1289, Chile:—Guaytecas islands to Cape St. Antonio. 1303, Chile:—Approaches to Lota and Coronel. 2323, Mexico, south-west coast:—Manzanilla bay to the Gulf of California. 1924, Anchorages on the coast of Lower California. 2348, Alaska:—Sitka harbour and approaches. 607, Africa, west coast:—Entrances to the Salum and Jumbas rivers. 1849, Africa, south coast:—Simons bay. 1491, Mauritius:—Grand port. 2284, Plans of anchorages on the west coast of Sumatra. 934, Eastern Archipelago:—Surabaya, Bali, and Sapudi straits, etc. 2637, Strait of Makassar, south part. 416, Paláwan island:—Malanut and Nakoda. 2062, Cochin China:—Tong-king gulf. 2562, China:—Chu-kiang or Canton river. 2734, China:—Si-kiang or West river (sheet 2). 2735, China:—Si-kiang or West river (sheet 3). 1767, China:—Amoy harbours and approaches. 1199, China:—Kee-shan islands to the Yang-tse Kiang. 1256, China:—Gulfs of Pe-chili and Liau-tung. 1602, China:—Approaches to the Yang-tse Kiang. 2981, Japan:—Furubira Wan to Ishikari Gawa.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2548	Vigo bay.	New Chart. Vigo and Pontevedra bays	2548
1878 1673 1668 1329	Port Tigani. Port Ajano. Sighajik harbour. Port Issue.	New Chart. Plans of anchorages in the Ægean sea	1878
1229	Santa Cruz to Cape Bojador, including the Canary islands.	New Chart. Cape Ghir to Garnet head, including the Canary islands	1229
2868	Tubuai island anchorage.	New Chart. Tubuai island	2868

(*J. D. Potter, Agent.*)

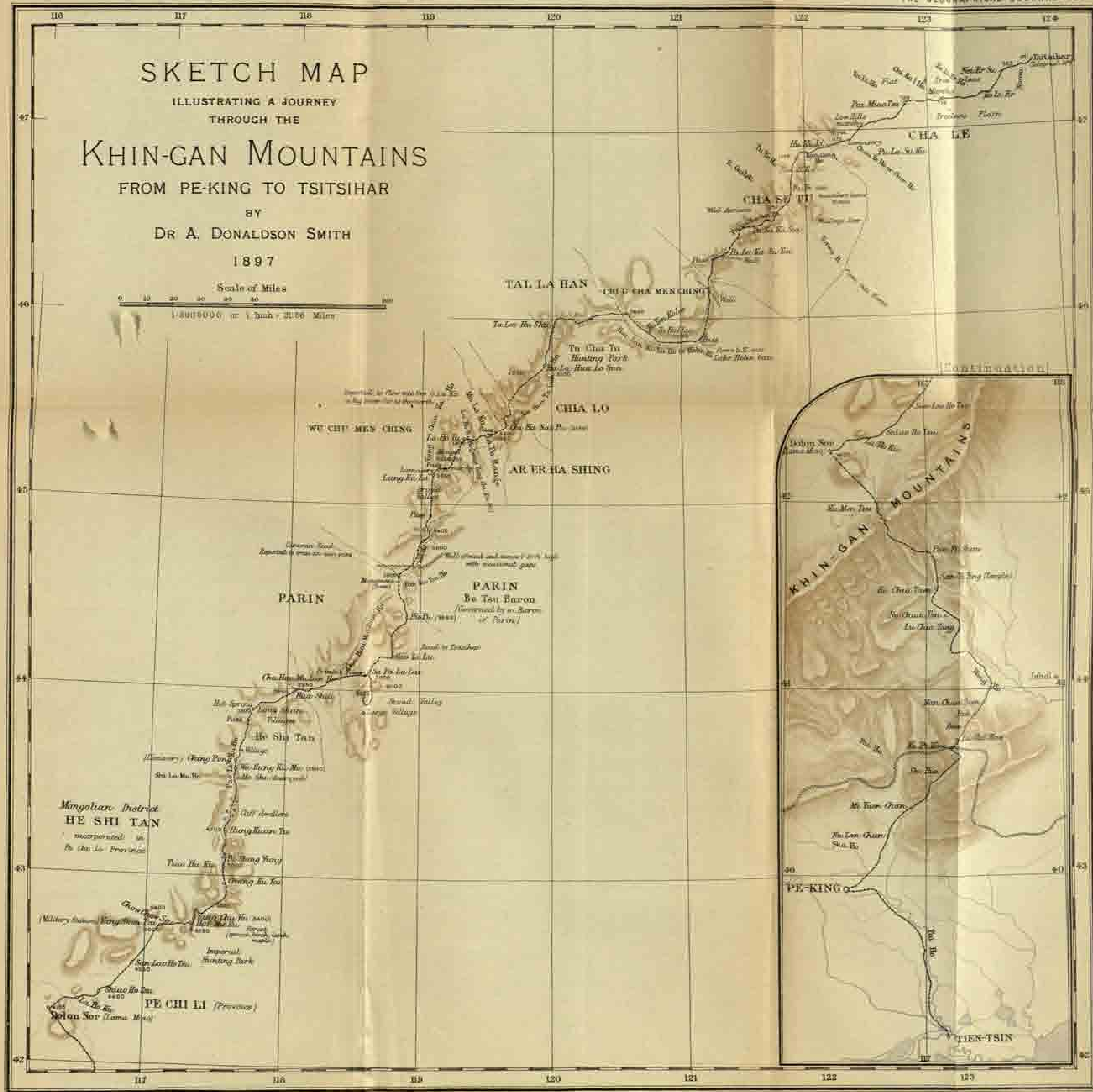
United States Charts. **U.S. Hydrographic Office.**

Pilot Charts for the North Atlantic Ocean for February and March, 1898, and North Pacific Ocean for March, 1898. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


CENTRAL & NORTHERN STATES
OF
THE MALAY PENINSULA,
SIAM.
by
H. WARINGTON SMYTH.
Scale 1: 2.000.000 or 1 inch = 31·56 miles.
Heights in feet.
K. Kaw. Island. Kl. Klong. Stream. M. Muang. Township.
BAY OF BENGAL
GULF OF SIAM
MERGUI ARCHIPELAGO
TENASSERIM
BANGKOK
RACHABURI
PETCHABURI
PRANBURI
KUWI
BANGTAPAN
PATIYU
CHAMPAWN
PAKCHAN
RENAWNG
LANGSUAN
CHAIYA
TAKUAPA
KANCHANADIT or BANDON
LAKAWN
TAKUA TUNG
PANG NGA
KRABI
TRANG
PALIEN
SATUN
SITAMARAJ
PATALUNG
SUNGKLA
CHANA
POLIT
SAI or KEDA
Mergui
Tavoy I.
King I.
Whale Bay
Lenya
Bangtapan
Kopa Head
M. Takupa
Kiriwong
Bandon
M. Chaiya
Junk Ceylon or Puket Island
Pulo Lanta
M. Trang
M. Palien
M. Satun
Sungkla
M. Lakawn
M. Pran
M. Kuwi
M. Champawn & Bay
M. Langsuan
M. Renawng
K. Pungnun 2220
K. Samui 2269
Lem Kolam Puk
Pak Ranawt



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A JOURNEY THROUGH THE TUNISIAN SAHARA.*

By Sir HARRY H. JOHNSTON, K.C.B.

Towards the close of last November I found myself landed at Humt Suk, the capital of the island of Jerba, with the intention of journeying thence to the French military posts in the Tunisian Sahara, and afterwards visiting the Jerid, or date-producing country, round the dried-up salt lakes in Southern Tunis.

The island of Jerba is more full of history than any other part of the regency of Tunis, with the exception of Carthage and its vicinity. It is supposed to have been the island of Lotos Eaters of the Greeks; the Romans here had most important settlements, the existence of which is attested by the remains of vast public works. It was reconquered from the Arabs by a king of Sicily in the fourteenth century; again taken by a Genoese, who entitled himself "King of Gerba;" and for a brief time was held by the Spaniards in their struggles with the Corsairs in the sixteenth century. At Humt Suk the Spaniards built a most imposing fort, which stands in very good preservation at the present day. Here, however, they sustained a terrible defeat at the hands of the celebrated pirate Dragut, and it is said that twenty-five thousand Spaniards lost their lives on this occasion. Two large columns were built of their skulls, which remained in evidence until 1848, when the Bey of Tunis acceded to a petition of the first Maltese colony in Jerba, and consented to the Spanish skulls being reverently buried by the Maltese at the Christian cemetery at Jerba.

Since the beginning of this century the Maltese colony in Jerba has been an important element. There are, indeed, at the present time only some ten or eleven Europeans in the whole island (which has a superficies

* Map, p. 692.

of about 800 square miles) who are not of Maltese origin. The local population appears to belong mainly to the old Berber stock common to all North Africa, with a very slight introduction of Arab blood, and some European admixture, arising from the constant European descents on Jerba.

The modern Jerbians are a handsome race, very well disposed towards Europeans and French rule. There is an almost entire absence of Mohammedan fanaticism amongst them as regards their attitude towards Christians, though towards each other they show some religious animosity, as they are divided into at least five Mohammedan sects. In addition to their varied forms of Mohammedanism, they retain vestiges of older faiths. In all but the most recently built mosques a phallic emblem is placed on the summit of the minarets. (I shall treat of this subject later on in dealing with the Tunisian Sahara.) Again, in the country districts outside the towns, in almost every household—all the Jerbians are well-to-do farmer folk who live in substantial farmhouses—there is a rude shrine, made and tended by the women of the family, in the vicinity of the house or in the courtyard. This is held to be the abiding-place of a protecting house-spirit, and offerings in the form of libations of oil and wine, or rags of cloth, are placed on the rudely piled stones, which—sometimes smeared with mortar—form a rough cupola or dome over a hollow place. Sometimes the spirit thus worshipped is said to be that of a saint or of an ancestor. The men laugh at these practices, and dislike to be questioned about them. They will refer to the spirit thus worshipped by the women as a "sheitan."

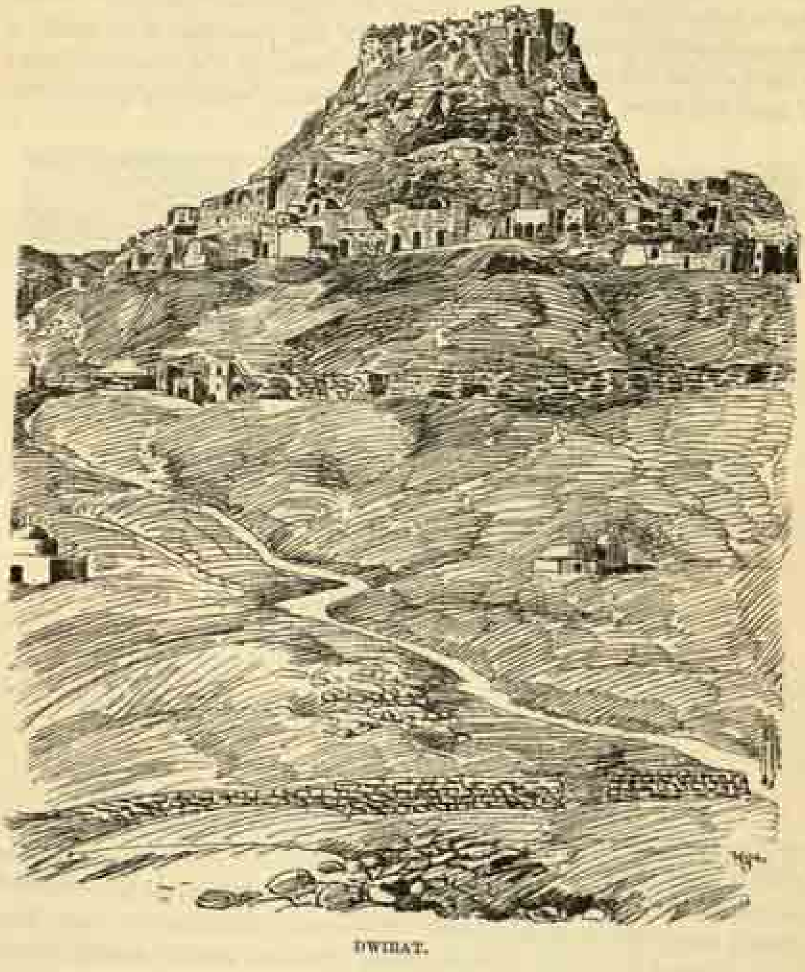
Europeans are allowed—are even invited—to enter the mosques of Jerba. The inhabitants of this most fertile island detested the government of the beys of Tunis, and therefore the French were welcomed here as nowhere else in Tunisia. It must be said truthfully that they have justified the expectations of the inhabitants. Not only have they made life and property absolutely safe throughout the island, but they have relieved the people of many onerous taxes, have made roads and wharves, and have bored several artesian wells. I believe I am correct in saying that there is not a single French soldier in the island —merely a few gendarmes.

Jerba is very flat, but nowhere marshy. The highest land is only some hundred feet above the level of the sea. There is absolutely no watercourse or running water (except an artificial stream, recently made by the tremendous volume of water issuing from an artesian well). Yet everywhere water is near to the surface, sometimes within 6 feet. Wells, therefore, are abundant, and the natives of the island construct underground cisterns, where the rainfall is stored. In consequence of this abundant underground moisture, the island is an ideal home for the date palm,* and the whole island seems to be one huge forest of scattered

* The oft-repeated Arab saying is quite true, that the date palm must have its head in fire and its feet in water.

palm trees. Abundant crops of barley and many vegetables are grown in and out of the date palms, and olive trees and fig trees are nearly as abundant, though not so prominently seen from a distance as the palm trees.

The Controleur Civil of Jerba, M. Ballut, drove me across the island from Humt Suk to El Ajim in his English cart, along a capital French-



DWIRAT.

made road. El Ajim is a port on the shallow strait which separates Jerba from the mainland.* We arrived at El Ajim at low tide, a rare sight in the Mediterranean; but in the Gulf of Gabes the tide rises and falls about 7 feet. Entering a huge boat, like a gigantic flat-bottomed

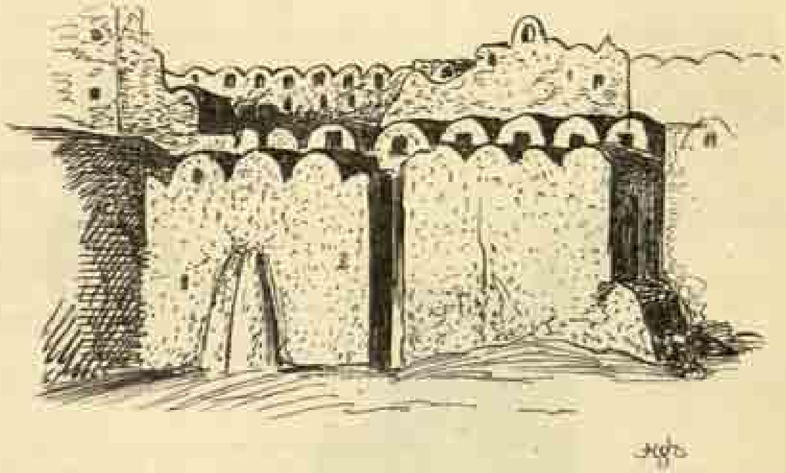
* This strait at El Ajim is only a few miles in width; elsewhere it may broaden to more than 20 miles. In the direction of Gellala the water is so shallow that, at low tide with a south wind, men can wade across to the mainland.

canoe, with a broad sail, we sailed southwards to a point called Bu Ghara. At this place I parted from my kind guide, and rode 15½ miles to the military post of Mednin.

The extreme south of Tunisia still remains under military government, and the *commandant supérieur* of Mednin is practically the governor of the Tunisian Sahara. At Mednin we come to a remarkable type of desert town. It is mainly composed of "ksūr," or "castles." These are continuous buildings made of rubble and plastered with mud, of several stories in height, and with vaulted roofs. It was explained to me at least five times how the vault was constructed without supports, but

THE SAHARA, FROM DWIRAT.

as I understand not very much Tunisian Arabic, I could not come away with a clear idea. As far as I can understand, the vaulting is effected by overlaying flat stones, and plastering the whole outside and within with a singularly tenacious mud. When every three or four years there is an unusual downpour of rain, these mud and rubble castles are apt to crumble. On the outside of these extraordinary buildings (which form continuous streets) are rude staircases of stone jutting out from the front of the houses. In front of each doorway, on each story, there is a rude slab of stone as the threshold, and, in addition to the fragmentary staircase, many odd blocks of stone or wood project from the surface. By means of these hazardous stairs, the natives will climb to the highest story most nimbly, like goats. Arrived in front of their doorways, they insert a huge wooden key with iron points through a hole in the wall, and turn a rude lock, which releases a bolt, and thus opens the door.* Formerly the "ksûr" were used as store-houses for grain and for goods, and also for occasional habitation, by the semi-Berber populations, who were always threatened by Tawarek invasions. Though they might not always reside in these towns, but rather in tents, they would resort to them on market days, or when pursued by the enemy. For some time past, however, they have taken to living a settled existence, and round and about a *ksar* † other houses have sprung up of the hovel type, with occasionally a Moorish-looking dwelling for the sheikh, or headman.



KSUR, OR GRAIN STORE CASTLES.

Mednin is rather a large town for the Tunisian Sahara, and presents an imposing appearance seen from the French military camp on an opposite ridge of high ground. In the foreground there is a flat depression with a thin covering of green grass, out of which grows a clump of unusually tall palm trees. Behind this the town rises over a few stone-strewn fields, sparsely cultivated. A winding road—never in daylight without human figures and laden beasts passing to and from the town—strikes at the centre of the serried row of vaulted buildings, and where it pierces the mass of houses there is a pretty white mosque with a green-tiled cupola and a square white minaret.‡

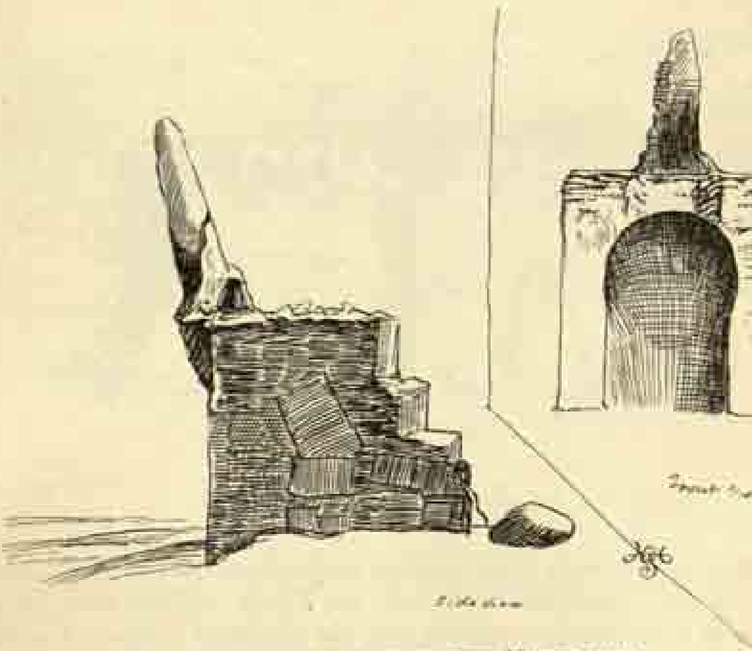
* For illustrations of these extraordinary castles and of the foot-long keys that open their doors, I must refer those specially interested in the matter to some illustrated articles which I am about to publish in the *Graphic*.

† In the singular this word is *ksar*.

‡ In the larger towns of the Tunisian Sahara, and in the Jerid country, the minarets of the mosques are square, and of several stories, somewhat like the Giralda of Seville. In the Sahara these minarets continue to be surmounted by a phallus.

This patch of white stands out with the greater contrast because of the uniform red-mud colour of the rest of the town. The huge vaulted granaries, of perhaps 30 feet in height (though some may be only 10 feet above the level of the ground), resemble at a distance a series of English warehouses. The roof of each building may be divided into five or six parallel vaults. This shape of roof is so difficult to explain in words, that I append a small sketch to better illustrate my meaning.

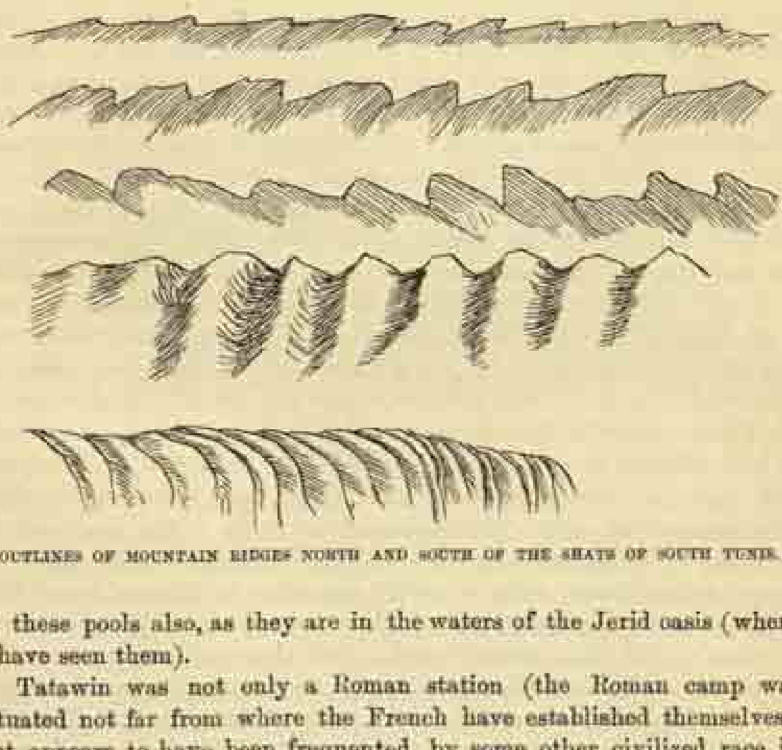
From Mednin I rode 32 miles south-west to Tatawin, or "Fum Tatawin," as it is sometimes called. We rode through regular Sahara country—sandy ground, over which grows in tufts a sparse vegetation,



PHALLIC TEMPLE NEAR DWIRAT, ABOUT 13 FEET HIGH.

with occasional "weds," strewn with boulders, and supporting a growth of thorny bushes. A strong west wind blew up the sand into clouds, and surrounded us at times in a sandy mist. As we approached Tatawin low mountains rose before us, and the scenery became more agreeable to the eye, though rocky and destitute of vegetation. Fūm Tatawin is a collection of white buildings, forming within a large square, and without a rampart against an enemy. In times gone by it was the great resort of the Tawarek, or "Touaregs," from the Sahara, who, if they could manage to ravish and plunder, would come to trade with the Arabized Berber inhabitants. Since the murder of the Marquis de Morès they have ceased coming.

A little distance beyond the native town (which is little more than a fortified market-place) is the French military camp. Below the market-place and the camp (which are backed by a range of hills) is the Wed Tatawin—a broad, boulder-strewn watercourse. In this watercourse lies the oasis of Tatawin, just beyond the French camp, and where two ranges of hills converge and form a broad gorge. Found in the middle of such a waterless desert, this oasis of palm trees and other vegetation is very striking. Water is never wholly absent from the Wed Tatawin, which is fed by springs. At the time I was there, water was actually running through the oasis, which ultimately lost itself in the sands lower down. I found large pools, thick with a bright green water-weed, and swarming with frogs. I believe fish are found



OUTLINES OF MOUNTAIN RIDGES NORTH AND SOUTH OF THE SHATS OF SOUTH TUNIS.

in these pools also, as they are in the waters of the Jerid oasis (where I have seen them).

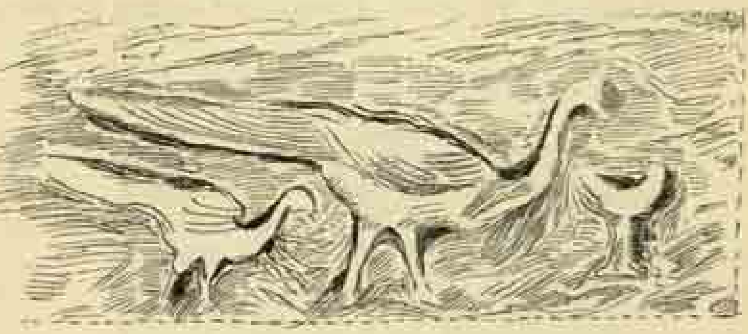
Tatawin was not only a Roman station (the Roman camp was situated not far from where the French have established themselves), but appears to have been frequented by some other civilized race in pre-Roman days; such at least is the deduction one forms after examining some very interesting remains recently discovered by the French in the bed of the river. These consist of oblong blocks of stone carved with various designs in low relief, and it is thought that they may be of Punic origin. Pending further arrangements, and to save them from the risk of injury, these stones have been built into the wall of a small unoccupied house in the centre of the military camp. I have copied a selection of the designs on these stones with the most scrupulous accuracy, and leave my readers to form their own deductions as to their origin. I have been very careful in my reproduction to exaggerate or explain away nothing. In addition to the subjects here illustrated were some less clearly defined. Amongst these I fancied I could make out a representation of a man and an elephant, several lions, and a lion jumping on to some animal. There were also at least four representations of a bird, which I could only liken to a peacock.* About 2 miles from the French camp are the ruins of a Roman tomb, and indiscriminate fragments of Roman masonry.

To the south-west of Tatawin, the mountains of the Sahara assume their typical form of a broken-down plateau. Sometimes it would seem as though this eroded plateau consisted of two different deposits, one on the top of the other. In each mountain one sees first of all a flat wall of stratified rock (surmounted, perhaps, by a loose soil); then follows a smooth slope or talus of rubble, which is interrupted halfway down the mountain-side by a second vertical wall of natural masonry—slabs of rock lying horizontally one on the top of the other, as though placed there by a race of giants. The rock which composes this natural wall is often of a fiery red, almost crimson, colour. At other times it is rust-red or even pink. I have sent a specimen of it to the Royal Geographical Society for identification. The rubble which composes the vast slopes of this worn-down plateau consists of stones of a dirty yellowish-white or Naples yellow, in some parts calcareous. I send a specimen of this also for identification. In some of these mountains the soil would appear to be full of lime. It is much eaten away by wind and rain-water into fantastic forms and caves. All this part of the Sahara undoubtedly consists of a flat tableland cut up into blocks (which continue to dwindle and crumble) by the action of water, and still more, in recent times, by the strong sand-laden winds, which triturate and rub down the surface of the rocks. Man has long inhabited this inhospitable region. Although it appears at first sight the most hopeless desert, water is nearly always to be obtained by sinking wells in the dry watercourses, or hollows between the ridges of plateau, or even on the high plateau itself. And these table-mountains with their steep sides formed natural castles and strong places, where man has added masonry so exactly in the style of the geological formation around him, that at a distance it is impossible to tell the natural castles and walls from the artificial. The most singular place of this description is the hill town of the Beni-barka. When I rode out to this extraordinary place with a French officer, I saw a steep-sloping mountain rising nearly to an apex; but the top of the pyramid, as it were, was cut off, and its place taken by a cap of masonry, a vertical wall so lofty that I found it difficult to realize it was the work of man. This town,

* It is, perhaps, worth remark that the peacock has been long domesticated in Tunisia, and is very cheap and abundant in the north.

at a little distance, appears as difficult of access as the Matterhorn; nevertheless, the French military engineers have constructed a wonderful serpentine road round and round the pyramid of mountain, so that you can ride up to the entrance of the town on horseback. Here you dismount at a narrow, tortuous entrance, with immensely high red walls of many-storied buildings on either side. The upper stories of the houses occasionally communicate with each other across the street by palm-trunk bridges. By means of rough stone steps, one can mount to the flat roofs of some of the houses, and obtain the most wonderful views thence over the desert.

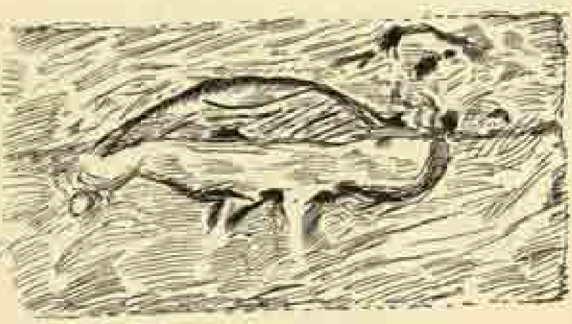
After spending a short time in the vicinity of Tatawin (I would strongly recommend to the tourist the fantastically picturesque town of Getoffa), I rode southwards to Dwirat, perhaps the most remarkable of



PEACOCKS (?).

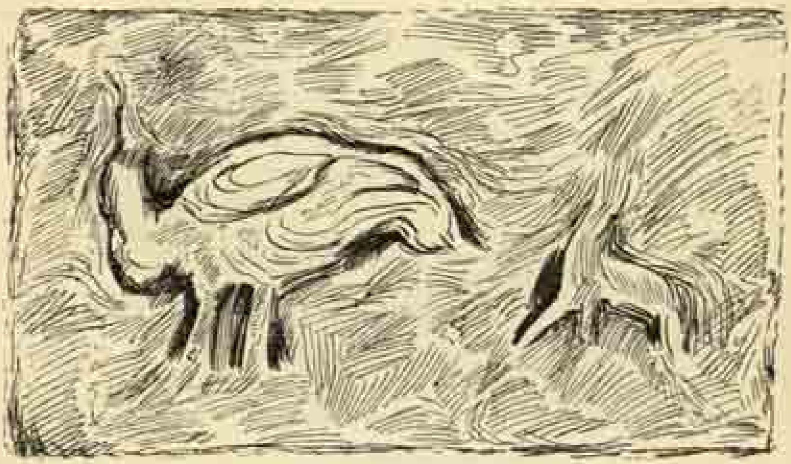
these old Berber mountain cities. To save wearisome verbal description, I give a rough sketch of this remarkable place. The crag on which it is situated rises very abruptly about 1500 feet above the ravine, and about 3000 feet from the broadened plain below. My sketch, though accurate topographically, fails to render adequately the extraordinary effect of this precipitous mass of mountain and masonry, because want of space prevents my including the precipitous sides of the ravine. The effect that this and other agglomerations of Berber dwellings made on me was that of some ogre's or giant's castle of fairy tales. In these constructions it is often difficult to distinguish between nature's masonry of the layers of stratified rock and the prehistoric style of building with enormous blocks of stone which is still to be found here and there in these towns, though the modern inhabitants build with rubble and mud. The picturesque effect is enhanced by the simplicity and directness of the colouring. The sky, of course, is almost invariably a vivid ultramarine. The great mass of mountain, with its parasitic towns of masonry, is a uniform red-mud colour, which of course, under the setting sun, becomes *vieux rose*. Here and there stands out a saint's tomb, or a modern mosque or sheikh's house, in vivid blazing white; but ordinarily the colour of the human settlements is so exactly that of the soil that, but for the black slits of the doors and windows which honeycomb the mass, you do not realize at first that you are looking at a town. The slender, spindly palm-trees that rise up from the ravines and valleys, have scalloped trunks of dusty grey, but their crowns of fronds contribute an agreeable note of glaucous green to the brown and blue landscape.

In Dwirat the inhabitants all talk amongst themselves a Berber language, which appears to be closely related to the tongue of the Tawarek of the Sahara desert. I append a short vocabulary of this. This is the first place one reaches, coming from the north, where Berber is openly and commonly talked, though, as I shall afterwards point out, Berber dialects are much more widely used in Southern Tunis than is commonly imagined. The sheikh of Dwirat told me that his town and



AN OSTRICH (?).

tribe were founded 950 years ago by an Arab, who came from the Tafilelt oasis of Morocco, married a Jerba woman, and settled in the Sahara desert on this inaccessible mountain. He assured me that the language of Tafilelt (which, of course, is a Berber tongue) was closely allied to the dialect of his people. On the other hand, the words I collected from him showed the great resemblance which exists between the dialect of Dwirat and the Tawarek language of the Sahara; and the chief himself admitted that his people could understand and make themselves understood by those fierce nomads who range between the southern frontier of Algeria and Tunis and the Sudan. An Arab from Tafilelt may have come to Dwirat 600 years ago, but he certainly found a Berber-speaking population in possession of the country. At Dwirat, as in all these mountain fortresses in the Tunisian Sahara, it is very quaint to see an enamelled-iron plaque with "bureau de postes" on it, and below "boite aux lettres," and these announcements on the wall of some rude dwelling like a robber's den. But, in the first place, the Berber populations have taken very kindly to French rule; secondly, the French Government has had the wisdom to concede to them a large measure of self-government; and, thirdly, being a very enterprising race in matters of commerce, they thoroughly appreciate the advantages of postal service, which they manage locally themselves. At Dwirat the same sheikh (a handsome man of fair, ruddy complexion and almost European features) gave me much interesting information about the Sahara desert and the Sudan. In common with many other natives in this part of Tunis, he evinced a great interest in the countries of the Niger basin and Lake Chad. For some years past caravans have ceased to find their way into Southern Tunis, owing to the enmity between the French and the Tawarek; but occasionally an envoy comes through. For instance, the sheikh of Dwirat told me that a few months before a

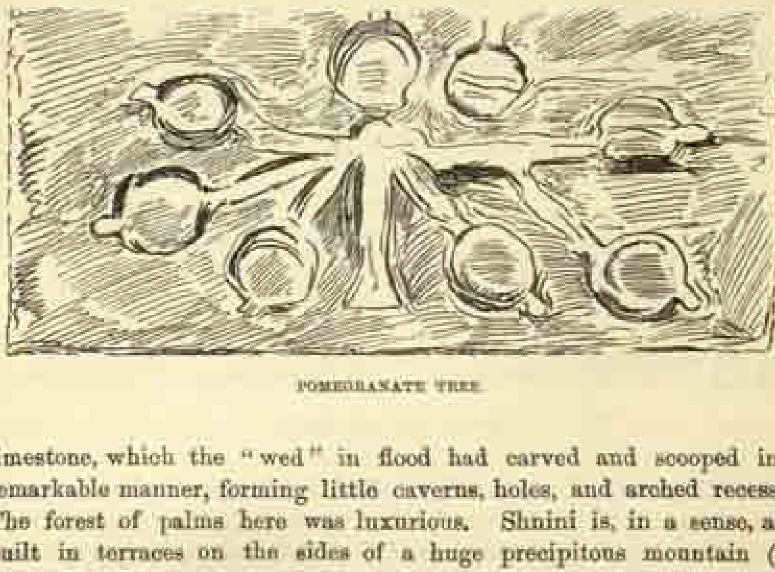


OSTRICH AND GAZELLE (?).

Hausa "doctor" had come overland from Sokoto (or, as the Arabs pronounce it, Suktu). From him he had learned that the English were regarded as the allies of Sokoto, and that they had recently come into the country with a large force of men, and had fought several battles.

At Dwirat, Shnini, and similar towns in the vicinity, exists the same unrecognized phallic worship that I have referred to in my remarks on the island of Jerba; but the phallic altars or temples are of still more marked form, and are kept more separate from the actual mosques. I give a drawing of a phallic altar on the high mountain ridge behind the peak of Dwirat. Questioned about these monuments, which are not of large size (perhaps at most 15 feet high from the ground), the people profess no knowledge of the meaning we ascribe to them; they simply say, "It was a custom of our ancestors to make monuments of this kind." Or sometimes they say that the altar marks the birthplace of a saint; or, again, they say, "It is a place of prayer." I was told that these temples are generally sought after the feast of Ramadhan. They are usually a hollow cube of rough masonry, with the phallic emblem placed above the doorway. These temples are by preference placed on a height, on a striking peak or ridge.

From Dwirat I rode over a bleak moorland of plateau to another town of the most extraordinary appearance, called Shnini. On the way I caught a glimpse of profound gorges in the mountains, one of which reminded me of scenery I had seen in pictures of the course of the Takaze in Abyssinia. There was probably water in these profound ravines, as they supported a fairly luxuriant vegetation of palm trees, olives, figs, and pistachios. About 3 miles from the town of Shnini we entered the gorge of the Shnini river or watercourse, where water lay here and there in bluish pools. The sides of this "wed" were very precipitous, and the formation looked like a friable



POMEGRANATE TREE.

limestone, which the "wed" in flood had carved and scooped in a remarkable manner, forming little caverns, holes, and arched recesses. The forest of palms here was luxurious. Shnini is, in a sense, also built in terraces on the sides of a huge precipitous mountain (by the side, rather, of a cañon, which has been scooped out of the plateau by the agency of water). I say "in a sense," because, with the exception of a few houses and mosques, Shnini is not built at all; its dwellings are simply excavated chambers in the rock, furnished with doorways and windows cut in the rock wall, with here and there, possibly, a little masonry to render the wall of the dwelling tidier and more regular. The rock would appear to be some soft stone in consistency, and easily carved, though at the same time not given to crumbling. The sheikh's house, which I occupied, was a most spacious apartment, excavated in the mountain-side. Its floor rose in flat terraces; its height varied from 20 to 10 feet, with inner store-rooms still further cut into the bowels of the rock, with a higher floor and lower pitch. The hard rock floor was like polished cement. Round the walls wooden pegs had been driven into the rock to hang up a variety of articles. The excavators had had the forethought, in their carving, to leave projecting blocks of stone, and these, with the niches cut into the surface of the wall, supplied the place of furniture—tables and shelves—while the steps of the terraces became seats or tables or beds. The floor was beautifully covered with rich-tinted carpets, and the interior displayed, on the whole, a well-developed æsthetic taste.

From Shnini I rode northwards to Ghumrasen—a "wed" with abundant water derived from wells, much irrigation, and consequently flourishing crops. Flat-topped crags and hillocks rise above the water-course. The most fantastic of these crags is surmounted by a pretty little white mosque. The principal settlement of Ghumrasen appeared

A LION.

to be of recent date as regards its architecture, the houses being built of rubble; but in the surrounding villages close at hand—in fact, visible from one point of view—were curiously illustrated three stages of early human dwellings. In the sides of one hillock, halfway up, were some remarkable caverns (scooped out by water, long ages past, in the calcareous soil), situated below a huge superimposed mass of horizontal stratified rock, the slopes of which acted occasionally as a natural roof to the hollow below. These caves were being inhabited by a number of nomad Beduins. On another hillside, what had formerly been natural caverns had been slightly enlarged in the interior, and the sides of their openings had been filled up with rude masonry to restrict the entrance. This, therefore, was an adapted cavern. But elsewhere man had deliberately carved and excavated the rock to form artificial caverns of rectangular shape.

Such woodwork as is absolutely necessary to the inhabitants of this part of Tunis, is derived from rough-hewn planks of the date palm trunk or sections of the same, so the whole trunk may be used for columns or beams. The trunk of the date palm here and in the Jerid is also split into two, hollowed out, and used as conduits for water. The gnarled branches and trunk of the olive tree also furnish materials for rude implements of agriculture, such as ploughs. Doors are made of palm-trunks, adzed to a flat surface, or else split off by wedges. They have no idea of sawing planks, though they much appreciate such fragments of deal timber as come to them in the shape of boxes. All over this district the cutting out of huge round stones for pressing olive oil is a regular industry, the stone of this district and the adjoining parts of Tripoli lending itself to the purpose. These enormous circular stones—often nearly 3 feet in diameter—are pierced with round holes for the reception of the wooden turning-handle. In

A PINE TREE (?).

A FIGURE WITH RAISED ARMS.

addition to those stones that are made to-day, large numbers of others, identical in size and shape, are found on almost every site of former Roman or Berber settlements in the northern Sahara.

From Ghumrasen I rode to Howaya, another Berber market town, but one in which there were few dwelling-houses, the buildings being mainly corn stores, or "ksūr," similar to those I have described at Mednin. On the journey to Howaya, however, most of the hillsides were honeycombed with excavated houses, like those at Shnini, the existence of which at a distance was only indicated by the black slits of the doorways. The bare brown ridges of rocky mountain, thus punctured with the minute doorways of these human burrowings, has the appearance of a moth-eaten garment.

For Dwirat northwards I had been travelling over a great plateau, broken by watercourses and water-hewn valleys. This was gradually rising in average altitude as I journeyed northwards, while, from being nearer to the zone of regular rainfall, the ground was less denuded of vegetation. So, after leaving Howaya, the general level of the ground rose still more markedly, and the vegetation increased until the country was entirely covered with short grass and shrubs and herbs. Around me was a panorama of gentle undulations, rising here and there into downs and rounded mountain-tops. The bare flat ridges of the Sahara mountains had quite disappeared, giving way to scenery resembling parts of Scotland. Though in a certain sense beautiful, with the rounded outlines of swelling downs, the varied tints of green vegetation, and the flying cloud shadows, which threw purple patches over the green, the landscape appeared to me peculiarly desolate. The eye ranged over an immense tract of country without the slightest sign of human habitation. I subsequently learnt that I had passed within a few miles of a village of troglodytes, whose dwellings were as usual inside the earth, and only marked by a doorway; but I saw nothing of man for a ride of some twelve hours, during which all traces of the route disappeared, and we lost ourselves in the immensity of the rolling downs of Matmata,* and in addition were drenched to the skin with a torrential downpour of rain. To the south of this district, it was said that rain had not fallen to an appreciable extent for four years. This plateau must either be more favoured in regard to rainfall, or else the mists coming up from the not far distant Mediterranean lie on the downs and refresh the abundant vegetation, so abundant in parts as to be a serious difficulty to our progress. At last we struck a tiny track which led us by degrees into a romantic stream valley, having in it trees of several kinds, and lower down clumps of date palms. The crags which rose above the watercourse were crowned with ruins of old Berber castles, and the remains of numerous dams in the main watercourse and the tributary runnels testified to former settlement and cultivation.

THREE HEADS.

But beyond a camp of Beduins we saw no inhabitants. An Arab from this encampment very civilly put us on the road towards civilization. It led us down the watercourse we had struck in its infancy. At last this debouched on to the great plain of 30 miles broad which stretches between the Matmata plateau and the sea-coast. The scenery in the foothills on the eastern versant of this Matmata plateau reminded me most strongly of parts of East Central Africa—the red soil, the dry watercourse filled with abundant vegetation, the acacia trees loaded with blossom, scattered date palms growing like the wild date palms of tropical Africa; the extraordinary solitude and the absence of inhabitants

* As the country is called.

recalled similar landscapes in the Kilimanjaro district, and to the north and east of Lake Nyasa. Of course, there was a very little real resemblance in the vegetation, which rather belonged to the Mediterranean types. The unreasonable zigzags of the paths were quite African in character, and after having laboriously descended into the plains we had again to scale the plateau, the ascent in some places being so difficult that our horses could scarcely clamber up. Late that night we arrived at a little village called Tujān, nestled on a ledge halfway up the precipitous sides of this now lofty plateau of Matmata. When we finally arrived at this welcome refuge we had been nearly twenty-four hours on horseback, without rest and without food, for our luggage and our other attendants had continued along the route which we had lost in the early morning. The "we" means my janissary, myself, and one native cavalryman.

I should like to say a few words about this little village of Tujan, as illustrating the results of the French occupation of Tunis. Its inhabitants, in common with all this mountain district, utterly defied the rule of the Tunisian beys, whose soldiers and officials probably never penetrated into the Matmata plateau. It is doubtful, indeed, whether this part of Tunis had ever been explored by Europeans prior to the arrival of the French, and any stranger arriving with a weak escort would almost certainly have been plundered, and perhaps massacred. Yet a few years pass, and without any warlike operations —at Tujan, at any rate—the country is entirely subdued by the presence of a few French soldiers in the plain as upholders of law and order (it must also be remembered that these military posts are mainly composed of locally recruited native soldiery); the Matmata plateau becomes almost as safe to travel in as France itself. For the attempt is made to appeal to the inherent reasonableness of the commerce-loving Berber race. A post-office under native management is established in every town and hamlet, and its "boite aux lettres" is the outward and visible sign of the stamp of civilization, a kind of fetish which appeals to the native pride. Respect for wandering strangers is impressed on the people, and the headman of every village and town (except where the French have themselves built such houses) is enjoined to build and maintain a rest-house, or "guest-house," for passing travellers. I arrived at this kind little village of Tujan at midnight. No word or notice had reached the surprised people of my coming. We had, indeed, to ride into the sleeping village with the risk of being attacked by the very zealous Arab dogs, and shout and knock at the doors of houses to rouse some one. The sheikh of the village soon made his appearance, and at once showed us the way to the guest-house, a poor little structure in rude masonry not yet completed, and with the wind whistling through the chinks between the stones. But already the house had been furnished with some preposterous Arab imitations of European furniture, which reminded me of the thoughtlessly disproportionate tables and chairs with which we furnished our dolls' houses as children. The chairs in this case were small and squat; but the table was of such a height that it seemed to reach nearly to the ceiling, and I could never have lived up to it. Seeing I was quite worn out with fatigue, the chief brought a pile of carpets, which he folded to increase their thickness, and laid them on the mud floor, thus forming an extemporized bed, on which I laid myself gladly, and slept whilst supper was being prepared. It made its appearance at two o'clock in the morning, and consisted of *kuskus*,* a plate of dates, and, what I most enjoyed, a basket full of dried figs; the whole being wound up with cups of coffee. The next morning we started at daybreak, being provided with a guide. There was nothing to pay for the hospitality, and it was with difficulty that I pressed a small present on the acceptance of the chief, whose only request was that I should not complain of the meagreness of his hospitality.

After half an hour's arduous mountain-climbing, I reached the French post of Matmata Kabira, where there is a French officer of the Intelligence Department, who has under his orders a few native soldiery. Matmata a year ago had been the scene of a slight outbreak occasioned by the opposition of the natives to the new system of enforced military service. There were other grievances, however, more vivid, due to the maladministration of some native Tunisian employés, who unhappily cannot divest themselves of that Oriental tendency to plunder when placed in positions of authority over their fellow-men. But a new kaid, or native governor, had been appointed, and the district was now absolutely peaceful. At Matmata Kabira the plateau probably touches an altitude of 4000 to 5000 feet above the level of the sea. The plateau is carved here into ridges and downs. On one of the highest points of elevation, from which a magnificent view is obtained for 40 miles over the eastern plain, the French have built a fort and pretty houses for the European officer and his subordinates. After the savage desolation of the scenery southwards, it was a great surprise to find myself situated in a charmingly furnished dwelling at a most delicious breakfast, with a bright French lady as hostess talking to me alternately in English and French. It was extremely cold here at this time of the year, and a roaring fire was burning in the tiled grate. From the windows one had a view of yellow and blue immensity, as one might have had from the car of a balloon—the yellow being the sunlit plain, 4000 feet below the crag on which the house was built; and the blue, the hazy Mediterranean and the sky.

In the towns and villages of Matmata proper I met with another

* Crushed corn cooked in the steam of meat and richly flavoured; served with meat and vegetables.

type of troglodyte dwelling—the most recent and the most developed of all. It will be remembered that I have already described other stages still existing in this country. First the natural cave, pure and simple; then the cave improved, with its entrance restricted by heaps of stones; next, the rock chamber, which man has deliberately excavated in the vertical mountain-side. But amongst the Matmata the fourth type of dwelling is the most elaborate of all. Here the people select in the mountain-side a flat piece of level ground. They commence by digging a great pit, which they finally shape into a rectangular well, usually square, and from 20 to 30 feet deep, with vertical sides. A little distance off they make a sloping tunnel, which leads by a very gradual descent from the upper surface of the ground to the floor of this well

A HARTEBEEST (?), SOME KIND OF ANTELOPE.

below. This tunnel is made sufficiently high and broad for the passage of camels. The central court of the dwelling, therefore, is reached from above ground by this long-descending passage, though it may also communicate directly with the upper surface by a long ladder or stone steps. From the central court other chambers and stables for the beasts are further excavated into the bowels of the earth. During the very cold winter weather in which I visited these underground houses, I found them so warm and dry that I thought they were artificially heated by braziers, and was surprised to find that there was no artificial warmth at all—merely that the temperature of the underground rooms remained pretty equable all the year round, being very cool in summer and very warm in winter. The soil which permits this easy excavation, and yet retains a marble-like consistency and does not crumble, must be of a peculiar composition. I was informed by a French officer that it was a mixture of clay and gypsum. This final development of troglodyte architecture is said to date only from about 200 years ago. On all the crags and ridges round about Matmata are traces of abandoned dwellings of the older type excavated in the vertical hillsides; and again, far older than these, vestiges of castles built of large stones lingered on certain prominent heights. Amongst the Matmata I noticed no trace of phallic temples, so prominent to the south and east. The people here are said to still retain the use of a Berber dialect, though its existence is not so obvious as at Dwirat and Shnini, where it is the common tongue of the people.

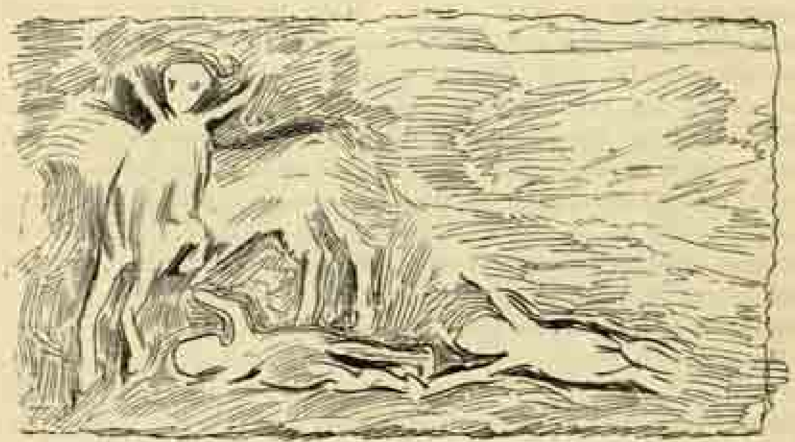
Before quitting the Matmata country and descending into the plain (in my recapitulation of my journey), I might pass in review the leading physical characteristics of this interesting region.

MEN TRUMPETING, AND WOMEN (?) AND CHILDREN (?) DANCING.

South of the district of Gabes, at a varying distance of 20 to 40 miles from the shores of the Mediterranean, stretches a block of tableland south and south-eastwards to the Tripolitan frontier, where it seemingly joins the tableland of the Nefus. South of Dwirat, however, there is a break and a lowering of the general level, so that the Matmata plateau may be said to end southwards about here. This plateau, of course, is cut up, especially to the east and west, by deep gorges and valleys carved out of the friable soil by the action of rain-water, at a time probably when the rainfall was far larger than at the present day. In the central portion, however, the plateau retains a greater uniformity of surface, and there is an extent of about 50 miles long and 30 miles broad, where the eye ranges over rounded undulations of tableland of an average height of 3500 feet. In some parts, especially to the north and east, the heights attained by the ridges and crags probably exceed 4000 feet. I am following approximately the heights computed by the French surveyors, but this region is as yet imperfectly mapped, and I should not be surprised to hear that recent investigation has established one or two points of the Matmata plateau at an altitude exceeding 4000 feet. The southern part of the plateau about Dwirat and Tatawin is much broken up, and is of a very "desert" character, vegetation being almost entirely absent on the mountains; but to the north, as the average altitude of the plateau increases, the ground becomes more and more covered with grass, herbs, and shrubs, until about the Matmata district proper it presents the appearance of a country well clothed with vegetation. Varieties of plants are not numerous. They consist chiefly of a strong-smelling shrub, with its leaves reduced to fleshy scales, resembling in growth a thuja, but with minute four-petalled yellow flowers at the termination of the stalks;* a wispy thing with broom, with no leaves and no flowers to define it by at this time of year; a leafless composite with white flowers like the wild carrot;† a glaucous grey bush with flowers like the camomile; *artemisia*; a bush with green flowers like the privet, but thorns and leaves in growth like a hawthorn; the rosemary, covered at this season with its pretty mauve-blue flowers; a coarse grass, growing in tussocks, and with a flower like a diminutive pampas grass; and the halfa or esparto grass. This latter is only found on the heights. The first three flowers mentioned are met with on the desert plains; the tamarisk grows near most watercourses, or wherever there is moisture in the soil; and on the highest parts of the Matmata plateau I noticed a conifer, which was apparently a species of juniper. I nowhere noticed the oleander, nor did I see a single specimen of the Aleppo pine, or any other conifer except those growing like the juniper. The Aleppo pine ‡ and the oleander did not seem to grow in Tunisia south of 34° 30′ of altitude. In the river valleys of the Matmata plateau I noticed an occasional fig tree grows abundantly, though it is probably always cultivated or run wild. Olive trees were abundant wherever there was a slight moisture, but they seemed to be the cultivated kind. I think the wild olive does not reach so far south. As regards animal life, it is singularly scanty. The lion has long been extinct; the leopard probably exists no longer; the striped hyena and the ordinary North African jackal are fairly abundant. I heard of no lynx or ichneumon, nor did I anywhere hear of the Barbary ape.§ Jerboas abound. In the sandy desert to the south and west the addax antelope still lingers. The people of Dwirat and Shnini frequently make expeditions into the desert and hunt this animal, and a considerable trade is carried on with

* *Thymelæa hirsuta* (they tell me at Kew).
† *Deverra scoparia.*
‡ *Pinus halepensis.*
§ Which seemingly is entirely absent from Tunisia and the Tripolitaine and Egypt.

the French officials and traders in its horns, which find their way northwards to be sold as trophies to tourists. I was nowhere able to hear of the so-called Tunisian hartebeest, and a German naturalist who had travelled in these parts, told me that the hartebeest is almost, if not quite, extinct in Tunis, and is only now found in Algeria and Tripoli; in the latter country it is still abundant. The hartebeest, he informed me, prefers slightly wooded hill country, while the addax, like all oryxes, frequents the sandy desert. The audad, or wild sheep (here actually known by that name*), I did not hear of in the Matmata country, though it is still fairly abundant further north, between Gabes and Gafsa, on the Algerian frontier, and in the hills of the Jerid. As regards birds, they were nearly as scarce as mammals, but more prominent in appearance. The Berber settlements were frequented by



A BATTLE SCENE.

a charming species of chat—the black chat (*Saxicola leucura*). This is rather a large bird for its kind—almost the size of a song-thrush—quite black except for its large tail, which is snowy white, and which it delights to spread out like a fan. The black chat is described in natural histories as being a very shy and retiring bird. In the Sahara, curiously enough, it is seldom seen away from human settlements, where it is as tame and as much at home as any sparrow. So tame are they, that I was enabled to make some drawings of them in their pretty postures only 2 or 3 feet away from them. The griffon vulture, the common kite, and various falcons are seen from time to time; there are bustards and coursers. The commonest bird of all is the crested lark, and the most rapacious the carrion crow. The ostrich now is never heard of,

* Or more correctly by the name of "udad."

though within the memory of men still living it was commonly met with. The French officers told me that snakes are numerous, and amongst them is found the Egyptian cobra.

As regards the human inhabitants, they are, linguistically, emphatically Berber; but the physical type is not uniform. There are a great many negroes amongst them from the Sudan, slaves and the descendants of slaves. There has evidently been some negro intermixture. As a rule, the people are handsome and of good stature; some of the men are strikingly good-looking, with clear complexions. I saw nowhere any trace of the so-called blond Berbers. I think a great deal of exaggeration has of late been bestowed on the fact that there are in the mountains of Algeria people of Berber stock who have red moustaches and brownish-black hair, together with grey eyes. From this fact certain anthropologists have started the idea that the blond races of Europe originated in North Africa. With the evidence at present before us, and seeing that the blond races with flaxen hair and blue eyes predominate in the north, north-east, and east of Europe, I think it far more likely that they had their origin in the adjoining countries of Eastern Europe. The presence of red hair (red moustaches and beards are commoner than red hair of the head) among some tribes in the mountains of Algeria may be much more easily explained by intermixture of the old Berber stock with European blood—perhaps with European immigrants who had taken refuge in the mountains—or by an independent outbreak, so to speak, of red hair and grey eyes, which I believe occasionally occurs quite independently in various races, either as the sport of nature, or as a reversion to some red-haired species among the human progenitors. There have been countless invasions of North Africa from Europe, from prehistoric times down to the present day. There have equally been invasions of Europe by the North African races, which have far more profoundly affected existing European populations than the counter-invasions of Europeans have influenced the existing races of North Africa. If I may seem to speak with some dogmatism on this subject, I should like to state in extenuation that the journey I am now describing is not the first I have made in North Africa. I am fairly well acquainted with the whole of Tunisia, and with some parts of Algeria. As to the origin of the dark-haired Berber races, I still hold to the opinions expressed by me in my 'Life of Livingstone and the Exploration of Central Africa,' where I gave a synopsis of the Berber origin and the relationships of the African races. I believe the Berbers, in common with all other Hamite peoples, and with the Arabs and some other Semites, have sprung originally from a Negritic stock.

After leaving the Matmata plateau, I descended into the country of the Jerid, and stopped at El Hamma, a congeries of villages in a fine oasis of palms, not far from the shores of the Shat-el-Fejej. In this district there are many towns and villages called El Hamma. This is an Arab word (seemingly) meaning "heat," "fever." It always indicates the presence of hot springs. The whole of the Jerid country, from near Gabes on the east to beyond the Algerian frontier on the west, and from the southern shores of this dried-up salt lake on the south to the district of Gafsa on the north, is permeated with hot springs welling up from the sand or the sandstone formation.* The water is sometimes medicinal in character, being impregnated with various salts; sometimes it is quite fresh and potable. Its temperature varies from near boiling-point to tepid. The water is invariably pellucid, but sometimes has a faint bluish tint which is indescribably beautiful where the water lies in deep cisterns. The Romans were quick to appreciate the value of this gift of nature, and the whole of

TWO HORSES, AND MAN ON HORSEBACK WITH SHIELD (?).

the Jerid abounds with remains of their settlements. Almost every important spring has relics of Roman baths. At some places, as at the El Hamma, near Gabes, and especially at Gafsa, the Roman baths are used to this day by the natives, though in a state of considerable disrepair. The French have had the good taste to leave almost untouched (except as regards protection from further ruin) these interesting monuments; but where the spring is sufficiently important, as at El Hamma, they have built in a separate place modern bath-houses for both Europeans and Arabs, and often for men and women of both races. The baths of El Hamma are said to be marvellous as the cure of rheumatism and similar ailments. It is not advisable to stop in more

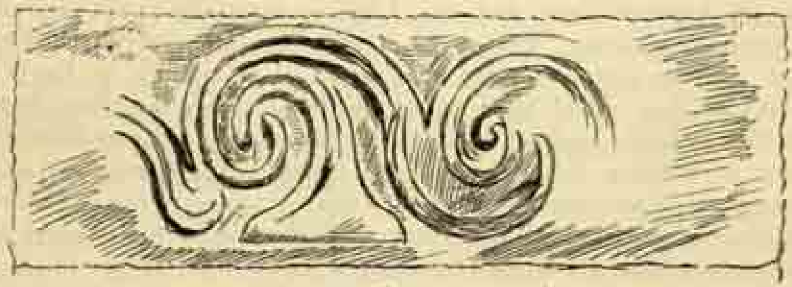
* I forward with this paper two specimens of rock taken from the geological formation where these springs abound. Some expert may be able to supply the Society with a proper definition of its character. In a vague way I term it "sandstone," because it is very friable, and the action of the wind breaks it into sand.

than five minutes. One feels parboiled, and leaves the bath with the sensation of having had a vast mustard plaster applied all over one's body, and a face in hue as the boiled lobster. Very often perfectly salt and perfectly fresh springs will rise within a few feet of one another. At Tuzer, which I afterwards visited, there are salt rivers and fresh rivers, with the result that the natives end by drinking a kind of amalgam of the two. All these streams, after being utilized for baths, are dispersed in natural and artificial channels through magnificent oases of verdure—a veritable garden of the Hesperides. So well utilized is the water that but little of it reaches its original destination—the *shat*, or dried-up salt lake. The country around these shats * is of such desert aridity that the dense forests of date palms which mark the sites of each oasis are enhanced in their effect of shade and verdure. All the Jerid is a most picturesque country from the artist's point of view. The bare mountains of fawn-coloured sandstone assume at sunrise and sunset the most lovely rose tints I have ever seen. Some of the hills which are calcareous and whitish rival at these times the sunset glow on snow-fields. The arid nature of the soil is rather agreeable to the eye from its monotonously warm tint as contrasted with the glowing blue of the sky and the varied greens of the oases. The outlines of the mountain ranges are remarkable, and are best illustrated by the accompanying sketch, which is no exaggeration of the strange regularity of these serrated ridges or of their curious crumplings. The rainfall in the Jerid is very slight, except in the vicinity of the coast; yet these inexhaustible springs in some places maintain ever-flowing rivers, as, for example, the river of Gabes, the river of Kebili, the many streams at Tuzer and Nefta.

The ancient Roman-Berber town of Gafsa is situated on a broad river-bed, which is seldom without a thin running stream, though this river is of considerable length, and starts in the mountains on the borders of Algeria. The shats, or salt lakes, of the south of Tunis are rather a disappointment to the traveller. On the map they promise so much in the way of expanse of water, and in reality all one sees is a flat plain of hardened mud, with a few streaks and pools of stagnant water and stretches of white salt incrustation. It is probable that these shats were at one time connected with the sea near Gabes. Some portions of their bottoms are said to be below the level of the Mediterranean, though not to the extent originally stated by those engineers who talked of letting the sea into the south of Algeria. Apart from the diminished rainfall, man has been the principal agent for the last few centuries in the drying-up of these salt lakes by intercepting the

* "Shat" (pronounced like the English word "shut") is the correct spelling; not "schott," which our geographers so love, following blindly the French spelling. *Shat* is an Arab word meaning "lake," "sea." Compare "Shat-al-Arab," the joint Euphrates-Tigris estuary.

water of the innumerable hot springs, and spreading it out in such elaborate irrigation of the desert that very little of it reaches the lake shores. The heavy showers which occasionally fall in the late autumn make these shats too muddy to be passed by man or beast; otherwise, in the dry season of the year, they are traversed as one might traverse a slightly marshy plain. Their appearance from a distance varies according to the degree and angle of sunlight. On a dull day the traveller looks down from the heights on a perfectly flat plain of mud-colour, and sees no shat; on another occasion, when the sun strikes the salt incrustation and the thin sheets of rain water, the appearance then is something like a lake. Yet the view is rather grand from Tuzer or Nefta. One looks eastward over a perfectly flat surface, which gives one an extended horizon, level as the horizon of a sea. Far away to the right and to the left stretch the encircling mountain ranges 40 miles



SCROLL-WORK (? WAVE PATTERN).

apart. With the aid of an occasional mirage and the refraction from the salt, the effect is that of a vast expanse of water, a gulf which might communicate with the Mediterranean.

"Jerid" means in Arabic a palm frond. It implies a forest of date palms. I am of opinion that the date palm—belonging to the African genus *Phœnix*, with outlying relations in Western India—is indigenous to the Sahara Desert and Arabia, and is a relic of the days when the Sahara was a well-watered region, with a continuity of flora and fauna with those of tropical Africa. The date palm therefore grew wild in the south of Tunis as far north as 34°, and undoubtedly was the real lotos of the Greeks. The ancients were far more easily pleased in the matter of fruits than ourselves. We should find the original fruit of the wild date palm very poor eating—no better, in fact, than the fruits of other wild species of *Phœnix* which abound in Central Africa. But to the Greeks it must have seemed deliciously sweet-eating in comparison with the crab apples and wild plums to which they were accustomed. The Romans cultivated date palms in their South Tunisian settlements, but not to anything like the same extent as the olive and the fig. Until about four hundred years ago the staple cultivation of the Jerid was the olive tree, but at that period the olive was given up in favour of the date, at that time growing practically wild; and these districts round the salt lakes of Tunis now produce the finest dates in the whole world. Some notes on the cultivation of dates will be found in my commercial report to the Foreign Office, so I shall not give them here.

The Arab conquest of the Jerid brought about the ruin of the Roman cities, but the fatness of the country soon encouraged the revival of civilization. At Tuzer there must have been a remarkable development of Saracenic art in the twelfth and thirteenth centuries. There are details in some of the ruined and abandoned mosques as exquisite as anything I have seen in Spain or Egypt. I am going to illustrate some of these shortly in the *Graphic*. The modern architecture of the Jerid cities is peculiar in that thin bricks are almost wholly employed, and are arranged in such a way as to execute fantastic and often beautiful designs. This phase of brick decoration extends westward into the Algerian Sahara, and even, I believe, penetrates to the verge of the empire of Sokoto. The people of the Jerid suffer very much from that parasitic affection of the eyes which is so common in Egypt; otherwise they would be a handsome race. They are free from fanaticism, kindly, and polite, and their commercial aptitudes have led them to welcome the arrival of the French. Throughout all this country one is singularly safe, and the French maintain law and order with but a handful of police. Much credit, however, must be given to the officials whom the French Government has had the wisdom to place there—men of tact, with a good knowledge of Arabic, who are without fussiness or undue assertion of their authority.

As regards the fauna of the Jerid, mammals are numerous. There are the striped hyena, the jackal, the fennic fox, a hare, numerous rats, and jerboas, the porcupine, the wild sheep (Audad), a few lingering specimens of the addax antelope, the wild boar, and a species of gazelle.* Amongst birds are said to be found two or three species in the palm forests characteristic of Senegal, such as the *Turtur Senegalensis*. There is one bird here which (I write under correction) is unknown to me, and seems to be peculiar to the Jerid country. It appears to be a species of bunting, but has a blue-grey head and breast, with black striations, and a chestnut body. The effect at a distance is that of azure and chestnut. This charming little creature, which the Arabs call "Bu habibi" ("father of my friend"), is of extraordinary tameness, and frequents the environs of houses with a winning friendliness.

Gafsa, to the north of the Jerid, is an ancient city of great interest and great picturesqueness. This paper is already too long and my time is too short to deal with a description of Gafsa, which, indeed,

* I am also informed that the cheetah and the Caracal lynx are found in the desert country south and south-west of the Shats. I often saw cheetah skins for sale here, and at Tripoli.

comes more within the ordinary range of the tourist. From Gafsa I made my way north, through scenery of ever-increasing interest, to Feriana, a place about which, not papers, but volumes might be written, so remarkable is the interest of its Roman remains. Here one felt in touch with the north. Indeed, the Sahara region really comes to an end at Gafsa, and one slowly mounts to the tableland of Central Tunis, where you are in a country that does not differ much in appearance and products from Southern Spain. To all this country north of Gafsa and Sfax the date palm is a stranger, except where deliberately introduced by man—it is absent, that is to say, from the wild landscapes; and on the hills the Aleppo pine begins to appear. Few experiences in my many years of travel have been so delightful as the abrupt transition from the regular Sahara Desert scenery round Gafsa to the Swiss-like mountains on the frontier of Tunis and Algeria. In this latter district, gentle mists swept over the hills, the air was thick with the aroma of the pine trees that covered the slopes in an almost unbroken mass; snow lay on the higher peaks and ridges, and purling streams meandered through turfy glades, or dashed in cascades over deep chasms. The scenery here was quite Alpine, and its resemblance to Switzerland was further enhanced by the splendidly engineered road along which we wound through the mountains.

I can strongly recommend South Tunis as a winter resort for tourists who do not mind roughing it in a very moderate degree. (I may mention, by-the-by, that you can bicycle almost everywhere, thanks to the roads which the French have made.) The hire of horses and camels is cheap; but, except at Gafsa and Gabes, there are no hotels, though the French Government have built along most of the main roads good rest-houses, which in all essentials are equivalent to hotels. In all the district of the Matmata plateau, however, there are neither rest-houses nor hotels, and persons who desire to explore this interesting region should provide themselves with tents and provisions. The French officials are most hospitable, but this fact should not lead tourists to constitute themselves a charge on men whose means are naturally limited.

VOCABULARY OF WORDS IN THE BERBER DIALECT OF DWIRAT (TUNISIAN SAHARA).

English.	Dwirat.
one	eijen
two	sen
three	tlata
(And the rest of the numerals as in Arabic.)	
man	ariaz; *plural* eriazen
woman	tamtat; *plural* alχalat
child	afroχ; *plural* adderati
daughter	tafroχt; *plural* tifraχ

English.	Duirati.
head	eχfin; *plural* eχfaun
eye	teit; *plural* tetawin
nose	tinzert
mouth	eme
teeth	*plural* sinin
tongue	elsen
neck	takramt
hand	füsin
arm	füs
ear	amzor; *plural* imzan
leg	dareq
foot	dareq
hair	zau
ox	afunas
cow	tafunast
horse	yis
mare	tralid
camel	alγum
female camel	talγumt
goat	aslan } *joint plural* maaz
female goat	teχsi } *joint plural* maaz
sheep	birkus
dog	aidi
bitch	taidit
lion	(same as in Arabic)
moufion (wild sheep)	Udad (*our* "Aoudad")
pigeon	aitbir
water	aman
rain	amzar
bread	aγu
fire	timsi
dead	immit

NOTE.—In the foregoing the Greek letters χ and γ (gamma) stand for the guttural sounds inadequately expressed by *kh* and *gh* (Arabic خ and غ).

NOTES ON SPECIMENS COLLECTED BY SIR HARRY JOHNSTON. BY E. T. NEWTON AND J. J. H. TEALL.

1. Rock from mountains of Tunisian Sahara.

Dolomitic limestone.

2. Rock from mountains of Sahara, South Tunis.

Limestone stained a deep red colour with ferric oxide.

Under the microscope this rock is seen to contain many fragments of shells, all of which are very much altered and decomposed. They appear to belong to lamellibranchs and very thin-shelled gasteropods. A few quartz grains are also present.

3. Rock from the Jerid (Region of the Shats).

This appears to be a "coral rock." It is very largely made up of organic remains, including foraminifera (amphistegina, etc.), pieces of the tests and spines of echinoderms, fragments of coral, and possibly nullipores. A few quartz grains also occur.

4. Same locality—similar rocks.

RESEARCH IN THE NORTH ATLANTIC.

His Excellency, Count Lewenhaupt, the Minister for Sweden and Norway, has forwarded to the Society for publication the following Memorandum, which has been presented to the Foreign Office, on the desirability of further international research in the North Atlantic:—

Memorandum.

The following members of the Swedish Hydrographic Commission—Prof. Aug. Wijkander, Mr. G. Ekman, and Prof. Otto Pettersson, who have, at the expense of the Swedish Government, executed a series of scientific observations in the waters lying around the Swedish coasts—have addressed a petition to the Swedish Government, that invitations may be sent to the governments of Great Britain, Norway, Denmark, and Germany to organize, according to a common scheme, a research into the chemical, physical, and biological conditions of the water in the North Atlantic, in the North sea, and in the Baltic, especially with regard to the fishing interests; and in the hope that this proposal may be accepted, they have further proposed that, in such case, H.M. King Oscar II. may call a conference of one or a few persons from each country, to elaborate a common plan for the division of the work, to be afterwards submitted for approval to the respective governments.

In support of these proposals, they have made the following statements:—

At the Congress for Natural Sciences held at Copenhagen in 1892, an arrangement was made between the Swedish and Danish hydrographers to organize a common research concerning the hydrographical and biological conditions of the sea; and in this research Prof. Krümmel, of Kiel, also took part by executing, during several years, deep-sea soundings in the Baltic.

Later, in the years 1893–1894, the governments of Great Britain, Sweden, and Norway made, according to a common scheme and during all seasons, a contemporaneous research in the North Atlantic, in the North sea, and in the Baltic, especially with regard to fishing interests; and the scientific and economic results obtained by these several researches were such that the Sixth International Congress, held at London on August 3, 1895, decided to record its opinion "That the survey of these areas should be continued and extended by the co-operation of the different nationalities concerned, on the lines of the scheme presented to the Congress by Prof. Otto Pettersson."

This scheme is founded on the opinion that all fishing in the North Atlantic, and especially the presence of the migratory fishes, depends upon the great currents in the upper layers of the sea, and the variations of the presence in these layers of the food required by the fishes, viz. "Plankton," or organisms of animal or vegetable origin floating in the water. A knowledge of these currents, and of the quality and quantity of the food which they contain, is necessary in order to determine the legislation required for the creation of a rational organization of the fisheries.

In consequence, a research ought to be made concerning the existing conditions, and the currents during all seasons, in the upper layers, between the surface and a depth of about 400 to 500 fathoms, as well as concerning the nature and the quantity of the "plankton" to be found in these layers. The best way to make the research would be to divide the area between the participating countries, in order that each country might establish a system of observations over a certain area of the adjoining sea. For Sweden, it would, for instance, be most convenient to explore the middle parts of the Baltic and the Skagerrack.

The necessary expenditure for a research of this kind would be comparatively small for each country. The research is less difficult when the intention is not to explore the deepest, but only the upper layers; the methods actually used for the observations are also less complicated than previously, and, as a result of the experience already acquired, it is now possible to avoid useless work by concentrating the observations upon essential points. Almost all the countries on the North Sea have now—with the exception of Sweden—established on their coasts scientific stations and institutes to make observations with regard to fishing interests.

Private associations are also found everywhere for this same purpose, and if all these institutions, which are now working without any common plan, could be persuaded to devote part of their work to a great common purpose, a great part of the object pursued could thereby be attained. The time for the research ought to be extended to five years. The observations ought to continue during all seasons, and as a convenient date to begin, May 1, 1899 or 1900, might be selected.

If the respective governments should feel inclined to accept this scheme, it is proposed that similar invitations ought also to be sent to the other countries situated on the Baltic and on the North sea. As the object of this proposal is only to make observations with regard to the fishing interests, it is not proposed to make any common exploration of the deepest layers. Such explorations, which are of purely zoological interest, cannot be made without great expense, and they ought not to be considered obligatory.

London, April 23, 1898.

In connection with the above, the following paper by the distinguished Swedish oceanographer, Prof. O. Pettersson, of Stockholm, is of interest:—

On the Influence of the Temperature of the Surface Waters of the North Atlantic on the Winter Climate of Northern Europe.

By Professor O. Pettersson.

At the meeting on July 31, 1895, of the Sixth International Geographical Congress in London, I had the honour to lay before the scientific authorities of meteorology and oceanography there assembled an account of a remarkable correspondence, which I had found to exist between the average temperature of the air in Scandinavia in the winter months, January and February, and the temperatures of the Atlantic surface-water, as recorded by the serial observations at Færoe, Iceland, and the Norwegian coast-stations. A paper upon this subject was published afterwards in the *Meteorologische Zeitschrift*,* wherein I showed that the warm-water area (*i.e.* the Gulf Stream) of the North Atlantic is liable to variations of temperature from one year to another. These variations are of little amplitude—the greatest differences in the sea-temperatures at the Norwegian coast in the month of January, from 1874 to 1892, do not amount to more than $+2^\circ \cdot 9$ F. and $-2^\circ \cdot 0$ F. from the mean value—but seem, nevertheless, to exert a great influence upon the winter temperature of North Europe, so that a relatively small surplus in the temperature of the ocean in January and February is accompanied by a great excess of up to 9° or 11° F. in the mean temperature of the air in Orebro, Upsala, and other places in Sweden; and likewise a deficiency of only 2° in the water-temperature is followed by a depression of the air-temperature amounting to 7°, 9°, or 11° F. beneath the mean.

This seems to indicate that the character of the winter in North Europe is influenced by relatively small variations in the distribution of heat in the upper layers of the North Atlantic. These small oscillations in the temperature of the surface water are, however, very powerful in their effect upon the state of the atmosphere, on account of the great capacity for heat inherent in the layers of warm and salt water which the Gulf Stream spreads over the Norwegian Sea and North Sea. Before 1893 nothing was known about the state of these parts of the ocean in winter. From the time of the International Hydrographic Co-operation in 1893 and 1897, we have some extremely important deep soundings executed by Mr. Dickson, on board H.M.S. *Jackal*, in the Færoe-Shetland channel and adjacent parts of the North Sea in August, 1893, November, 1893, and February, 1894, from which I have drawn the following diagram (Fig. 1), representing the distribution of heat in summer, autumn, and winter in that part of the ocean. It must be observed that the uppermost layer of water is entirely homogeneous, with regard to its salinity, from the surface to a depth of 100 to

* "Ueber die Beziehungen zwischen hydrographischen und Meteorologischen Phänomenen," *Meteorologische Zeitschrift*, 1896, 8 (August).

150 fathoms, so that the vertical thermic circulation caused by the contact of the warm Gulf Stream water with the colder atmosphere acts freely throughout the entire bulk of the warm-water layer. A cooled water-particle will thus sink until it reaches a layer of its own temperature, and another particle of warmer water will ascend from the depth to fill its place. The diagram (Fig. 1) shows that there exists a superficial stratum 25 fathoms thick, heated to about 54° F. in August. From that time until November the heat stored up in this layer is given up to the atmosphere. From November to February the vertical connection extends from the surface to the entire depth of the Gulf Stream

Fig. 1.

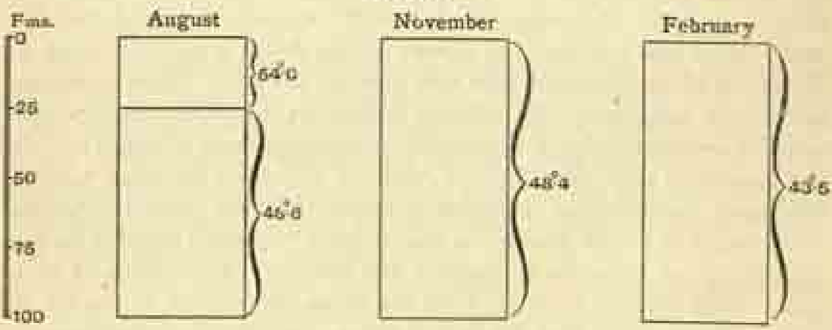
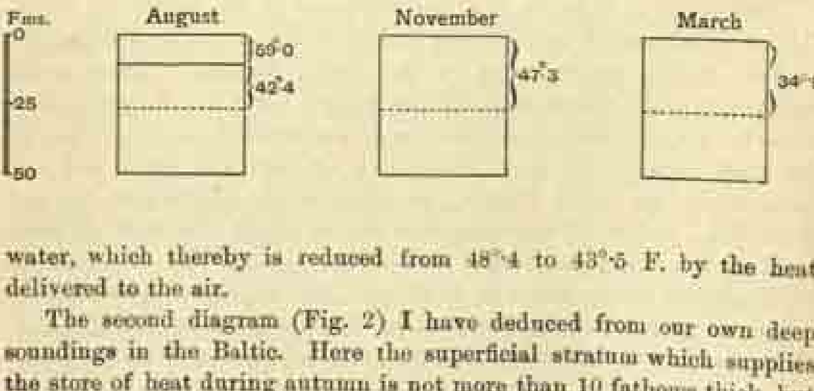


Fig. 2.



water, which thereby is reduced from 48°·4 to 43°·5 F. by the heat delivered to the air.

The second diagram (Fig. 2) I have deduced from our own deep soundings in the Baltic. Here the superficial stratum which supplies the store of heat during autumn is not more than 10 fathoms thick, but is nevertheless very effective, as it is intensely charged with heat (up to 59° F.). The long and mild autumnal season, which is peculiar to the climate of the Baltic islands, must be due to the heat thus stored up in the water. After this store of heat has been delivered to the atmosphere, *i.e.* from November, the vertical convection extends deeper to about 30 fathoms, or to the upper limit of the salt bottom water, which, on account of its higher density, stops the thermic convection. Thereby the Baltic water becomes so exhausted of heat that its temperature in March has sunk to 34°·5 F., which is still high enough to prevent the freezing up of the sea in hard winters. In a mild winter, as that of 1897–98, the water-temperature does not sink so low as to 34°·5 F. The last Swedish deep sounding, March 19, 1898, showed that the temperature from the surface to 30 fathoms depth in the Baltic, east of Bornholm, was 37°·4 F. It takes a great time of the spring and summer to restore to the Baltic water the heat lost in the winter. Thereby the seasons of the year are retarded in the Baltic islands and in the countries surrounding the Baltic.

The heat given up to the atmosphere by the areas of warm water in the Norwegian Sea and the North Sea saturates the air with moisture, and gives birth to the great regions of barometric depression which were found to exist in winter over the northern parts of the Atlantic by Hoffmeyer.* It is easy to see that a difference of +2° or −2° F. from the mean temperature of the Gulf Stream area in the North Atlantic in winter will increase or diminish the heat which is delivered to the atmosphere by some hundred thousands of heat units per square foot, or 20 to 30 per cent. of the available quantity.

This view of the matter seems to militate against the recent meteorological theory, which seeks the *vis movendi* of cyclones in the upper strata of the atmosphere. The difference seems to me, however, to be only apparent. It must be remembered that this theory is based upon an elaborate study of the continental (especially the alpine) cyclones. We must distinguish between the permanent barometric depressions which form over the North Atlantic in winter and the wandering cyclones that sweep over the continents. The former are sustained by an incessant supply of energy from the warm areas of water beneath; the latter are whirls detached from their root and origin, which soon must perish unless they are reinforced by a new impetus from the breeding-place of cyclones—the ocean. That the range of temperature and humidity from below upwards can be reversed (as was found to be the case in the Alps) in a cyclone, which is dying out and consumes its own store of energy, is not more than we ought to expect.†

In the years 1896 and 1897 G. Ekman and I tried to keep account of the changes in the surface water of the sea south and west of Spitsbergen. Fragmentary as our observations necessarily must be, they bear out the following facts:—

A decrease in the flow of the Gulf Stream through the Norwegian

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* N. Hoffmeyer, 'Ueber die Luftdruckvertheilung in Winter,' *Zeitsch f. Meteorologie*, Bd. xiii. and xiv. (1878).

† This matter is treated from a mathematical point of view in a paper by Prof. W. Bjerknes, "On a New Theorem in Hydrodynamics and its Application to the Movements of the Atmosphere and the Ocean," read to the Swedish Academy of Sciences, April 13, 1898.

Sea takes place in winter, followed by a reflux of the arctic water from higher latitudes, which partially overflows and thereby diminishes the warm-water area open to contact with the atmosphere. This can be proved partly by our own observations west and south of Spitsbergen * in May, June, July, October, and November, partly from the soundings of the Norwegian hydrographer, Dr. Hjort,† between Norway and Iceland in March and May, 1896.

The impact of arctic water upon the Gulf Stream area comes partly from north and partly from north-west, *i.e.* from the sea between Iceland and Jan Mayen. This invasion of cold Arctic and west Atlantic water in the winter months seems to rule the migrations of the cod towards the Lofoten banks and fjords, and of the winter herring into the Skagerack. We have certain reasons to suppose that the great periodical herring fisheries on our coasts in winter is due to a flight of the fishes from such parts of the sea where the conditions are rendered unfavourable by the intruding Arctic water. One of our reasons for this hypothesis is that, whenever the waters of the Baltic current, which in winter is as cold as the arctic current, accumulate on the Swedish coast-bank, the herring likewise immediately disappears and seeks shelter in the warmer waters of the open Skagerack.

The Gulf Stream, so far as it is a surface stream, keeps up an almost constant temperature of 41° to 43° F., even at the highest latitudes, where it is in contact with the atmosphere; while the surrounding arctic water, which partly overflows the Gulf Stream, rapidly decreases in temperature in winter into 36°, 34°, and 32° F.

The conditions of the atmosphere, with regard to barometric pressure and temperature over the Norwegian sea, closely follow the changes in the condition of the surface water, so that the warm-water area becomes the seat of a barometric depression. The isobaric lines on the meteorological charts follow the isotherms and isohalines of the surface water.

During the summer of 1896, and still more in 1897, there existed a remarkably strong flow of the Gulf Stream towards the shores of Spitsbergen and into the Barents sea. To this is due the success of the voyages of the Jackson expedition, of Colonel Feilden and Mr. Pike in these seas during last summer. Our observations show that in July, 1897, the Gulf Stream area extended over the entire distance between Norway and the north-west part of Spitsbergen:—

WATER-TEMPERATURES BETWEEN NORWAY AND SPITSBERGEN.

From July 14 to 16, 1897.

Norway. Spitsbergen.

49·2, 47·0, 47·0, 46·2, 46·0, 47·0, 45·3, 45·3, 42·3, 42·2, 42·2, 42·0, 41·5.

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* "Die hydrographischen Verhältnisse der oberen Wasserschichten des nördlichen Nordmeeres zwischen Spitsbergen, Grönland und d. Norwegischen Küste," *Bih. K. S. V. Handl.*, Bd. 23.

† "Undersögelse over organismerne og strömforholdene i det Norske Hav." From *Naturen*, Bergen, 1897.

Still more unexpected was the discovery that this strong flow of the Gulf Stream in these northerly latitudes continued almost unabated in November last year :—

WATER-TEMPERATURES BETWEEN NORWAY AND SPITSBERGEN.

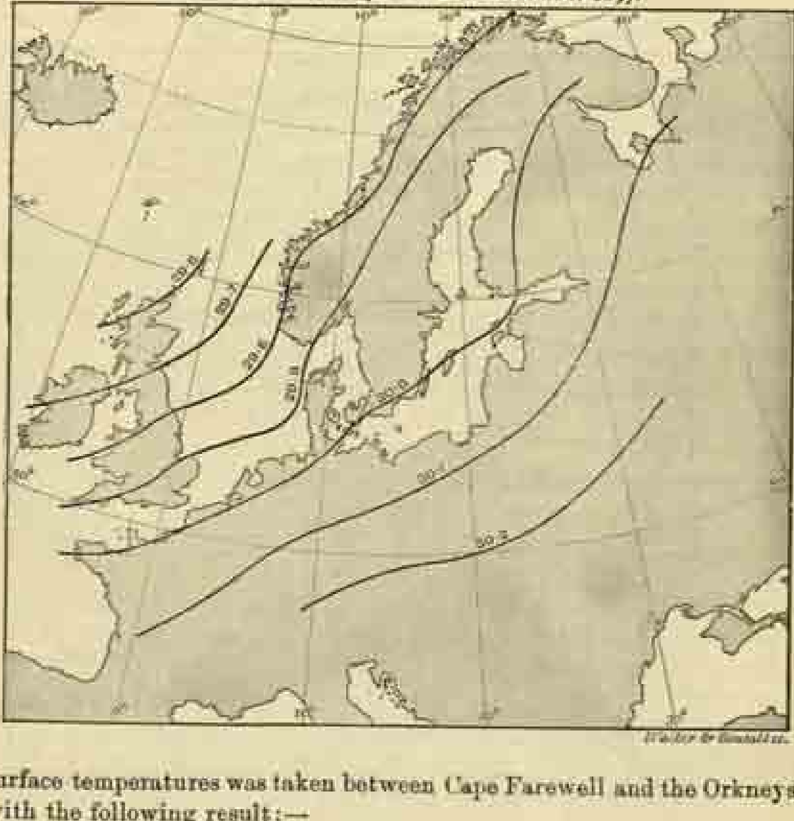
From November 8 to 10, 1897.

Norway. Spitsbergen.

44·6, 44·6, 43·7, 43·5, 43·2, 43·2, 42·8, 42·8, 42·8, 41·8, 37·9, 39·1, 37·5.

Simultaneously with this series of observations, another series of

Mean Barometric pressure in December 1897.



surface temperatures was taken between Cape Farewell and the Orkneys, with the following result :—

WATER-TEMPERATURES BETWEEN CAPE FAREWELL AND ORKNEYS.

From October 28 to November 6, 1897.

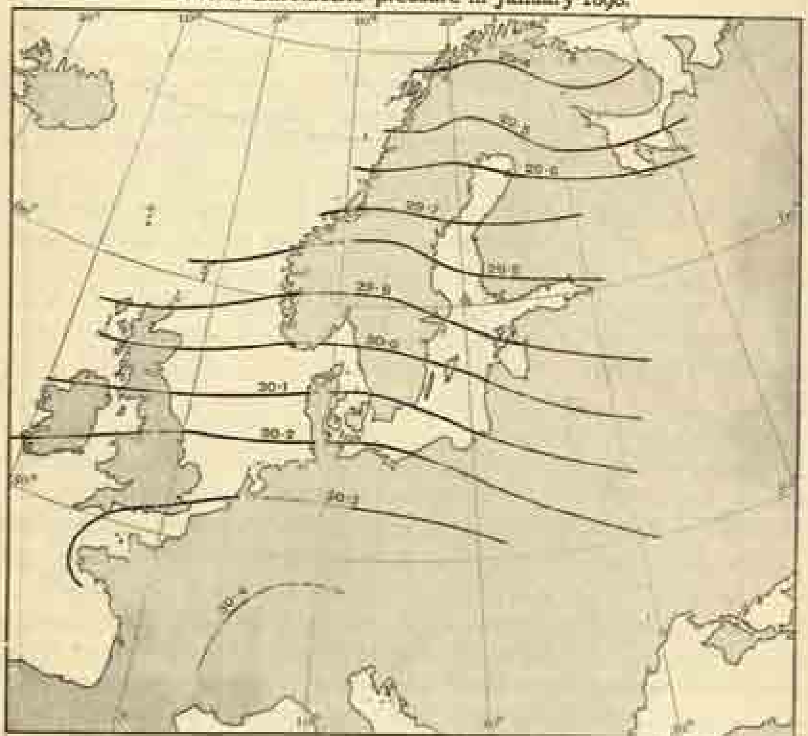
Cape Farewell. Fair island.

41·9, 43·2, 44·6, 46·5, 49·5, 49·1, 50·9, 50·0, 50·0, 51·8.

From this we may infer that the warm water of the Gulf Stream at the close of November, 1897, extended over the Atlantic and the Norwegian Sea from the 59th to the 75th degree of latitude. This great area of warm water, which may have occupied a space of from 80,000 to 160,000 geographical square miles (English), has evidently given birth to the great barometric depression over the Norwegian Sea, indicated by the lines of mean atmospheric pressure at 8 a.m. delineated in the preceding chart.

In January, 1898, the warm area seems to have undergone some alteration, since the isobaric lines for that month in the following chart do not run parallel to the coast-lines of the Norwegian sea, but show a trend from west to east, indicating that the centre of the depression was then situated north-west and north of Norway :—

Mean Barometric pressure in January 1898.



The cause of this change of position may be twofold. First, we must bear in mind that the Gulf Stream water is moving northwards constantly; and, secondly, it seems probable that from the sea between Jan Mayen and Iceland the Arctic current has impinged upon the Gulf Stream, and inundated the southern part of its area. Be this as it may, it seems to be certain that the extremely mild nature of last winter must be due to the extraordinary hydrographic conditions which have existed in the Norwegian Sea.

It will be of importance for meteorologists in future to ascertain the size, the depth, and temperature of the Gulf Stream area in this part of the ocean, from which we may probably forecast the character of the coming winter. This can be done by means of a few soundings and surface observations executed in the autumn (September), and at the commencement of the winter season (November).

NORTHERN RHODESIA.

I. THE CHOMA DIVISION OF THE MWERU DISTRICT.

By HECTOR CROAD.

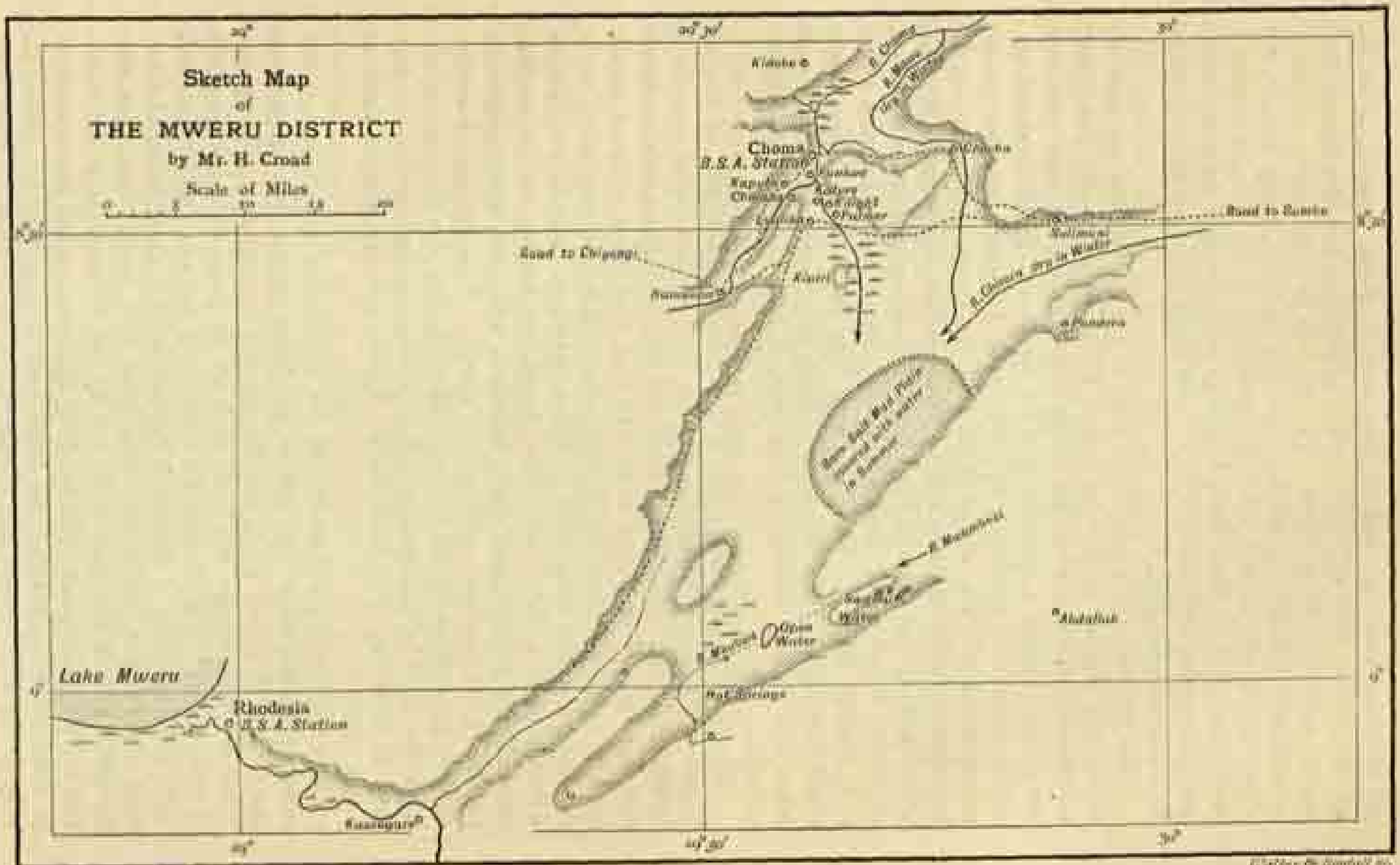
The Mweru district lies east of Lake Mweru, and stretches along the boundary of the Congo State. Choma station is, roughly speaking, halfway between Lake Tanganyika and Mweru, and is close to the Belgian line; its native name is Gansenga, and it is on the west bank of the Choma river, which loses itself in what is called the great Mweru swamp. Choma is the British South Africa Company's station, from which this part of the district is administered; an assistant collector is stationed here, who is under the collector at Rhodesia station, on Lake Mweru. The Choma division stretches from the west side of Mkula's village (Mkula is in the Tanganyika district), and, coming along the Belgian boundary, takes off to the south, along the west side of the Mweru swamp. The Choma is the only permanent river in this part; the other streams, though running well in the rainy season, nearly dry up in the winter, but have pools in places along their courses.

The road from Tanganyika, after leaving Mkula's, skirts the plain along the course of the Chisera stream. There is a village called Simwena's on the south side of the Chisera, a short run from Mkula, and the old road used to cross the stream here through a small swamp: there are generally a lot of hippo between this and Mkula's. The present road goes along the north side, and comes past Sulimani's village, who is the son of the old Mkula. Mkula built this as a sort of hunting-box, as it was a splendid place from which to hunt elephant. Mkula himself was a good elephant-hunter.

Sulimani's is some half-day's march from Mkula. In the winter he gets his water from a hole below his village, the Chisera being on the south side of the plain. The road from here, after running a little way along the plain, turns to the right into the bush, and comes out on the Mawe plain, a stream that in the summer flows out of the Choma on the Belgian side of the line, and runs into the swamp near the Chisera. After crossing this stream, the road leads by Chocha's village, which is quite small, and, running along the edge of the plain, turns to the left along the edge of the Choma swamp, and, crossing the Choma by a bridge, arrives at Choma station. The march from Sulimani to Choma may be done in a day. A little over half an hour brings one to Kaputa's village, where the road leaves the woods and again enters the plains. This part is often bad in the summer, as the water does not drain off. There is a small stream that runs into the Choma some 3 miles below the station. It is about 12 miles from the station to Namkupa's, the next village. This is the general camping-place. On leaving Namkupa, the road goes up the side of the hill—a rather steep climb—and passes through some fairly good woods. The next camping-place is generally in the bush, but the water here is never good, and in the winter there is often difficulty in finding it. The next place is Chiyengi, where there is a station of the African Lakes Trading Corporation. This is on Lake Mweru. The road's general direction is west. The country consists of open plains and dense bush, called matesi; there are stretches of open woods, which look charming in the spring, when the new grass is a few inches long, and the trees have just put on their bright green leaves. There are delicious scents as one goes through them; but, unfortunately, this time does not last long. There is very little good timber, as nearly all the trees are small; but there is a clump of good timber at the south end of the swamp, near the head of the Mofwe stream, but it is of no great extent.

Though it is called the swamp, there is not much swamp about it. There is a stretch of swamp at the north end, where the Choma enters the plains, and another at the south end. It is a huge stretch of nearly level plain (with short grass along the edges), anywhere on which, on a clear day, one can see the surrounding hills. When the rains start, the grass grows fast, and reaches to a height in some places of 10 feet and over. There are large stretches covered with a growth that reaches a great height. This growth has a stem sometimes an inch thick, but generally under this, and when green is very sticky, and has a small green leaf. It dries up and becomes extremely brittle, and makes a great noise as it snaps when one passes through it. I mention this, as it is a favourite place for elephant.

The water lies about a foot deep in the summer, over a large stretch of these plains, which at the north end, near the Choma and Chisera, are much cut up by small spruits and hippo tracks. The water soon dries up, however; practically, no water finds its way from the swamp into the Kalungwisi river, on which Rhodesia station is built. The Mofwe, which at one time must have been the outlet, has next to no current now. There used to be far more water here, from what the natives say, as at one time they had to use canoes to get from the edge to the Kipiri (a small hill in the centre), which may now be done with dry feet. In August the grass dries up and is burnt off, but soon springs



Walker & Boutall sc.

up again and gets dry; and the fires seem to go on burning below the surface, for as soon as a little wind springs up, the fires run through again, sometimes three times. The ash left is very thick, coming in some places halfway up to the knee, and it is too hot below the ash, often for a couple of days after the grass has burnt, for the natives to walk through it. South there is a large stretch of salt mud, cracked in every direction, as it has dried up. Old hippo paths are the only thing to break the monotony.

The Choma runs a good way west of the Kipiri, but one does not notice any current in the dry season below this. As the rains start and the water comes down, this stream overflows, and the water runs over the plain. This is a splendid spot for elephant. Mr. Knight and myself have seen from the Kipiri fully six hundred elephant, stretching right across the plain. The shores of the plain are sandy, and I have not the least doubt that it was once a large lake. In fact, almost up to Mkula's, one sees along the sides of the hills a line, sometimes more than one, of round wave-washed stones, showing where the old shores were; and, coming down to these, one sees the paths that hippo make when they nightly leave the water. That there must have been large lakes, and a huge rainfall, in this part of Africa is, I think, without question.

On the hill round these plains is the dense elephant bush, all tangled together and almost impassable, but for the elephant paths that cut it in all directions. The ground looks like clay, half burnt into red brick, and there is in places what looks like iron slag, often polished on the surface, as if fused into iron by lightning. This red clay seems to be the same as on the south cliffs of Kilwa island, on Lake Mweru; but on Kilwa it seems to have been better burnt, and has become like paving-stones, lying in strata, and easily detached. All this country seems to speak of great heat and upheavals of nature. This red ground is often cut into great holes by the elephant when digging for the roots of the trees that grow in this bush, and often tearing up large stones that may come in their way, with their tusks. These roots are often as thick as a man's leg.

The country is not of much use for cultivation in this part, except along the plains, where the natives get large crops. The crops along the Choma river are good, but the ground is very salt. The plains between Choma station and Namkupa's are the large salt-producing part of this country. People come for a long way south of Tanganyika, and, with the permission of Kaputa or Namkupa, build grass huts and set to work to make salt, which they take back with them. One often sees the white salt on the open spots, left by the evaporation of the water. The natives make a salt of rather dirty character, which is not much to be wondered at, considering the rough method they have for making it. They go out with baskets, and, having cut off the top grass, fill them with the soil, and take it to where they have prepared filters. These filters are made of grass, tied thickly round a hoop, and brought to a point at the bottom; they are supported on four sticks driven into the ground, and a vessel, made of the bark of a tree, taken green and dried in shape, is placed underneath. Making a mixture of the earth and water, they pour it into the filter, and let it drop through; they then empty the salt water into pots placed over fires, and evaporate the water. This salt could be bought for four yards of calico a load, of about 40 lbs., but I believe the price has gone up.

There is plenty of game in this part—puku, hartebeeste, roan, sable, and eland. Situtunga and Inyala are to be seen in the swamps, but are hard to find. There is an occasional buffalo or rhino; there are a good many of these across the line in Belgian territory. There are bush-buck, duiker, and impala in the bush country, and plenty of water-buck. There are huge herds of zebra along the Mweru swamp; klipspringer may be found on the hills north of the Mawe, and an occasional blue-buck. The elephant-hunting is, I believe, as good as any south of the Equator, but though there are any number, they must be hunted for; men must not expect to see them when on the march with a caravan, as is the case, indeed, with all the game.

There are plenty of geese and duck, and the partridge and guinea-fowl swarm. There are a lot of hyæna and leopard, and the lions are far too numerous for the good of the buck. The lion goes about in herds of twelve or more together, and has been seen in herds of this number hunting zebra on the plains. They sometimes attack men on the roads, but only, I think, when driven to it by hunger, when their teeth and strength are too poor to kill game. The Mweru swamp in November is the best place I know of for elephant; I have killed several on the plains there. But the shooting is quite open. There is, as a rule, no chance of cover, and the hunter must depend on his gun. There are swarms of hippo in the swamps, but they are hard to get at. Occasionally, when the water is falling, one finds a place where some dozen hippo have cleared a spot in the grass and taken up their quarters, and one can shoot the lot if one so wishes, as they have no chance to escape. It is rather dangerous work, as the grass one walks over is floating, and going through into the water and deep mud means a bad time, even if one is able to get out again, as sometimes a man is not able to reach the surface on account of the grass. There are large stretches of papyrus, which grows so as to completely cover the largest elephant; and there are innumerable hippo tracks, overgrown with grass, that look all right till one goes over one's head in water. The natives kill some hippo by spearing them through the grass; they can see where they are by the movement of the grass, and, running on the surface, they drive their spears into the hippo's backs.

The Choma river is grown over with grass, and is of no use for a canoe. There are lots of fish which will take a hook in the open places; these are chiefly what the Americans call "mud-cat," but are fairly good eating. The natives catch lots when the water falls, by building fences and putting down baskets, so that the fish are caught in them as the water drops. They also catch a good many partridge and guinea-fowl in snares; and they trap a good many bush-cat for their skins. The natives, as a whole, are not good hunters or trackers. A native elephant-hunter puts all his trust in the charms that he carries, and these generally fail him.

The natives are a peaceable lot, and go in for agriculture for four months, and sit down and eat for the rest of the year. They are chiefly people who have left Congo territory. This country was raided out by the Arabs, and when the Administration came into it, the only villages to speak of were Namkupa's and Kaputa's; now there are a lot of small villages scattered about, and the country is well populated for Central Africa. Lualika, who occupies the village near where the Choma flows into the swamp, and who gets splendid crops from the rich land on which he lives, was living on the Kipiri in the swamp, and tells of how he was nearly eaten by the mosquitoes, and how hippo used to walk through his village by night, and elephant to look in on him by day. There is no hut tax; but the Administration get what men they want as porters and as workers from the chiefs, who are asked for men in their turn, in accordance with the number of men they have under them. There is now no difficulty in getting men.

When a new man comes into this district, he comes before the official, and if he has any claim to ground, as having lived there in the old days, or his people having done so, he is allowed to return to his old site; or if he is not an old inhabitant, he is put with one of the chiefs. These men are all small headmen, no single man will live by himself. Though the men do a little work themselves, and build the houses, the women do nearly all the work in the fields. The huts are of the usual round style. A circle is marked out, and posts are driven in, at the most 2 inches thick; these are bound together, and reeds bound round the tops, when the posts are cut level. The roof is made of reeds, placed leaning against the sides and meeting in the centre; these are tied together, and it is turned over and placed on the top; it is thatched with grass, and the walls mudded. The roof reaches some 3 feet from the ground, and forms a veranda, part of which is sometimes closed in, and forms an extra room. The walls are about 5 feet 6 inches high. There are generally mud seats inside, and also low ones outside under the veranda. The beds are made by placing poles on four posts driven into the ground, and reeds are tied across these. The men seldom go into their huts in the daytime, and always have a wood fire at night.

In most of the new villages there is no protecting wall round the huts. But the old villages are what are called tembes: they have two mud walls, some 6 feet apart; these are divided into rooms, and have a mud roof all the way round. They have loopholes outside and inside, so that, if the enemy should get inside, they can shoot across the square, and also one side can sweep the roof on the opposite side.

The mail service is carried on by police, of whom a certain number are kept on the station, and who are armed with sniders. They are drilled by the official, and are used for keeping order in the district. All small cases go before the chiefs, but a native can always appeal to the official. Cases between chiefs naturally come before the official, who is treated as the sultani of the country. In the case of an elephant being shot, the chief whose man has shot it sends in the tusks to the official. The Administration takes the ground tusk: this is supposed to be the tusk nearest the ground when the elephant falls, and which by native law belongs to the sultani of the country. The pay for porters is reckoned at about one yard of calico per day. Men from Sumbu or Tanganyika are paid at Choma, and new men taken on to carry the loads to Rhodesia station. Men prefer to take loads rather than to work. The pay for workers is only six yards a month. Workers who cannot go home at night get "posho," or four yards a month for food.

The women are generally without the hideous ornaments used by some of the tribes, but a few have small brass things through their lips, or through one side of the nose. They have the usual love for beads. They all wear calico, though some have not very much, and they love bright colours. There is not much tattooing.

Before going after elephant, a hunter will go through a certain ceremony, and will be painted with red and white on the chest and face. They will go great distances, to a man who is known for his good hunting charms. They have small grass huts, about a foot high, under which they place the elephant-tusks after a successful hunt. They leave them there for about three days. A successful elephant-hunter is met at his village with great rejoicing. The people are well built on the whole, though as a rule they are not tall. There are a few cases of madness amongst them. There are special men in each village who do iron and wood work; but they are poor hands at these things, on account of the rough life they led when raided out by the Arabs.

They have no cattle, and but few goats. Horses would, I think, do all right if they could be brought up. The crops consist of Indian corn, millet, casava, sweet potatoes, beans, oil seeds, pumpkins, and tobacco. There are made roads near Choma station over to Kaputa, and a branch running towards Lualika, but only going as far as Mr.

Knight's place, which is about 6 miles down the river. There are two whites in the Choma division. The rainy season begins in December with short showers, and the heavy rains are over about the end of March; the grass is burnt in July. The natives are mostly armed with cap guns, and nearly all carry spears. One seldom sees a bow and arrows.

Large tracts of land are now being put under cultivation by the natives. The edges of the swamps can be turned into rich rice-fields, and can produce a huge crop. European potatoes can be grown well too, with a little trouble. The climate, in spite of the large swamps, is not worse than in most parts of Central Africa, and with care whites can live without much discomfort.

II. EXPLORATIONS WEST OF THE LOANGWA RIVER.*

By CYRIL D. HOSTE.

In December, 1895, the late Dr. J. A. Maloney, having constructed his wet season's camp at Mafuta's, some 20 miles north of the Angoni chief Mpeseni,† returned to England. His sudden death preventing his return, I was instructed to proceed and explore the country to the west of the Loangwa river.

On August 17, 1896, having engaged enough carriers from the villages close to us, my companions and I left Chinunda and took the now well-known path to Kambwire; only stopping long enough to obtain additional carriers, we passed on to Chisiri, on the Aruangwa (Loangwa) river. This chief lent us three very small canoes, with which we transported our loads across. The path led us through a Mopani forest, and we crossed the Mpamasi river about 20 miles north of Chisiri. Game was fairly plentiful in this part, the chief antelope being, of course, the impalla; and I noticed the spoor of kudu, roan antelope, water-buck, and wart-hogs. A good troop of elephants had also moved off, quite recently, from that river. After crossing the Mpamasi, the path takes a turn to the north-west, and we reached the villages of Kavimbe and Mnawaria, on the Mnyamasi river. I sent up for the chief, and was rather surprised to find Mnawaria a woman. She has a good deal of authority over her people—in fact, more than one generally sees among the chiefs of these small Wabisa villages. To the west of her village there are some sandstone hills, at the foot of which, on the east side, there is a very strong sulphur spring of boiling water.

After leaving Mnawaria, we again crossed the Muyamasi river and struck to the south-west, reaching the Mtinondo river, having passed over a track of country strewn with water-worn stones. The country for 10 miles before reaching this river is open, and we had a good view of the Mchinga range, which looks like a wall stretching north and south without a break, except for two very fine waterfalls, where the Mnyamasi and Mtinondo seem to drop directly from the Mchinga plateau to the low country of the Aruangwa (Loangwa) valley. As the carriers

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* Map, p. 692.

† See Mr. Money's map of British Central Africa, *Geog. Journal*, vol. x. p. 236.

were running short of food, we were not able to get a close view of these falls, but had to make for the nearest village, which was Mpemba, on the Matisi river. From here we moved on to Chitala's village, on the Mpamasi river. Chitala (known to Joseph Thomson as Katra, and to Mr. E. J. Glave as Katara) belongs to the Wabisa tribe, and is, I believe, related to Kambwire, who used to live in this district until he could stand the Awemba raiding-parties no longer, when he moved eastwards, and built his village where it now stands on the Lokusye (Rukusi) river. Chitala told me that his name was Chitala, and not Katara or Katra, but he is sometimes called Chiwesa, and I have frequently heard him called by this name myself.

Soon after arriving at his village, Chitala brought me a letter written by Mr. E. J. Glave, of the *Century Magazine*, who passed through in June, 1894. This is a copy of the letter :—

"Katara's, June, 1894.

"*To any Gentleman visiting this Chief.*

"SIR,—He is the most hospitable and friendly chief I have met in this part of the world. He is, as far as I can learn, loyal to the British. He permits no Arab to enter his stockades, and allows his people to sell them no slaves. He can supply guides either across the Mchinga mountains to the Ilala country, or to Kambuidi (Kambwire?), *the* Bisa chief to the south-east from here. He is thoroughly friendly, and most anxious that the British build a fort, somewhere in the country, to protect his neighbouring villages against the Angoni of Mpeseni and Mombera. With a very little assistance from the whites, such men as Katara can hold their own against their enemies. Two hours from here will be found a curious section of country strewn throughout with sections of fossilized timber.

"Between here and the hills you can get sport—eland, koodoo, water-buck. I went out twice—each time got a beast, first eland, and then water-buck.

"Very truly,

"E. J. GLAVE,

"Special correspondent of the *New York Century Magazine*."

The fossilized timber mentioned by Mr. Glave is scattered over a very large area, and is to be found almost as far south as Chilenga's village. The country at the foot of the Mchinga range is very much cut up with "dongas," and here again we found a great deal of water-worn stones, chiefly a very poor quartz. The range itself is composed almost entirely of granite, and, except for where the granite is protruding, trees cover the whole sides and summit. The timber is chiefly machabel, gusi, mopani, and on the higher country mabobo-hobo; bamboos also grow at the foot of the range along the banks of the Mpamasi river. Chikwanda, the dreaded chief of the southern Awemba, lives on the high plateau, his village being two days to the north-west of Chitala.

After crossing four running streams we reached the Kapamba, which is a fair-sized river. Here we saw a troop of about fifty elephants, but were unable to get a shot. Crossing the Kapamba and Luanda, the next river of any importance is the Mtisasi, where we found the remains of an old village, which the natives say belonged to Chilovi, who was raided and burnt out by the Chikunda from the lower Aruangwa (Loangwa). All that remains of the village is a large grove of bananas. Between the Mtisasi and Chilenga's village we crossed seven streams, all of which contained good cold water.

Chilenga, Chinema, and Mtanda have their villages close together, and their mother, Anatandali, has her village about 4 miles down the Lusuaswe river, which passes through this small colony of Mlala people. These people came down some years ago from the plateau, as they found that the soil was more fertile in the low country.

From Chilenga's we moved up to the top of the mountains. The climb was very severe even for us white men, who carried nothing, but what it must have been for the carriers with their loads it is hard to imagine. They only asked that the drummer might be sent on ahead, so that he could sit on the top of the mountains and beat his drum, and they could then tell how much further they had to climb. The country at the edge of the plateau is a good deal broken up with large valleys and rocky "kopjes," and the formation is granite; but after passing through about 2 miles of rough country, we got a view of rolling bush veldt, which extended as far as we could see. The climate on the plateau is delightful, and, of course, much cooler than the Aruangwa (Loangwa) valley. While up on the Mchinga plateau this time I bagged a very fine old sable antelope bull, the first and last which I saw in Central Africa. It must have been a very good game country before the cattle plague passed over it, as game can find green grass all the year round, and water is very plentiful.

Returning to Chilenga's to meet some of our party who had brought up further supplies, we next moved to Saide's village, on the Aruangwa (Loangwa), crossing the Mtisasi river 5 miles to the east of Anatandali's village. Then we struck south through Kampara, and stopped for the first night at Chombomere, where the Lusuaswe joins the Aruangwa (Loangwa) river. From here we went south-west, passing through two or three small Chikunda villages, and reached Señor Cardoza's place at the junction of the Mpapushi and Aruangwa (Loangwa) rivers. Cardoza, or, as the natives call him, Mzassa, is a black Portuguese.

Finding that we could not get through to Salisbury, on account of the Mashona rising, I here turned back, and, sending some of the white men home *viâ* Kota Kota, Blantyre, and Chinde, proceeded with the others to Chombomere; then, striking straight across to Chilenga, climbed up to the plateau again, and built our huts for the wet season about 2 miles to the east of the Lusuaswe river. Fresh provisions and calico having arrived from Blantyre, I started off to look at the country about Serenje's village, and make, if possible, round to the south. Crossing the Lusuaswe over a natural bridge, we reached the valley of the Wangala 5 miles further north, and followed that river to its headwaters, which are close to Serenje. Serenje has moved his village since Joseph Thomson passed through, so as to be nearer a large iron-mine which supplies the whole of this country with materials to make assegai-heads, axes, hoes, etc. Striking to the north-north-east, we came to Nansara, on what Joseph Thomson calls Moir's lake, though now it is little more than a swamp, being overgrown with grass and reeds. Nansara told me that the situtunga antelope inhabits this swamp, although of course he did not know it by this name, calling it the n'zoe.

Five miles to the west of Nansara we passed Serenje's old village, on the headwaters of the Molembo river, which, the guide told me, runs into the Luapula. Mchinka's was the next village, lying about 18 miles west of Nansara. Striking to the south-west, we passed through a more open country, which is well watered, and reached Kawamba, having passed Kwamwando about 6 miles to our west. Crossing the Chipendesi, we passed through Mkwessa's and Chikolongo's, and reached Muwundu, or Kawondo, as he is sometimes called. The country changes suddenly at the crossing of the Chizimba river, between Chikolongo and Muwundu, to a schist formation, whereas all the journey before reaching the Chizimba was through granite, with an occasional iron "bar." The whole district passed through would make a good farming country, and is well adapted to stock-raising, as there is good feed all the year round, plenty of running water, and, as far as I could see, no tsetse fly. The climate is as fine as any that I have ever seen in Africa. The water is good and plentiful. The timber is almost the same as in Mashonaland. The whole country has been covered with it, but the natives have cleared large tracts for their fields.

Muwundu has the largest village of any Mlala chief that I have yet seen, and after he got over his first scare he seemed to be a very good specimen of his tribe. Taking the path to Chaiye, we crossed the Chizimba and Mweshia, besides a few smaller streams, all running to the south through a very rough and broken country. The Mweshia is a very good river, with a tremendous current. Between the Mweshia and Chaiye the path takes one over three high ranges, passing close to Chilefwi mountain, over the top of Miniwanga mountain, and then suddenly drops down to the Kaombe river, on which Chaiye has his village. The difference in temperature on the Kaombe at this point was very noticeable, being a good many degrees hotter than the high veldt.

On inquiring about the country to the west, and where the Lokosashi had its headwaters, I found all native opinions differed, so determined to go west and see for myself. The only thing that they agreed about was that the Lokosashi rose in the Irumi mountains.

Striking west, after traversing a broken country, we reached Katiso hill, which is a bald granite kopje, after rising, according to my aneroid, about 1000 feet since leaving Karulania. Kamela and Lalasia are the next villages, both on the Lokosashi rivers. Passing by the villages of Wemba, Mkwampura, and Chimkwampi, we reached the new village of Chiwali, who seems to be an influential man amongst the Mlala, and is building a very large village. There are a good many open valleys in this district, and plenty of water, the whole country being drained by the Lokosashi and its tributaries. Going north from Chiwali, we passed the old deserted village of Kafura, on the Chimpinda river, and camped for a night at Mtinauli. The next morning we crossed the Lokosashi again running south-east at the drift. Striking east after crossing it, we next came to the Chipondesi, which we crossed by a natural bridge. This bridge is formed by one enormous boulder, under which the river burrows, coming up again 40 yards lower down. Still continuing to the east, we passed Changwi and Chintankwa, and reached Muwundu on April 28. Having rejoined our party, we struck across towards Serenje's to escape the rough broken country immediately to our east. We passed through a splendid district, crossing the Mweshia, Msuema, and Kaombe, and got into our old road near Serenje's iron-mine, reaching our main camp on May 11. On our next journey we struck north, crossing the Kapamba, and, passing through a good piece of country, got on to Joseph Thomson's road, which we followed down the mountains to Chitala. There is a much easier descent from the plateau here than at Chilenga, and the scenery is very fine all along the Mpamasi. From Chitala we took our old road back to Chilenga, and soon after reached the main camp. Our relief having now arrived, we commenced the homeward journey. Walking as far as Cardoza's place we took canoes down to Zumbo, which is close to the junction of the Aruangwa (Loangwa) and Zambesi. From Zumbo to Kachomba took us five days, at which place we had to leave the canoes and walk to Tete (eight days), taking the broad "machila" road to the south of the river. At Tete we engaged a house-boat to take us down the Zambezi, and arrived once more at Chinde, after an absence of over two years.

NOTE.—The accompanying map is made from compass bearings, and distances measured by the time of marching.

Kambwire's, near the Loangwa river, was taken as a fixed point from which to commence the surveys.

APPROXIMATE HEIGHTS ABOVE SEA-LEVEL BY ANEROID.

	Feet.
Chintankwa	4440
Chizimba	2890
Chiwali	4360
Chaiye	2190
Kamela	3490
Kaombe	5090
Karubuma	1990
Katiso	2390
Mtinauli	4340
Muwundu	4290
Mweshia river (upper crossing)	2990
Mkwampura	4340

HEIGHT BY BOILING-POINT THERMOMETER.*

Kasandwe	4795
Kwakumbi	1818
Mambesa	2173
Sunda	2062
Saide	1931
Lusuasawe river camp	1984
Mzassa	1612

ON SEA-BEACHES AND SANDBANKS.†

By VAUGHAN CORNISH, M.Sc. (Vict. Univ.), F.C.S., F.R.G.S.

§ 11. ON THE CHESIL BEACH, A LOCAL STUDY IN THE GRADING OF BEACH SHINGLE.

The Chesil Bank has long been a sort of prize puzzle among beaches, and space forbids detailed reference in this place to the somewhat extensive series of papers which geologists and engineers have written upon the subject. To put the matter shortly, the chief *crux* has been the circumstance that the pebbles are fine at the west end and coarse at the east end. This has been generally regarded as a peculiarity to be explained by special causes, as, *e.g.*—

(*a*) That the material travels from east to west, and not from west to east,

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* Kindly communicated by Dr. J. S. Hyland.

† Paper read at the Royal Geographical Society, March 16, 1898. Continued from p. 543.

which is to make the material travel for the greater part of its course against the wind and waves and stronger tide current.*

(*b*) That the material travels from west to east, but that the sea transports the larger stones more quickly than the small.†

This seems to be a mistaken deduction from the circumstance that large pebbles can outstrip smaller ones when rolling freely down a slope, a case which has little analogy with the transport of pebbles along the shore, where buoyancy is the important factor.

(*c*) That the arrangement of the shingle on the Chesil Beach is due in but small part to what is happening now and has happened of recent years, being mainly due to circumstances operating through long preceding periods.

Now, the stones supplied in bygone ages were either friable or they were not.

FIG. 3.—EAST END OF CHESIL BEACH.

If friable, they no longer remain on the surface of the beach; if not friable, then such as still remain on the surface of the beach have made countless journeys to and fro in the course of countless tides and waves. The Chesil Beach is periodically raked over by the sea throughout its whole length and breadth. Thus the present arrangement of the stones upon the surface of the beach is certainly conformable with the present circumstances of wind, wave, and tide, whatever may have been the original mode of supply of the shingle.

The Chesil Beach, in the greatest extension ascribed to it, is reckoned to reach from Bridport harbour to Chesilton In my study of the grading of shingle on this beach, after two preliminary visits to the Chesilton end, I started from Bridport harbour, and made my way on foot from thence to Abbotsbury (first day), taking samples of shingle, and thence on foot and by boat to Chesilton (second day). On

* For particulars of the tides, see King's 'Channel Pilot,' 12th edit.

† Sir John Coode, *Min. Proc. Inst. C.E.*, vol. xii., 1852-3.

the third day I went by boat close under the shore to Blacknor Point, landing occasionally, and then walked back from Chesilton for about a mile westward along the beach. Near the west end of the beach the material of the cliffs is mostly fine, and hence in travelling will be graded up, *i.e.* the *average* size will increase (Law 2). It is, however, obvious, upon slight inspection, that the small shingle of the beach, from Bridport harbour to Burton Bradstock, is not mainly derived from those cliffs, and hence the grading of their detritus is not the principal, and probably is but a small factor of the whole process of grading up of the shingle during west-to-east travel. I found that the increase in size of shingle was very gradual until near the Chesilton end when the increase became rapid, at the same time that a certain kind of flattened white stone became conspicuous. On arriving at "the end of the beach," that is to say, where the foreshore is almost entirely composed

FIG. 4.—BLACKNOR POINT, PORTLAND.

of material freshly supplied from the Portland cliffs, it was evident that these white stones were from the Portland rock, which is here fed to the foreshore by tipping the waste stone of the quarries, which have for many years been extensively worked on the plateau (Figs. 3 and 4). Almost all the fragments thus supplied to the foreshore are large, for not only is the stone compact, but, as is easily recognized, the material is sorted by sizes in the well-known way by tipping, the fine stuff mostly remaining near the top, and the large fragments mostly reaching the bottom. Nevertheless, the material within reach of the breakers, though mostly large, contains a notable quantity of little stones, not, however, rounded shingle, like the small stones near Burton Bradstock, but for the most part angular, which indicates that they have been produced on or near the spot by chipping and breaking of larger stones. Under water I saw, from the boat, a great store of rounded boulders, larger than those upon the beach. On retracing my steps westwards along the beach, I lost sight of the chips almost immediately. My attention was given to the flattened white stones, which I found to decrease rapidly in average size within the first mile of their origin (Law 1). We see, then, that the grinding down and bodily removal of fine stuff from the fresh detritus, copiously supplied by the Isle of Portland, is an important factor in the grading of the beach in its eastern part. The sudden change in the direction of the coast-line at Chesilton is sufficient to account for the supply to the beach of a very large proportion of the big fragments from the quarries and cliffs (for the south-westerly winds must send the waves along the shores of Portland in towards Chesilton). On the other hand, the strong *outset* along this shore (see *post*, Fig. 11) is sufficient to explain a rapid removal of the *chips*.

The wind during my visit being easterly, I saw, especially in the neighbourhood of Abbotsbury, how the gentle waves from the east, which must transport shingle in a westerly direction, were picking out all the smaller stones, so as to leave the part of the beach which they raked over much coarser than the beach immediately beyond their reach. This illustrates how the operation of Law 5 assists to increase the proportion of fine to large shingle at the west end. But on reflection, while the proportions of the things seen were still present in the mind's eye, it seemed to me that something was still lacking to explain the greatness of the accumulation of fine, rounded (and therefore travelled) shingle at the west end, an accumulation the more remarkable that large quantities are annually shipped away at Bridport harbour, and that the shingle there is mostly fine throughout its whole thickness. I therefore took an early opportunity of examining the shore to the westward of Bridport, which, strictly speaking, I ought to have done before, for no beach not supplied by waste of the shore at back of it can be adequately studied within its own limits; we ought always to go beyond and examine its sources of supply from both ends. I started from Lyme Regis and went to Bridport by boat and by walking, taking samples of the shingle, and then worked my way back to Lyme; and here I may note that it is advisable to walk a beach both ways when studying the grading of material. The trend of the coast changes at Charmouth, just eastwards of which the great accumulation of shingle which characterizes the eastern part of Lyme Bay really begins (Fig. 5). On the lonely shore between Charmouth and Eype, *Golden Cap and Thorncombe project somewhat from the line of coast, and a reef of rocks projects from each headland, forming altogether very considerable natural groynes, the last before Portland.* On the western side of Golden Cap is a considerable shingle beach, which rises to a notable height above ordinary tide-level, and is composed, near the promontory, of coarse shingle (Fig. 6). On the east side of the promontory the level of the beach is lower. I commenced taking specimens about the middle of the bay opposite Chidcock (or Seatown) Mouth, and found a steady increase of size eastwards, accompanied by an increase in the height of the beach until the Thorncombe or Down Cliffs double promontory was reached, where the shingle was about as big as that at Chesilton. From this point the beach to Golden Cap presents to the eye an imposing accumulation of shingle. On the east side of the promontory of Thorncombe there is no proper beach accumulation, the sea reaching the cliffs at high tide; but a beach begins to form about opposite Eype Mouth, the material being the finest shingle (Fig. 7). On the east side of Bridport harbour the size of the shingle is already *slightly* greater, and thence eastwards, as we have seen, the increase of size proceeds slowly until we near Portland, when it becomes rapid. It is noteworthy that on the west side of Bridport harbour the shingle under the training wall or pier is bigger, not only than that on the east side, but than that at Abbotsbury. Westwards of Lyme, again, there is no lack of large shingle in favourable situations, as, *e.g.*, at Seaton and at Beer.

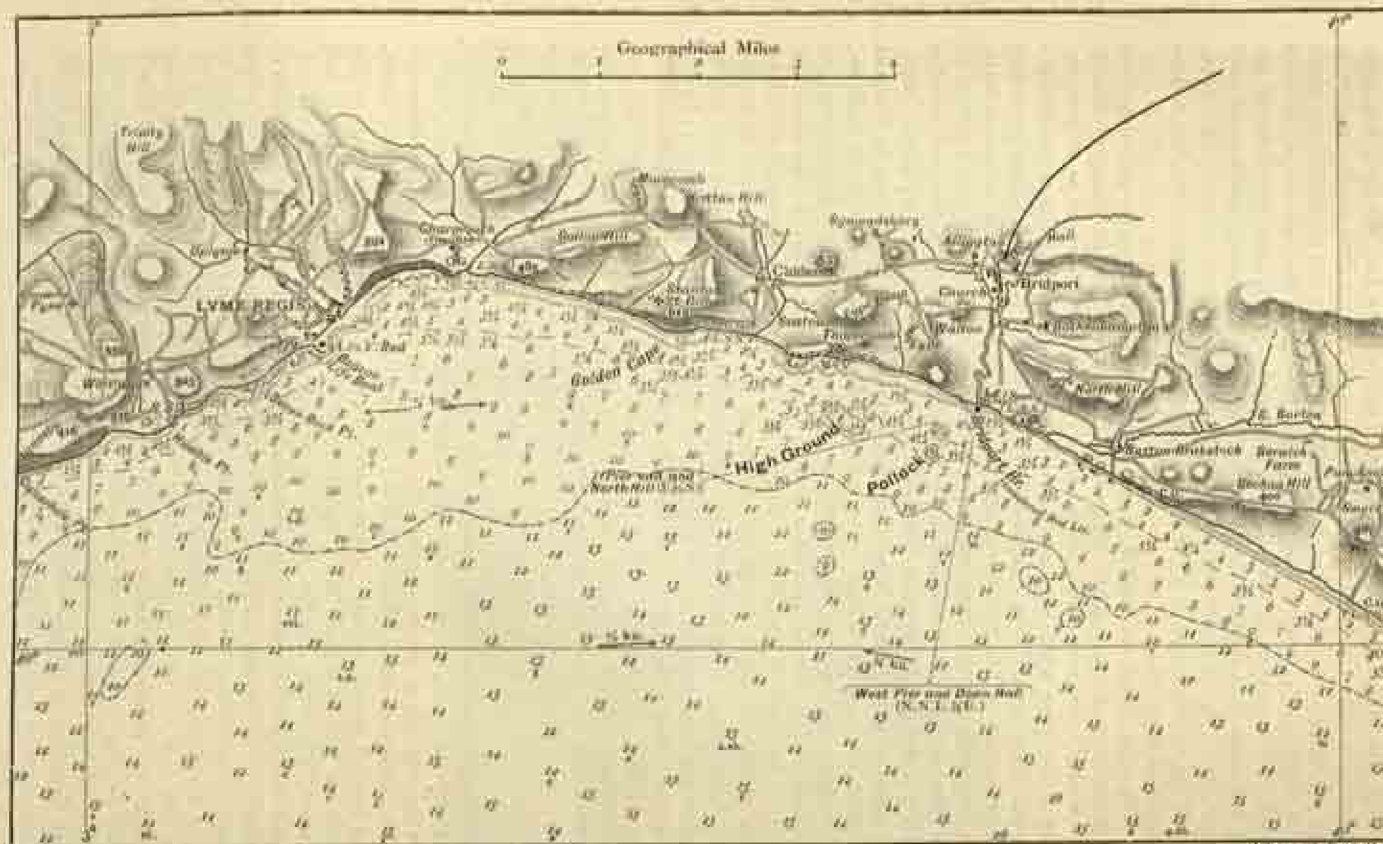

FIG. 5.—CHART: LYME TO BURTON BRADSTOCK.

FIG. 6.—SHINGLE BANK, WEST SIDE OF GOLDEN CAP.
(*From a photograph by F. W. Shephard, Lyme Regis.*)

It appears, therefore, that, in addition to the causes already adduced as contributing to produce the observed grading of the Chesil Beach, the natural groynes at Golden Cap and Thorncombe are of capital importance, for it is these projections, to a far greater extent than the character of the local rock, which determine the supply from the west of an overwhelming proportion of fine material to the western end of the Chesil Beach (see Law 5).

There may be other factors, in addition to those of which I have taken account, contributing to produce the grading of shingle upon the Chesil beach; indeed, it is never permissible to assert that all the factors have been ascertained which contribute to produce any natural phenomenon. But I think the causes I have adduced are adequate to explain the moderate store of facts which we as yet possess as to the sizes of shingle upon different parts of this beach. To recapitulate, the salient points as to grading on the Chesil Beach are briefly as follows:—

1. The beach is fed at both ends (Bridport and Chesilton).
2. The material fed in at the west end is mostly fine, owing chiefly to the natural groynes at Golden Cap and Thorncombe.
3. The material fed in at the east end is mostly coarse, owing to the nature of the local rock and the mode in which it is supplied to the foreshore.
4. The main drift of water is easterly, but
5. Of the fine shingle carried eastward from Bridport, much is brought back by waves from the east; whereas
6. The strong outset at Chesilton removes such fine stuff as may be there supplied from Portland.
7. The largest waves converge on Chesilton from both sides.

It will be noticed that there is nothing abnormal in all this, but that the co-operation of causes is remarkable.

§ 12. The Influence of Specific Gravity on the Behaviour of Beach Material.

(*a*) Dense Minerals.—The angle of slope of the ridge of a shingle beach depends primarily on the materials of which it is chiefly composed, on their size, shape, and specific gravity. *Regimen* is attained when the assistance which gravity gives to transport with the back-wash makes the seaward equal to the shoreward transport. An individual pebble of equal size to those of which the beach is mainly composed, but of twice the specific gravity, if brought on to the *regimen* slope of such a beach will work its way down to the bottom, for its extra resistance to the back-wash is mainly that of greater inertia, whilst it resists the onwash by diminished buoyancy also. Thus it happens that dense minerals are not commonly found upon the *Fulls* of a shingle beach; but, as size diminishes, difference of specific gravity makes less and less difference in buoyancy, hence the dense minerals are ordinary constituents of sandy beaches.

(*b*) Flotsam and Jetsam.—Bodies which have so low a specific gravity that they float in less than their own depth of water are flung in upon the shore by the breaker, riding in on the back of the wave, as boats are beached in a rough sea. As soon as the depth of the water is too small to float them, they are stranded, and this is the perfection of the action by which shingle *Fulls* are formed. These objects are pushed up by each succeeding onwash, in the same way that a boat is hauled up, viz. by partial flotation on the arrival of deeper water. They thus reach the extreme margin of the wash, where they form the wrack which marks the limit of the sea's advance. The wrack is sometimes collected together out at sea. Thus, in Poole bay, when a calm or a light off-shore wind follows rough weather, one occasionally observes that the flotsam which has been drifting widely scattered on

FIG. 7.—THORNCOMBE, FROM EYPE MOUTH

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FIG. 7.—THORNCOMBE, FROM EYPE MOUTH.

the fresher waters of the ebbing tide, is caught and collected where the burrowing salt water wedge of the incoming tide rolls up the lighter bay-water as a scroll. The welling up of the water is indicated by a smooth streak,* which stretches for some miles, in appearance a meandering stream, and here the wrack collects. When the water of the incoming tide reaches the shore, the strange collection of oddments is cast upon the beach.

A body drifting in water is set so as to offer the greatest resistance to its passage through the water. Thus, a disc borne by the swirling motion of the incoming wash has its broad face downwards, resisting the upward swirls. This resistance to motion *through* the water gives the disc its greatest buoyancy. When hurried back in the shallow stream of the back-wash, the disc tends to set so as to resist the stream—that is to say, edge downwards. Thus, at the same time that the water has become shallower, the depth required to immerse the disc has become greater. In this way flat shells are stranded on the beach.

The sea's power of transport of detritus depends mainly upon buoyancy. The range of specific gravity of detritus is small compared with the variation of the size of the particles which the sea moves. Therefore the buoyancy of the earthy materials which the sea has to deal with, and hence the power of the sea to transport them, depends mainly on comminution.

§ 13. Sandy Beaches.

(*a*) The Sub-stratum of Shingle.—Sandy beaches are found not only where shingle is wanting, but where the *proportion* of shingle to sand is small. To fix our ideas, we will take the case of the sandy beach between Bournemouth and Poole Haven, on either side of Branksome Chine. The sea here is shallow, and the sea-floor is covered with sand. The cliffs, of about 100 feet, are mainly sandy, with a relatively small proportion of stones. These cliffs (which waste somewhat rapidly by weathering and drainage) must have supplied, even in quite recent times, a quantity of stones sufficient to form a shingle bank, and as the sea seldom reaches the cliff-foot, and there is no platform of hard rock, such a beach would be fairly permanent. Instead, however, of being collected in a bank with sand visible at its foot at low tide, the shingle tends to form a layer underneath the sand of the beach and underneath the sand seawards of the beach. It is only visible when the sand is removed either (1) after a succession of gales, (2) locally by a brook, (3) just behind the breaker, the pumping action of which sorts the material by sizes, increasing the *proportion* of shingle to sand, so that the surface there is often quite stony.

It is important to explain why the shingle derived from the wasting of the cliffs does not follow their recession in such a manner as to form a shingle bank. Something can be done towards providing an explanation by pointing out that stones do not travel readily up on a bed of soft sand, and that the breakers of a flat shore, falling, as they do, on a cushion of water, cannot readily *push* shingle before them, and therefore have to act mainly by the rush of water from the back of the wave. The examination of these disabilities, however, only serves to show that they are quantitatively insufficient to account for the failure of the sea to collect the shingle in a marginal bank. The alteration of the relative positions of sand and shingle from that observed, say, at Eastbourne, Hastings, or Folkestone, is far too great to

* With a light on-shore wind, I have seen the line of meeting of the tidal waters marked, not by a smooth streak, but by a line of foam, where little waves were *breaking*. In this case there are probably two salt-water wedges, with a wedge of the brackish water interposed.

be accounted for by differences in the relative mobility of the individual pebble and the individual sand-grain. *The attempt to deduce the behaviour of a heterogeneous aggregate from the observed behaviour of individuals representative of the constituents is foredoomed to failure, unless allowance be made for the proportion in which they are respectively present*, and much that has been written upon beaches is vitiated by neglect of this rule. Observations of the behaviour of shingle where present in excess lead to erroneous conclusions if applied without correction to the behaviour of disseminated shingle. We must, therefore, once more have recourse to the statistical method. At the foot of our sandy beach we find pebbles exposed under the breaker; why are these not driven up the slope of the beach to the limit of the wash? Because, *when the intensity of action begins to diminish, the pebble is soon buried by the relatively great quantity of sand which is dropped there, and is thus removed from the sphere of action*; for in beaches, as in dunes, it is only the top layer which moves. Thus the shingle which underlies a sandy beach is practically stationary, not for want of mobility, but for lack of opportunity for movement. The sand of the beach comes in and goes out according to the weather* and the seasons, the beach being thickest in summer and thinnest in winter, and occasionally almost stripped of sand after a succession of gales. When the sand is carried out, the shingle is for the most part left behind, necessarily at a low level. The incoming sand buries it, and so prevents the wash from pushing it to a higher level. Thus each round of the seasons tends to leave the fresh supplies of shingle as a bottom layer close to the eroded sea-bed. Thus, if the finer material be present in excess, it smothers the shingle and forms the surface. If the shingle be present in excess, so that pebble beds on pebble, the fine stuff is floated away from the steeply-sloping surface. In either case the material present in great excess normally forms a bank, beneath which the material which is present in small quantity tends to spread out as a layer.

(*b*) The "Low" and "Ball" of a Sandy Shore.—The formation of a beach-ridge, or *Full* of sand, is well seen when the sand is being brought in during off-shore winds. Sand being readily raised by upward-swirling water (which is equivalent to suction dredging), *the building up of a Full of sand in front of the breaker is accompanied by the excavation of a trough, or Low, at the back of the breaker* (Fig. 8). This is roughly similar to the simultaneous excavation and elevation which produces the ridge and furrow so well known as "ripple-mark." Fine dust or mud settles too slowly, coarse shingle too quickly, to lend themselves readily to this mode of distribution by waves. A *Low* is dredged out in sand when the breaker-line remains stationary for a time, as, *e.g.*, during tidal high water. During the ebb of spring tides, a lagoon is often left between the beach and a second stretch of sand. This lagoon marks the strip where the breakers act during the period of neap tides. At low water of spring tides, the belt of sand beyond the *Low* is a sort of beach, the seaward face of which is where the wash of the waves acts. When the tide is up and the sea is rough, there is an outer line of breakers on this bank, which is called the *Ball*.

(*c*) Ridge and Furrow Structure on a Sandy Beach.—A continuous *Full* is formed by on-shore action with gentle waves, but as the size of the breakers

* In a rough sea, the removal of coarse sand and fine shingle is presumably facilitated by the inertia effect already referred to. The shoreward movement of the wave is so short and sudden that the small stony particles lag behind the water. The seaward swing of the water, on the other hand, lasts long enough to impart its motion to them.

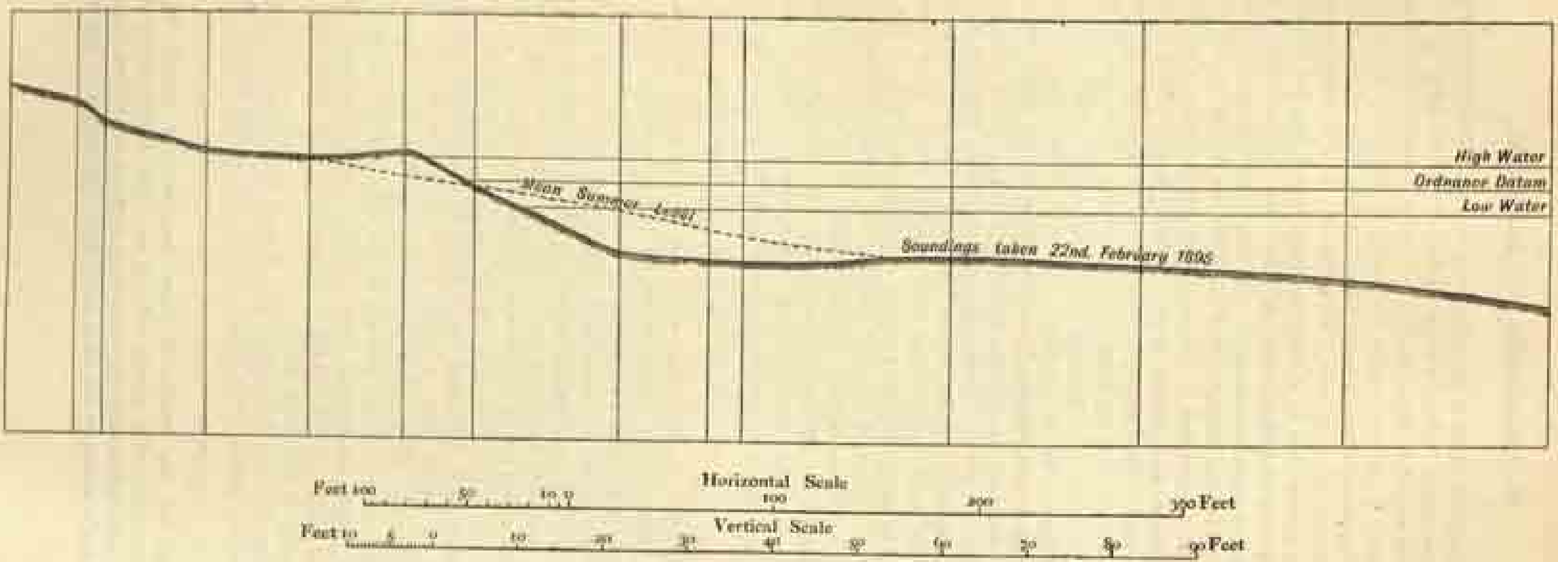

FIG. 8.—SECTION OF SHORE AT ALUM CHINE, BOURNEMOUTH.

increases the wash tends to make the slope less steep. Neither the force nor the resistance are absolutely uniform along the shore, so that this action commences at selected places. From the moment that even the shallowest groove is thus formed, the back-wash finds its way to sea almost entirely by this path. The discharge of the breaker continues, however, to send the on-wash up the ridges as well as up the furrows. Sand, therefore, is still deposited on the ridges, which may continue to increase in height while the absolute level of the troughs may be lowered, and the amplitude from the crest of the ridge to the bottom of the trough necessarily increases. In this way is produced that succession of ridge and furrow *at right angles to the sea-front* which is doubtless familiar to many, from the inconvenience it causes to the pedestrian.

Shingle Barchanes.—A similar structure is often produced when the waves of the receding tide have to deal with a line of shingle uncovered beneath the breaker during the time of high water. The shingle collects in ridges with

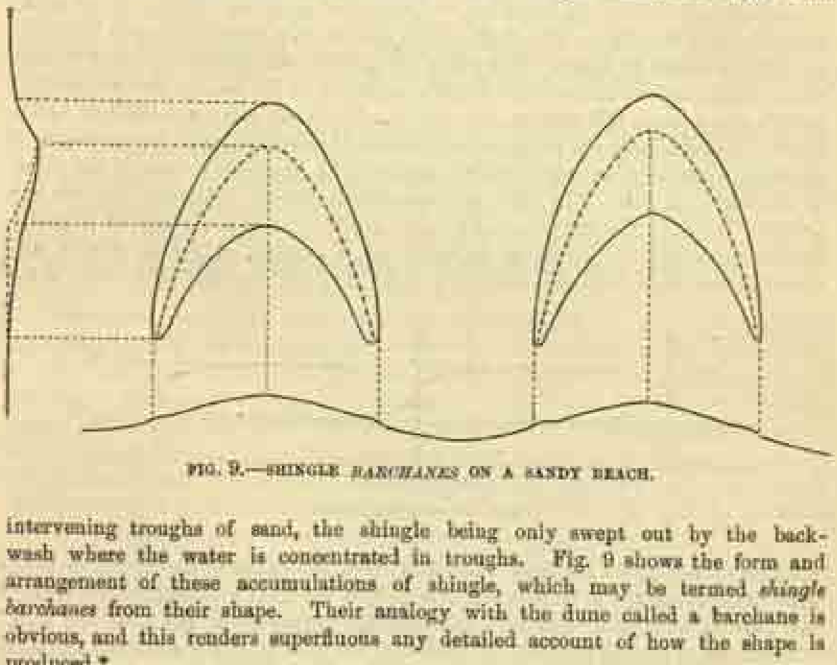

FIG. 9.—SHINGLE *BARCHANES* ON A SANDY BEACH.

intervening troughs of sand, the shingle being only swept out by the back-wash where the water is concentrated in troughs. Fig. 9 shows the form and arrangement of these accumulations of shingle, which may be termed *shingle barchanes* from their shape. Their analogy with the dune called a barchane is obvious, and this renders superfluous any detailed account of how the shape is produced.*

The carving of a sandy beach into ridges and furrows, the axes of which are parallel to the line of action of the wash, alters the character of the *Low*. The sand drawn out down the troughs forms here and there bars across the *Low*, which at low water spring tide is seen cut up into a number of oblong or oval lagoons.

(*d*) THE FLOODING OF A FLAT SANDY COAST.—Although the wash can pile up sand in a *Full* owing to percolation, this action does not afford the same protection against flooding by the sea as does the fulling of shingle. This is not merely due to the greater liability of sand to be swept off-shore, but also to the circumstance that the height reached by the wash is much less when it runs a long course on the nearly flat shore of sand. On such a shore it is easy to observe that the edge of the wash is more and more below the level of the crest of the breaker in proportion

* "Formation of Sand-dunes" (*Geographical Journal*, March, 1897).

as the breakers increase in size. Protection from flooding on a flat sandy shore is given by the blowing of sand into dunes.

§ 14. On the Making of Sandbanks and Sandy Forelands.

(*a*) Tidal Nodes.—In tidal seas the *rate of change* of currents is great, which brings out the inertia effects which sand shows so much better than do mud and shingle.

When a body which is capable of transmitting a disturbance, as a pulse, is disturbed at any part, a pulse is transmitted to the boundaries of the body, whence it resurges. The pulsation continues for a time, but ultimately dies out. If the disturbance be repeated at a short interval of time the second pulsation encounters the resurging of the first, and if this repetition of disturbance be kept up at regular intervals, the body presently attains a condition of persistent rhythmical vibration, being parcelled out into vibrating segments, whose boundaries are nodes. The forms of the segments are various, according to the mode of agitation of the body and to the contour of the boundary. The shallow tidal seas are thus parcelled out in vibrating segments bounded by nodes. The following remarks are intended to apply to such areas. Confining our attention to the tidal agitation of the sea, we perceive that no particle of sea-water will wander, but that it will vibrate about a position of equilibrium. The extremities of its excursions are also the extremities of the excursions of particles in the neighbouring vibrating segments. A line drawn through the points of meeting is a node. *The lines of demarcation between vibrating segments are probable positions for the accumulation of sand.** In the vicinity of a nearly straight coast-line the vibrating segments are, I suppose, elongated ellipses, and accumulations may take place along the nodal lines AA′ and BB′ (Fig. 10). If the

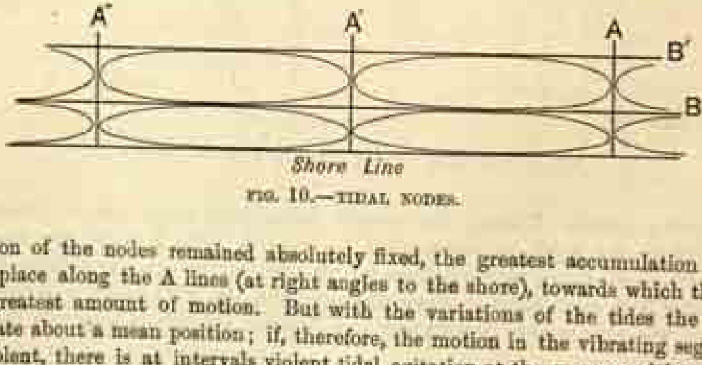

Fig. 10.—Tidal Nodes.

position of the nodes remained absolutely fixed, the greatest accumulation would take place along the A lines (at right angles to the shore), towards which there is the greatest amount of motion. But with the variations of the tides the nodes oscillate about a mean position; if, therefore, the motion in the vibrating segments be violent, there is at intervals violent tidal agitation at the mean position of the A nodes, and, unless the supply of sand be very great, accumulation does not take place there.

The displacements of the B nodes, on the other hand, are less violent, and it is therefore along these lines that the principal accumulations take place when accumulation is prevented at the A nodes. Thus I conclude are formed—

(*b*) Longitudinal Sandbanks.—Such are the sandbanks parallel to the shore which are numerous off the coasts from Flamboro' Head to the South Foreland, and from Calais, at least, as far as the Zuyder Zee. These sandbanks are parallel to the main run of the along-shore tidal currents. They present analogies with the longitudinal dunes of deserts. When the formation of such shoals is once

* Compare Faraday on "Acoustic Figures" (*Phil. Trans.*, 1831).

started, the mechanism which produced them is thereby assisted, for the currents are deflected by the ridges and concentrated in the intervening furrows. Any sand deposited at slack water in the furrows is thus swept out, say by the flood-tide, and carried as far as the end of the ridge. Here are formed two eddies of water close to one another. The sand, being denser than the water, eddies in wider curves, and the sand brought by one eddy is thus flung into the other, whose motion is equal and opposite. Thus the sand is concentrated along the prolongation of the axis of the shoal near the inner margin of the two eddies. The same kind of action lengthens the shoal at the other end during the ebbing tide. Such shoals, when small, are liable to shift with those irregularities of the vibratory motions of the sea which result from seasonal and casual variations of weather. The larger shoals are not subject to much movement from short-lived disturbances, even if violent, for these large heaps of incoherent material cannot be moved bodily, but only by the rolling of the surface layers. On the other hand, a very small disturbance of conditions, if long continued, can shift the largest shoal. Such a disturbance is the recession of the coast-line. It is probable, *e.g.*, that the shoals off the coasts of our eastern counties tend to travel at the same rate as the coast is cut back.

(*c*) THE VERTICAL SECTION OF SANDBANKS.—Sandbanks frequently rise steeply, their material standing at the maximum resting angle. These steep sides are more common than in the case of dunes, for winds of maximum force are comparatively rare, and dunes are usually seen with the shapes imparted by gentler winds. In the case of tides, on the other hand, slack water, during which a large proportion of the deposition must take place, lasts a comparatively short time, and the shoal is shaped by the scouring currents which succeed.

There is another action besides scouring which gives steep sides to sandbanks, especially those which rise from fairly deep water. The action of the waves being in such cases great at the surface of the shoal and small at the base, sand is continually shaken over the edges, and, falling into nearly still water, gives the well-known steep *talus*. The rapid ratio in which the intensity of wave-action increases with approach to the surface thus tends to preserve a flat top to shoals. The hills and hollows of the surface of such a shoal as the Dogger bank are much less marked than is common in the case of a tract of dunes in deserts of deep sand, for the force of wind increases in a relatively small ratio with increase of elevation.

(*d*) BANNER SANDBANKS.—The sandbanks which accumulate on the more sheltered side of headlands, good examples of which are the Skerries shoal, eastward of Start Point, and the Shambles shoal, eastward of Portland Bill, suggest by their shape and position that they are deposited in "the eddy" caused by the headland (Fig. 11). This mode of statement, though perhaps not altogether incorrect, is apt to mislead. Thus, when the tide is running up-channel, there is an eddy known to the navigators of small vessels on the east side of Portland. Not only is the area of the obvious eddy very small compared with the area of the Shambles shoal, but its centre is not even situated within that area, but quite close under the Bill. As a matter of fact, *the materials (broken shells, etc.) which form the Shambles sandbank are not deposited in still water*, as is clearly brought out in the following note printed upon the Admiralty Chart 2450 (Portland to Owers). "From about II.hrs to XI.hrs F. and C. there is an outset from the west bay of Portland of nearly 9 hours' duration, which closely skirts the rocky shore, and gradually increases in strength as it approaches the Bill. It rushes past the Bill and over the Portland Ledge at the rate of 6 or 7 knots at springs. A short distance eastwards of the Ledge this outset is met in the latter half of its course *at nearly right angles* by the stream which sets for nearly 9½ hours (viz. from VI.^{hrs} 20^m to III.^{hrs} 50^m F. and C.) out of the east bay of Portland; these united streams press on towards the Shambles, which they cross obliquely about E. by N. at the rate of from 3 to 4 knots. The tidal streams set over the Shambles in an easterly, northerly, and westerly direction, making to the eastward at III.^{hrs} 45^m, and to the westward at X.^{hrs} 45^m, and attaining a rate of 3 to 4 knots." Thus *the sand deposits from the mixing waters of the meeting streams*, an effect that is not surprising when we consider that the mixing of waters is achieved by vortices.

The surface layers of this shoal are frequently in active motion even in calm weather,* and the permanence of the shoal under these conditions has excited surprise. In point of fact, *the permanence of a sandbank is ensured by equality of supply and loss*, the equilibrium being dynamic. As in the case of a banner cloud or a standing

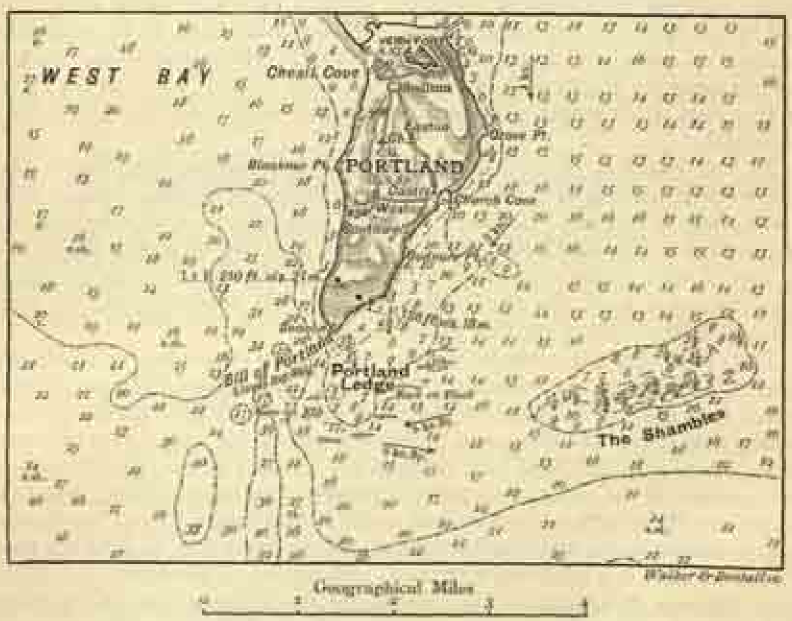

FIG. 11.—CHART: THE SHAMBLES SHOAL.

wave, the structure persists, whilst the material is changed. In the case we are considering, the supply may be reckoned as constant; the loss depends upon the amount of surface. Consequently, if a part of the shoal were removed by artificial means, supply would be greater than loss, and presumably the shoal would grow again to its maximum dimensions. Only the surface particles of a sandbank or sand-hill are removed by currents, so that the material of the interior of a stationary sandbank is unchanged. In the case of a travelling accumulation of sand, such as the moving sand-dunes of the desert, each part in succession is brought to the surface, and the materials may be completely changed.

The position of the Shambles shoal may be considered to be fixed relatively to the Bill of Portland. As the Bill is cut back, so will the shoal shift. When the coast of Portland corresponded with the position of, say, the present 5-fathom line,

* Deane, in *Min. Proc. Inst. C.E.*, vol. xi. p. 217.

the centre of the Shambles was presumably a little south and east of its present position.

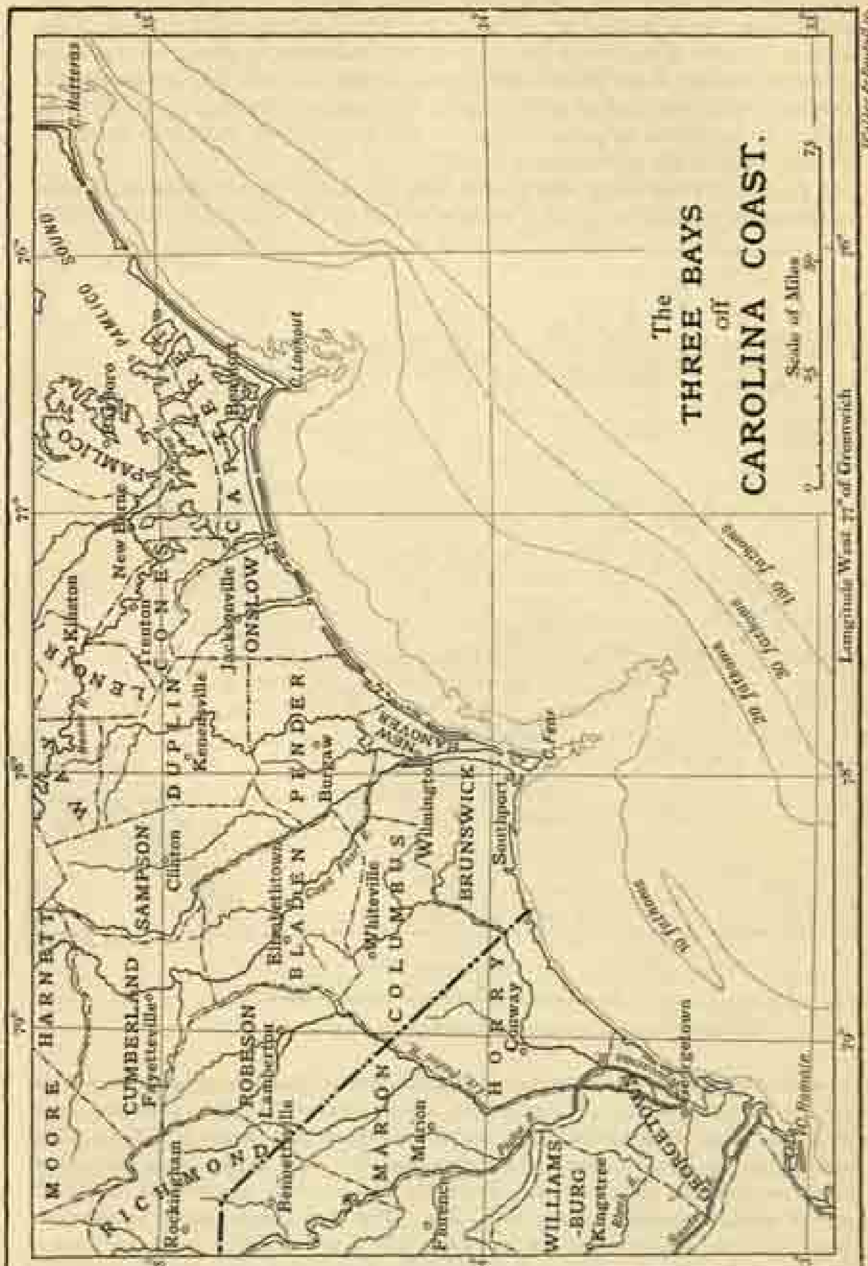

FIG. 12.—CAPES HATTERAS, LOOKOUT, AND FEAR.

(*e*) RIVER BARS.—The entry of the salt-water wedge (see § 2) is probably an important factor in the formation of the sandy bar which usually occurs near the mouth of a river. The inertia of the sand and its superior density must cause it to cut through the stream-lines of the river-water when this is deflected upwards,[*] so that the sand passes into the salt-water wedge more rapidly and completely than would be achieved merely by settling. But the checking and deflection of the streams is probably not nearly the whole of the mechanism by which the deposition of sand is brought about where a river meets the sea. A great part of this effect is probably due to the motions which attend the mixing of waters, a process which appears to be almost as potent a factor in the formation of sandbanks as is the mixing of airs in the production of clouds.

(*f*) Sandy Forelands and Transverse Shoals.—The accumulation of sand in transverse bars (*i.e.* along what we have termed the A nodes) is the action which

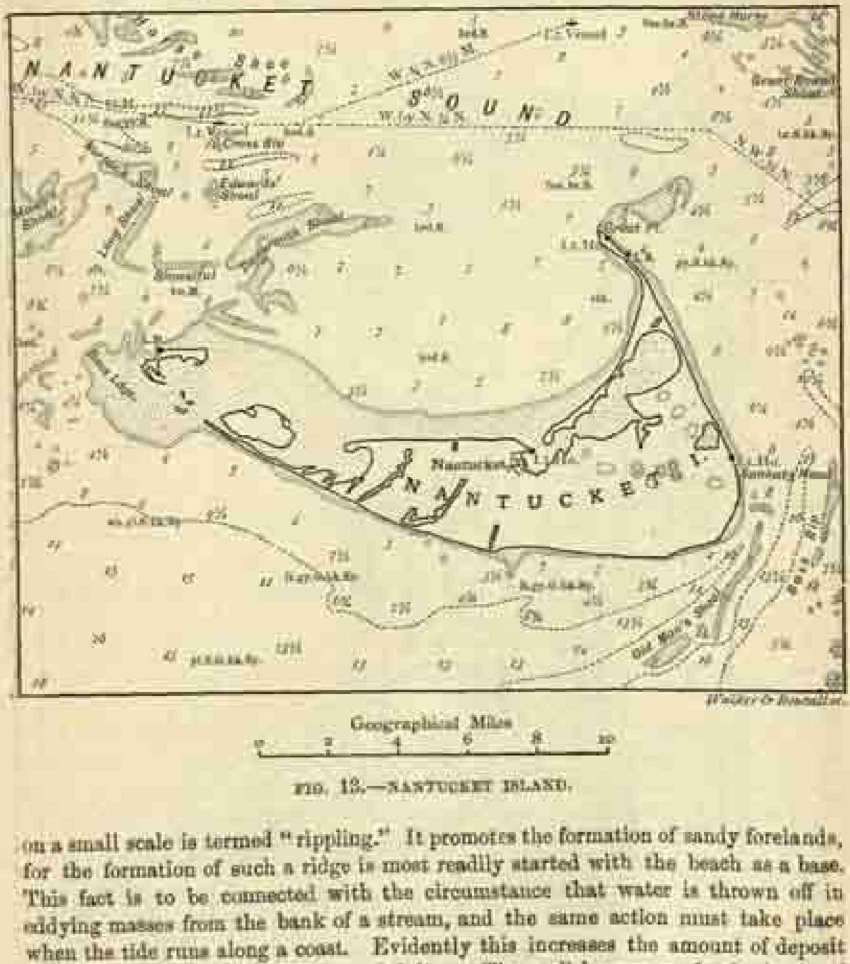

FIG. 13.—NANTUCKET ISLAND.

on a small scale is termed "rippling." It promotes the formation of sandy forelands, for the formation of such a ridge is most readily started with the beach as a base. This fact is to be connected with the circumstance that water is thrown off in eddying masses from the bank of a stream, and the same action must take place when the tide runs along a coast. Evidently this increases the amount of deposit at the coastal extremity of the nodal line. The well-known sandy forelands of North Carolina (Capes Hatteras, Lookout, and Fear) are each continued under-water as spits of sand projecting seawards for miles (Fig. 12). The under-water

[*] See Humphreys and Abbott, 'Report upon the Physics and Hydraulics of the Mississipi River.'

part of these great sand-ridges is moulded in accordance with the tides and currents of this part of the sea, whereas the contour-line which is "the shape of the foreland," is moulded by the action of the breakers and their wash, which, for this open coast, is equivalent to the local action of the wind, which is stated to be most powerful from the north and east.* In many cases the shape of a sandy foreland, that is to say, the form of the sea-level contour-line, conveys an utterly false idea as to the shape of the sand-hill whose top is the foreland. Fig. 13 shows how the coast-line of the northern spit of Nantucket Island curves away from the weather side, while the submerged part points seaward, presumably under the influence of a current which is stated (Captain Davies, quoted by J. D. Dana, *Man. Geol.*, p. 681 of 3rd edit.) to set from west to east and from south to north. It appears, therefore, that, if the sand which accumulates off the coast of

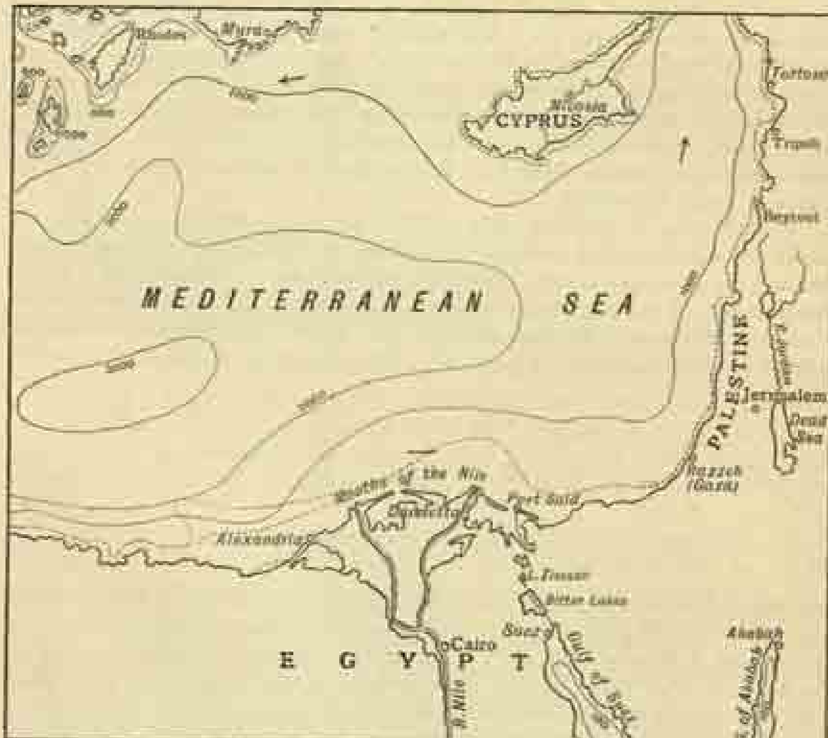

FIG. 14.—DELTA AND SUBMARINE DELTA OF THE NILE (AFTER DELESSE).

North Carolina were really moulded to the curves of contiguous "back-set" eddies induced by the Gulf Stream,† the result of such moulding should be sought, not in the contour of the forelands, where Dr. Gulliver seeks it, but in that of the submerged spits. These spits, however, do not show the required sharp points and

* See Wheeler in *Min. Proc. Inst. C.E.*, vol. cxxv., 1895-96, pt. iii. p. 17, quoting L. N. Haupt; and N. S. Shaler, 'U.S. Geol. Survey, Thirteenth An. Report,' 1891-92, pt. ii. "Geology" (on "The Geological History of Harbours"), p. 128.

† See F. P. Gulliver on "Cuspate Forelands" (*Bull. Geol. Soc. of America*, vol. 7, pp. 399-422).

double-concave curves. In the same way, the east-flowing current off the south coast of the Mediterranean is recorded in the form of the submarine parts of the Nile delta (Fig. 14).

A stream which erodes an alluvial channel continually increases its sinuosity (until a "cut-off" takes place), because the opposite banks or shores are close, and the current is relatively rapid. Thus the chief scour is directed into the bays, and deposition on the headlands of the material thus removed is promoted.* Such co-operation does not occur between opposing coasts of the sea, so that the scour is greatest on the headlands, and the tendency is to deposit in the bays material thus eroded.

When a shore is growing by means of the along-shore distribution of detritus brought down by rivers (*e.g.* the coast of North Carolina), the coast-line becomes indented by the growth of sandy forelands, as explained in the last section. The indentation proceeds until the loss of material from the lengthened coast-line is equal to the supply. Now, the forelands grow where the supply is greatest, but as they are built out, the exposure, and consequently the rate of removal at the point, increases. At length, therefore, the indentation of the coast reaches a maximum. If subsequent scouring of the points and accumulation in the bays should shorten the coast-line, deposition would then be once more in excess of removal, and the forelands would be renewed.

The curves of a coast-line, so far as they are due to erosion and deposition, record the *relative* rates of recession (or advance) in different parts. Thus, where a foreland has grown out more rapidly than it has broadened (*e.g.* where rippling action deposits sand off the point below low-water mark, as in the cuspate forelands of Carolina), the curves of the coast are concave to the sea, and the foreland is sharply pointed at their intersection (Fig. 15, A). When the scour off the point begins to

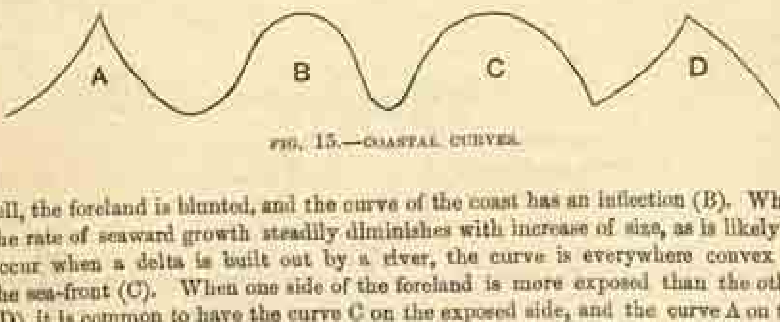

FIG. 15.—COASTAL CURVES.

tell, the foreland is blunted, and the curve of the coast has an inflection (B). When the rate of seaward growth steadily diminishes with increase of size, as is likely to occur when a delta is built out by a river, the curve is everywhere convex to the sea-front (C). When one side of the foreland is more exposed than the other (D), it is common to have the curve C on the exposed side, and the curve A on the sheltered side, as at Dungeness. In this instance the whole form shifts bodily to the left in sympathy with the progressive deflection of the mouth of the Rother (see *ante*, § 9).

(*g*) MANGROVE COASTS.—The growth of deltas and forelands of sand and silt is facilitated where the mangrove and courida grow. The latter, according to Mr. J. Rodway, is the more effective in building out the shore.† In the first place, the roots direct the water into many devious channels, greatly increasing friction, and causing streams following opposite courses to meet and still each other. In the second place, *by yielding and recovering in the moving fluid, not rhythmically but*

* See James Thompson on "The Windings of Rivers in Alluvial Plains" (*Proc. Roy. Soc.*, 1876, p. 5, and 1877, p. 356).

† 'In the Guiana Forest,' 2nd edit.

confusedly, the vegetation produces tumultuous stirring of the waters, which is eminently favourable to the deposition of sand. In a somewhat similar way, waving reeds and grass stop sand driven by the wind. Planting has succeeded best as a means of stopping the encroachment of blown sand, and our sandy coasts might be similarly protected against sea-attack by sturdy plants with matted or tangled structure, and the habit to withstand salt water at their roots. Such growths appear to be at present unknown much beyond the tropics; nevertheless, this mode of protection from sea-attack might afford scope for interesting experiment in colder climates.

In the fascine dam, withies, and the like, by their yielding and subsequent recovery, reproduce one of the features of protection by a natural wall of matted mangrove or courida.

POSTSCRIPT.

The next paper which I hope to lay before the Society will be upon undulating Waves, a subject upon which I have been engaged for some time past. I endeavour to deal with waves of the sea, of lakes, and rivers; with ripple mark and ripple drift and snow ripples; with gusts of wind, and undulating air-waves and their accompanying cloud forms, with the ridging of hillsides, and with such other rock (and ice) structures as are dynamically related to undulating waves.

I shall be grateful for any help which gentlemen interested in these matters may be kind enough to afford me, particularly—

(1) By suggesting problems for investigation.
(2) By assistance in mathematical treatment.
(3) By the loan of, or reference to, photographs and other illustrations.

Before the reading of the paper, the President said: Mr. Cornish gave us a very interesting paper last year on the formation of sand-dunes, which was followed by an admirable discussion, and I feel sure that the paper he is going to read to us this afternoon will be equally interesting. I will now ask Mr. Cornish to read his paper.

After the reading of the paper, the following discussion took place :—

Dr. BLANFORD: I am afraid I cannot contribute anything of value to the discussion. It is very difficult indeed to discuss papers of this sort, which require a great deal of reading and thinking over before any one can form a judgment upon them. Of course, this paper consists partly of facts, some of which are patent to any one who looks for them, and some are less obvious, and partly of conclusions formed by the observer, and it is not fair to attempt to criticize his views without going very carefully into them. I can only say they are exceedingly interesting, and I am only too happy on this occasion, as on a former one, to bear witness to the interest of the paper.

Mr. A. STRAHAN: England is not very large, and if it were not for its shingle beaches, it would be undoubtedly a great deal smaller. They are the best protection to our shores that we can have, and the subject is therefore of much importance from a national point of view as well as a scientific problem. The application of Mr. Cornish's views to a particular example is of great interest. The example I know best is the Chesil Beach, and it would be difficult to find a better specimen of a graded shingle bank. Mr. Cornish, I hope, will forgive me when I say that I do not entirely agree with him, or perhaps I should express myself more correctly if I say that I think he has not exhausted the subject. There is a copious literature on the Chesil Beach, beginning with a paper by Sir John Coode, and including a very fine piece of work by the late Sir Joseph Prestwich. There are great difficulties in accounting for several features in the beach. In the first place, where did the material come from? in the second place, how is it now being supplied? and in the third place, why does the beach maintain its curious position at all? The beach extends from Portland to Eype, near Bridport, and is completely hemmed in at either end; nothing but the finest stuff can escape. I think Mr. Cornish will agree with me that only the finest material can escape round Portland, and that nothing but the finest stuff can be fed in, as he says, round the headland at the west end of the beach. The beach, for much of its length, is separated from the mainland by a long lagoon of shallow water 12 miles long, and cannot, therefore, be fed with stones from that part of the mainland. It seems, then, that it is starved at both ends and in the middle, and that some other sources must be found for the stones composing it. The stones themselves consist principally of chalk-flints, though there is no chalk anywhere in the neighbourhood; not anywhere so near, at any rate, as to supply flints. Amongst the stones, moreover, there are some quartzites, which must have come from Budleigh Salterton, a distance of some 20 or 30 miles. The theory formed by Prestwich to account for such stones was that they were washed into the sea from some part of the Devon coast, and brought direct to form the raised beach of Portland; that they were driven thence by storm-waves on the southern end of the Chesil Beach, and travelled in the beach north-westwards. It was supposed, also, that as they were carried they were worn smaller and smaller, and eventually passed almost into sand at the extreme end of the beach. But it always seemed difficult to me to understand how such large pebbles could get across Tor Bay. What could move them when they had got beyond the sphere of the waves? There is, however, an alternative source for these pebbles; the Tertiary strata of the Hampshire basin extend to the neighbourhood, and in a former period not improbably touched the rocks in which these pebbles are *in situ*. At any rate, they contain foreign stones of great variety, derived from that origin. Later than these, though of course altogether pre-historic, there is a set of gravels which once overspread a large part of this area, but which have now been cut by denudation into isolated patches; in those gravels I have myself seen such pebbles embedded. Now the sea is encroaching by slow degrees upon this coast. There still exist two hills on the landward side of the valley of the Fleet occupied by these gravels, and there can be no doubt that before the sea encroached upon the seaward side of that valley, there was there also a corresponding set of gravels, and that they may just as likely have contained these quartzite pebbles as the gravels on the north side. I regard the Chesil Beach, therefore, as having been formed from the sweepings of all the gravels and of the harder residuum of the rocks that once occupied the west bay, heaped up into a ridge. No doubt these stones oscillate, but I consider they are, and always have been, hemmed in effectually at each end, and that the beach is not fed from any other part of Tor Bay, but has been derived solely from the actual region in which it occurs. If the beach were fed from outside, it seems to me inevitable that it should pile itself up towards its eastern end in the direction in which it travels, and that eventually it would assume enormous dimensions. Under such circumstances it would take the form of a series of banks, such as form the promontory of Dungeness, an example of a beach which is continually growing. The only direction in which the beach can persistently travel is towards the shore. In a storm sooner or later waves reach to the top of the bank, and throw the stones on it, or even over it. There is a case on record of a ship having been thrown so high up on the beach that it was decided to launch her into the Portland Roads, as being an easier matter than to launch her into the sea again. Similarly, the stones roll over, and never get back again. They oscillate backwards and forwards with east and west winds, but once thrown over the ridge they are safe. So that it seems to me that the beach is being rolled over upon itself towards the shore. Further, I think that it is travelling faster at the Portland end than at the Bridport end, and is therefore swinging; and, for this reason, that at its west end it is more or less covered with vegetation, but that at the east end it is completely bare. The raised beach at Portland Bill seems to represent the end of the beach when it extended in a curve 2 or 3 miles further out to sea than it now runs. The application of Mr. Cornish's laws to such a beach as this will be of the highest interest. It is impossible, in a discussion limited to time, to enter into matters of detail, but I feel certain that if he continues his careful investigations in the same spirit as he has commenced them, he will attain results of the highest value.

Sir Erasmus Ommanney asked if Mr. Cornish was acquainted with the accumulation of shingle round the extremity of Dungeness point, because all these sort of projections into the Channel are formed under different influences of tide and weather. According to a measure made from the point to the lighthouse, the shingle beach is advanced at a certain ratio of a few inches every year. Could he account for this accumulation continually going on there?

Prof. George Darwin: Having been one of the first to make experiments on ripple-marks, Mr. Cornish's paper has interested me very much. But, as Dr. Blanford has said, the subject is too large a one to discuss thoroughly after only once reading this elaborate investigation. I should, however, like to ask Mr. Cornish's view on one point to which he refers. On page 640 he gives a figure illustrating the eddies which are supposed to occur at the change of tide on an open coast-line. I should like much to know how these eddies were determined, and what reason there is for believing that there are two sets of eddies, one more seaward than the other; also what evidence there is for the existence of the nodal lines shown in the figure. No doubt he has authority, but the point is so interesting that it will be well worth while to give full details as to how the motion of the water was observed. The wrinkling of hillsides is one of the topics he proposes to take next; it was a subject in which my father, Charles Darwin, was much interested when he was studying earthworms. He was not quite able to make up his mind as to the origin of these longitudinal wrinkles. He concluded, I think, that they were largely, although not entirely, due to the action of sheep grazing sideways; but I do not suppose sheep would be able to make the longitudinal paths, unless the earthworms had given them a friable substance to trample down. If I remember aright, he thought that these wrinkles also appear without the intervention of animals; but it was not possible, in the cases observed, to determine the extent of the several influences which may produce them. In conclusion, I wish to congratulate Mr. Cornish upon his interesting paper, and to wish him success in his future work.

Dr. Mill: I am unable to speak as a specialist upon this question, but I should like to call attention to its national importance. Researches in physical geography have not been made in this country with anything like the frequency and detail that has been devoted to them on the continent, and latterly in the United States of America; and I think this Society should congratulate itself on securing a man like Mr. Cornish, who is prepared to devote his whole time to the study of questions like this. Much of the paper, of course, deals with matters which have been already studied by geologists, and, although the difference between the geological and geographical standpoint is not yet so generally understood in this country as it is, for instance, in Germany or in Austria, nothing can do more to prove the claims of geography to be considered an independent science than such researches, carried on from this point of view.

Captain Wilson Barker: I do not propose to offer any criticism upon the paper, but I should like to call Mr. Cornish's attention to the remarkable reefs on the east coast of Brazil, which are probably due to the action of the wind, and which I think are well worthy of his attention, and of the application of the theories which he has brought before us in this paper. They are commonly reported as coral reefs, but it is well known that they are nothing of the sort, but are formed of mud and sand of different kinds brought down by the rivers. In the trade winds, there is often a shifting of beaches with slight alterations in direction of the wind, so that at one time of the year you get it sandy, and at another time ordinary bare rock. The places I particularly allude to are at the landing-place, Fernando Noronha, and also in the harbour of Bahia, at the entrance. There is a remarkable bank of sand in the island of Gran Canaria, between Las Palmas and Port Luz, which, I believe—quite within ordinary memory—has grown very extensively, and is formed entirely of sand. The island of Gran Canaria is of volcanic formation, and it is difficult to say where the sand comes from. The popular idea is that it has been blown across from the African continent.

Mr. Cornish: I am extremely obliged to Mr. Strahan for giving at this time these further facts with regard to the Chesil Beach. Such a subject cannot be adequately treated from a single standpoint, and although I had read the papers of Coode and Prestwich, and, I think, the greater part of that extensive literature to which Mr. Strahan refers, I did not feel myself competent to analyze the geological evidence in the way he has done. With regard to the amount of the actual difference which there remains between Mr. Strahan and myself, it practically amounts to this: that I have supposed the shingle is travelling, while Mr. Strahan, I think, limits himself to the supposition that the shingle is oscillating on the beach, and that it neither comes nor goes at the two ends. Well, that is a point which I will not labour here, because investigations of the Chesil Beach will no doubt continue, and further evidence will, I hope, show which view is the more correct. In either case, as I have shown in my paper, it is the present and not the past conditions which mainly determines the present mode of grading. Admiral Sir Erasmus Ommaney has asked a question about Dungeness. In a part of the paper which I did not read, this curious accumulation of shingle is dealt with in some detail. I am extremely glad to have heard the remarks of Prof. Darwin, whose paper on "Ripple Marks" greatly helped me when I was struggling with the difficulties of this subject of the movements of incoherent material some two years ago. With regard to Fig. 10, the chief point which I wish to bring out is the *grid* pattern of the probable positions for deposition of sand under the conditions mentioned. The existence of nodal lines approximately at right angles to the shore is commonly recognized; *e.g.* in the case of the tides of the English Channel. With regard to the B nodes, parallel to the shore, I apprehend that these are necessarily established by reflexion, and *seiches* in closed seas and channels probably co-operate with tides (see Forel in 'Le Leman,' vol. ii., on the longitudinal and transverse *seiches* of the Lake of Geneva). A *grid* arrangement of sand formations has been noted by Prof. Osborne Reynolds in a tidal estuary, and by Major MacMahon in a mountain pass in the desert between India and Persia. In the open plains of Sindh the *stripes* (B) and *bars* (A) are not laid down together, but successively as the distance from the coast increases. Such considerations, however, do not enable one to construct a satisfactory figure, and I trust that Prof. Darwin, who commands mathematics, will go more deeply into the matter. With regard to the ridging of hillsides, the Down sheep walk on the flat top, and not on the sheep-sides, and that no doubt accentuates these ridges when once they are formed. But I have seen them equally well in the slopes of the valley at Grindelwald, and I have seen them near Innsbruck, and in other places where apparently sheep do not go, and I have learned only to-day from one of the gentlemen of the geological survey that this ridging is very noticeable on the quartz screes in the Highlands, and yet other examples have been given me. Therefore, although curious structures may be produced by animals on hillsides, and although the remains of old agricultural workings will sometimes ridge a hillside, yet I think there is a true formation of pressure ridges, which, I may take it, would be analagous to undulating waves, independently of any effect that animals may produce.

Prof. Darwin: I only meant that my father could not distinguish what part of it was due to the sheep, and what was due to some natural ridging. The difficulty was to eliminate one cause from the other.

Mr. Cornish: I am much obliged to Captain Barker for pointing out certain interesting formations, and I shall hope to examine into them. In conclusion, I can only thank the gentlemen present for the kind way in which they have received the paper, and to express my gratitude in the usual way by asking for further help in connection with the paper that is coming.

The President: I feel sure that every one present will fully concur in what has been said by Prof. Darwin, Dr. Mill, and the other gentlemen who have joined in the discussion, with regard to the importance and interest which attaches to these investigations, and also with regard to the merit which belongs to Mr. Cornish for the perseverance and ability with which he has conducted them. If Mr. Cornish attaches importance to what he has said about the shingle survey, we shall be happy to report the matter to Admiral Domvile, and I have no doubt he will give it favourable consideration. If the expenses would only consist of the postage, I feel sure that matter would be easily arranged. I now propose a vote of thanks to Mr. Cornish for his valuable paper, and beg to assure him, on the part of the meeting, that we all look forward with great pleasure to hearing the other paper he has promised us.

Mr. Clement Reid (writes): I have read with great interest the proof of your paper on "Sea-Beaches and Sandbanks." It contains the explanation of many familiar coastal phenomena, the reason of which I have never clearly understood. There are only two criticisms that I should venture to make, and these may have been taken into account, though the paper is perhaps not quite clear on the point. I would suggest that it might be well to emphasize the fact that, contrary to the ordinary teaching of engineers, large shingle-beaches and sandbanks have not reached an equilibrium. As the last change of sea-level only took place in Neolithic times, and probably only some three thousand years ago, there has not yet been time for such a balance to be attained. The enormous accumulation of beach at Dungeness during the historic period shows that this historic period is no inconsiderable part of the total life of the beach.

The other point is, that the erosion of old gravel deposits at a low level has probably supplied a very large part of the material of some of the beaches analogous to the Chesil beach. In Cley beach, for instance, the accidental preservation of a single outlier of the low-level gravel in the middle of the beach preserves evidence which in a few years will be entirely destroyed. Without this it would be imagined that the whole beach was derived from one of the ends, instead of owing its origin to gravel outliers formerly in the immediate neighbourhood.

In your account of the Chesil beach, you do not allude to the fact that great part of the large pebbles at the eastern end are tough Budleigh Salterton quartzites. I should think that the life of one of these is many times the length of the life of a flint pebble—the one is slowly *rubbed* down, the other wears more rapidly by small conchoidal fractures. The proportion of these quartzites is so large towards Portland, that I suspect the nature of the material has here a good deal to do with the size of the stones.

THE LOB-NOR CONTROVERSY.*

When Dr. Sven Hedin made, in October last, a communication to the Russian Geographical Society on the discovery of what he considers to be the true historical Lob-nor, a lively discussion ensued. P. K. Kozloff, who knows the region well, as he has visited it more than once as a companion of Prjevalsky, and as a member of the last Tibet expedition, took an important part in the discussion, and now he sums up his arguments in a paper published both in the *Izvestia* of the Society and as a separate pamphlet.

The controversy, as is known, is about what is to be considered as Lake Lob-nor. No lake is called Lob-nor by the natives; they give that name to a whole region. Prjevalsky discovered an elongated lake, Kara-koshun-kul; also Kara-buran, which runs west-south-west to east-north-east in 89°-90° E. long., its south-western extremity being 35 miles south of 40° N. lat. It became known since that this lake is continued towards the east-north-east by an old lake-bed, as far as 91° E. long. On the other hand, Sven Hedin discovered a chain 30 miles long, composed of four small lakes, running north to south in the north-west of Prjevalsky's Lob-nor. Kozloff had, two years before Hedin, visited the southern lake of this chain, which lies almost under the 40th degree of latitude; but Hedin went along the eastern shore of the whole chain.

When Prjevalsky's discovery became known, Baron Richthofen contested it. He maintained that the Kara-koshun-kul cannot be the Lob-nor, which has a more northern position on a Chinese map of the region: and now Sven Hedin claims that the chain of lakes which he has discovered along an old bed of the Konche-daria must be a relic of the Lob-nor, which formerly extended in that latitude further east; while the Kara-koshun-kul is but a temporary and recent formation, which, indeed, has much decreased since Prjevalsky's first visit in 1884–85, while the northern chain of Sven Hedin's lakes has increased since. This northern chain occupies, as to its latitude, the position given to Lob-nor on the Chinese map. Richthofen wanted, moreover, to identify the southern lake (Prjevalsky's Lob-nor) with another lake, Khas-nor (or Khas-omo), marked on the Chinese map.

P. K. Kozloff proceeds systematically in his paper, and gives in it all documents relative to the controversy; especially he quotes passages from the Chinese work, 'Si-yui-Shui-dao-tsi,' published in 1823, relative to the region, and gives a reduced copy of the Chinese map published by Dr. Georg Wegener in 1863, upon which map Richthofen and Sven Hedin based their arguments. He reproduces next the texts of Prjevalsky's description of the Lob-nor, as given in his preliminary reports and travels; the geologist K. Bogdanovich's description of the same, as well as abstracts from his own diary relative to his visit, in 1893–94, to the region of the lakes discovered by Sven Hedin, and of the sandy deserts where the old bed of the Konche-daria is still seen in the north-east of Sven Hedin's lakes. He reproduces, also, the text of Hedin's description of the lake, and his remarks and arguments in favour of his hypothesis (taken from his paper, "Das Lob-nor Problem"). Finally, he publishes a map of the region, upon which all new discoveries and the journeys of Sven Hedin and Kozloff are marked. This map, alone, would be a weighty argument in the controversy.

Prjevalsky's description of the Lob-nor is well known to English readers, and it need only be mentioned that when he questioned, in 1885, during his second journey, the natives settled on the Lob-nor as to the possible existence of another lake situated northwards, they all replied in the negative, explaining at the same

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* Map, p. 692.

time that, according to tradition, the lake was always situated in the same spot where they now lived.

In the autumn of 1890 the Lob-nor was revisited by the Tibet expedition of M. V. Pevtsoff; and as his description was never published in English, some abstracts from it are reproduced here.

"The lake of Lob-nor," wrote General Pevtsoff, "represents, according to the unanimous testimony of the natives whom I questioned, a large basin, mostly covered by thick and unusually high rushes, which reach in some places the height of 28 feet, and a thickness of more than an inch. It has an oval shape, and its longer axis runs from the south-west to the north-east for more than 62 miles; its width is about 25 miles. Kunchikan-Bek, who went round the lake, informed me that he made the journey in five days, travelling at the rate of about 30 miles a day. This Bek asserts that the lake is surrounded by a vast uneven area of clay, impregnated with salt, quite sterile, and covered in places with shells. Riding on its uneven hardened surface is very difficult, and only possible near the edge of the rush, where the ground is softer and more even. In vain did Kunchikan-Bek look out for convenient spots for settlements on the shores of Lob-nor. He found none.

"In the south-western portion of the lake, near the mouth of the Yarkand-daria (Tarim), there is an area of about 7 miles in circumference, which is free from rush-growth, and where the depth is 14 feet. But of such large open basins there are few, the rest of the spaces not covered with rush being much smaller. The same portion of the lake contains a narrow channel of about 13 miles long, in which one notices a very weak current of fresh water from the Yarkand-daria (Tarim), but on both sides of this channel the water of the lake is slightly salt.

"According to the unanimous testimony of the natives, the lake Lob-nor is becoming more and more shallow every year. The old folk still remember that it was much larger and contained incomparably more open areas. In the village of Abdal, situated 2½ miles above the mouth of the Yarkand-daria (Tarim), there lived during our sojourn a man, 110 years old, named Abdul-Kerim, who represented living annals of the physical changes which took place in the lake during his long life. He was still healthy and walked about freely, but he spoke so indistinctly that only his son, Arkhei-jan, fifty-two years old, could easily understand him, and with him we often spoke of the old times. The latter transmitted from his father to me that great changes had taken place in the Lob-nor since his father's youth. The old man said that he would not have recognized his country if he had spent his life abroad and had returned home in his old age. The lake Lob-nor, during the young days of Abdul-Kerim, *i.e.* more than ninety years ago, was in its south-western portion free from the rush, which grew only in the shape of a narrow rim along the flat shores, while the open area of water in the lake was spreading to the north-east as far as the eye could see. The mouth of the Yarkand-daria at that far-off time was 2½ miles more to the west than the present one, just opposite the spot where Abdul is situated now.

"The depth of the lake was much greater than it is now, and on its shores there stood many villages, from which hardly any traces are left now. In consequence of the gradual shrinking of the lake and its getting grown over with rushes, the inhabitants of these villages were obliged to leave their sites and to settle on the lower Cherchen-daria. Thus were deserted, one after the other, the villages Tur-kul, Bayat, Lob, and Kara-koshun.

"The river Yarkand-daria (Tarim), in accordance with tradition, was flowing two hundred years ago more to the north than it now flows in its lower part, and it discharged itself into a small lake, Uchu-kul, which communicated with the

Lob-nor by a channel. This tradition was confirmed by the old man, Abdul-Kerim, who heard of it from his grandfather, during whose life the river ran still in the just-mentioned place, and afterwards changed its channel. The ancient bed of the Yarkand-daria, called at present Shirga-chapkan, is clearly visible up to the present time. There are still, here and there, stumps of trees which grew on the shores of the river. . . .

"Twenty-five miles to the south-west from Lob-nor lies another large lake, Kara-buran (black isthmus), about 38 miles in circumference.* This lake (Kara-buran), like Lob-nor, is mostly covered with high rushes. In its western part there are, however, several open areas of sweet, unusually clear water reaching 5 miles in circumference, the depth being up to 28 feet. . . . The Kara-buran is fed by the waters of the Yarkand-daria (Tarim) and the Cherchen-daria, of which the first flows into its north-eastern part, and the last one into the western part. . . .

"All along the Kara-buran, from the very mouth of Yarkand-daria, there runs, amongst the growth of rushes, a narrow channel, widening in places into lakes. In this channel a weak current is to be noticed, and one can row on it in a boat.

"The Yarkand-daria, on issuing from the lake Kara-buran, carries pure and fresh water, which, however, is not so clear as in the lake itself. This river, on the whole distance from Kara-buran to Lob-nor, has a winding bed and rather high shores, but its width does not exceed 175 feet. It flows with a velocity of about 4 feet in the second and is everywhere very deep; its length between the lakes, counting with the windings, attains 38 miles. . . .

"About 32 miles from Chighelik, near the spot Kabagassy, the Yarkand-daria receives from the left a branch of the Konche-daria, which contains plenty of water, and forms in its course a chain of four lakes. In 1880 the Konche-daria, about 22 miles from its mouth, has opened for itself a channel in a south-eastern direction into a valley, which further on turns to the south. On its way along this valley it has formed four deep lakes—Chivelik, Sogot, Talkelchin, and Tokum-kul, each of them from about 3 to 4 miles long, and about 1 or 2 miles wide, covered on the shores with high rushes. . . ."

After having reproduced the above important extracts from General Pevtsoff's work, Kozloff gives an excellent picture of the present state of Lob-nor, and very interesting conjectures as to its former development by the geologist of the Tibet expedition, K. T. Bogdanovich.† According to the observations of Bogdanovich, there are in the Lob-nor region doubtless dunes whose characteristic distribution in rows could not be accounted for otherwise than by supposing that they mark an ancient shore-line of the Lob-nor.

Kozloff gives next extracts from his own and Roborovsky's descriptions relative to the region, his visit to the southern lake of the chain of lakes discovered by Sven Hedin, and reproduces in full Sven Hedin's interesting description of the part of his journey which he made along the eastern shore of the lakes and his discovery, as given on pp. 305–361 of vol. xxxi., 1896, in the *Zeitschrift* of the Berlin Geographical Society, under the title of "Das Lop-nor Problem." The cartographical results of Sven Hedin's investigations are given by Kozloff in the map (p. 655), which is reproduced from the *Izvestia*.

After having thus brought before the reader all the necessary materials for forming an independent judgment, Kozloff takes one by one Richthofen's arguments. To the argument based on the fact that the Kara-koshun-kul is a fresh-water lake, while the Lob-nor is a salt lake, Kozloff replies that the Kara-koshun-kul

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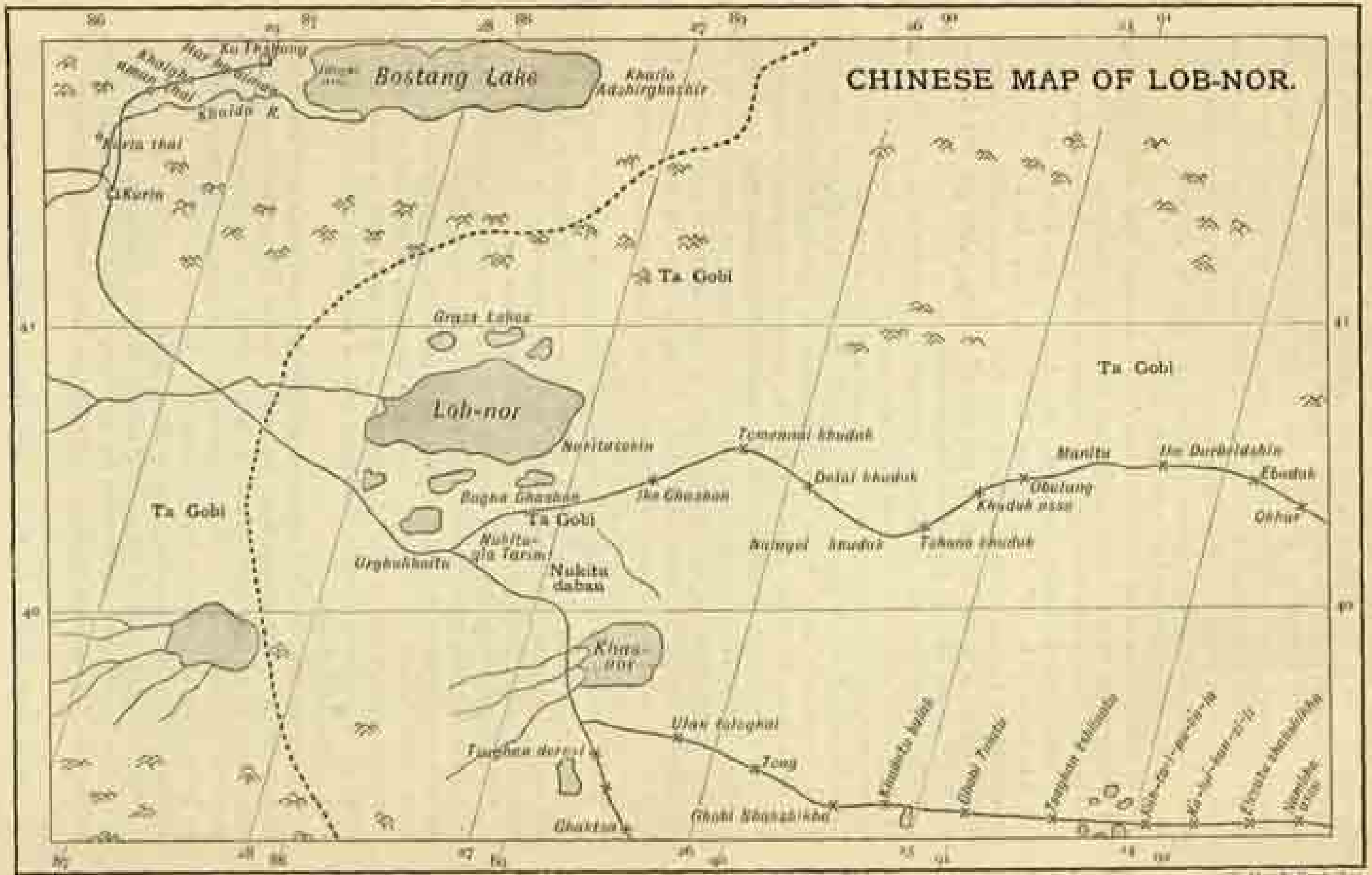
* Kara-bouran, according to Prjevalsky (Kozloff).

† 'The Works of the Tibet Expedition' (Russian), part ii., 1892, pp. 93–100.



CHINESE MAP OF LOB-NOR.
Bostang Lake
Khaido R.
Kurla thai
Kurla
Ta Gobi
Grass Lakes
Lob-nor
Ta Gobi
Nukitusahin
Tomennai khuduk
Dalai khuduk
Manitu
Ebuduk
Obutang
Khuduk ossu
Tahana khuduk
Qohur
Ta Gobi
Nukitu daban
Urghukhaitu
Khas-nor
Ulan Tulughai
Tong
Tunghan dersi
Ghaktan
Ghobi Khonakikha

contains fresh water only in the channel of the Yarkand-daria, which flows through it. As to the borders of the lake where the water does not flow, it is slightly salt, and further to the east it becomes more salt, even bitter. This was pointed out by Prjevalsky, Pevtsoff, the Prince of Orléans, Sven Hedin, and Kozloff himself. The further one proceeds from the spot, where the Yarkand-daria enters the Kara-koshun-kul, the more salt is the water, and at last even the camels refuse to drink it. The drying-up bottom of the lake is impregnated with salt, and areas of clay impregnated with salt surround it. All this is in accordance with both the historical facts and with theory.

The main argument of Richthofen was the Chinese map upon which the Lob-nor is marked one degree further north than Prjevalsky's Lob-nor. This is true, Kozloff says, but the map is wrong. The position of the spot Airylgan, where the Konche-daria joins the Tarim, was already determined by the Jesuits in 1760–65, and was found to be 40° 2′ N. lat. and 87° 23′ E. long. Its true position, as determined by General Pevtsoff, differs very little in latitude from the Jesuits' determination: it is 40° 8·7′ N. lat. and 88° 20′ E. long. And yet the Lob-nor was placed on the Chinese map much further north.

Richthofen wanted also to identify Prjevalsky's Lob-nor with the Khas-nor on the Chinese map; but the country in the south of Lob-nor is not flat on the Chinese map, as it bears between the Lob-nor and the Khas-nor an inscription, "Nukitu dahan," which means "Nukitu pass." So it is in reality, as seen from V. M. Uspensky's paper, "The Land Kuke-nor or Tsin-hai," * compiled from Chinese sources, in which paper the Nutsitu range of mountains is mentioned. The lake Khas-omo of Richthofen and Khas-nor of the Chinese map is evidently Prjevalsky's Lake Ghas, and this was pointed out at once to Sven Hedin by the Russian geographers. It also has in reality a more southern position than on the Chinese map (38° 7′ instead of 38° 15′). If the latitudes be corrected on the Chinese map according to recent determinations, the whole argument based on the Chinese map falls to the ground, Kozloff remarks.

Kozloff analyzes next Hedin's arguments based on the old course of the Konche-daria (or Kum-daria), which Kozloff visited under the 90th degree of longitude and mapped; these arguments—although very interesting—are too lengthy to be reproduced in full, but he words his conclusions as follows :—

"The Konche-daria thus took formerly a more eastern direction. Gradually its course was more and more diverted southwards, as is proved by the old beds which are now seen between the old Konche (Kum) daria and its present bed. After having thus turned full 40 to 45 degrees to the right, it took its present bed toward Airylgan, where it joins the Tarim. At any rate, even in those remote times the river flowed towards the lowest part of the desert which it watered—that is, into the Lob-nor.

"There was undoubtedly a time when the Lob-nor spread much more northwards than it does now; its western shore lay along the line Urten—Abdal—Airylgan, as is proved by the only dunes preserved in Kashgaria (see Bogdanovich's reports). As to the southern shore of Lob-nor, it occupied approximately the same position as it has now, and along it ran the road from Lob-nor to Sa-chau, which was followed six hundred years before me by Marco Polo.

"In the upper part of its shifting course, between Gherelgan and Turpan-korul, the Konche-daria shows some old dry beds, but has now a defined water-course. In the swamps adjoining Tykenlik we have the first store-basin, in

* *Memoirs (Zapiski) of the Russian Geographical Society*, "Ethnography," vol. vi. 1890.

which a first transmission of water takes place from the Konche to the Tarim—that is, to the Kunchikash-tarim, which joins the Yarkand-tarim at Airylgan, and which, therefore, the natives quite rightly named Konche-daria to Prjevalsky. The investigations made by Sven Hedin in the spring show that two-thirds of the water of the Konche-daria runs in cascades into Kok-ala, and only one-third continues to move in the former direction in a deep bed, bending abruptly in its lower half towards the south. From this remarkably long old bed—Ilek—a comparatively small branch flows into the Kunchikash-tarim above Airylgan, and a still smaller one below Airylgan to join the Yarkend-tarim. Such was, I believe, in a broad outline, the scheme of the Konche-daria before the lakes discovered by Sven-Hedin had been formed.

"The level of the water in the Konche-daria stood then somewhat higher than it stood in the Tarim, as is now the case near Tykenlik, where the Konche-daria falls in cascades into Kok-ala. From nine to fifteen years ago, the waters of the Konche-daria, always deflected westwards, so as to approach, so to say, the Tarim, came down almost to the same level as this last. At that time, just in the middle of Kunchikash-tarim, where the shores are comparatively not high and solid, a trench was formed, as the natives say, and the water ran back to the old bed Ilek, inundating the sandy and salted depression of Chiveilik, and thus revived the nearly dried-up lake-shaped valley of the Ilek; which the natives now began to name Avyuln-kul, Kara-kul, Sogot (Arka-kul), etc. A great portion of the water, however, again returns down the nearest old bed to the Yarkand-Tarim, while a very small portion only flows further down, along the more distant part of the old bed, where most of the lagoons were entirely dried up. I consider that such an abnormal deviation towards the east is merely temporary; the sand and the wind, working hand in hand, will necessarily soon raise the bed of the river, and they will thus deflect the water in its proper direction towards the west. Then the lake-shaped old bed will again begin to dry up, and while this will be going on, the Kara Koshun-kul—that is, the true Lob-nor—will continue to be further reduced in size. But several water-arteries will finally join in the principal one, the Chu-tarim, although, of course, unimportant fluctuations may take place in the mean time.

"More serious changes will happen in the future, when the Tarim will join the Konche-daria in the meridian of Kurla, and will flow in its lower part again in the bed of the Ketek-tarim, while the present basin of Lob-nor will move also south-westwards, and will form something in common with the present Kara-buran, spreading at the same time to the north and to the east; but it will hardly abandon the salty depression which from time immemorable was the bed of Lob-nor, and maintains this historical name."

Kozloff's final conclusions are the following: "The Konche-daria, since very remote times till the present day, has moved a long way. The spot Ghereigan may be taken as a spot of relative permanence of its bed, while the basis of its delta is a line traced from the farthest northern border of the area of salt clays surrounding the Lob-nor to the Tarim. At a later period the Konche-daria mostly influenced the lower Tarim, and each time a change occurred in the latter's discharge, the Konche took a more westward course, to the detriment of its old eastern branch (Ilek). Always following the gradually receding humidity, the vegetable life changed too, while moving sands were taking its place, conquering more and more ground for the desert, and marking their conquest by remains of old shore-lines. . . .

"The facts noticed by Sven Hedin have thus another meaning—the desert in the east of the lakes, which he discovered, was formed, not by Lob-nor, which is situated 1° southwards, but by the Konche-daria, in its unremitted deflection to the west. The old bed Ilek, lake-shaped in places, and having a belt of salt lagunes and swamps along its eastern shores, represents remains of waters belonging, not to Lob-nor, but to the shifting river which has abandoned this old bed.

"These facts and explanations refute the second point of the arguments which were brought forward by Sven Hedin in favour of his hypothesis, asserting the existence of some other Lob-nor.

"I accept the third point of his objections, namely, that the grandfathers of the present inhabitants of the Lob-nor lived by a lake whose position was more to the north of Lob-nor; that was mentioned already by Pevtsoff, and the lake was Uchu-kul.

"Why Marco Polo never mentioned the Lob-nor, I leave to more competent persons to decide.

"The only inference which I can make from the preceding account is that the Kara-koshun-kul is not only the Lob-nor of my lamented teacher, N. M. Prjevalsky, but also *the ancient, the historical, and the true Lob-nor* of the Chinese geographers. So it was during the last thousand years, and so will it remain, if 'the river of time' in its running has not effaced it from the face of the Earth."

NORTH-EAST NICARAGUA.*

By JOHN M. NICOL, C.E.

Nicaragua has only been half explored, and very few surveys have been made; the latter have been mostly done by compass, with the exception of those for railway and canal work. The accompanying map is copied from a reduction of the Government map, with some alterations made after going through the country myself, and after collecting all the reliable data I could get. It is, of course, not correct, but is probably the most reliable extant. The red lines indicate my various routes. I also travelled, by canoe, up the rivers Coco, Wasspook, and Pis Pis from Cabo Gracias to the Pis Pis mines, and on foot from the mines to Matagalpa. This journey took me nearly two months, and as the country is almost uninhabited, and covered with dense forests, we were often short of food, living principally on monkey meat. The area within the dotted red line is almost all of a gravel formation, with pine forests and grass land, very healthy, and free from insects.

Bluefields.—The real harbour here is just inside the lagoon behind the bluff; Bluefields town is situated on the further and shallow side of the lagoon, and is quite inaccessible to craft drawing over 14 feet of water, and even these often drag on the oyster-beds. The only way to save the town, and place it in direct communication with the steamers, would be to throw an embankment across the channel separating Deer island from the mainland, where the shallow water is only from 2 to 3 feet deep, and abundance of the necessary material could be obtained behind Bluefields. On this embankment and on a second at the other end of Deer island a tramway could be laid down, thus connecting the town with the small island opposite the bluff; and, if necessary, a further anchorage could be dredged where are now the oyster-beds, or a regular harbour could be constructed there.

The present bar averages 12 to 14 feet of water. Bluefields is a healthy little town of about 3000 inhabitants; it is well laid out on high ground, and has plenty of room for expansion. According to Dr. Garcea, the Government engineer, it is

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* Map, p. 692.

possible to make a railway from Bluefields to the interior without crossing any swamp.

Rio Grande.—The mouth of this river offers no real harbour, as there is a bad bar, averaging only 7 to 10 feet (8 feet when I crossed), and even if the bar were deepened, it would still be bad, as, the mouth being quite straight, the swell would penetrate for a long distance; besides this, the enormous quantity of *débris* brought down by the river, and the constantly shifting sandbanks at its mouth, would always cause great expense, if an attempt were made to keep open a good harbour here. Further, as the whole country round consists only of flat lowlying sands, with marshy pools and large areas of mangrove swamps, there is no site suitable for a town, nor for the construction of docks, etc., and a railway would be almost out of the question, owing to the swamps. At present there are two jetties, some Government buildings, about thirty houses, and one large and three small stores. There will always be a good traffic for coasting vessels of small size, as for a long distance the river is deep and navigable, and for a considerable mileage has an average depth of 20 feet, with a width of 300 yards.

An American company has a concession giving it an exclusive monopoly over the cutting and export of mahogany and cedar from this river; the company owns a twin-screw, two-masted, sea-going tug, called the *Yulu*, drawing about 7 feet of water. This boat can go as far up as the steamer limit marked on the map, and also makes trips to Bluefields, Rio Prinzapulca, and up the Wawa river. Above the steamer limit there are bad rapids, and navigation by canoes is even difficult.

Rio Prinzapulca.—This is only a river mouth with a bad bar, where there is often only 6 feet of water; the anchorage is bad, the river being narrow and the current swift and strong—so strong in flood-time that, when I was there, the schooner dragged her kedge and began drifting. The *Yulu* has been—in flood—as far up as Tungla; but often she has difficulty in getting over the bar. There is a stern-wheel steamer, the *Progreso*, plying regularly on the river; in flood she goes as far up as Tungla, but in dry seasons only as far as the steamer limit marked on the map. At present it takes from four to six days to descend the river from Wani by "pitpans" (dug-out canoes) and steamer, and from ten to fourteen days to go up, as the pitpans are slow travellers. Prinzapulca town is built on the swamps at the mouth of the river, and consists of about fifty wooden houses and shanties with galvanized iron roofs; the houses are built on posts, and the wooden side-walks are on posts, as the town is surrounded with swamps, and during floods the water runs under the houses. There are nine fairly large and well-stocked stores. There will always be a considerable trade carried on here, as the river is a natural, though bad, highway to the mines of Pis Pis, Siuna, and Quiquina.

Rio Kukulaya and the Waunta Lagoon.—This river is marked as large and important on the existing maps, though, according to the best information I can get, it is only a small river discharging into a lagoon, into which a few other small creeks drain; but there is no navigable water, except for Carib craft and canoes.

Rio Wawa.—This is a good-sized river, and navigable for quite a long way up. The harbour is comparatively good, the bar averaging 10 feet of water, with sometimes more; the river makes a sharp bend to the north just inside the bar, and is a safe anchorage for small craft in all winds; the sandbanks are a little higher and less swampy than either at Rio Grande or Prinzapulca. This, without any great expense, could be made into a good coasting harbour, and with steamers on the river would soon develop into a place of some importance, as it would be the nearest point to the mines of Pis Pis. The river, a short distance up, opens out into an extensive lagoon; still farther up the river is bounded by extensive forests of tropical screw-pine and pitch-pine, where for some time a steam saw-mill has been established, which supplies lumber to the coast towns. The steamer *Yulu* comes into the river frequently for cattle and lumber, and can go as far up as the steamer limit marked on the map. At the mouth of the river there is only a very small settlement, consisting of about ten houses and one small store.

Braghmans Bluff.—This is a rock promontory of high ground, the highest point being probably over 100 feet above the sea; it is covered with forest, and connects with the mainland by a strip of solid ground between the swamps, which spread widely to the right and left. This point offers a shelter to vessels in north and north-west winds; there is deep water up to 3 and 4 fathoms close to the beach, and within one mile out there is 10 fathoms. By constructing a breakwater, a harbour for ocean-going steamers could be made here, with freedom from the shifting sands and strong currents of the river harbours; also the high ground would make a good and healthy site for a large town, and it is probably the only place on this part of the coast where a railway could be brought down to the sea without crossing swamps.

Krapakia Lagoon.—This is a fine large salt-water lagoon connecting with several others. There is 9 to 10 feet of water on the bar, with deeper water inside. The lagoon is surrounded with impenetrable mangrove swamps; but small stern-wheelers could ply up the Krapakia creek as far as Krapakia village, where pine trees and solid ground commence.

Cabo Gracias a Dios.—This point lies to the south of the main mouth of the Coco or Wanks river. The town is situated on the inland shore of a lagoon 2 or 3 miles further south. The entrance to the lagoon is very shallow, with 3 feet of water, whilst the lagoon has only from 2 to 6 feet; a narrow and shallow channel connects this lagoon with the Coco river, and through this passage all the canoe traffic is carried on. One hundred years ago this was a fine harbour, but it is silting up so rapidly that it will soon be nothing but a swamp. The steamers that touch here, and even the coasting craft, have to anchor outside, and the loading and discharging is carried on by dug-out sea-going canoes.

Coco River.—This river has three mouths, besides the channel into Cabo Gracias lagoon; all the entrances are shallow and bad, which is unfortunate, as the river would be navigable for quite a long way up (see map). It is one of the largest rivers of Central America, averaging 200 to 300 yards wide, in some places 500 to 600 yards, but at its delta with only 2 to 3 feet in depth. At Andres, in flood, I have seen the water up to the houses, and 15 feet above normal level.

THE MONTHLY RECORD.

THE SOCIETY.

Honour for the President.—The King of Sweden and Norway has conferred upon the President, Sir Clements Markham, K.C.B., the honour of Commander (first class) of the Order of the Polar Star, on account of the valuable assistance and advice which he has on many occasions rendered to His Majesty's Government.

Awards of the Society for 1898.—The gold medals and other awards to distinguished travellers have been adjudged this year as follows: The Founder's Medal to Dr. Sven Hedin, for his important exploring work in Central Asia, and especially for his survey of the glaciers of Mustag-ata, for being the first explorer to cross the Takla-Makan desert, for his discovery of a new route south of the Kuen-Lun range, and for his investigation of the physical geography of the Lob region. The Patron's Medal to Lieut. R. E. Peary, U.S.N., for his explorations in Northern Greenland, dating from twelve years ago, and especially for his memorable sledge journey across the Greenland ice, and for his discovery of its northern termination. The Murchison Grant for 1898 has been awarded to Mr. H. Warington Smyth, for his important journeys in Siam; the Back Grant to Mr. George P. Tate, for his surveys in Afghanistan and Beluchistan, especially Makran, as well as at Aden and on the Indus; the Gill Memorial to Mr. E. J. Garwood, for his geographical work in Spitsbergen during 1896 and 1897 in company with Sir Martin Conway; while the Cuthbert Peek Grant has been given to Mr. Poulett Weatherley, for his exploration of the country between Lakes Mweru and Bangweolo, and for his circumnavigation of the latter lake in his steel boat, the *Vigilant*.

The Vasco da Gama Celebrations.—The celebration of the four-hundredth anniversary of the discovery of the sea-route to India was inaugurated in Portugal on May 17, by the firing of a salute of 101 guns by the forts and ships anchored in the Tagus. Later in the day a grand naval review was held, the foreign warships sent to do honour to the occasion being visited by the king in person. The ships sent by the British Government were the *Magnificent*, *Prince George*, *Repulse*, *Mars*, *Jupiter*, and *Resolution*, forming the principal section of the Channel Squadron. The Royal Geographical Society is represented, during the ceremonies at Lisbon, by Lord Dunraven, who was named by the Council as the Society's delegate. In this country the occasion has been celebrated by a special evening meeting of the Society, at which their Royal Highnesses the Prince of Wales and the Duke of York were present. An address was delivered by Sir Clements Markham, in which the persistent labours of the Portuguese, under Prince Henry the Navigator and other members of the royal family of Portugal, to open a sea-route to the East were clearly set forth, and the events of Vasco da Gama's first voyage to India briefly described. After speeches from the Portuguese *chargé d'affaires* and Lord George Hamilton, the Prince of Wales read to the meeting telegrams of congratulation which had been exchanged between himself and the King of Portugal, and expressed, on behalf of the British nation, the cordial sympathy here felt for the celebrations then taken place in Lisbon. The Hakluyt Society has taken its part in the celebration by the publication, for the first time in English, of the 'Roteiro' of Vasco da Gama's first voyage, ably edited by Mr. Ravenstein, and illustrated by portraits of the Portuguese admiral, and by representations of his ships, and of places and objects of interest in connection with the voyage.

EUROPE.

The Seventieth Anniversary of the Founding of the Berlin Geographical Society was celebrated on May 25, a special meeting being held at 6 p.m., followed by a dinner in honour of the occasion. The celebration of the discovery of the sea-route to India was combined with the more special object of the meeting, papers being read by Dr. Sophus Ruge and Dr. Georg Wegener on "Vasco da Gama" and on "India of To-day" respectively, after an address by the President on the work of the Society during the last five years.

The Climate of London.—In a paper on the daily values of the non-instrumental meteorological phenomena in London from 1763 to 1896, published in the *Quarterly Journal* of the Royal Meteorological Society, vol. xxiv. (1898) p. 31, Mr. R. C. Mossmann continues his laborious investigation into the variations of local climate. The general results may be given under the head of each of the phenomena which is considered. Thunderstorms practically do not occur in London between October and April. The maximum frequency occurs in July, especially between July 14 and 20, but July 6 is credited with twenty-two thunderstorms, five more than are recorded for any other day. Mist and fog show an almost opposite seasonal distribution, dense fogs scarcely ever occurring between May and August, but becoming very numerous from October to December. The period of most frequent and also of densest fogs is from November 5 to 24, the 23rd having the highest record of dense fogs. Snow has been recorded in London in every month except June, July, and August. It is most common in January, February, and March. The period when snowstorms are most frequent is at the beginning of January, and again at the beginning of March. Hail is most common in April. Gales are most frequent at the end of January, the beginning of March, and the middle of December, and least frequent from May to September.

Geological Desert Conditions in the British Islands.—Mr. J. G. Goodchild has published in the *Transactions* of the Edinburgh Geological Society, vol. vii. (1897) p. 203, an interesting paper on "Desert Conditions in the British Islands." He first defines desert conditions as those induced by a rainfall so small as to be insufficient for the maintenance of any form of vegetable life not specially adapted by evolution to stand desert conditions, and, taking this limit as anything less than 10 inches per annum, he shows how characteristic is the action of denudation in deserts. Following Walther's researches, he points out how the increased radiation, due to the absence of water-vapour in the atmosphere, tends to the rapid disintegration of crystalline rocks by the different expansion and contraction of their constituent minerals. The sand so produced is rounded by wind-drift in an unmistakable manner, the grains being entirely different from those of sea-sand. Proceeding farther to consider the sedimentary rocks formed by the consolidation of desert sands, Mr. Goodchild carefully examines the various structures as preserved in the sedimentary strata, or as modified in the metamorphic rocks. From this he deduces the occurrence of several periods when desert conditions of climate prevailed in Great Britain. The New Red (Permian) rocks show, by their well-rounded sand-grains covered by ferric oxide, by their exaggerated false bedding, and by their breccias of rough blocks akin to the screes formed in wadies by sudden torrents, that at that period, when continental Europe was under water, our islands occupied the desert heart of a continental area. Similar evidence points to desert conditions having prevailed during a great part of the Old Red Sandstone (Devonian) period; the exceptional durability of the Caithness flagstones being due to their permeation by bituminous matter formed in the internal lake-basins of a desert. Mr. Goodchild finds evidence of the most striking desert-period of all in the very ancient Torridonian rocks of the north-west of Scotland, which he finds to present striking analogies with the formations now being laid down in the Sinaitic peninsula. It need not be pointed out that the whole of this geological argument depends upon geographical conditions now prevailing, from the study of which evidence of past distribution of land and sea may be obtained.

Rainfall of Seathwaite.—The rainfall of Seathwaite in Borrowdale is perhaps the greatest in any part of the British Islands, and the records obtained during the fifty years 1845–94 have already been discussed by Mr. J. G. Symons, F.R.S. Mr. W. Marriott has a paper in the last number of the *Quarterly Journal* of the Royal Meteorological Society (vol. xxiv., 1898, p. 42), on the records obtained by the Seathwaite rain-gauge belonging to that Society from 1881 to 1897. The mean annual rainfall for the fifty years discussed by Mr. Symons was 137 inches; that found for the last seventeen years is 130 inches. The rainiest year in this period was 1882, when 146 inches were registered; the driest 1895, when the rainfall was just under 100 inches. The greatest recorded fall for any one day was 8 inches on November 12, 1897; but falls of 6 inches and over have been recorded at Seathwaite on eleven occasions since 1845. The heaviness of the rainfall appears to be proportional to the strength of the wind. The curious fact that Seathwaite lies on the sheltered side of the mountain barrier that faces the rain-bearing south-west winds, is explained by Mr. Marriott as follows. The wind, rushing up Wasdale and Langdale, is thrown up by the steep ascents at the head of those valleys, and continuing to rise and to move forward after reaching the summit-passes, the maximum cooling effect and consequently the maximum precipitation occur at a point directly over the sheltered valley on the lee side. It is interesting to note the difference between the action of rain-bearing winds on a mountain range reaching to or approaching the snow-line where all the precipitation takes place upon the exposed slope, with that on a barrier of hills like those of the Lake District, where the valleys of the lee side are subject to a heavier precipitation than the weather slopes.

A Local "Magnetic Pole."—At a meeting of the Academy of Sciences of Paris on May 9 (*Comptes Rendus*, cxxv. (1889), p. 1380), M. Mascart announced that Prof. Leist of Moscow had discovered a curious magnetic disturbance at Kochetovka, in the government of Kursk. At this place there was a point at which the horizontal magnetic needle pointed indifferently in any direction, and the dipping-needle was vertical. The phenomenon was so local that at a distance of 70 feet from the centre of vertical dip the declination decreases by 1°.

ASIA.

An Indian Province.*—Although many excellent accounts of India as a whole exist, the vast size of the country and its varying conditions of life make it impossible that these should deal in a satisfactory way with many points of detail respecting particular parts of the empire. An exhaustive study of a limited area, such as Mr. Crooke has supplied for the North-Western Provinces, is therefore of much value. The author, whose position as director of the Ethnographical Survey of the province has placed at his disposal a large amount of trustworthy information with regard to its inhabitants, has aimed chiefly at pourtraying the present condition of the people in its social aspect, but, in order to clearly explain their environment, he begins with a useful sketch of the land in its physical aspect. Although the fact that the area known as the North-West Provinces and Oudh is at

* 'The North-Western Provinces of India, their History, Ethnology, and Administration.' By W. Crooke. London: Methuen, 1897.

present a single administrative unit makes it convenient to treat the province as a whole, the author points out that its boundaries nowhere agree with the physical conditions by which it is dominated, and that its present frontier is neither ethnical nor linguistic. It includes in the north-west a portion of the higher Himalayan ranges, while in the east it does not even include the *tarai* at the foot of the mountains. In the south, again, it includes districts naturally belonging rather to Rajputana and Central India. It therefore presents extraordinary diversity of physical aspect, scenery, and climate, the only country with which a comparison is possible in this respect being Peru. Mr. Crooke describes in turn the three main, strongly contrasted, physical divisions of the province, the great plain of the Jumna and Ganges, which includes about 72 per cent. of the area and 89 per cent. of the total population, of course receiving the largest share of attention. In subsequent chapters the history of the province, the ethnology, social and religious life of the people, and their relation to their present rulers, are fully dealt with.

On the Geology of the Tian Shan.—We have received from Mr. George Macartney, the British Agent in Kashgar, the following geological notes made by Prof. Karl Futterer, who is at present engaged in the exploration of Central Asia. The geological observations show a striking difference between the structure of the western and central parts of the mountain range and its eastern spurs stretching as far as the region of Kashgar. On the Russian map of Ferghana (Sheet 7) the most exact representation of this mountain region, the name Alai ridge is applied to a high mountain chain running from west to east, and reaching to Terek Davan (c. 73° 30′ E. long.). From this point the direction of the principal chain changes, and, after the Beleuli pass, assumes a northern and north-eastern direction to Ain-Tapam. These parts bear the name of Baksu Beleuli, and in 72° 45′ E. long. there branches on the north from the chief Alai range a chain with high summits which runs parallel to the north-eastern ridge of the Alai. The great Alai valley belonging to the basin of the Amu Daria divides these Alai ranges from the equally east-and-west running ridge of the Trans-Alai, the eastern continuation of which is found in Mustag-tau. The geological structure on the road between Osh and Kashgar corresponded to the configuration. The strata ran in west-to-east and north-to-south directions. The latter dominated the ancient rocks, clay slates, phyllites, and Palæozoic sediments, which occurred from Gulcha to the neighbourhood of Irkeshtam, and usually showed a high or even vertical dip. These north-and-south running bands showed only a slight western extension. A much consolidated limestone and marl also occurred, and from the fossils they contained they belong to the younger Mesozoic or older Tertiary formation. Between Gulcha and Sufi Korghan, as well as near Irkeshtam, these rocks appear strongly folded and tilted with a north-and-south strike. In the mountains east of Irkeshtam most of the sedimentary rocks belong to the younger formations, probably only of Tertiary age. They are sandstones with gypsum and coarse conglomerates of enormous thickness, and without exception they have an east-to-west strike. In the ancient rocks of the higher mountains the strata also exhibit a north-and-south strike; they are much folded and show a dark brittle limestone, which is to be found eastward from Irkeshtam to a small pass west of Eghin with the same strike and vertical dip. Recent sandstones with a strike running west-south-west and east-north-east occur quite near. It follows from this observation that the folding of the ancient part of the mountains (schist, Palæozoic rocks, and perhaps also late Mesozoic formations) occurred in one or probably several phases. One folding and compression took a north-and-south direction; but a criterion is wanting as to whether the disturbing forces acted from the east or from the west. A second and later period of folding, which acted almost exactly at right angles to the first, ridged up the more recent limestones, sandstones, and conglomerates, the strike of which is from east to west. It is noteworthy that traces of these directions of folding also occur in the western part of the mountains, but outside of the crystalline zone. Thus, for example, the great conglomerates in the mountains north of Gulcha have an east-to-west strike, while further west, at Kaplan-Kulit, they run quite normally almost from north to south. Between Gulcha and Sufi-Kurghan two great granite masses are cut through by the Gulcha river in deep, narrow, picturesque gorges; between the granite the highly tilted phyllite shows a splendid contact-metamorphosis into a sort of calcium silicate hornstone, the granite at the same time showing traces of foliation and mechanical alteration. True gneisses, micaschists, or other fundamental formations are never found, not even as river pebbles. On the contrary, phyllitic rocks and altered sedimentary strata take a great place. Palæozoic limestones with fossils of an age not yet exactly determined (corals, crinoids and brachiopoda) were found on the east side of the Terek Davan, near Koksu. Fossils with a great predominance of *Ostrea* in a formation apparently belonging to the Upper Cretaceous, were found abundantly near Kizil-Kurghan between Gulcha and Sufi-Kurghan, near Gulcha itself in Irkeshtam, and to the east of that place. Old river terraces are splendidly developed everywhere in the mountains. Traces of them are found high up on the valley walls, and especially in the east several perfect terraces may be seen rising one above another at different levels. At the junction of tributary valleys with the main valleys there are fine examples of loess-covered alluvial fans (delta formations) which have been cut through by the stream, and a second or secondary fan formed further down toward the main river. On the borders of the Tarim basin æolian deposits begin to acquire great importance, and in the neighbourhood of Kashgar the efflorescence of Glauber's salt, which covers the ground like snow, bears evidence to the insufficiency of the rainfall. In the remaining part of the journey, proceeding from Kashgar by Aksu, Turfan, and Khami, to the northern border of the Tarim basin, and thence through the Gobi Desert to the central Kwen-lun (Nan Shan mountains), the attention of the expedition will be specially directed to the formation and origin of the different kinds of soil formed from different rocks by the influence of the desert climate and to the formation of salts upon the surface.

Captain Deasy in Central Asia.—A second communication has been received from Captain Deasy (*ante*, p. 544), dated Yarkand, March 2, in which he announces his return to that place after an unsuccessful attempt to ascend the Yarkand river to the west end of Raskam. Owing to a sudden burst of hot weather, the ice on the river broke up fully a month earlier than usual, and he was compelled to give up the attempt. He is able to state, however, that the true course of the stream from about 37° N., 75° 56′ E., is northerly to Langar (37° 41′ N., 76° 14′ E. approximately), and thence almost due north to Kosarab, about three-quarters of a mile west of which it makes a sharp bend to the east. This agrees on the whole with the earlier delineation of the river, previous to Gromchefski's journey, it having been shown even in Shaw's map (1871) as flowing north by Langar to Kosarab, although the longitudes there given are much too far to the east. Captain Deasy visited both Kosarab and Langar, but though within a few miles of the Khandar Dawan, leading to the Mariom Pamir, a heavy fall of snow prevented him from getting his animals across. He was able to get good longitudes by chronometer, his observations being taken with a 6-inch transit theodolite, by Troughton and Sims. The whole country explored since leaving the Taghdumbash Pamir was excessively difficult, consisting of very deep narrow valleys, bounded by barren and precipitous mountains. The Sandal Dawan in particular (not marked on any map) presented almost insurmountable obstacles. Captain Deasy met with great courtesy on the part of the Chinese officials, but complains of the extreme difficulty of obtaining trustworthy information with regard to the routes. In a postscript, dated March 31, he announces his intention of starting at an early date to examine the ruins in the Takla Makan, after accomplishing which he hopes to do some exploring in hitherto unvisited regions.

Lake Gokcha.—Prof. T. McKenny Hughes describes in *Nature*, vol. 57 (1898), p. 392, part of his recent journey in Russian Armenia, and in particular his observations on the geology of the country round the Gokcha lake. The situation of this great lake is remarkable; it lies along the edge of the Armenian tableland, over 6000 feet above sea-level, for 43 miles in length, and its breadth in some places exceeds 20 miles. The valley of the Araxes lies far below it, and the lake appears to be barred in by moraine-like ridges. These are not, however, ridges of glacial origin blocking a long narrow valley; but streams of solid lava poured out in front of the steep mountain slope and shutting in against it a basin which has become filled with water and forms the great lake. A narrow stream has cut an outlet at Elenofka, through the more profoundly weathered portion of the lava; but the channel is small, and full even at low water. Prof. Hughes suggests that, when the level of the lake rises, the surplus water escapes by percolation through broken or scoriaceous rocks to other outlets. The maximum depth of Lake Gokcha is usually supposed to be 360 feet, but much remains to be done before the structure and history of the interesting volcanic region of its basin are fully understood.

Expedition of Count Zichy to Central Asia and Siberia.—On March 13 last, Count Eugen Zichy started on an exploring journey, which he has undertaken for the purpose of a thorough investigation regarding the original home and subsequent wanderings of the Magyars, down to their arrival in their present habitation. He will first proceed by way of Tiflis to the country inhabited by the Bashkirs, and the districts south-east of Lake Balkash, in order there to study the remnants of the Hungarian tribes, which, it is thought, reached that region and remained there. He will then continue his journey by way of Omsk and Tomsk to Irkutsk and the districts east and south-east of Lake Baikal, and there make inquiries with regard to the remnants of the Huns dwelling in those parts. Count Zichy, whose energy and determination are well known, will be supported by three scientific experts. One of these, the well-known geographer and ethnologist, Johann Janko, has already carried out preliminary studies in St. Petersburg and Helsingfors; he joined Count Zichy in March at Tiflis. The latter hopes to proceed from Urga across the Gobi to Peking, and thence to Mukden and other Manchurian towns. He thinks it not impossible that he may find there the national records taken from Hungary by Batu Khan in 1241, and carried with him as trophies on his return home in the spring of 1242.

AFRICA.

The Position of Insalah.—M. Foureau, the well-known Saharan explorer, has a note in the *Comptes Rendus* of the Paris Geographical Society, in which he gives his reasons for supposing the longitude of Insalah to be given on our maps far to the west of its true position. The question is important, as on the position of this point the whole of the cartography of Tuat and the neighbouring region has been based. Astronomical observations were supposed to have been made there by Major Laing in 1825, and his assumed position was used by map-makers for over half a century. His notes, however, were never published, and a strange discrepancy is noticeable in the statements as to his longitude of Insalah, a writer in the *Quarterly Review* (vol. 38, 1828) giving it as 2° 15′ E. of Greenwich, while Jomard was informed by General Sabine that Laing had found it to be in 1° 51′ E.

In any case, great dependence could not be placed on Laing's result, as his instruments are known to have been damaged during his journey. Hassenstein, in his memoir on his map of Rohlfs' journey (*Petermanns Mitteilungen*, 1865), discusses the position of Insalah, and is inclined to place it in long. 2° 10′ E., or 5′ W. of Laing's position as given in the *Quarterly Review*, while he gives the probable latitude as 27¼° N., or 19′ to the north of Laing's position. M. Foureau has held for some years that the true longitude was about 2° 43′ E. of Greenwich, or 28′ E. of the most easterly position hitherto assigned to the place. He now shows that the astronomical determinations by M. Flamand during his mission to Gurara in 1896 support his view, by showing that other places in the same region must be shifted between 22′ and 38′ to the east, a result corroborated by the itineraries of other officers in the same country. The same number of the *Comptes Rendus* contains a list of M. Foureau's own astronomical determinations of positions, made during his journey of last summer to the country of the Tuareg. His attempt to penetrate further southward was then frustrated merely through want of means to pay the Tuareg for their co-operation. A strong party well supplied should, he thinks, have no difficulty in crossing the Sahara (*Comptes Rendus*, Paris G.S., 1897, p. 350).

Mr. Silva White's Journey to the Siwa Oasis.—Mr. A. Silva White has lately made a bold but unsuccessful attempt to reach the oasis of Jarabub, the stronghold of the powerful Senussi sect of Mohammedans, situated beyond the Siwa oasis, on the line of depression which runs between Egypt and Tripoli parallel to the shore of the Mediterranean. No European seems to have yet visited the oasis, although Rohlfs in 1869 passed within a short distance of it, and was subsequently told that he would have been well received there. Of late years it has been entirely closed to Europeans owing to the fanaticism of its inhabitants. Mr. White started from Cairo with seven attendants, not one of whom was aware of the intended destination. Siwa was reached in nineteen days, and Mr. White was cordially received by the Egyptian governor and the chief headmen, but the Senussi Skeikhs, whose duty it is to prevent Europeans from proceeding westwards towards Tripoli, informed him that his life would be in danger if he persisted in his endeavour. His men, with one exception, refusing to proceed, Mr. White was compelled to relinquish the idea. He stayed some days at Siwa, however, and was able to explore parts of the oasis not previously seen by Europeans, taking a large number of photographs, and bringing away copies of hieroglyphs dating from 1200 B.C.

The Basikunu District, west of Timbuktu.—M. Vuillot contributes to the *Comptes Rendus* of the Paris Geographical Society (1898, No. 2), and to the *Bulletin de l'Afrique Française* (March), notes on the region west of Timbuktu lately traversed by French officers, accompanied by sketch-maps; that in the latter periodical being on the scale of 1 : 1,000,000. Basikunu, which was temporarily occupied by the French in 1897, lies on the borders of the Sahara in about 16° N. and 5¼° E., or about 200 miles west-south-west of Timbuktu. The various routes leading to it from the Niger, Lake Faguibini, etc., as well as those leading north across the Sahara, are shown in M. Vuillot's map. Those from the former direction are well provided with water, and although the direct route north to the Saharan town of Walata is waterless, wells are found on a route *viâ* Neme bending slightly to the west. The subterranean layer of water is at a much smaller depth in this direction than it is to the east of Basikunu. The country generally is thickly covered with acacias and mimosas, and supports large flocks of sheep and goats. Around the towns there are immense fields of corn (millet, wheat, barley, etc.), the environs of Basikunu being exceptionally fertile; while Neme is surrounded by luxuriant groves of date palms. Basikunu occupies a very important position from its command of trade routes, and M. Vuillot urges the importance of its occupation by France as a preliminary to that of Walata and Arauan.

M. Dubois in the Bend of the Niger.—We learn from the *Revue Française* for April, that M. Félix Dubois, author of 'Tombouctou la Mystérieuse,' returned in March from an exploring journey in the French Sudan. He is said to have crossed the country within the bend of the Niger from the Upper river to Say, and thence to have made his way to Dahome, visiting Mossi and Gurma *en route*. By this land-journey he will have supplemented the results of the river-journeys of Toutée and Hourst.

The Uganda Railway.—The time and fare table for the section of the Uganda railway now open for public traffic, is published in the *Zanzibar Gazette*, having come into force on April 2. First, second, and third-class passengers are booked between any stations as far as Voi, a little north of the Ndara hills, and just 100 miles from the coast. In this distance there are nine stations, in addition to the termini. Each day (except Sundays) the train makes the journey in one direction, returning the following day, so that the service consists of three trains a week in each direction. Starting from Kilindini (the port of Mombasa) at 7.20 a.m., the train reaches Voi at 4 p.m. (or 16^h according to the timing employed). Thus, in the space of little over eight hours, a distance is traversed which, in the days of caravans, represented an arduous march of several days, including the passage of the waterless Taru desert, and there can be no doubt that even this comparatively small section will prove of immense advantage as a means of access to the interior. Voi is, according to the railway survey map, at a height of 1650 feet above the sea. The fares from Kilindini to Voi are respectively Rs. 38, Rs. 19, and Rs. 3 as. 3, or roughly 6*d.*, 3*d.*, and ½*d.* per mile, for the three classes.

Major Gibbons' New Expedition.—Major Gibbons, whose excellent surveying work in the region of the Upper Zambezi is well known to our readers, has just completed his preparations for a new expedition to the same part of South Africa, on which he will be accompanied by six Europeans, including a mineralogist, an ornithologist, and a taxidermist. He hopes to ascend the Zambezi from its mouth to 15° S. lat., and there take up his surveying work, which he will continue if possible to the sources of the river, returning either by the Congo or by Lake Tanganyika and Uganda. The journey is expected to last fifteen months.

English Expedition to Lake Rukwa.—Following on the German expeditions to Lake Rukwa, lately noticed in our pages, comes the news of a journey by an Englishman, Mr. Wallace, which seems to have cleared up the doubt as to the present extent of the lake. A short account of the journey, derived from a letter written by Mr. Wallace from Ujiji, appears in the *Deutsche Kolonialblatt* for April 1. The English traveller appears to have made the complete circuit of the lake, which he reached by following down the Saisi to its mouth, afterwards passing round the south end and up the north-east shore. In lat. 7° 40′ S., he crossed the plain to the south-west side, and proceeded down that side to the Saisi mouth once more. He then made his way to Abercorn, at the south of Tanganyika. Mr. Wallace found open water for a distance of 25 geographical miles only from north-west to south-east, the greatest breadth being 12 geographical miles. The lake lies at the south-east corner of a wide plain, varying from 20 to 30 geographical miles in breadth. Beyond the open water, in a north-westerly direction, a narrow, by no means deep, swamp extends for 30 miles along the north-east margin of the plain, and is followed by a bare, muddy flat, 20 miles long, dry at the time of Mr. Wallace's visit. The Saisi and Songwe streams, which enter Rukwa in the south, are of about equal size. Along the north-east side there were few stream-beds, all of them dry. The Kafna and Lunga (? Katuma and Rungwa) appear also to dry up before reaching the plain. There is a fair population on both sides of the lake, but water is scarce and bad; game, of two or three kinds only, was everywhere abundant. Mr. Wallace thinks that in the wet season the lake may have a length of 75 to 80 geographical miles, with an average breadth of 15 or 16 miles, and a depth of 3 to 5 feet.

Rock-painting in Manicaland.—Mr. Harry Good writes that, while exploring the geology of Mount Melinjio (about 6000 feet), situated to the west of Umtali, he came upon a rock-painting near the summit, evidently of great antiquity. It represents two elephants and another animal, too indistinct to recognize. A small spring of water hidden by rocks was discovered in the direction the animals were shown to be making for, and the writer believes that the object of the picture may have been to show the way to the water, as the stream did not reappear lower down the mountain. The figures are drawn in good proportion, and are coloured of a reddish-brown tint. No information respecting the picture could be obtained from the natives.

The Anglo-Abyssinian Boundary.—We regret that, owing to a mistake as to the locality of Mount Egu, the new frontier of British Somaliland is incorrectly shown on our map given on p. 293 of the present volume of the *Journal*. The mistake arose through the confusion of the halting-place Egu, a few miles north of Harar, with the "Mount Egu," which, with the mountains of Sau, is mentioned in the treaty as determining the frontier beyond Somadu. These names appear on few of the existing maps, but both may be found on the "Carta dimostrativa dell' Etiopia," in eight sheets, compiled by Captain E. de Chaurand for the Italian War Office in 1894. Both lie roughly in a straight line with Somadu and Mega Medir, so that the whole south-western angle of the British Protectorate, as shown on our map, has now to be cut off.

AMERICA.

Dr. O. Nordenskiold's Expedition to Alaska.—Dr. Otto Nordenskiöld, the leader of the late Swedish Expedition to Patagonia, has started on an expedition to Alaska, for the purpose of geological exploration in that country and the neighbouring British territory around Klondike. Two assistants will accompany him, and the collection of ethnographical objects forms part of the programme.

Boundary Line between Idaho and Montana.—The following particulars regarding the determination of the boundary line between Idaho and Montana appear in a recent number of the *Bulletin* of the American Geographical Society. In the Sundry Civil Bill, approved June 4, 1897, an appropriation was made for surveying the boundary line between Idaho and Montana, beginning at the intersection of the 39th meridian west from Washington (or 116° 3′ 0″·60 west from Greenwich), with the boundary line between the United States and the British possessions, then following this 39th meridian south until it reaches the summit of the Bitter Root mountains, this line being in all about 70 miles in length. It lies within some of the wildest and least known portions of the United States, and crosses a number of large rivers. In locating the position of the 39th meridian a base was taken in the vicinity of the city of Spokane, Washington; from known points here triangulation was continued westward to the summits of the Bitter Root Mountains, and thence in a belt having a general northerly and southerly position, certain points being determined near the designated meridian. A sufficient number of points have been fixed, so that it will be practicable during the season of 1898 to locate positions for the monuments marking the meridian. Temporary marks are to be established on preliminary or random lines, and when the true line has been determined monuments will be erected. Distances along the line are to be measured by chaining, or by stadia, where the slopes are so precipitous that they cannot be crossed. The photographs taken along the course of this boundary exhibit a country of extraordinary roughness and complication of structure.

The Modern Mississippi Problem.—Mr. W. J. McGee discusses the history and present position of the study of the greatest river of North America in the *National Geographic Magazine*, vol. ix. (1898) p. 24. He points out that the earlier inquiries turned mainly on the utilization of the river as a means of transportation. Steam navigation began in 1811, and speedily led to the development of the country bordering the river, and the establishment of numerous great towns on its banks. But a third of the towns were in time deserted by the ever-changing channels of the mighty river, a quarter were invaded by the current, and only a third or a quarter were reached by the railways which had grown into the successful rivals of the river in carrying traffic. The railway has conquered. The only remaining river-towns are those which form good railway centres; the palatial passenger steamers, once the finest in the world, have disappeared, and the current of traffic on the river has sunk to one-half or less. At the present time the engrossing problem of the Mississippi is how to preserve the immensely fertile flat plains bordering the river from devastation by the stream itself. When these bottom-lands began to be utilized the natural *levees* or banks of the river were raised artificially to reduce the risk of floods; but this has only rendered the effects of a flood more disastrous when it takes place. Consequently, the Weather Bureau of the United States has established a special service for the study of flood-phenomena, and the prediction of their occurrence.

AUSTRALASIA AND OCEANIC ISLANDS.

Rusden's 'History of Australia.'—Mr. G. W. Rusden has issued a new edition of his 'History of Australia,'* first published in 1883. A preliminary account is given of the history of the discovery of Australia, of its physical geography, and native tribes. This is followed by the detailed history of Australian colonization from the landing of Governor Phillip and the founding of Sydney in 1788 down to 1897. The history of exploration in the interior of Australia is fully treated, and the resources of the continent, both natural and derived, are discussed in a thorough manner. A series of statistical tables are supplied, comparing the resources and present conditions of the several colonies, and the text of a draft bill for creating a Commonwealth of Australia is given as an appendix. There is a full index admitting of easy reference to all the subjects treated in the work.

The Gladstone Colony in Queensland.—The history of the town of Gladstone,† in Queensland, affords some interesting reminiscences of an almost forgotten colonial experiment. Gladstone is situated on the fine bay of Port Curtis in 24° S., south of the mouth of Fitzroy river, and the site of the landing of the Spanish navigator, De Quiros, in 1606, according to Cardinal Moran, Archbishop of Sydney. In 1846 Mr. Gladstone formulated the proposal of establishing a new colony, to be called North Australia, to which convicts might be sent under special restrictions, after public opinion in Sydney had stopped transportation to New South Wales.

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* 'History of Australia,' by G. W. Rusden. 3 vols. Melbourne: Melville, Mullen, and Slade, 1897.

† 'The Gladstone Colony, an unwritten chapter of Australian History,' by James Francis Hogan, M.P. London: T. Fisher Unwin, 1898.

On January 30, 1847, the colony of North Australia was duly proclaimed at Port Curtis by Colonel Barney; but in the next year a change of government at home led to the abandonment of the project, and the decree was rescinded. The settlement, however, remained, and grew by the immigration of free settlers. When the colony of Queensland was ultimately established, Gladstone was a serious rival to Brisbane as the site of the capital. In 1858 the discovery of gold caused a rush of diggers, and Gladstone was the Dawson City of the hour; but in a few months thousands left again hopeless of success. Rockhampton became the centre of the gold-fields, when, some years later, they were found to be really of great value; but its possession of the best harbour in Australia, next to Sydney, enabled Gladstone to recover from the damage done by the gold rush, and the approaching completion of the railway from Brisbane will place it in an exceedingly favourable position for further growth.

Irrigation of the Mallee District in Victoria.—Several schemes have lately been set on foot for carrying water into the arid district known as the Mallee, situated to the south of the Murray river near its confluence with the Murrumbidgee, for which no artesian supply can be obtained. Details regarding these were given in the *Melbourne Argus* for December 13, 1897, whilst the most recent developments of the question are recorded in the same journal, in its issue of February 7. It had been pointed out by Mr. Melville that Sea lake and Lake Tyrell in the Mallee are below the flood-level of the Murray at Swan Hill, and, in order to test the feasibility of the scheme proposed by him, the Victorian Government commissioned Mr. Cecchi, of the Water Supply Department, to fully investigate the matter. He is said to have endorsed Mr. Melville's views, and to have found that the flood-waters of the Murray could be carried by gravitation to the portions of the Mallee for which a supply is still needed, without any need for pumping. Improvements on the existing works on the Avoca and Avon rivers are also contemplated, whilst a proposal to form a large storage basin at Lake Lonsdale, in the Grampians, is said to have been approved by the Minister of Water Supply. The *Argus* gives a sketch-map showing the Mallee lands which have, so far, been made available for cultivation.

Clipperton Atoll.—Two communications have recently been read before the Geological Society on Clipperton atoll—the first by Rear-Admiral Sir W. J. Wharton, and the second by Mr. J. J. H. Teall. This atoll, situated in the Pacific in lat. 10° 17′ N., long. 109° 13′ W., possesses a lagoon which is now completely cut off from the sea. In this is a perfectly round hole, where soundings of 20 fathoms or more are reported. On the coral ring there rises a mass of modified trachyte—the subject of the second communication—about 60 feet in height. In Sir Wm. Wharton's opinion, the great depth of the lagoon and the rock-mass on the ring are not compatible with the origin of the reef by subsidence or outward growth; and the possible hypothesis is put forth that this reef had grown on the lip of a volcanic crater or on an island, such as Krakatao, in which the interior has been enlarged and deepened by volcanic explosion. In the discussion, Prof. Clowes stated that, from a chemical standpoint, Mr. Teall had fully proved an extremely interesting case of chemical metamorphosis. Dr. Blanford did not agree with Admiral Wharton that the facts as stated are incompatible with subsidence. He pointed out that neither a volcanic crater with a distinct rim, nor a lava-flow, such as the phosphatized trachyte appeared to have been originally, could be of submarine origin; nor was it probable that either originated on a level with the surface of the sea. In his opinion it was more likely that both crater-rim and lava were formed above the sea, and had been depressed. Sir A. Geikie could see no reason why a volcanic crater should not be formed below the surface of the sea;

but the Clipperton crater may have been of the same explosive origin as that of Santorin, and its solitary rocky peak may be the only remaining visible fragment of its rim. With regard to the supposed impossibility of lavas having flowed under the sea, he observed that no facts in the geological history of Britain were more abundantly proved than that from the earliest Palæozoic periods the vast majority of the volcanic eruptions in our region have been submarine, and that they have included the outflow of lava, the solid, unbroken sheets of which are now found intercalated between strata full of marine organisms.

Ethnographic Investigations in Sumatra.—Dr. Volz, of Breslau, who is engaged in geological and ethnological investigations in Sumatra, has lately (February, 1898), in company with Herr von Autenrieth, made a journey through the Batak country in the northern part of the island, on the shores of Lake Toba. These travellers are the first who have succeeded in penetrating into the district of the Pakpak tribes, who are still cannibals. They returned to Medan, near Deli, after a successful journey, during which large ethnographical collections were made.

POLAR REGIONS.

Danish Arctic Voyages—Early Chart of North Atlantic.—A valuable addition to the literature of Arctic discovery has been made through the publication, by the Hakluyt Society, of a series of accounts of Danish expeditions to Greenland and Hudson bay in the early years of the seventeenth century.* The Society had already issued new editions of all the accounts of early English Arctic voyages, undertaken between 1576 and 1632, and the volumes now before us may be said to complete the series as far as concerns voyages to the north-west within the period in question. The three first voyages treated of are those sent from Denmark in 1605–6–7, in search of the lost colonies in Greenland, in all of which the Englishman, James Hall, took part as pilot. To these is added the account of Hall's own voyage of 1612, undertaken for commercial purposes to the scene of his former labours, as, although this was purely an English enterprise, it helps to throw light on the earlier voyages, supplementing the discoveries made in them. Accounts of three of the Greenland voyages appeared in Purchas and Churchill, and these are reprinted; but a valuable addition to the previously printed material is the publication for the first time of another account by Hall of the voyage of 1605, from a manuscript in the British Museum, with maps, drawn by the pilot himself. Translations of two Danish accounts of the two first voyages are also given, as well as a facsimile of an old chart existing at Stockholm, which evidently belongs to the period in question. The last voyage described in this collection is that of Jens Munk to Hudson bay in 1619–20, which was likewise piloted by Englishmen, and intended to follow up the results obtained by English voyages in search of a North-West passage. The present account is a translation of the 1624 edition of Munk's *Navigatio Septentrionalis*, corrected by the help of his original manuscript. The name of Mr. C. C. A. Gosch appears on the title-page as responsible editor, Mr. Miller Christy, to whose initiative the publication is due, having retired from participation in the editorship before the completion of the work. A certain number of the notes, together with one of the appendices and a chapter of the introduction to Munk's voyage, are, however, by the latter gentleman. In the appendix referred to, Mr. Christy discusses in an exhaustive way the mysterious Buss island, supposed to have been discovered by one of Frobisher's vessels in 1578, and subsequently believed to have sunk beneath the waves. He considers it probable

* 'Danish Arctic Expeditions, 1605 to 1620,' in two books. Edited, with Notes and Introductions, by C. C. A. Gosch. London: Printed for the Hakluyt Society, 1897.

that land was really seen, and that it was part of South Greenland. The other appendix, by Mr. Gosch, treats of the Stockholm chart above alluded to, the conclusion arrived at being that it is a copy of another chart, probably executed by Hall during his stay in Denmark from 1605 to 1607, or perhaps a little later. The names on the copy, several of which are misspelt, were, Mr. Gosch thinks, not given in the original. Mr. Christy does not accept Mr. Gosch's conclusions, but has published a pamphlet, giving his own views on the subject, the principal divergence being that he believes the chart to have been drawn before 1605, possibly to serve as a guide during the voyage of that year, and that the names were added after his return.

Proposed German Arctic Expedition.—We learn from the *Verhandlungen* of the Berlin Geographical Society, that a German arctic expedition has been set on foot for the coming summer. Its object is mainly zoological, but cartographical work and meteorological and other observations will be undertaken. Its leader is Theodor Lerner, who will be supported by various scientific workers, while the ship will be under the command of Captain Rüdiger. The steamer *Helgoland* has been chartered, and, in pursuance of the plan already formed, the expedition started in May from Bremerhaven for Tromsö, where the services of Norwegian ice-pilots and harpooners will be secured; proceeding then to Spitsbergen, of which first the east side, then the west and north, are to be examined. Jan Mayen and the Greenland sea having been visited, the ship will, it is planned, return to Tromsö in August, and thence set out again for Novaya Zemlya and, if possible, Franz Josef Land. It is proposed to return *viâ* East Spitsbergen, where an endeavour will be made to effect an accurate survey of Kong Karl islands. In the most northern parts reached inquiries as to the fate of Andrée's expedition will be made.

Andrée Search Expedition.—It is announced that the Swedish Anthropological and Geographical Society has set on foot an expedition to Siberia for the purpose of searching for the members of Andrée's expedition, or obtaining information which may throw light on their fate. Herr J. Stadling, who accompanied Andrée to Spitsbergen in 1896, has been appointed leader, and was to start from Stockholm early in April.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The German Deep-sea Expedition.—We have already mentioned (*ante*, p. 302), the general outline of the programme for the deep-sea expedition about to be despatched by the German Government under the leadership of Prof. Chun. Further details as to the tasks to be undertaken, and the probable plan of the expedition are supplied by Dr. G. Schott, in a paper read before the Berlin Geographical Society in March last (*Verhandlungen*, 1898, Nos. 2 and 3). Dr. Schott divides the objects of the expedition into two groups, the oceanographical and the zoological, devoting greater attention to the former, as of more interest from a geographical point of view. Soundings, for the purpose of determining the form of the ocean floor, form, of course, one of the primary tasks, and for this purpose the Sigsbee machine with some improvements will be employed. A large part of the voyage will lead over still entirely unknown depths, and important results may be expected, both in the South Atlantic, and still more in the Indian ocean. Two areas in particular await exploration here, the one lying east of the Cape of Good Hope, and extending towards the outliers of the Antarctic plateau, the other occupying the wide space between Madagascar in the west, and Sumatra and Australia in the east. In the second of these, over a space little smaller than the whole of South America, only twenty soundings have hitherto been obtained. Great surprises may await us here, in view of the sudden precipitous slopes which do undoubtedly exist in the depths of the sea. Soundings are also much needed in the neighbourhood of the Seychelles, Chagos islands, etc., in order to prove whether or not these form isolated groups rising from great depths. The chemical constitution and temperature of the water will also be investigated, and as regards the latter the plan of action will differ from that of former expeditions, in that it is considered advisable, owing to the general uniformity which is known to exist in the deeper water, to restrict operations as a rule to the upper layers, to a depth of 2000 to 3000 fathoms, and to the determination of the bottom temperatures. The fact that in the North Atlantic and Pacific, owing to the influence of currents the temperature at 1000 fathoms depth is generally warmer in 30° to 40° of latitude than at the equator, will render an examination of the Indian ocean in this respect of special interest. The reversible thermometer supplied by Negretti and Zambra will be employed by the expedition, but it is hoped that experiments will also be made with Prof. Eschenhagen's telethermometer, which allows of determinations at a distance by means of electricity. As regards the determination of currents, it will be impossible, considering the size of the ship, to adopt Captain Pillsbury's method of anchoring in order to take their direction and speed; the old method, by comparison of the log and astronomical reckonings, must be employed. Other subjects of study will be the dimensions of ocean waves, the colour and transparency of the water, while the thorough investigation of marine life—the primary object of the expedition—will of course be undertaken. Dr. Schott sketches the probable route of the expedition, premising that the general idea will be a cursory examination of the North Atlantic for the purpose of practising the observers; a more detailed study of the east half of the South Atlantic, and a still more careful exploration of the Southern and Central Indian ocean.

Broadening of Atolls.—Mr. Charles Hedley, who took part in the successful coral-boring expedition to Funafuti, gives a short paper in *Natural Science*, xii. (1898) p. 174, on the manner in which coral atolls increase in breadth. The islets of which atolls are usually composed have been shown by recent observers, especially by Dr. Guppy, to be increasing in breadth, although remaining of the same altitude. At the windward corner of an atoll parallel lines of shingle beaches are usually found. As these beaches appear to be due each to a single storm they are termed hurricane-beaches, and they may be used to supply some approximation to a chronological system for measuring the rate of growth of coral formations. If this process were to go on, the submarine reef-flat would in time be entirely built up into land, and as this does not happen it is apparent that the reef-flat itself is being extended seaward. The existence of channels or even caverns in the reef-flat is an indication that the outward growth is brought about by the building out of a talus of coral *débris*. It appears incredible that these channels and caverns can be excavated by the action of the sea on so homogeneous a substance as coral rock.

CORRESPONDENCE.

The New Division of Time and Angles proposed by M. Sarrauton.

For nearly a year the metric system has been legal in England, and before long it will be adopted and appreciated as it deserves. Still, the metric system is yet incomplete. For the measurement of time and angles the ancient sexagesimal method has been retained, the hour being divided into 60 minutes, the minute into 60 seconds, whilst the same has been done for the angular unit, the degree. Thus, whereas the solution of problems concerned with lengths, areas, volumes, weights, and values has been simplified to the placing a decimal point in its proper place, angles and time have not shared in the benefit.

A century ago Laplace attempted to introduce a new division of the circle into 400 grades, and of the day into 10 hours; but the public declined to accept these disturbances of deeply rooted custom, which had its origin in the far-off times of the ancient Egyptians and Chaldæans, whose judicious choice of twelve as the basis of subdivision both for the day and year bore witness to a profound knowledge of the theory of numbers.

On the appearance of the metric system, the question of the division of the circle, and the assimilation of measures of time and arc, was at once raised. It was proposed to divide the day—the unit of time—into two periods of 10 hours each, and the hour into one-hundredth and one-thousandth parts; whilst the right angle—the angular unit—was divided likewise into 100 grades, the grade into one-hundredth and one-thousandth parts, the ratio between the units being as 1 to 20. The public, however, could not make up its mind to change its ancient unit.

I should not refer to this system, were it not that it has been brought forward anew with very slight modifications of detail. The public would not accept the reform now, any more than a century ago, and it is, moreover, in no way indispensable. The true unit of time in common use is the hour; that of arc is neither the circumference nor even the right angle, but the degree. We say that an angle contains 32°, 76°, but we never employ in calculations arcs of $65\frac{3}{8}$ circumferences.

It is, therefore, only the hour and the degree which there is any need to decimalize, for but slight would be the advantages of decimalizing a unit which is not employed, such as the circumference, or one which is employed only in its fractional parts. We make use of the day and half-day, but have no need to divide it further; whereas in the case of the hour, this is not enough, but we require to measure time down to the minute, or even second. The subdivision, and consequently the decimalization, of the hour is therefore a necessity. So far from being an approach to the decimal day, our system of the decimal hour is positively hostile to it.

It is in astronomy chiefly that the inconvenience of the present system makes itself felt, long calculations being necessary for the comparison of time and angles. Two kinds, both of latitudes and longitudes, have to be employed. The sailor, who reads measures of arc on his sextant and of time on his watch, has on this account to employ more complicated tables than would be necessary were the relation between arcs and times more simple. It is the sailor especially who needs simplicity of method, and who therefore suffers the most from the present state of things.

The system here advocated, which has been proposed by M. de Sarrauton, vice-president of the Oran Geographical Society, fulfils the following requirements: (1) The simplification of calculations by the use of decimal subdivision; (2) the complete assimilation of the day to the circle, so as to avoid the necessity of transforming arcs into time, and *vice versâ*; (3) the least possible disturbance of existing habits.

The sun, in its daily revolution, describes a circle, a day, of twenty-four hours. We divide the hour into one-hundredth and ten-thousandth parts, and thus have a decimal minute and second. The circle in its turn is divided into 240 degrees, so that the hour will correspond to 10 degrees, and in order to pass from a number of hours to a number of degrees, it is only necessary to move the decimal point one point to the right, and *vice versâ*. A table of trigonometrical logarithms may be arranged as simply as one of logarithms of numbers, the arcs becoming, under our system, decimal numbers, with no complicated notation of minutes and seconds. It will be seen at once how great will be the advantage, in the fact that arcs 10,000 or 1000 times as great as a given arc may be written with the same figures, the decimal point alone varying. In short, the conception on which the whole system rests is the retention of the advantages of a decimal division, whilst identifying, so to say, the measurement of time and angles. Although it is quite of recent date—it first appeared only two years ago—it has already made its way, in part, at the *Bureau des Longitudes* in Paris, through the adoption there of the decimal hour.

It is probable that the question will shortly receive the attention of international congresses, in order that an authoritative verdict, before which the world in general must bow, may be given. It is for this reason that I have been anxious to bring the system before the English public, in hopes of obtaining its approval. It is England, in fact, which can alone decide the success of the reform, for any attempt in this direction without her concurrence would remain a dead letter, as nautical charts, tables, etc., are almost all constructed according to English ideas and methods.

In order to bring clearly forward the advantages of the new system, it is necessary to have recourse to dry figures, and to show the two notations side by side.

To take a problem such as frequently suggests itself in practice, and one which should be extremely simple. Let it be required to determine the time at Washington when it is $5^h\ 18^m\ 8^s{\cdot}2$ at the island of Ferro, or, according to our system, $5^h\ 30^m\ 22^s{\cdot}8$. The detail of the calculation will be as follows:—

Longitude of Washington	$51^h\ 34\ 00{\cdot}0$
" " Ferro	$11^h\ 93\ 27{\cdot}8$
Difference	$39^h\ 40\ 72{\cdot}2$
Time at Ferro	$5^h\ 30\ 22{\cdot}8$
Difference	$3^h\ 94\ \ 7{\cdot}2$
Time at Washington	$1^h\ 36^m\ 15^s{\cdot}6$

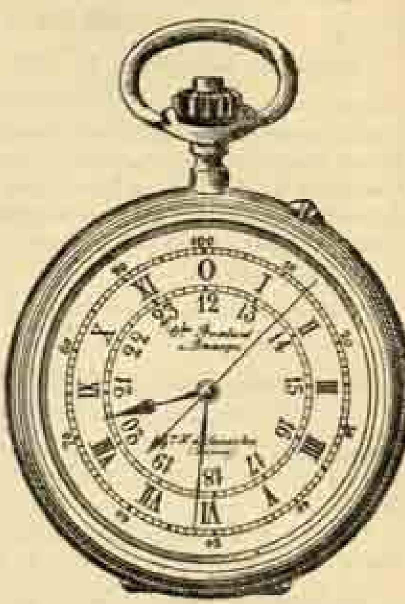
I leave to the reader the pleasure of carrying out the same calculation with sexagesimal figures, merely informing him that he will find the result $1^h\ 21^m\ 41^s{\cdot}6$.

The slightest reflection will show how many conveniences and simplifications will be brought about, in astronomy, from the assimilation of time and angles, a single table serving for both kinds of quantities. But the benefit is not confined to astronomers and navigators, but all questions into which time enters are simplified by the decimalization of the hour. Thus, in measures of speed, there will no longer be any calculation needed to deduce the speed by the minute or second from that by the hour, or *vice versâ*; whilst the inverse problem, the determination of the distance traversed in a given time, is reduced to a simple decimal division.

A decimal watch has been constructed by M. Briselard, of Besançon, showing the decimal second, *i.e.* the ten-thousandth part of the hour. It ticks the decimal half-second, that is to say, it is possible, if it is in good order, to tell the time within one twenty-thousandth part of an hour. The ordinary time is also shown on the central dial.

The dial is divided into 24 hours, so that, as one hour corresponds exactly to 10 degrees of arc, if the watch is set to the time of the initial meridian, it may serve to determine, *without any calculation*, the longitude of the place in which I may happen to be. In fact, in all points situated in longitude 10 degrees, in the direction of the apparent movement of the sun, that body passes the meridian one hour after it has done so on the initial meridian; in 26·5 degrees it does so $2^h\ 65^m$ later, and so on. Thus we may formulate the following theorem:—

"At every point of the Earth a decimal watch, set to the time of the meridian zero, marks at mean noon the longitude of that spot; at any other time, the longitude is obtained by a simple subtraction"—slightly more simple and rapid, is it not, than the process necessitated by the employment of the sexagesimal co-ordinates?



I have still a word to say on the question of the universal hour and hour-zones. In our system the question solves itself. The groups of 10 degrees of longitude form naturally the 24 hour-zones into which the circumference of the equator is divided, and which, numbered from 0 to 23, will give the time of all places on the Earth in terms of the initial hour. Thus, the longitude of Washington being 51·34 degrees, *i.e.* $5^h\ 13^m\ 40^s$ as compared with Greenwich, Washington lies in zone No. 5, and the time of this zone will be 5 hours behind that of Greenwich. If, knowing the time of the Washington zone, we wish to know the true time at that city, all that we have to do is to deduct the fractional part of the longitude of Washington expressed in time, *i.e.* $0^h\ 13^m\ 40^s$. If, then, it is $4^h\ 67^m\ 89^s$ Washington universal time, it will be $4^h\ 54^m\ 49^s$ local mean time.

Since October, 1895, when M. Sarrauton first publicly put forward his system, it has received the support of the *Conseils Généraux* of several French departments, and of men like M. Adolphe Carnot, inspector-general of mines; M. Ch. Lallemand, chief mining engineer; and others. The decimal hour has been adopted by the *Bureau des Longitudes*, but it is still not official, as the question must be submitted to an International Congress before receiving a definite solution.

The eminent geographer, M. Elisée Reclus, whose collaborator I have the honour to be, has adopted the decimal division for the globe on the scale of 1 : 500,000, the construction of which is at present the object of his study. It will show in a striking way the advantages of a reform from the geographical point of view. M. Lebègue, the eminent Belgian mathematician, is constructing tables of logarithms on the same basis; whilst maps, instruments of mensuration, and chronometers will also soon be in the hands of all who may be desirous of following us in the field of practical application.

The system of the decimal hour and of the circle of 240 degrees has in two years and a half won the suffrages of all who have been willing to rise above questions of opportunism and routine. It is now passing from the domain of theory to that of practice; in a very short space it will, of its own merits, win general recognition.

MAURICE MOREAU MÉRY.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1897–1898.

Ordinary Meeting, *March* 28, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Percy Hamilton Beechey; F. C. Broadhurst; John Haddock; Donald Hardinge; Godfrey Edward Procter Hertslet; John Massey Leech; Lord Monk-Bretton; Dr. William John Murby; George Bellsworth Piggott; Captain F. C. Quicke (King's Dragoon Guards); William J. G. Reid; T. Fisher Unwin; Frank Whymper; Robert Arno Wood; Right Hon. Earl Percy.*

The Paper read was:—

"Exploration on and around Mount Aconcagua." By E. A. Fitz Gerald.

Ordinary Meeting, *April* 25, 1898.—General Sir CHARLES W. WILSON, R.E., K.C.B., K.C.M.G., Vice-President, in the Chair.

ELECTIONS.—*H. D. Kyrle-Money Bellew; the Earl of Camperdown; Lieut. Maurice Harvey Clarke, R.N.R.; Frederick Holkham Dangar; J. Buchanan Guthrie; James George Holmes; Percival Henry Ingram; E. A. Locock; John P. Long; John E. Marr, M.A., F.R.S.; Sir William MacGregor, K.C.M.G.; Archibald Sim Montgomery; Harold S. Simmons.*

The Paper read was:—

"Oceanography of the North Atlantic." By H.S.H. the Prince of Monaco.

Afternoon Technical Meeting, *Wednesday*, *April* 27, *at* 4.30 *p.m.*—Sir JOHN KIRK, K.C.B., G.C.M.G., in the Chair.

The Paper read was:—

"The Possibility of Acclimatisation of Whites in Tropical Countries." By Dr. Sambon.

Ordinary Meeting, *May* 9, 1898.—LORD BELHAVEN AND STENTON in the Chair.

ELECTIONS.—*Lord Ampthill; Edwin C. Arden; Lieut.-Colonel Alfred E. Bates (United States Army); George Board, B.A. Lond.; George F. Bosworth; Lieut. Claude Russell Brown, R.E.; William Scott Fulton, J.P.; Dr. W. H. Furness; John Alexander Harvie-Brown, F.Z.S., F.R.S.E.; Kenneth Havers; Dr. W. H. Hobson; Charles J. Innes-Baillie, M.A., LL.D.; William Kelly-Patterson, M.D.; Frederick Victor Longstaff; Thomas Arrowsmith Meates; John Cavendish Molson; James Moorhead; Rev. Tom Ferdinand Nicholas, B.A. Oxford; E. de Pentheny-O'Kelly; T. Hilton Renwick; Elkin Salaman; George William Sheldon, M.A., Litt.D.; Kunwar Kushal Pal Singh, M.A., LL.B.; Aubrey Strahan, M.A., F.G.S.; Rev. George Ernest Thorn; C. P. Torrens; Charles Rotherham Walker, M.D.; A. P. Watt; Carleu Lacey Weller.*

The Royal and other awards for the present year were announced.

The Paper read was:—

"Journey across Tibet from West to East." By Captain M. S. Wellby, 18th Hussars.

Special Meeting, May 16, 1898.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS AT COUNCIL MEETING.—*Ralph Appleton; Theodore Barnsby; Lieut. H. E. M. Bourke, R.N. (Retired); G. R. Boyle; Captain F. J. S. Cleave, R.A.; James Charles Getting; Walter Henty; Thomas Mackenzie; Major F. R. McCrea; William J. McG. McCaw; Major E. F. H. McSwiney (1st Lancers); Lieut. Charles Loughlin O'Malley, R.A.; James Henry Osbourne; Thomas R. Threfall; Alex S. Waley.*

The Paper read was:—

"The Four Hundredth Anniversary of the discovery of the Cape Route to India by Vasco da Gama." By the President.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria—Cannosa. **Ludwig Salvator.**
Cannosa. Prag: H. Mercy, 1897. Size 13 × 10, pp. vi. and 36. *Plates. Presented by H.I.H. the Archduke Ludwig Salvator of Austria.*

The Archduke Ludwig Salvator continues, in this beautiful little book, his series of monographs on the islands of the Mediterranean, illustrated by wood engravings executed from his own drawings.

Austria—Galicia. *B.S.G. Romană* **18** (1897): 116–129. **Burada.**
Remaşiţi româneşti în Galiţia. Conferinţă de T. T. Burada.

Austria-Hungary. ———
Publicationen für die Internationale Erdmessung. Die Astronomisch-Geodätischen Arbeiten des K. und K. Militär-Geographischen Institutes in Wien. XI. Band. Astronomische Arbeiten. 3. Längenunterschied-Messungen Sarajevo—Ragusa, Kronstadt—Krakau, Czernowitz—Kronstadt; Polhöhen- und Azimuth-Bestimmungen auf den Stationen Magoshegy, Sághegy und Schöckl. Herausgegeben vom K. und K. Militär-Geographischen Institute. Wien, 1897. Size 12 × 9½, pp. vi. and 284. *Presented by the k.k. militär-geographische Institut.*

Balkan Peninsula. **Weigand.**
Die nationalen Bestrebungen der Balkanvölker. Vortrag gehalten von Dr. Gustav Weigand. Hochschul-Vorträge für Jedermann. Heft ix. Leipzig: Dr. Seele & Co., 1898. Size 9 × 6, pp. 24.

On the Albanians, Greeks, and Slavs of the Balkan peninsula.

Denmark. *B.S.G. Com. Paris* **19** (1897): 807–812. **Castonnet des Fosses.**
Une excursion en Danemark. Le peuple danois. Par M. Castonnet des Fosses.

A short account of a short visit to Denmark.

Europe—Towns. *B.S.G. Com. Bordeaux* **21** (1898): 100–103. **Huni.**
La population de certaines villes d'Europe à 77 ans de distance. Par A. Huni.

A table of the population of eighty-eight towns in Europe in 1820, 1885, 1893, and 1897.

France. *B.S. Topographie France* **21** (1897): 24–32. **Guyot.**
Description topographique et historique du village et de son territoire. Par la Monographie communale. Par M. le capitaine Guyot. *With Map.*

A plea for the preparation of geographical memoirs for the communes and villages of France.

France and England. *Rev. Maritime* **136** (1898): 246–260. **La Roncière.**
Quatrième guerre navale entre la France et l'Angleterre (1335–1341). Par M. Ch. de La Roncière.

France—Assérac. *B.S.G. Com. Saint-Nazaire* **14** (1897): 17–64. **Chiron.**
Monographie de la commune d'Assérac. Par M. Chiron. *With Plates.*

A compendium of facts affording a basis for geographical treatment.

France—Ile de Groix. *B.S.G. Madrid* (1898): 153–162. **Sardá.**
La Escuela de pesca de la isla de Groix (Bretaña). Por D. Agustin Sardá.

France—Mont Blanc. *B.S. Topographie France* **21** (1897): 47–61. **Guyot.**
Annales de l'Observatoire météorologique du Mont-Blanc (altitude 4,358 mètres), publiées sous la direction de M. J. Vallot. Par M. Guyot. *With Illustrations.*

France—Normandy. *B.S. Topographie France* **21** (1897): 5–15. **Filon.**
Le cap Antifer et la carte de l'État-Major. Par M. F. Filon.

This paper appeared also (with maps) in the *Revue de Géographie* for March, 1897.

France—Statistics. ——
Statistique Générale de la France. Tomes XX^{bis}, XXI et XXII. Statistique Annuelle (Années, 1890–1891–1892); Tome XXIII. Statistique Annuelle (Année, 1893). Paris: Imp. Nationale, 1895–1896. Size 11 × 7½. *Presented by the French Ministry of Commerce.*

France—Statistics. ——
Annuaire statistique de la France. XVII^e volume. 1897. Paris: Imp. Nationale, 1897. Size 11 × 7½, pp. xxxii. and 522. *Presented by the French Ministry of Commerce.*

France—Time Standard. *Rev. Scientifique* **9** (1898): 491–497. **Lallemand.**
L'heure légale en France et les fuseaux horaires. Par M. Ch. Lallemand.

A discussion of the French time-standard, with the view of showing the advisability of adopting Western European time.

Germany. **Oberhummer.**
Bericht der Central-Kommission für Wissenschaftliche Landeskunde von Deutschland von Ostern 1895 bis Ostern 1897 erstattet vor dem XII. Deutschen Geographentage in Jena vom vorsitzenden der Kommission Prof. Dr. Eugen Oberhummer. Sonder-Abdruck aus den Verhandlungen des XII. Deutschen Geographentages. Berlin, 1897. Size 9½ × 6¼, pp. 16. *Presented by the Author.*

Germany—Hamburg. *Questions Diplomat. et Colon.* **1** (1897): 212–219. **Blondel.**
Le port de Hambourg. Par M. Georges Blondel.

A study of the growth of Hamburg as a commercial port.

Iceland. *G. Tidskrift* **14** (1898): 130–149. **Bruun.**
Gjennem affolkede Bygder paa Islands indre Højland. Rejseberetning for 1897 af Kaptajn Daniel Bruun. *With Map and Illustrations.*

Account of a journey through the centre of Iceland in 1897, for the purpose of finding and investigating the ruins of early dwellings.

Iceland—Earthquakes. *G. Tidskrift* **14** (1898): 93–115. **Thoroddsen.**
Jordskjælv i Islands sydlige Lavland, dens geologiske Forhold og Historie. Af Dr. Th. Thoroddsen. *With Map.*

Italy. **Magistris.**
L. F. de Magistris. La depressione prenestina e il passo degli olmi nell' estremo lembo di sud-est della Campagna romana.—Estratto dal "Bollettino della Società Geografica Italiana," serie iii. volume xi. 3. Roma, 1898. Size 9½ × 6, pp. 16. *Presented by the Author.*

Italy—Elba. ———
B.S. Languedoc G. **19** (1896): 291-316, 435-454; **20** (1897): 222-239.
L'île d'Elbe au début du XIX^e^ siècle. Extrait des *Souvenirs* de Pons (de l'Hérault).

Historical notes on the Island of Elba about the time of Napoleon's imprisonment there.

Italy—Herculaneum and Pompeii. **Horne.**
The Buried Cities of Vesuvius: Herculaneum and Pompeii. By John Fletcher Horne, M.D., D.SC. London: Hazell, Watson & Viney, 1895. Size 9 × 6, pp. vi. and 114. *Illustrations. Presented by Dr. Innes-Baillie.*

This sketch of Vesuvius and of the ruins of Herculaneum and Pompeii was designed as a popular lecture. It contains some descriptions of Roman life at the beginning of the Christian era.

Italy—Po Delta. *Riv. G. Italiana* **5** (1898): 24-37, 65-85. **Marinelli.**
L'accrescimento del delta del Po nel secolo XIX. Di G. Marinelli. *With Map.*

This paper will be referred to in a note.

Italy—Sardinia. *Riv. G. Italiana* **5** (1898): 106-128. **Cossu.**
Una ricerca antropo-geografica sull' isola di Sardegna. Distribuzione della popolazione rispetto alla distanza dal mare di Angelo Cossu.

A study of the distribution of the population of Sardinia with reference to the slopes to the four sides of the island, and to distance from the sea.

Italy—Sicily. *Globus* **73** (1898): 169-174, 186-192. **Bergeat.**
Die äolischen Vulkaninseln bei Sicilien. Von Dr. Alfred Bergeat. *With Illustrations.*

Mediterranean—Cyprus. *Globus* **73** (1898): 218-222. **Deschamps.**
E. Deschamps Reise auf Cypern.

Mediterranean—Lampedusa. *Questions Diplomat. et Colon.* **2** (1897): 449-455. **Brunet.**
Un projet de colonisation russe au XVIII^e^. siècle. Par M. Louis Brunet.

Norway. *G.Z.* **4** (1898): 185-202. **Magnus.**
Verkehrswege und Verkehrsformen in Norwegen. Von Hagbart Magnus. *With Three Plates.*

On the means of transport in Norway, with pictures of boats, bridges, and roads.

Portugal—Archæology. **Vasconcellos.**
Quarto Centenario do Descobrimento da India. Contribuições da Sociedade de Geographia de Lisboa. Religiões da Lusitania na parte que principalmente se refere a Portugal. Por J. Leite de Vasconcellos. Volume i. Lisboa: Imp Nacional, 1897. Size 10 × 6½, pp. xl. and 440.

On the prehistoric religions of Portugal, especially in the Neolithic period, with a discussion of the significance of inscribed and cup-marked stones, dolmens, and other early monuments.

Rumania. *B.S.G. Română* **18** (1897): 151-181. **Brun.**
La Roumanie actuelle, les habitants et leurs mœurs, la montagne et la plaine, le Danube et la mer. Par M. Jules Brun.

Rumania. *B.S.G. Română* **18** (1897): 15-109. **Felix.**
Geografia medicală a României. De Doctor I. Felix.

Russia—Baltic Provinces. *Globus* **72** (1897): 377-384. **Bielenstein.**
Das lettische Wohnhaus in der Mitte des 19. Jahrhunderts. Von Dr. A. Bielenstein. *With Illustrations.*

Russia—Caspian Sea. **Pushchin.**
Caspian-Sea Pilot. Hydrographical description and guide for navigation. By Captain N. Pushchin. Published by the Hydrographical Department, Ministry of Marine. St. Petersburg, 1897. Size 9 × 6, pp. 1-345. *Maps, Illustrations, and Tables.* [In Russian.] *Presented by the Russian Hydrographic Department.*

Russia—Census. *Contemporary Rev.* **72** (1897): 837–845. **Dillon.**
The First Russian Census. By E. J. Dillon.

A brief account of the recent Russian census, and some discussion of its statistics.

Russia—Finland. *Norske G.S. Aarbog* **8**, 1896–97 (1897): 1–21. **Nielsen.**
Prof. dr. Yngvar Nielsen: Valamo i Ladoga.

Russia—Lapland. *Iz. Imp. Russian G.S.* **32** (1897): 411–439. **Sikora.**
Expedition to the sources of the river Muonio (tributary of Tornea) for the observation of the solar eclipse, July 28 (August 9), 1896. By I. I. Sikora. *Map and Illustrations.* [In Russian.]

ASIA.

Asia—Central. *Rev. G.* **41** (1897): 433–440; **42** (1898): 6–13. **Chaffanjon.**
A travers le Turkestan Russe, la Mongolie, la Mandjourie et la Sibérie méridionale. Par J. Chaffanjon.

Asia Minor. *Questions Diplomat. et Colon.* **2** (1897): 11–32. **Avril.**
Les Arméniens indépendants du Taurus. Par le Baron A. d'Avril. *With Map and Illustration.*

Describes the historical relations of the Armenians in Cilicia, Hajin, Sis, Zeitun, most of the space being given to the last named.

Asia Minor—Lydia. **Buresch.**
Aus Lydien, epigraphisch-geographische Reisefrüchte, hinterlassen von Karl Buresch. Herausgegeben von Otto Ribbeck. Leipzig: B. G. Teubner, 1898. Size 10 × 7, pp. xvi. and 226. *Map. Price 14 marks. Presented by the Publisher.*

This important work is prefaced by a biography of the author, Karl Buresch, who was born in Hanover in 1862, studied at Marburg, and in 1888 made a journey through Asia Minor, which was followed by a long residence in Greece and Asia Minor, studying the ancient inscriptions, until his death in 1896. A map on the scale of 1 : 500,000 gives the routes of his four chief journeys, three of which are fully described in the text, which contains, besides, a transcript of the inscriptions which he studied, together with his notes upon them.

Asia—Railways. *Deutsche Rundschau G.* **20** (1898): 313–317. **Umlauft.**
Die Eisenbahnen Asiens. Von Friedrich Umlauft. *With Map.*

More than two-thirds of the total length of the railways in Asia are credited to India, and about one-seventh to Russia.

China. *Questions Diplomat. et Colon.* **2** (1897): 513–535, 585–613. **Brenier.**
Rapport général de la mission Lyonnaise d'exploration en Chine. Par M. Henri Brenier.

China. *Fortnightly Rev.* **63** (1898): 664–679. **Hallett.**
British Trade and the Integrity of China. By Holt S. Hallett.

China. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 301–308. **Michie.**
China in Commotion. By A. Michie.

China—Hainan. *Questions Diplomat. et Colon.* **1** (1897): 516–522. **Madrolle.**
Hainan. La colonisation chinoise; l'île au point de vue économique et diplomatique. Par M. Claudius Madrolle. *With Maps.*

Notes of a visit to Hai-nan in 1896, with a linguistic map of the island.

China—Kiauchou. *Rev. Française* **23** (1898): 213–220. **Fauvel.**
Kiao-tcheou. Par A. A. Fauvel. *With Map.*

China—Mongolia. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 387–400. **Gowan.**
Mongolia, with an Introduction on "The Partition of China." By Lieut.-Colonel W. E. Gowan.

The account of Mongolia is stated to be translated from Lieut. Z. Matusovski's Russian 'Sketch of the Chinese Empire.'

China—Trade. *Questions Diplomat. et Colon.* **2** (1897): 129–143. **Pila.**
La mission lyonnaise d'exploration en Chine et le développement de notre commerce extérieur. Par M. Ulysse Pila.

Discusses the relative shares of the European powers in the foreign trade of China, and describes the important visit paid by a Commercial mission from Lyons during 1895–97 to Yunnan and the south of China.

China—Yangtse. **Moucher.**
Questions Diplomat. et Colon. **2** (1897) : 144–156, 206–210, 259–270.

Souvenirs de Chine. Par C. Mouchez. *With Maps.*

Describes the visit of the French gunboat *Lutin* to the Tong-ting and Poyang lakes on the Yang-tse, and gives an account of the incidents which led to it.

Chinese Empire. *B.S.G. Com. Paris* **19** (1897) : 801–806. **Bonin.**

Les grandes voies commerciales de l'Asie centrale. Par M. Ch.-E. Bonin.

On the existing trade-routes of Tibet and Mongolia.

Chinese Turkestan—Lob-Nor. **Kozloff.**

P. K. Kozloff. Lob-Nor. [In Russian.] St. Petersburg: Printed by A. S. Suvorin, 1898. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 62. *Maps. Presented by the Author.*

M. Kozloff discusses the whole question of Lob-Nor, giving the views of the Chinese historians and geographers, of Prjevalsky, Richthofen, Pyevtsoff, Bogdanovich, and Sven Hedin. The memoir is summarised, *ante*, p. 632.

Eastern Asia. *Quarterly Rev.* **187** (1898) : 546–566. ——

Changes in the Unchanging East.

A study, based on recent books, of the changes now in progress in China, Japan, and Korea.

Eastern Asia. **Loureiro.**

Quarto Centenario do Descobrimento da India. Contribuições da Sociedade de Geographia de Lisboa. No oriente. De Napoles á China (Diario de viagem). Por Adolpho Loureiro. 2 vols. Lisboa: Imp. Nacional, 1896–97. Size $10 \times 6\frac{1}{2}$, pp. (vol. i.) 370; (vol. ii.) 420.

The diary of an extensive tour in the East, carried out by the author between July, 1883, and August, 1884. He visited Macão, where he stayed some months, and touched at many ports of China, French Indo-China, and India.

Historical. *J.R. Asiatic S.* (1898) : 241–288. **Kennedy.**

The Early Commerce of Babylon with India—700–300 B.C. By J. Kennedy.

French Indo-China. *Questions Diplomat. et Colon.* **1** (1897) : 28–31. **Attanoux.**

La navigabilité du Mékong de la Chine au haut Laos. Par M. J. B. d'Attanoux. *With Map.*

On the ascent of the Mekong by the gunboat *La Grandière*, and a sketch-map of the river from Pakta to the Chinese frontier.

French Indo-China. **Fleury-Ravarin.**
Questions Diplomat. et Colon. **1** (1897) : 86–91, 133–137.

Ce qu'il faut faire en Indo-Chine. Par M. Fleury-Ravarin.

India—Assam. **Monahan.**

Report on the River-borne Trade of the Province of Assam for the year 1896-97. By F. J. Monahan. Calcutta, 1897. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. iv., 16, and ix. *Map.*

India—Burma. **Bird.**

Wanderings in Burma. By George W. Bird (Educational Department, Burma). Bournemouth: F. J. Bright & Son; London: Simpkin & Co., 1897. Size $11 \times 7\frac{1}{2}$, pp. 410. *Maps and Illustrations. Presented by the Author.*

This handsome volume commences with a compilation from various authentic sources descriptive of Burma and its present resources. Most of the book consists of a series of detailed itineraries between the principal places of the province, in the course of which full details are given of the present condition of the country, its historical sites and great buildings. Plans of the towns and temples, numerous fine photographs, and a large-scale map of the province (about 1 : 2 000,000) add greatly to the value of the work, which represents a vast amount of careful and conscientious labour.

India—Burma. *Scottish G. Mag.* **14** (1898) : 188–198. **Sutherland.**

Along a Shan Road, Southern Shan States, Upper Burma. By Wm. Sutherland.

A graphic narrative of a journey in Eastern Burma.

India—Palk Strait. *J.R. Asiatic S.* (1898) : 377–378. **Ferguson.**

Palk's Bay and Strait. By Donald Ferguson.

On the derivation of the name of Palk strait, which was named after Sir Robert Palk, governor of Madras from 1763 to 1767, but is derived by Egli, on the authority of Schlagintweit, from a Sinhalese word meaning "the whirl." The probable reason of this mistake is suggested.

Indo-China. *Questions Diplomat. et Colon.* 2 (1897): 274-281. ——
Considérations sur les voies de pénétration du Sud de la presqu'île indo-chinoise. Par M. A. V. *With Map.*

Indo-China. **Orleans.**
Prince Henri d'Orleans. Du Tonkin aux Indes, Janvier 1895—Janvier 1896. Illustrations de G. Vuillier. Cartes et Appendice Géographique par Émile Roux. Paris: Calmann Lévy, 1898. Size 12 × 8½, pp. 442. *Maps and Illustrations. Price* 16s.

This work, which differs in some details from the English translation, has been noticed in the *Journal* for May, p. 545.

AFRICA.

Algeria—Sahara. *Rev. G.* 42 (1898): 22-32. **Attanoux.**
L'utilisation du Sahara Français. Par J. Bernard d'Attanoux.

The title scarcely indicates the nature of the contents of this article. The actual condition of the Sahara and its inhabitants is the principal subject of the paper.

Algeria—Sahara. *C. Rd. S.G. Paris* (1898): 68-69. **Oltramare.**
Rapport sur les déterminations astronomiques de latitudes et longitudes, effectuées par M. Foureau dans son voyage de mars à juin 1897. Par F. Oltramare.

British South Africa. *J. United Service I. India* 27 (1898): 26-50. **Baden-Powell.**
The Campaign in Rhodesia. By Lieut.-Colonel R. S. Baden-Powell. *With Diagram.*

British West Africa. *B. Comité l'Afrique Française* 8 (1898): 19-21. ——
La chemin de fer de Sierra-Leone. *With Map.*

The map shows the progress of the Sierra Leone railway up to October 25, 1897.

British West Africa—Benin. *B. Liverpool Museums* 1 (1898): 49-70. **Forbes.**
On a collection of Cast-Metal Work, of high artistic value, from Benin, lately acquired for the Mayer Museum. By the Director of Museums. *With Illustrations.*

British West Africa—Niger Delta. *Blackwood's Mag.* 163 (1898): 451-460. ——
Life and Death in the Niger Delta.

A graphic and painfully realistic account of the darker aspects of commercial enterprise in West Africa, and the conditions in which they are carried on.

Cape Colony. *P.I. Civil Engineers* 130 (1897): 263-275. **Heenan.**
The Harbour of Algoa Bay, Cape Colony. By R. H. H. Heenan. *With Diagrams.*

The sandy beach of Algoa Bay required the construction of a harbour, which has recently been extended and improved, so as to obviate the inconvenience of landing cargo in surf-boats.

Congo State. ——
Société d'Études Coloniales. Manuel du Voyageur et du Résident au Congo. 3 vols. Bruxelles, 1895-1897. Size 9¼ × 6¼, pp. (vol. i.) 344; (vol. ii.) 214; (vol. iii.) 428. *Map (in four sheets) and Illustrations. Price* 15 *fr.*

Congo State. *Rev. Scientifique* 9 (1898): 385-390. **Laurent.**
L'agriculture au Congo. Par M. Émile Laurent.

Congo State—Kasai. *Mouvement G.* 15 (1898): 165-167. **Wauters.**
L'ancienne mer intérieure du Kasai. Par A. J. Wauters. *With Map.*

Egypt. *Fortnightly Rev.* 63 (1898): 681-699. **Dicey.**
Egypt, 1881-1897. By Edward Dicey, C.B.

On the recent administration of Egypt and its results.

Egypt—Kassala. *Questions Diplomat. et Colon.* 2 (1897) 455-460. **Noll.**
Kassala. Par M. Noel Noll.

French Congo. *B.S.G. l'Est* (1897): 23-42. **Clozel.**
De la Sangha à la Ouôm. Par M. F. J. Clozel. *With Map.*

The Wom is one of the head streams of the Logone flowing into Lake Chad.

French Guinea. *Questions Diplomat. et Colon.* 2 (1898): 465-471. **Maclaud.**
La Guinée Française. Par Dr. Maclaud.

French Guinea. *B. Union G. Nord de la France* **18** (1897): 43–67. **Salesse.**
De Conakry au Niger. Par le Capitaine Salesse. *With Map.*

The survey for a railway from Konakry to Farana on the Niger in 1896 is here described.

French Sudan. *B. Comité l'Afrique Française* **8** (1898): 96–99. **Vuillot.**
La région de Bassikounou. Par M. P. Vuillot. *With Illustrations and Maps.*

French Sudan—Timbuktu. **Machat.**
Questions Diplomat. et Colon. **1** (1897): 463–468, 522–529.
Tombouctou et la politique française dans l'Afrique du nord-ouest. Par M. J. Machat. *With Map.*

German East Africa. *M. Deutsch. Schutzgeb.* **11** (1898): 87–88. **Prince and Stadlbaur.**
Hauptmann Prince's und Lieutenant Stadlbaur's Reisen im Wakimbulande. Von Dr. Richard Kiepert. *With Map.*

NORTH AMERICA.

Alaska and Bering Strait. **De Windt.**
Through the Gold-Fields of Alaska to Bering Straits. By Harry De Windt. London: Chatto & Windus, 1898. Size 9 × 6, pp. viii. and 312. *Map, Portrait, and Illustrations. Price* 16*s.*

The gold-fields of the Canadian Yukon are described, as well as those of Alaska referred to in the title.

Canada. *American J. Sci.* **5** (1898): 273–282. **Chalmers.**
The Pre-Glacial Decay of Rocks in Eastern Canada. By Robert Chalmers.

Canada. **Dalton.**
Salmon Fishing in Eastern Canada. By Lieut.-Colonel J. C. Dalton. Reprinted from *Proceedings*, Royal Artillery Institution, No. 2, vol. xxv. Woolwich, 1898. Size 10 × 6½, pp. 12. *Map. Presented by the Author.*

Canada—Colonisation. **Anton.**
Questions Diplomat. et Colon. **2** (1898): 355–365, 432–438, 487–495.
Parallèle entre la Colonisation moderne et la Colonisation, sous l'ancien régime. Par Dr. G. K. Anton. Traduit. Par Alexandre Halot.

A study of the results of French and British colonisation in Canada, with a discussion of the future evolution of the Dominion.

Canada—Geology. *J. G.* **6** (1898): 147–160. **Tyrrell.**
The Glaciation of North Central Canada. By J. Burr Tyrrell. *With Maps.*

This paper traces the glaciation of Canada to three glacial systems, consecutive to each other in the order—the Cordilleran glacier, the Keewatin glacier, and the Labradorean glacier.

Canada—Western Ontario. *B. Geolog. S. America* **9** (1898): 223–238. **Coleman.**
Clastic Huronian Rocks of Western Ontario. By Arthur P. Coleman.

Mexico—Palenque. **Maudslay.**
Biologia Centrali-Americana; or, Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America. Edited by F. Ducane Godman and Osbert Salvin. Archæology. By A. P. Maudslay. [Part ix., October, 1897.] (Vol. iv. pp. 27–39.) London: R. H. Porter and Dulau & Co. Size 13 × 10½. *Plates* xlix.–lxxiii. *Separate.* Size 13 × 20½.

The continuation of Mr. Maudslay's fine series of photographs of Central American ruins.

United States. *Scottish G. Mag.* **14** (1898): 169–187. **Gannett.**
The Material Growth and Present Condition of the United States. By Henry Gannett. *With Diagrams and Maps.*

A paper read at the Toronto meeting of the British Association, illustrated by numerous statistical diagrams and outline-maps.

United States. *J. Geology* **6** (1898): 171–181. **Leverett.**
The Weathered Zone (Sangamon) between the Iowan Loess and Illinoian till sheet. By Frank Leverett.

United States—California. **Reinstein.**
Address of Regent J. B. Reinstein at the Special Meeting of the Regents of the University of California "For the purpose of suggesting and discussing matters necessary to the prosperity of the University," January 15, 1898. Size $9\frac{1}{2} \times 6$, pp. 42.

Deals with the functions of a University with relation to the whole life of the State.

United States—Coast and Geodetic Survey. ———
Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the Progress of the Work during the Fiscal Year ending with June, 1896. Washington, 1897. Size $12 \times 9\frac{1}{2}$, pp. xxiv. and 722. *Maps and Charts. Presented by the Survey.*

This report contains a history of the work of the Coast and Geodetic Survey for 1896, together with a series of appendices dealing with terrestrial magnetism, the resulting heights from spirit-levelling operations in several states, and other geodetic questions. The more important of these appendices are noted separately.

SOUTH AMERICA.

Andes. *Travel* **2** (1898): 551–558. **Whymper.**
Mountaineering outside Europe. I. The Andes. By Edward Whymper. *With Illustrations.*

Argentine Republic. **Gherardo.**
Argentina. Gl' italiani nel distretto consolare di Cordoba. Rapporto del nob. cav. Gherardo dei principi Pio di Savoia, regio console in Cordoba.—Bollettino del Ministero degli Affari Esteri. Febbraio, 1898. Roma, 1898. Size $9\frac{1}{2} \times 6\frac{1}{4}$, pp. 40.

Argentine Republic. **Moreno.**
Musée de La Plata. Reconnaissance de la Région Andine, de la République Argentine. I. Notes préliminaires sur une Excursion aux territoires du Neuquen, Rio Negro, Chubut et Santa Cruz effectuée par les sections topographique et géologique, sous la direction de Francisco P. Moreno. La Plata, 1898. Size $11\frac{1}{2} \times 7\frac{1}{2}$, pp. 186. *Map and Plates. Presented by the Author.*

Brazil—Rio Branco. *Deutsche Rundschau G.* **20** (1898): 241–250, 306–313. **Hübner.**
Nach dem Rio Branco. Von Georg Hübner. *With Map and Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia. *Imp. and Asiatic Quarterly Rev.* **5** (1898): 344–361. **Badenoch.**
Australasia in 1898. (A) Australia, (B) Tasmania, (C) New Zealand. By G. R. Badenoch, LL.D.

Statistical notes of the several colonies, apparently taken from official reports.

Australasian Travel. **Shoemaker.**
Islands of the Southern Seas, Hawaii, Samoa, New Zealand, Tasmania, Australia, and Java. By Michael Myers Shoemaker. New York and London: G. P. Putnam's Sons, 1898. Size $8\frac{1}{2} \times 6$, pp. xiv. and 278. *Map and Illustrations. Price 10s. 6d.*

The impressions of a tourist with a sense of the picturesqueness of his surroundings.

Australia. **De Winton.**
Soldiering Fifty Years Ago. Australia in "the Forties." By Major De Winton. London: European Mail Limited, 1898. Size $7\frac{1}{2} \times 5$, pp. 192. *Presented by the Author.*

Major de Winton's attractive autobiographical sketch contains some interesting description of life in Australia fifty years ago, when he was with the troops engaged in guarding the convict settlements.

Dutch New Guinea. *Tijds. Ind. Taal-, Land-, en Volk.* **40** (1897): 150–177. **Van der Roest.**
Uit het leven der bevolking van Windessi (Nederl. Nieuw-Guinea). Door J. L. D. van der Roest.

Ellice Group—Zoology. **Hedley.**
Australian Museum, Sydney. Memoir III. The Atoll of Funafuti, Ellice Group: its Zoology, Botany, Ethnology, and General Structure, based on collections made by Mr. Charles Hedley. Part 6. Sydney, 1898. Size $10 \times 6\frac{1}{2}$, pp. 349–368. *Presented by the Australian Museum.*

POLAR REGIONS.

Antarctic. *Scottish G. Mag.* **14** (1898): 198–202. ———
Antarctic Exploration.

After some introductory remarks, this paper gives a summary of the proceedings at the Royal Society's Antarctic meeting.

Antarctic. *B.S.G. Italiana* **12** (1898): 209–212. **Faustini.**
Alcune altre osservazioni sulle "Appearances of Land" nella zona polare antartica. Nota del Socio A. Faustini.

Antarctic. *P.R.S.* **62** (1898): 424–451. **Murray.**
The Scientific Advantages of an Antarctic Expedition. By John Murray, D.SC., etc.

The official record of the meeting which is reported in the *Journal* for April, p. 416. It includes the remarks made by the Duke of Argyll, Sir J. D. Hooker, Dr. G. Neumayer, Sir Clements Markham, Dr. A. Buchan, Sir A. Geikie, and Prof. D'Arcy Thompson, but not those of the other speakers.

Antarctic. **Russell.**
Icebergs in the Southern Ocean, No. 2. By H. C. Russell, B.A., etc. Sydney, 1897. Size 9 × 6, pp. 32. *Map and Diagram.*

Arctic—Danish Expeditions. *G. Tidskrift* **14** (1898): 123–130. **Jensen.**
Danske arktiske Expeditioner 1605–1620. Udgivne med Anmærkninger og Indledninger af C. C. A. Gosch for the Hakluyt Society. Anmeldt af J. A. D. Jensen.

On the Hakluyt Society's recent work on 'Danish Arctic Expeditions, 1605–1620.'

Arctic Exploration. *Wide World Mag.* **1** (1898): 53–62. **Nansen.**
How the North Pole will be Reached. By Fridtjof Nansen. *With Map and Illustrations.*

Arctic Regions. **Weber.**
Müncheuer geographische Studien, herausgegeben von Siegmund Günther. Viertes Stück: Die Entwickelung der Physikalischen Geographie der Nordpolarländer. Von Dr. Heinrich Weber. München: T. Ackermann, 1898. Size 9½ × 6, pp. 250.

MATHEMATICAL GEOGRAPHY.

Cartography. *B.S. Topographie France* **21** (1897): 42–46. **Perrin.**
Causerie sur les écritures en topographie. Par M. Albert Perrin.

Nautical Almanac. ———
The Nautical Almanac and Astronomical Ephemeris for the year 1901. Also Part I. (Containing such portions as are essential for Navigation.) Published by order of the Lords Commissioners of the Admiralty. London: Eyre & Spottiswoode, [1898]. Size 9 × 6, pp. xiv., 652, and 18; (Part I.) xiv. and 314. *Price 2s. 6d. Part I.* 1s. *Presented by the Admiralty.*

Nautical Astronomy. **Marcuse.**
Beiträge zur nautischen Astronomie. (Fortsetzung, Zweiter Theil.) Von Dr. Adolf Marcuse. Sonder-Abdruck aus 'Marine-Rundschau.' 3 Heft, 1898. Size 9½ × 6½, pp. [10]. *Presented by the Author.*

Photographic Surveying. *Nature* **57** (1898): 563–564. ———
Photographic Surveying.

A sketch of recent progress in photographic surveying, with special reference to the use of the Bridges Lee camera.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climate. *Meteorolog. Z.* **15** (1898): 85–105. **Meinardus.**
Ueber einige meteorologische Beziehungen zwischen dem Nordatlantischen Ocean und Europa im Winterhalbjahr. Von Dr. Wilh. Meinardus. *With Diagrams.*

An extension of Prof. Pettersson's important paper on the connection between oceanographical and meteorological conditions.

Land-forms. **Penck.**
Die Erdoberfläche. Bearbeitet von Universitäts-Prof. Dr. Albr. Penck. (Sonderabdruck aus Scobel, Geographisches Handbuch zu Andrees Handatlas. 2 Auflage. Bielefeld und Leipzig, 1895.) Size 10 × 6½, pp. 34. *Illustrations. Presented by the Author.*

Meteorology. *J. School G.* **2** (1898): 96-104, 139-146. **Jameson.**
Some suggestions for teaching Elementary Meteorology. By J. M. Jameson. *With Illustrations.*

Meteorology and Oceanography. *Meteorolog. Z.* **15** (1898): 16-29. **Zenker.**
Die Winterwinde des nordatlantischen Oceans und die Afrikanischen Antimonsune. Von Dr. W. Zenker.

Meteorology—Aurora. *G. Tidskrift* **14** (1898): 113-116. **Paulsen.**
Nordlys. Af Adam Paulsen.

Meteorology—Rainfall. **Supan.**
Dr. A. Petermanns Mitteilungen. Ergänzungsheft Nr. 124. Die Verteilung des Niederschlags auf der festen Erdoberfläche. Von Alexander Supan. Gotha: Justus Perthes, 1898. Size 11 × 7½, pp. 104. *Maps.*
This will be specially noticed.

Mountain structure. *B.S. Languedoc. G.* **20** (1897): 165-183. **Rouville.**
Quelques mots de Géographie rationnelle. Par M. Paul de Rouville.
This paper, a continuation of that noticed in the *Journal* for January, p. 116, deals with the nature of mountain chains, and points out that these, to be studied logically, must be considered in the light of geological structure.

Oceanography. *G.Z.* **4** (1898): 203-210. **Maas.**
Die Aufgaben der Tiefseeforschung und die deutsche Tiefseeexpedition. Von Privatdozent Dr. phil. Otto Maas.
A rapid *résumé* of the results of modern oceanographical research.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. ———
Commercial No. 1 (1898). Index to Reports of Her Majesty's Diplomatic and Consular Representatives Abroad on Trade and Subjects of General Interest. (With Appendix.) [In continuation of Commercial No. 8 (1896).] 1896 and 1897. London: Eyre & Spottiswoode, 1898. Size 10 × 6½, pp. 150. *Price* 7½*d.*

Commercial Geography. **Dubois and Kergomard.**
Précis de Géographie Économique. Par MM. Marcel Dubois et J. G. Kergomard. La France—l'Europe—l'Asie—l'Océanie—l'Afrique—les Amériques. Paris: Masson et Cie, 1897. Size 9 × 6, pp. viii. and 844. *Price* 10 *francs.*
This is a work of solid value. It is no mere compilation of recent statistics, but an admirably arranged and ably reasoned account of the economic geography of the world. It is right, also, to point out that no trace of political feeling tinges the descriptions of the countries outside France.

Commercial Geography. **Gulishambaroff.**
Stanislaus O. Gulishambaroff. The World's Commerce during the Nineteenth Century and Russia's share in it.—Zapiski, Imperial Russian Geographical Society, Statistical Section. VII. Part iii. [In Russian.] St. Petersburg, 1898. Size 10 × 6½, pp. xiv. and 230.
A statistical study of the international trade of the world during the latter half of the nineteenth century.

Commercial Geography—Gems. *J. Franklin I.* **145** (1898): 24-35, 133-143. **Kunz.**
Geography of Precious Stones. By George F. Kunz.
A study of the distribution of precious stones and the trade in them, concluding, "Since the dawn of history the principal markets for the gathering and distribution of precious stones have been probably the following: Ancient India, Egypt, Babylon, Tyre, Alexandria, Rome, Byzantium, Venice, Augsburg, Golconda, Goa, Colombo, Ratnapura, Amsterdam, Antwerp, Paris, and London. For the semi-precious stones and agates, Oberstein in Germany, St. Claude in the French Jura, and the great fair at Nijni Novgorod in Russia, are the most important; and the United States is the ultimate home of from one-third to one-half of the world's product."

BIOGRAPHY.

Bacler. *B.S. Topographie France* **21** (1897): 80-82. **Jung.**
Un général topographe. Notice Biographique (tirée de "la Plume et l'Épée" du 1er juin 1893). Par Bacler dit Bacler d'Albe, Louis Albert Guislain (1761-1824). Par le Général Jung.

Gerando. *Rev. G.* **42** (1898): 1-4. **Reclus.**

Attila de Gerando. Par Élisée Reclus. *With Portrait.*

Mr. Gerando, born in 1847, died in 1897. He was the author of several memoirs on the geography of Hungary.

Ivens. ——

Roberto Ivens. *With Portrait.* From *La Revue.* Illustrée du Portugal. 3ème Anner, Num. 2. Lisbonne: Février, 1898. Size 14 × 9½. *Presented by R. K. Gray, Esq.*

Rawlinson. **Rawlinson.**

A Memoir of Major-General Sir Henry Creswicke Rawlinson, Bart., K.C.B., F.R.S., etc. By George Rawlinson, M.A. With an Introduction by Field-Marshal Lord Roberts of Kandahar, V.C. London: Longmans & Co., 1898. Size 9 × 6, pp. xxii. and 358. *Map, Portraits, and Illustrations. Price* 16s. *Presented by the Publishers.*

This will be specially noticed.

Riehl. *Deutsche Rundschau G.* **20** (1898): 229-231. ——

Heinrich v. Riehl. *With Portrait.*

Herr von Riehl (born 1828, died 1897) was a journalist and historian who took part in several works of a largely geographical character.

Vespucci. *Riv. G. Italiana* **5** (1898): 86-88. **Masini.**

La data della nascita di Amerigo Vespucci. Nota di Enrico Masini.

Reasons for giving the date of birth of Vespucci as March 9, 1454.

Winsor. **Lane and Tillinghast.**

Justin Winsor, Librarian and Historian, 1831-1897. By William C. Lane and William H. Tillinghast. A Paper read before the Massachusetts Library Club, December 16, 1897. New York: Reprinted from the *Library Journal*, January, 1898. Size 10 × 8, pp. 10.

GENERAL.

Army Medical Report. ——

Army Medical Department. Report for the year 1896. With Appendix. Volume xxxviii. London: Eyre & Spottiswoode, 1897. Size 10 × 6½, pp. and 486. *Illustrations.*

Bibliography. **Cotgreave.**

A Contents-Subject Index to General and Periodical Literature, to which is added an extensive list of works on subjects of general and special interest. Compiled by A. Cotgreave. Sections 7, 8, 9, 10. Campanella—Crystoleum. Size 8½ × 5½, pp. 97-160.

This contains a number of references to matters of geographical interest in general literature and popular magazines.

Bibliography. *B. New York Public Library* 2 (1898): 92-95. ——

Periodicals relating to Geography.

A list of the geographical publications, old and actual, in the Public Library of New York and the Library of Columbia University.

British Association Report. ——

Report of the Sixty-seventh Meeting of the British Association for the Advancement of Science held at Toronto in August, 1897. London: John Murray, 1898. Size 9 × 6, pp. cxvi., 908, and 112. *Presented by the Association.*

British Empire. *J.R. Statistical S.* **61** (1898): 1-48. **Baines.**

The Recent Course of Trade within the British Empire. By J. A. Baines, C.S.I.

A study of the trade relations of the British Empire during the last 30 years. The average value of exports and imports during the whole period and five-yearly means are given for each possession; and also tables of the variations of the trade of each, grouped according to commodities and according to foreign countries, and discussed in various other ways.

British Empire. *Le Globe, B.S.G. Genève* **37** (1898): 33-37, 43-53. **Chaix.**

L'Empire colonial de l'Angleterre en 1897. (Résumé.) Par M. le professeur Paul Chaix.

The veteran Prof. Paul Chaix, whose regard for this country is well known and cordially recognized, has, at the age of eighty, given this interesting contribution to the Diamond Jubilee celebration in the Geographical Society of Geneva.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Bartholomew.**

New Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 17, Shropshire. J. Bartholomew & Co., Edinburgh, 1898. *Price* 2*s*., mounted on cloth. *Presented by the Publishers.*

England and Wales. **Ordnance Survey.**

Publications issued since April 8, 1898.

1-inch—General Maps:—

England and Wales:—280, 296, hills engraved in black and brown: and 26, 42, 43, 64, 72, 248, engraved in outline; 248, 273, 274, 316, hills engraved in black and brown (*revision*). 1*s*. each.

6-inch—County Maps:—

England and Wales (revision):—**Essex**, 3 s.e., 8 n.e., 9 n.w., 14 n.e., 17 n.w., 23 n.w., 27 n.w., s.w., 28 s.e., 29 n.w., 33 n.w., 36 n.w., 38 n.w., 46 n.w., 47 n.e., 55 s.e., 57 n.e., 59 n.w., 61 n.e., s.w., 65 n.w., 66 s.e., 67 n.e., 68 n.w., 76 n.w., 77 s.e., 79 s.e., 87 n.w., n.e. **Hampshire**, 21 s.w., 44 n.w., n.e., s.w., 54 s.e., 62 s.e., 63 n.w., n.e., 64 n.w., s.w., s.e., 65 n.w. **Kent**, 2 s.e., 4 s.e., 32 s.e., 40 s.e., 42 s.w., s.e., 43 s.e., 52 n.e. **Middlesex**, 25 s.w. **Northumberland**, 59 n.w., 76 n.w., 79 s.w., 80 n.w., 83 s.e., 88 s.w., 91 n.e., 92 s.e., 93 n.w., 94 n.w., 95 n.e., 102 s.w., 103 n.e. **Surrey**, 14 n.e., 26 s.w., 45 n.e. 1*s*. each.

25-inch—Parish Maps:—

England and Wales (*revision*).—**Cheshire**, III. 12; IV. 7, 9, 11, 13; IX. 10, 14, 15; XI. 10; XVIII. 3, 4, 10, 11, 12, 15; XIX. 4, 6, 10; XXVI. 2, 3, 4, 6, 8; XXVII. 2, 3, 4, 7, 8, 10, 12; XXVIII. 1, 9, 13; XXXV. 7, 10, 11; XXXVI. 8, 12; XLII. 6, 8, 10, 14; XLIX. 6, 7, 8, 10, 14, 16; L. 5, 7, 9, 10, 13, 14, 16; LI. 2, 13; LVII. 2, 6; LXII. 1, 5. **Derbyshire**, IV. 9, 10; V. 4, 8, 12; VI. 9, 13; VII. 1, 2, 5, 6; IX. 1, 2, 4, 7. **Durham**, II. 13; X. 9; XI. 2; LV. 5, 6, 10; LVI. 11; LVII. 12. **Essex**, XVII. 9; XXI. 15. **Hampshire**, LXXV. 5, 16; LXXVI. 12; LXXIX. 13, 16; LXXXIV. 1, 5, 6; LXXXVII. 3, 11, 12; XCIII. 3, 11, 13; XCIV. 11, 12, 16; XCV. 5, 10, 12, 13; XCVII. 2, 3. **Hertfordshire**, III. 4, 7, 15; IV. 1, 5, 9; VII. 11, 15; VIII. 2, 3; XI. 8, 15; XII. 3, 5, 6, 13, 15, 16; XIV. 13; XX. 3, 4, 5, 14, 15, 16; XXI. 4, 5, 14, 16; XXII. 14, 15; XXIII. 10; XXVIII. 1, 3, 8, 12, 13, 16; XXIX. 1, 2, 3, 4, 5, 7, 9; XXX. 1, 2, 3, 10; XXXI. 5; XXXIV. 6, 10, 12, 16; XXXV. 1, 2, 4, 5, 13; XXXVI. 5, 12, 15; XXXIX. 4, 6, 15; XL. 3, 4; XLI. 3, 5, 7, 10; XLIV. 3, 4, 12, 15; XLV. 5, 6, 11. **Kent**, V. 16; XXIII. 12; XXIV. 5, 6, 7, 8, 9, 10, 11, 12, 16; XLVI. 2, 6, 9, 10, 11, 12, 13, 15; XLVII. 2, 4, 12; LVII. 13, 14; LIX. 5; LXVII. 9, 10, 11, 13, 14; LXXII. 2, 6, 8; LXXXIV. 7, 9, 11, 15. **Northumberland**, XI. 4; LXXXVIII. 15, 16; XCVII. 3; CII. 14. **Surrey**, XLVII. 5. **Sussex**, I. 16; II. 13; III. 3, 4; IV. 1, 2, 8; X. 6; XII. 4, 5; XX. 3, 7, 11; XXXIII. 12; XLVII. 6; LII. 14, 15, 16; LIII. 13, 14, 15, 16; LXI. 11, 14, 16; LXII. 13; LXIII. 13; LXIV. 8, 9, 10, 11, 12, 13; LXV. 1, 2, 3, 4, 6; LXVI. 1, 2, 3, 4, 7, 8, 11, 12, 15; LXXII. 8, 12; LXXIII. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15 and 16; LXXIV. 2, 7; LXXVI. 1; LXXVII. 3 and 4; LXXXI. 1 and 6, 2, 3, 7. **Westmorland**, XXXVIII. 14, 16; XXXIX. 1, 6, 7, 9, 10, 11, 13, 14, 15; XL. 13; XLII. 1, 2, 3, 4, 9, 11, 13, 14; XLIII. 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XLIV. 1, 5, 9, 13; XLVI. 1, 2, 3, 4, 6, 7, 8, 9; XLVII. 1, 2, 3, 5, 8, 10, 11, 12, 13; XLVIII. 1, 5. 2*s*. 6*d*. each.

(*E. Stanford, Agent.*)

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World, connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College, and Lecturer in Diplomatic in the University of Oxford. Part xvii. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston, 1898. *Price* 3*s*. 6*d*. *Presented by the Clarendon Press.*

Part No. xvii. of this atlas contains the following maps: No. 22, England and Wales after the Accession of the House of Tudor, by the editor; No. 69, Italia Sacra, illustrating the Ecclesiastical Divisions in the Middle Ages, by Miss K. Dorothea Ewart; No. 89, European Colonies and Dependencies, and States independent of European Powers, 1815-1897, by Hugh E. Egerton, M.A. Each of these maps is accompanied by letterpress.

AFRICA.

German East Africa. **Werther.**

Originalkarte der Irangi-Expedition in den mittleren Hochländern des nördlichen Deutsch-Ost-Afrika, Juli 1896 bis April 1897. Nach den astronomischen Ortsbestimmungen, Aufnahmen und eigenhändigen Konstruktionen des Führers der Expedition Premierlieutenant W. Werther. Scale 1 : 750,000 or 10·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen.* Jahrgang 1898, Tafel 6. Gotha: Justus Perthes. *Presented by the Publisher.*

Limpopo River. **Commissão de Cartographia, Lisbon.**

Reconhecimento hydrographico do Rio Limpopo, desde a sua fóz até á confluencia do Chengane. Scale 1 : 39,816 or 0·63 stat. mile to an inch. 1897.—Reconhecimento da Barra do Limpopo. Scale 1 : 10,000 or 0·15 stat. mile to an inch, 1897.—Levantado em 1896 por Valente da Cruz, 2° tenente da armada. Ministerio da Marinha e Ultramar, Commissão de Cartographia. Lisbon. *Presented by the Commissão de Cartographia, Lisbon.*

This map contains a survey of the Limpopo river from the confluence of the Chengane to its mouth. Soundings are given as far up the river as Languene, and a plan on an enlarged scale is given of the entrance. On the map there are some useful notes with reference to the navigation.

Nile. **Philip.**

New Map of the Nile from its Mouth to Khartum, illustrating the operations of the Egyptian Army in the Sudan. Scale 1 : 2,555,000 or 40·8 stat. miles to an inch. London: G. Philip & Son. 1898. *Price 1s. Presented by the Publishers.*

South-East Africa. **Commissão de Cartographia, Lisbon.**

Africa Oriental Portugueza. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheets: No. 4, Zumbo—Tete; No. 8, Quelimane—Sofala. Published by the Ministerio da Marinha e Ultramar, Commissão de Cartographia. Lisbon, 1896–97. *Presented by the Commissão de Cartographia, Lisbon.*

These are two sheets of a map of Portuguese East Africa in course of publication. With the exception of that part of the river between Sena and Sango, the whole course of the Zambesi is shown from the delta to Zumbo, with the surrounding country.

West Africa. **Commissão de Cartographia, Lisbon.**

(1) Reconhecimento do Rio Cacheu. Provincia da Guiné, 1897. (2) Reconhecimento do Canal do Impernal e Rio Mansoa. Provincia da Guiné, 1897. (3) Plan do Porto e Cidade de Dilly. 2nd Edição, 1895. (4) Esboço Rapido da Communicação entre o Rio Tombali ao Canine, Provincia da Guiné, 1897. (5) Reconhecimento do Rio Geba, 1897. (6) Reconhecimento do Rio Mansôa, 1897. Provincia da Guiné. (7) Esboço do Rio Corubal, entre o Rio Geba e porto Ugui. Provincia da Guiné, 1897. (8) Reconhecimento hydrographico da Barra e Porto de Angoche, 1897. Provincia de Moçambique. Ministerio da Marinha e Ultramar, Commissão de Cartographia. *Presented by the Commissão de Cartographia, Lisbon.*

AMERICA.

Klondike. **Philip.**

Philip's Sketch-Map of the Klondike Gold Region, Yukon District, Dominion of Canada. Compiled from the latest authentic sources, and from information supplied by the Klondike Parent Pioneer Corporation, Ltd. Approximate scale 1 : 126,720 or 2 stat. miles to an inch. G. Philip & Son, London & Liverpool, 1898. *Price £1 1s. Presented by the Publishers.*

The principal map on this sheet is drawn on a scale of 2 miles to 1 inch, and contains all that is known of this territory. The auriferous creeks are printed in gold, other creeks and rivers in blue, and the hill shading in brown. Notes are given on river navigation, value of gold taken from various localities, particulars about discovery and Government claims, tables of distances and through rates from Liverpool, and other items of useful information. An inset on a large scale is given, showing all the claims on the Bonanza, Eldorado, and tributary creeks; this has been compiled from drawings in the office of the gold commissioner, Dawson.

North America. **Stanford.**

Stanford's Map of the United States (Eastern Part) and Cuba. Scale 1 : 5,385,600 or 85 stat. miles to an inch. E. Stanford : London, 1898.

United States and Spain. **Johnston.**

War Map with United States and Spain. 2nd edit. W. & A. K. Johnston, Edinburgh and London, 1898. *Price 1s. Presented by the Publishers.*

This sheet contains seven maps, on various scales, the principal being one of the West India islands, and another of the south-eastern part of the United States.

Yukon Gold Fields. **Canadian Pacific Railway Co.**

Map of the Canadian Pacific Railway and Connections, showing Routes to the Yukon Gold Fields, Alaska, Klondike, and the North-Western Mining Territories of Canada. Scale 1 : 6,570,000 or 105 stat. miles to an inch. *Presented by the Canadian Pacific Railway Co.*

GENERAL.

The World. **Andree.**

Andrees allgemeiner Handatlas, 126 Haupt- und 130 Nebenkarten auf 186 Kartenseiten, nebst alphabetischen Namenverzeichnis. Vierte, völlig neubearbeitete, stark vermehrte Auflage, herausgegeben von A. Scobel. Bielefeld und Leipzig: Verlag von Velhagen and Klasing, 1898.—Lief II. Nieder-und Ober-Österreich, Steiermark, Kärnten, Krain und Küstenland: Griechenland.—Lief III. Vegetationsgebiete, Meeresströmungen und Kulturpflanzen: Schleswig-Holstein, Mecklenburg und Freie Städte Hamburg und Lübeck.—Lief IV. Übersichtskarte von Schweden und Norwegen: Südamerika, Nördliche Hälfte.—Lief V. Königreich Sachsen: Westrussland, Nördlicher Teil.—Lief VI. Provinz Sachsen und Herzogtum Anhalt: Mittelitalien.—Lief VII. Hannover, Oldenburg, Braunschweig und Freie Stadt Bremen: Hinterindien und Malayischer Archipel.—Lief VIII. Provinzen West- und Ostpreussen: Böhmen, Mähren und Österreichischen-Schlesien.—Lief IX. Nordostfrankreich: Südöstliche Vereinigte Staaten, Cuba und Bahamainseln.—Lief X. Niederlande und Belgien: England und Wales, Südliche Hälfte.—Lief XI.—Übersichtskarte von Italien: Nord-Asien. *Price 50 pf. each part.*

This atlas is now being issued at the rate of one part each week, and eleven have already appeared.

PHOTOGRAPHS.

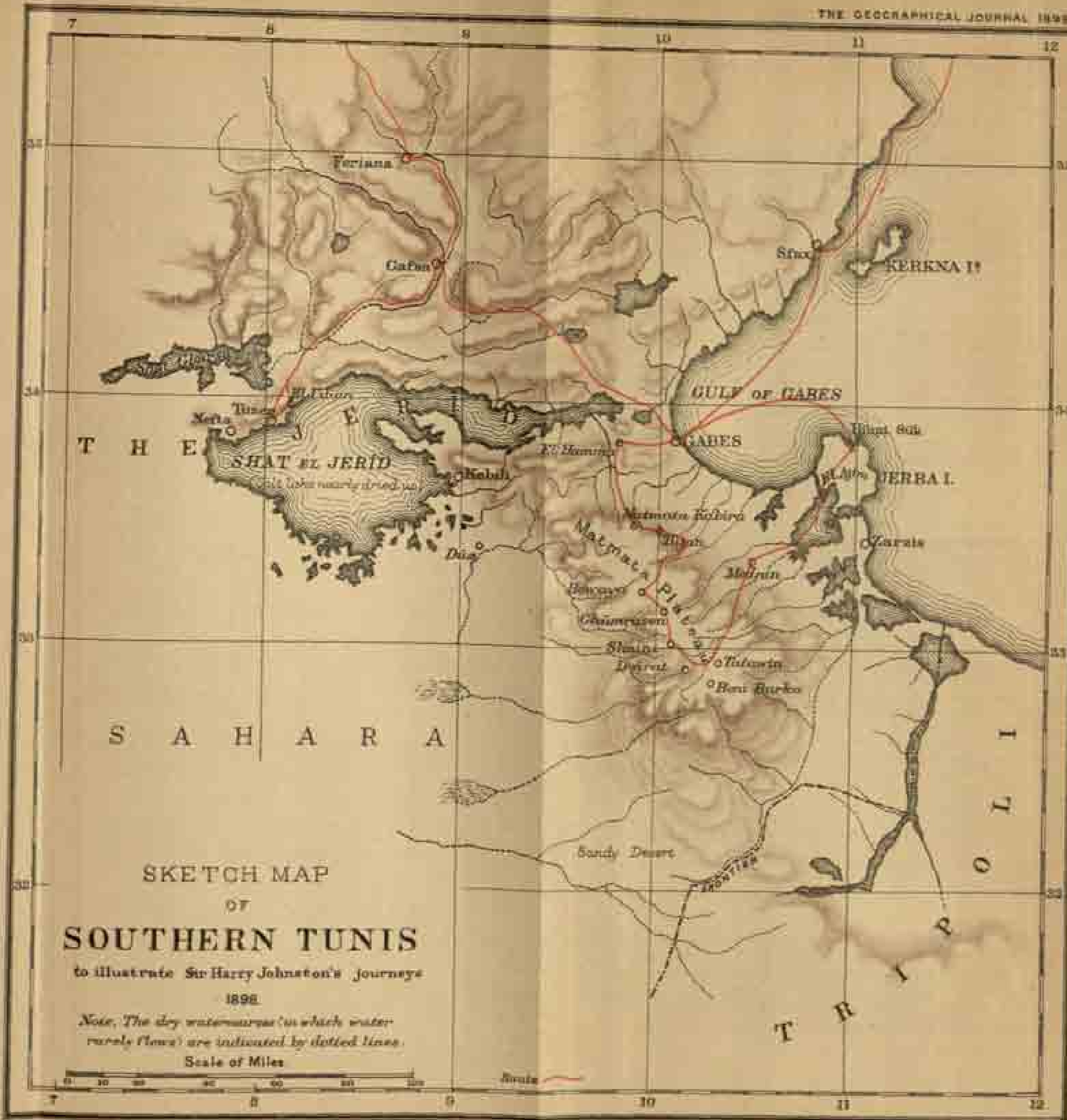
Mexico. **Krauss.**

Twenty-two Photographs of Mexico, taken by A. Krauss, Esq., during the expedition of J. Gurdon L. Stephenson, Esq., 1897. *Presented by J. Gurdon L. Stephenson, Esq.*

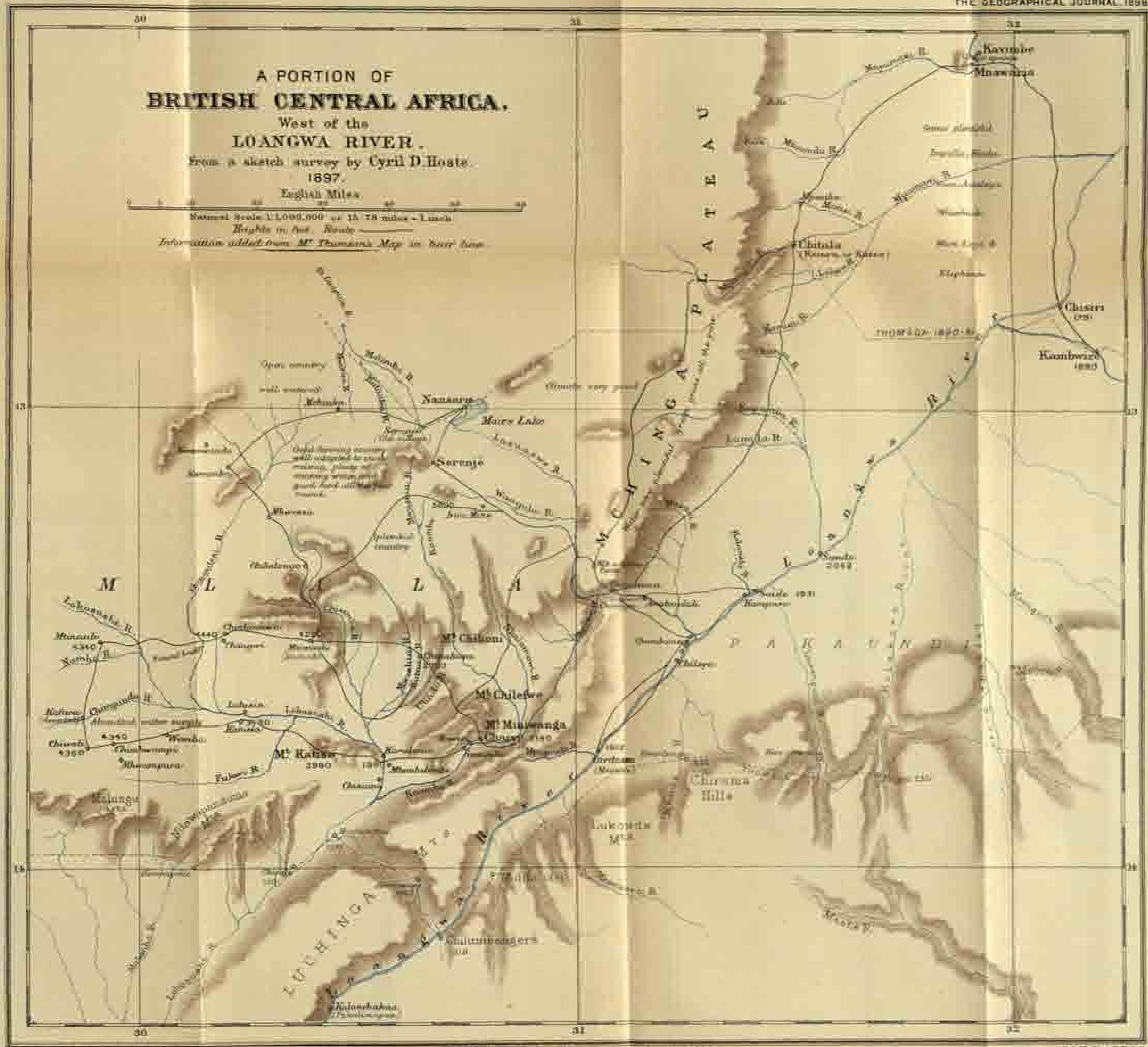
Though these photographs are of small size, they are very clear, suited for making lantern slides, and would, no doubt, bear enlargement. As will be seen by the following list of titles, they form an interesting series.

(1) Tarahumari Indians working in the Arroyo Eglesia; (2) House, Realito; (3) Fording Fuerte river, near Fuerte, dry season; (4) Ox-waggon, Carichic; (5) Batopilas Conducta coach and waggon at Ojos, Anjule's ranch; (6) House at Tehueco; (7) Tasajera; (8) Corral, Colorado ranch; (9) On trail near Realito; (10) On trail near Rodes; (11) Indian blanket loom at Charay; (12) Tarahumari Indians and store-house at Pilares; (13) Fording Fuerte river near San Ignacio; (14) Passing pack-train on trail between Batopilas and Calabases; (15) Fording Urique river near Siquirichic; (17) Ass dragging log, Fuerte; (17) Realito on Batopilas river; (18) Mules towing dug-out across Fuerte river, rainy season; (19) Rock in the Sivirijoa Arroyo, showing old carvings; (20) Fording Urique river near Siquirichic, Batopilas Conducta; (21) Crossing Fuerte river near Fuerte, rainy season—horse towing; (22) Batopilas Conducta coach at Carichic.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

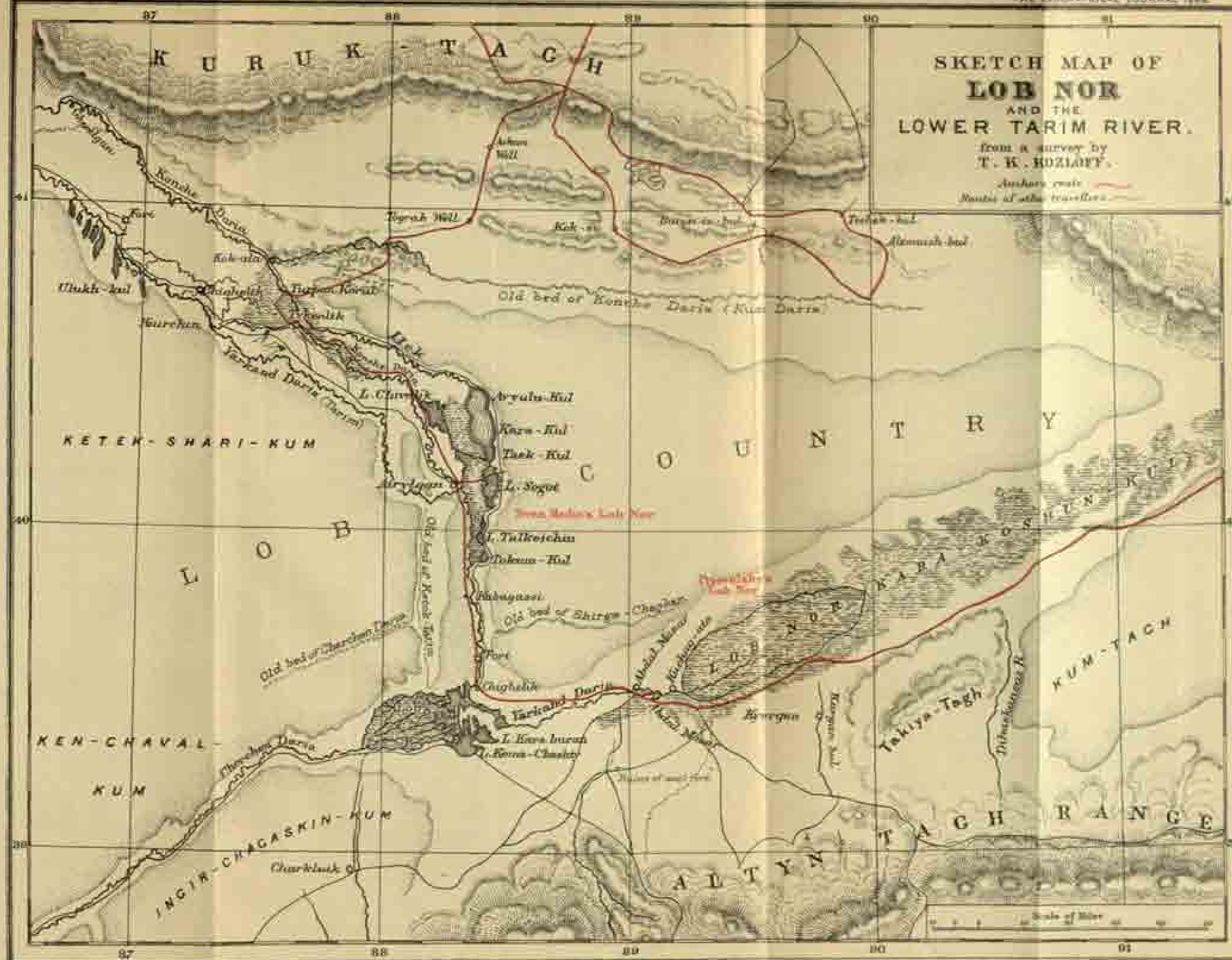


Published by the Royal Geographical Society



Published by the Royal Geographical Society, 1898.

E.S. Weller, F.R.G.S.



Published by the Royal Geographical Society.


NORTH EAST
NICARAGUA.
from a survey by
JOHN M. NICOL C.E.
1897.
Scale of Miles
0 5 10 20 40 60
Natural Scale 1 : 1,500,000 or 1 inch = 23·7 Miles
Steamer limit
Mangrove swamps
Gold workings
Coffee estates
Route
Heights in feet
H O N D U R A S
Pine Trees and Grass Land
MINES OF PIS PIS
Rio Wawa
MINERALS OF WAWA
Rio Kukalaya
R. Wawa
Sandy B.
Ocotal
Rio Tuma
Jinotega
Esteli
Matagalpa
Plains of Sebaco
C. Ka
Cerro Saial
Rio Prinzapulca
DISTRICT OF RIO GRANDE
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