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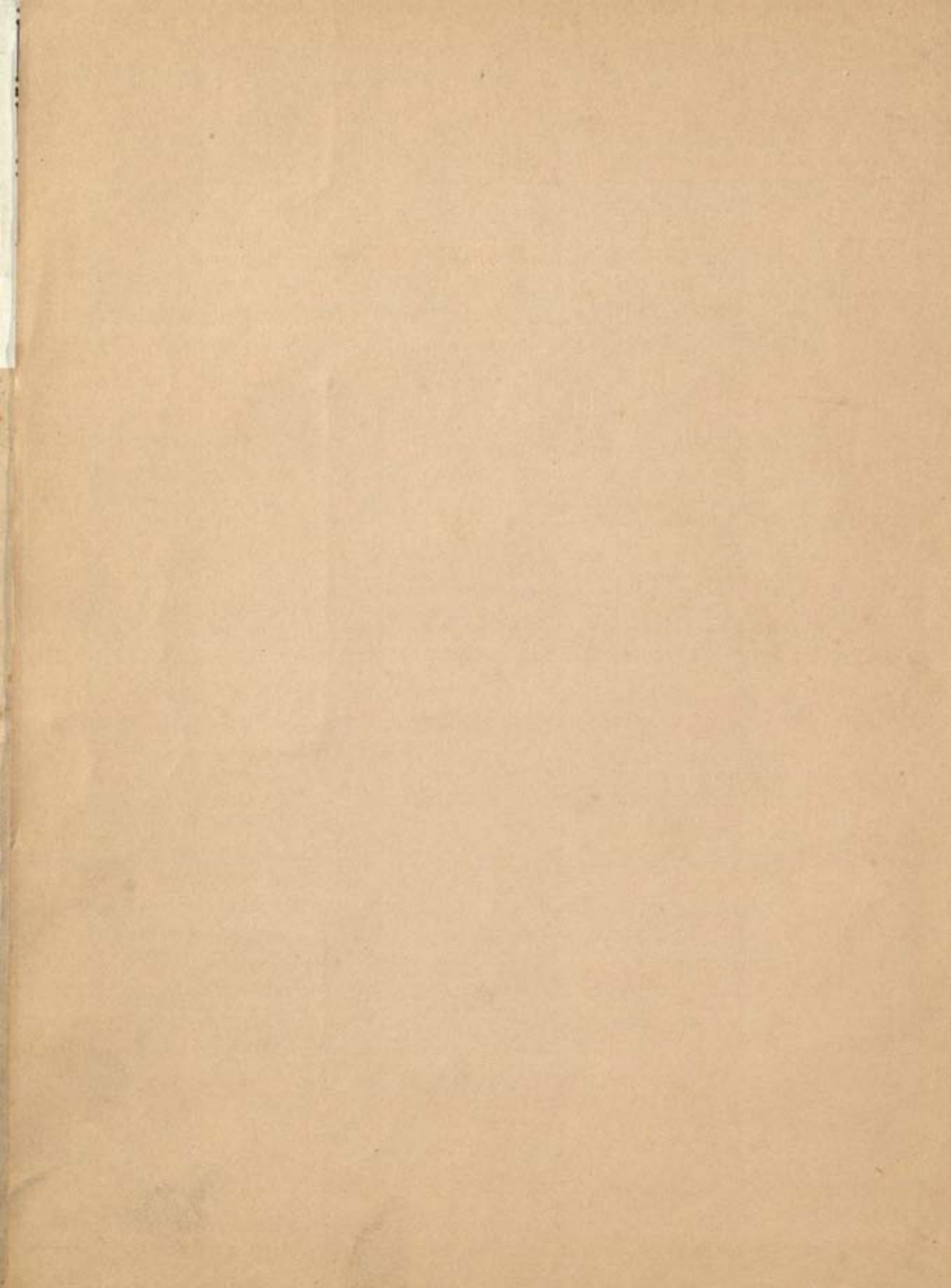
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PREHISTORY AND PROTOHISTORY
OF
EASTERN INDIA



Ministry of Education
Government of India,
New Delhi

83528

PREHISTORY AND PROTOHISTORY OF EASTERN INDIA

With a detailed account of the neolithic cultures in mainland South East Asia

83528

By

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PREFACE

THE Prehistory of India and Pakistan is still in the early stages of study. So far the exploration has been conducted very unevenly and the result has mostly given us a description of tool types recovered from such searches. Barring a few exceptions, no serious attempt has been made to study the geological context within which the different tools were produced and to reconstruct the environmental background in which early man lived in this sub-continent. We can hardly visualise at present the changing pattern of the geography and geology of this vast land mass when man evolved from early stone age to later periods of tool manufacture. The environmental reconstruction of Burkitt and Cammiade in South East India is a hypothetical proposition which needs exact correlation with geological phases. De Terra's attempt to define geological periods in the Potwar has been questioned by Prof. F. E. Zeuner, and Zeuner's own reconstruction in Gujarat lacks detail and remains to be supplemented by further analysis of the materials. In Eastern India N. K. Bose has tried to study the implementiferous beds of the Burhabalanga, but the result is still far from satisfactory. Consequently the geo-chronology in this sub-continent still remains to be established. In the present state of our knowledge only a general geographical and geological background can be given. On the other hand, the stone tools in this sub-continent have been studied mainly on the basic terminology evolved in European and African contexts. The attempt of H. L. Movius to evolve terms like, Chopper-chopping tools, Scrapers and Hand Adzes for the Eastern Asiatic tool types is hardly satisfactory. But as long as a comprehensive independent enquiry into the problem of the stone-industry of this sub-continent, based on the nature of the raw-material available here is not made, a researcher in a limited field has to make the most of the given opportunities. It is against this background that the first three chapters of this book have been written. The main idea throughout has been to provide an earlier background to the main part of the thesis which deals with the neolithic problem in Eastern India and South East Asia.

However, a review of the excavated material has definitely proved that the palaeolithic complex of Eastern India is fundamentally different from the so-called "Chopper-chopping" tool tradition of Eastern Asia. The microlithic industry of this region, which Col. D. H. Gordon vaguely suggested was "Chalcolithic" in character of the type that he noticed at Maski and Brahmagiri, or even in the Deccan trap area, is not borne out by a detailed analysis of the available material. This conclusion is confirmed by the recent excavation of B. B. Lal at Birbhanpur, but at the same time the latter's inference that the non-geometric character of the Birbhanpur industry should argue for a very early date is hardly tenable, as it is based on the assumption of Gordon's conclusion. The microlithic complex of Eastern India is peripheral, and it is this context which should ultimately decide its chronology.

The neolithic cultures in this sub-continent at present centre round the study of stone tools. The basic tool here is what has been termed "the pointed butt axe"—a median edged cutting tool which has its edge parallel to the haft. The adze-type with bevelled cutting edge perpendicular to the haft is not known to India except in the late context, and that again is limited to Eastern India. There are two types of this adze—the faceted and the shouldered tools—exactly identical with similar specimens in South East Asia where they occur at a time when developed neolithic complex has spread its influence from the river-valley cultures of the Chinese mainland. The Indian adzes are no doubt an off-shoot of this cultural movement, but there is nothing to support the view that the whole neolithic complex of this sub-continent is indebted to China. This conclusion is borne out by a detailed analysis of the materials given in the chapters dealing with the neolithic cultures.

The work, as a whole, was mainly completed in the early part of 1955 and submitted for the degree of Ph.D. in the University of London. Later on I altered and added some portions in order to bring the main part up-to-date, the most important being the excavations at Gua Cha in Malaya and those at Birbhanpur in West Bengal. It is unfortunate that I could not take evidence from the neolithic cultures of the Indonesian islands—a subject which has now been summarised by Van Heekeren in *Stone Age in Indonesia*. Similarly, Cheng Tek'un's thesis on *Archaeological Studies in Szechwan* has now been published but

I have not been able to utilize it for this book. It is hoped that these deficiencies will be met in future edition, if at all it will be in demand.

The work was done under the general supervision of Prof. K. de B. Codrington when I was working in the Institute of Archaeology, University of London. To him I am greatly obliged for all that he did in seeing my thesis through. But it is mainly the lectures of Prof. F. E. Zeuner on Prehistory that I had the good fortune to attend and which inspired me to write this thesis. I am most obliged to him for going through my second chapter and allowing me to work in his laboratory. I am also indebted to Dr. F. R. Allchin and Mr. A. H. Christie for their general help and criticism of many points raised in the thesis. Col. D. H. Gordon was good enough to let me have his detailed criticism, in the light of which I have revised some of the opinions stated originally in the thesis. I am also obliged to Prof. A. L. Basham for his kindly going through my first chapter. I shall be failing in my duty if I do not recall my indebtedness to Sir. R. E. Mortimer Wheeler, who was my first teacher in archaeology and whose contact has left a profound influence in my life.

Acknowledgements are also due to the following for the facilities that they gave me to study the collections in their museums and for the permission to make drawings and publish in this book:—the authorities of the Pitt Rivers Museum, Oxford; the authorities of the British Museum, London; the authorities of the Museum of Archaeology and Ethnology, Cambridge; the authorities of Musée de l'Homme, Paris. I am also obliged to the Librarians of the Institute of Archaeology, University of London, Royal Asiatic Society, London, School of Oriental and African Studies, University of London, India Office Library, and Natural History Section of the British Museum for all the facilities they gave me to consult books.

I am also grateful to Firma K. L. Mukhopadhyay for kindly undertaking to print this work and bring it out in this form. The plates were redrawn by my student Mr. M. Enamul Haque from my drawings, the sources of which I have mentioned in the text.

Dacca Museum.

AHMAD HASAN DANI

1. 9. 1960

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CHAPTER I

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GEOGRAPHICAL AND GEOLOGICAL INTRODUCTION

EASTERN India¹ comprises the provinces of Assam, East Pakistan, West Bengal, Bihar and Orissa. But these administrative provinces do not make a geographic homogeneity, nor are they in any way separated from the rest of India by physical or cultural barriers. They cannot even be said to show that bond of kinship which the term South India implies, as opposed to North India. The only geographic feature common to all these provinces is the fact that they share the monsoon climate and the heaviest rainfall in the sub-continent. On this point alone a wider link may be established with the monsoon countries of South-East Asia. As the Bay of Bengal washes the shores of most of these countries, it might be held to strengthen this link but not before the problem of the monsoon was understood and overcome by the people.²

Eastern India is an integral part of the Indo-Pakistan sub-continent, and hence shares equally the cultural heritage that developed in the great sub-continent. The Himalayan Range of the north defines the northern limit of this area, while the numerous forest-clad hills of the Assam-Burma border almost shut off communication with the trans-border regions, though a precarious passage could be forced through difficult passes. The western boundary is ill-defined. The Ganges links up Bengal and Bihar with northern India. The thickly forested uplands of Chota Nagpur continue this physical aspect right into the Vindhya and Satpuras. The River Mahanadi, again, connects the rice-growing areas of Orissa and the Chattisgarh plains. The southern boundary is well marked by the Orissan hills that penetrate right into the sea below the Chilka Lake, and thus separate the Oriya-speaking people of Orissa from the Telagus of the Ganjam district.

¹ India has been used here in a wider sense, denoting Indo-Pakistan sub-continent.

² Sylvain Levi (P. C. Bagchi, 1929, Pp. 125-26) has likened the Bay of Bengal to the Mediterranean of Europe, but the geographical conditions obtaining in the Bay of Bengal are altogether different from those of the Mediterranean Sea, which is not dominated by marked seasonal changes.

The physiographical aspect of Eastern India is dominated by the basins of the Ganges in Bihar, the Brahmaputra in Assam and their joint deltaic formation in Bengal, while the rice-growing nucleus of Orissa is formed by the deltaic alluvium of the Brahmani, Baitarni and Mahanadi rivers. The northern river basins and the Bengal delta make one uninterrupted stretch of land, in geological terms, a homogeneous formation brought about by the deposition of alluvium by the hypothetical Indo-Brahm River.¹ This alluvial flat is separated from deltaic Orissa by the gneissose plateau of Chota Nagpur,² a thickly forested area cut up by numerous hill ranges enclosing small river valleys—a wild area that has always presented difficulties from the point of view of communication between north and south India parallel with the eastern coast. This is the north-easternmost extension of the Peninsular block. O. H. K. Spate (1954, P. 585) aptly remarks, “geographically speaking it is *terra incognita*, rocky, jungly, isolated, backward, and almost empty.” There is another such detached block of the Peninsula lying between the Brahmaputra valley and the Bengal delta. It has been called the Shillong or Assam Plateau, and is divided into the Garo, Khasi and Jaintia Hills with the Mikir and Rengma Hills as further and even more dissected outliers (See map no. 8). Around it are wrapped the Tertiary ranges of the mountain wall. Towards the east the Shillong Plateau is linked with the Barail and so with the Assam-Burma Ranges by a saddle, which sinks below 300 feet and is used by the Assam Bengal railway (See map no. 1).

The thickly inhabited parts of Eastern India are naturally the river basins and the deltas. It is the fertility of their soil that has attracted throughout the known

¹ On this subject see, S. Burrard, 1914-15, P. 224; E. H. Pascoe, 1919, Pp. 138-155; R. D. Oldham, 1893, P. 444; G. E. Pilgrim, 1919, Pp. 81-99; D. N. Wadia, 1953, Pp. 55-57; Krishnan & Aiyengar, 1940-41, paper 6; Fox, 1938, P. 319; and B. Prashad, 1939-40, Pp. 560 ff.

² Chota Nagpur is used here as defined by L. S. S. O'Malley (1917, P. 24), “The term, Chota Nagpur Plateau, is used to designate the elevated country extending from the Gangetic valley to the hilly table-land of the Central Provinces and approaching close to the Bay of Bengal on the south-east. It is not intended to imply that it forms a table-land like the steep-walled precipice behind Cape Town with its long and lofty horizontal top. The word plateau is, in fact, a technical expression for an area of which the lowest levels are at a considerable height above the sea. The plateau as thus defined extends far beyond Chota Nagpur itself, stretching into the inner highlands of Orissa on the south-east, and through the Santal Parganas, as far as the bank of the Ganges on the north-east.”

period of history horde after horde of invaders and settlers. In the settlement of this region the northern river basins and the Bengal delta hold the first position as they are directly connected with the plains of northern India. Beginning from the first recorded tradition of the Vedic Aryan settlement in Videha (north Bihar) by the Vedic hero Videgha Mathava after crossing the River Sadanira (*Satapatha Brahmana*, I.4,1.10-18), this northern Gangetic plain has throughout history served as a highway for invaders, merchants and pilgrims alike. It is needless to repeat the well-known routes so fully recorded in the travel accounts of the Chinese pilgrims, Fa hien and Yuan Chwang (see Motichandra, 1953, for details). Orissa has always remained outside this northern movement of peoples. It comes into limelight for the first time with the missionary activities of the Buddhists and the Jainas. It is from the late evidence of the Hathigumpha inscription of Kharavela that Orissa is said to have come for the first time within the political orbit of a northern ruler, the Nanda king of Magadha¹ (4th century B.C.). The rice-growing area of Orissa was, no doubt, a great attraction, but to reach that region was not easy. The route,² if at all it can be called a route, lay through the south-western districts of Bengal, and the choice lay between the barren hilly ranges of the west and the alluvial delta, cut up by numerous broad rivers difficult of passage. It is clear that this passage could be forced through only by indefatigable conquerors, like Asoka, Samudra Gupta or Harshavardhana. The region seems to have attracted only homeless fugitive wanderers, such as the uprooted Rajputs in the early mediaeval period and the Pathans, true Afghans, who fled from Bengal into Orissa under the pressure of settled Mughal Government. As the result of its isolation, Orissa has always remained backward, but at the same time has developed a cultural pattern of its own. Its link with northern India is stronger than with the South, the Chilka Lake remaining the linguistic boundary.

In contrast with the river basins and their deltas, the uplands of Chota Nagpur and the Shillong Plateau are naturally very sparsely populated. They are the homeland of aboriginal tribes, living a precarious life in various stages of food-collecting or simple food-producing. They have always been left to their own

¹ On this evidence the historians have supposed that the Nandas ruled over Orissa.

² The straight route shown in Motichandra's map (1953) is hardly corroborated by history.

fate and way of life by the great empire-builders, such as Asoka and Samudra Gupta, though briefly mentioned in their inscriptions. These regions are not absolutely barren lands. As will be described shortly, numerous hill terraces and small river valleys lie between the hill ranges, which have been taken advantage of by these hill peoples, who have practised a form of agriculture, known in Assam as *jhuma* and in Chota Nagpur as *daya*. These forest-clad plateaus, which lie athwart the pattern of the main river basins and deltas, may be taken as refuge areas for those lesser peoples who were driven out from the alluvial regions, a fact to which later history bears ample evidence. But there is no evidence to show that these hill tribes were refugees from the great plains. The recorded tradition of the Vedic Aryan does not indicate any great opposition in the northern Gangetic valley such as they met in the country of the *Sapta Saindhavas*. Strangely enough, the archaeological finds of the stone artifacts are also confined to the south of the River Ganges. It must also be mentioned that it is in this southern hilly zone that the raw material for working stone tools is most plentifully found. It is in the same zone that important deposits of metal ores of iron and copper are also found. Probably it was the availability of metals that aided the rise of the Magadha (South Bihar) power and ultimately led to the foundation of the first great empire in India. Magadha maintained this position till the rise of the Rajputs and the advent of the Muslims, when the Gangetic political arena was linked westward beyond the Indus and the capital transferred from Pataliputra (Patna) to Kanauj or Delhi.

Besides the two broad divisions of the river basins and deltas on the one hand, and the hilly uplands and plateaus on the other, Eastern India can be divided into seven natural divisions:

1. The Middle Ganges Valley.
2. The Bengal Delta.
3. The Brahmaputra Valley.
4. The Orissan Coastal Plan.
5. The Sub-mountain Region of the Himalaya.
6. The Chota Nagpur Plateau.
7. The Shillong Plateau and the Tertiary Ranges of the East.

1. The Middle Ganges Valley

This consists of the eastern portion of the Gangetic valley lying between the lower spurs of the Himalayas on the north and the Chota Nagpur Plateau on the south. It is an alluvial plain watered and drained by the Ganges and its tributaries, the Gandak, Son, Gogra and Kosi. Throughout almost its whole extent, the general aspect is that of an unbroken level, diversified by clusters of villages, mango orchards, clumps of bamboos, and groves of palm trees. In geological terms, the great plain is an area of alluvial deposit older than that of the delta and the greater portion of the area is composed of *bhangar* land, through which the rivers cut their *khadar* valleys at depths from 50 to 200 feet below the general level. R. D. Oldham explains this distinction as follows: "The older alluvium (*bhangar*) is usually composed of massive clay beds of a rather pale, reddish brown colour, very often yellowish when recently exposed to the air, with more or less *kankear* disseminated throughout. In places, and especially in Bengal and Bihar, pisolitic concretions of hydrated iron peroxide, from the size of a mustard seed to that of a pea, are disseminated through the clay; occasionally these nodules attain larger dimensions, some being found, near Dinajpur of the size of pigeons' eggs. In places *kankear* forms compact beds of earthy limestone. Sand, gravels and conglomerates occur, but are, as a rule, subordinate, except on the edges of the valley, the quantity of the sand in the clay decreasing gradually as the distance from the hills increases. Pebbles are scarce at a greater distance than from 20 to 30 miles from the hills bordering the plain. Beds of sandstone, sufficiently compact for building, have occasionally been found, but are of rare occurrence. On the whole, there is no great difference between the alluvial formation of the Indo-Gangetic plain and those of the Narbada and Tapti, except that the latter are rather darker in colour, and perhaps less sandy.

"The newer alluvial (*khadar*) deposits consist of coarse gravels near the hills, and especially at the base of the Himalayas, sandy clay and sand along the course of the rivers, and fine silt consolidating into clay in the delta in the flatter parts of the river plain. In the Ganges delta beds of impure peat commonly occur. Fresh water shells are of more frequent occurrence in the newer forms of alluvium than in the older, the species being those now living in

the rivers and marshes of the country." (R. D. Oldham, 1893, Pp. 431-32).

The whole Middle Ganges Valley may be divided into two sub-divisions: 1(a) North Bihar, and 1(b) South Bihar.

1(a) North Bihar lies in the main highway of the northern invaders. It is an absolutely flat country, drained by numerous tributaries of the Ganges, originating in the Great Himalaya, which have flooded the plains with recent alluvium. Culturally it is a compact area with language, tradition and history formed round the historical names Vidéha, Tirhut (Tira-bhukti) and Mithila. The terminology is derived from the northern agricultural system based on the cultivation of irrigated *khadar* land.

1(b) South Bihar is sharply separated from North Bihar by the line of the Ganges. The change is definite, both naturally and culturally. Here the alluvial filling is shallow, a mere veneer, from below which the Peninsular edge emerges, showing groups of small, craggy hills (up to 1600 feet) like islands of bare rock or scrub. The only noteworthy tributary of the Ganges is the River Son, along which the alluvial strip expands to some 85 miles in width. In the east the Rajmahal hills abut almost directly on to the Ganges, thus closing the path-way along the southern bank of the great river. Historically South Bihar is the Magadha of ancient fame. Culturally its product was the *Magadhi* language preserved in the Asokan inscriptions and even now surviving as *Magahi*. The economic life is, again, based on agriculture, dependent on the utilisation of the available alluvial soil with the help of seasonal rains.

2. The Bengal Delta

R. D. Oldham (1893, P. 440) defines the delta as follows: "The limits of the delta, or the places where the rivers first bifurcate and commence to give off disturbances, are between Rajmahal and Murshidabad on the Ganges, and on the Brahmaputra opposite the south-west corner of the Garo Hills. But for a considerable distance above the actual delta the rivers flow through a broad plain of low ground, a large area of which is liable to flooding, and consequently to the deposition of silt. The delta is, in fact, the natural continuation of the *khadar*, or alluvial flat in the upper portion of the river's course, and this *khadar* becomes broader before it expands into the delta."

The plains of Bengal, though characteristically flat, have been unequally aggraded, with the result that some lie above flood-level, and others remain below water table. They can be broadly grouped into three classes:—(i) the older deltaic and flood plains lying north of the Ganges-Padma-Meghna axis, (ii) the younger deltaic and flood plains lying south of the axis, and (iii) the erosional and flood plains lying west of the Bhagirathi-Hughly river. The surface of the older delta have been partially preserved in the Barind, Madhupur and Lalmai uplands (the geology is fully explained by E. Vredenburg, 1908, Pp. 50-51). The younger delta is in many respects typical. It is a combination of the flood and deltaic plains, extremely low-lying with a web of distributary channels, especially in the south. If the sea were to rise 25 feet, its greater part including the city of Calcutta would be submerged. (S. P. Chatterji, 1949, P. 8)

Floods are both a boon and a curse in Bengal. They are common events in the province and the people have become used to them. Their little bamboo huts, erected on islands (*chars*) in the river or on the river banks, are easily dismantled and transported in boats to other islands which have just risen from the floods. The earliest written record discovered in Bengal refers to this danger of floods (Mahasthan Brahmi inscription, *Epigraphia Indica*, Vol. XXI, Pp. 83 ff.). This fear is all the more aggravated by the ever shifting river courses (see J. Rennell, Pp. 1-18). Nature is not constant here. The beds change according to the floods of the river, and with them alter the riparian cities, the surrounding fields and the very landscape. It is in the history of these rivers that a chronicle of the past civilisations can be built up and in their silts and beds can be seen buried the oldest material culture of Bengal.

This factor of change in the course of the river serves as an important background to the archaeological history of Bengal, a point well stressed by Dr. R. C. Majumdar (1940, Pp. 341-364). The present river system divides Bengal into five main parts:

(a) North-West Bengal, lying between the Ganges and the Jamuna,¹ the western channel of the Brahmaputra. In this tract the main rivers bypass the old alluvium of Barind (the ancient Varendra), though drainage rivers cut

¹ This Jamuna should not be confused with the great tributary of the Ganges in U.P., which also bears the same name.

through this high land and flow into the Chalan Bil. The rivers all run in a south-east direction.

(b) North-East Bengal, extending east of the river Jamuna. This is the great triangular sector, at the head of which stands Dacca, the capital of East Pakistan. Here the rivers, again, are confined by the raised reddish upland of the Madhupur tract, and many of them converge in the low-land to the north-east of this tract, then combined waters being drained by the Meghna.

(c) South Bengal, including the Sundarbans, lies between the Bhagirathi and the Padma (the western and eastern channels of the Ganges). In this region the rivers flow south to the sea. The changes in the river beds here have been fully explained by T. Oldham (1870, Pp. 47-48).

(d) South-West Bengal, lying west of the River Bhagirathi. Here is to be found a large area of older alluvium, the surface of which is undulating, the result of denudation. This tract is continuous with the alluvial area of the east coast, and probably owes its comparative elevation to the deposits from the Mor, Ajai and Damodar rivers, which originate in the Chota Nagpur Plateau, flowing in east and south-east direction. Geologically this is the most important part of Bengal. Kanangopal Bagchi (1944, P. 18) rightly says, "the greater part of the districts of Bankura, Burdwan, Birbhum and the western half of Midnapur is a continuation of the Chota Nagpur Plateau to the east, and the present surface of the region has been derived mainly by a process of degradation of the table-land." There is a high level laterite, resting on the old rocks at whose expense it has been formed, and a low level laterite, which is merely a detrital form. The former is found as a cap on the summit of low hills. The latter forms a broken band or mantle stretching from near the Bay of Bengal in Orissa and Midnapur to Rajmahal, generally occupying the eastern fringe of the gneissic table-land. Wherever seen in this area, it is detrital and contains pebbles of quartz, felspar and other rocks, the source of which is indicated by the way in which they increase the nearer we get to the gneiss rocks to the west. The true laterite occurs in massive beds, from which slabs are excavated for building.

The south-eastern part of Birbhum district is an alluvial plain with a soil composed of dark clay or sand and clay. Proceeding towards the west, the patches of reddish clay and gravel are seen, while the ground gradually rises and becomes

irregular and broken (Figs. 1-2). Here calcareous nodules, called *gbutin*, are found mixed with clay, coarse sand, or ferruginous gravel. Proceeding further westward, the ground becomes more elevated and is broken into irregular ridges, the coloured clay giving place to a reddish brown gravel and bedded laterite. In some places this rock is found on the surface, extending laterally for several hundred feet in one block. It is then of a darker colour. After cutting through this rock a bed of clay is met with, below which gneiss is found at various depths. Granitic veins traverse the district in many places, occasionally outcropping at the surface, the dip being at various angles and the strike from east to west. (O'Malley, 1910, P. 7). The lateritic deposits continue in the district of Burdwan, except in the Asansol sub-division, where Gondwana rocks are exposed. They are rich in coal-bearing seams. (J. C. K. Peterson, 1910, Pp. 11-12). One important lateritic outcrop in this district is near Durgapur on the left bank of the River Damodar. In the districts of Bankura and Midnapur the western area shows metamorphic or gneissic rocks only in irregular patches along the western edge, which are the projecting headlands of the western gneissic table-land (T. Oldham, 1859, P. 254). In the town of Bankura itself, and to the west of it, gneiss is abundantly seen, showing uniformly as great rounded bosses, which break through the more recent deposits of lateritic or gravelly character. South of Bankura, veins of epidotic granite may be traced cutting through the gneissic rocks. The most easterly point at which the gneiss crops out from beneath the lateritic flats in Midnapur district is near the village of Sildah, about 30 miles west from Midnapur town. The lateritic deposits occur in hard, massive beds or blocks and also in lateritic gravels. These gravels pass by almost imperceptible gradations into solid laterite on the one hand and on the other into a coarse sandy clay. (O'Malley, 1908 a, Pp. 8-11, and 1911, Pp. 10-13)

(e) South-East Bengal, extending east of the River Meghna. Here the rivers rise from the eastern Tertiary Hills of Tippera and Chittagong, and flow in a west or south-west direction. There are three important river valleys in this region, which cut through the Tertiary ranges. The Surma valley, incorporating the district of Sylhet, separates the Tipperah Hills from a fringe of the Tertiary rocks bordering the southern edge of the Shillong Plateau. The Gomati River, rising in the Tippera Hills, encircles the lateritic deposit of the Lalmai-Mainamati

Hill on three sides. This deposit is made up of slightly micaceous, yellow-coloured sandstone and ferruginous concretions which, when decomposed, colour the top of the Hill brick-red. The sandstone is not very compact and appears to be in horizontal beds. There are, also, horizontal intercalations of clay, only a few inches thick and occasional bands of argillaceous nodules. The most striking feature here is the abundant occurrence of fossil wood. These fossils are completely silicified and lie in horizontal beds. The fragments apparently lie parallel to one another and may well have been transported by a strong current (*J.A.S.B.*, 1908, P. 350). The fossil wood examined so far is supposed to be of the genus *Glutorylon* (the two species of *Gluta*, *G. Tavoyana* and *G. Travancorica*, also show similarity with our specimens from Lalmai). Some have linked the Lalmai fossils with the fossil wood of Burma. (*Science & Culture*, Vol. VII, Pp. 370 & 573-74). The third valley is that of the Karnaphuli river in Chittagong district, which cuts through the Chittagong Hill Tract. This Hill Tract consists of a substratum of Tertiary rocks, covered over by alluvial deposits. The hills are capped with laterite, and near Sitakund, 24 miles north of Chittagong, huge boulders of laterite occur in the overlying deposit of the alluvial soil. (O'Malley, 1908 b, Pp. 9-10)

These sub-divisions of Bengal have kept, throughout the centuries, their distinctive features in spite of the changes in the courses of rivers. Today, the main rivers are the Padma, Jamuna and Meghna, the Jamuna meeting the Padma near Goalando, and the Padma joining the Meghna near Chandpur. But about hundred and fifty years ago the Jamuna was a negligible channel and the main water flowed through the course of the Brahmaputra east of the Madhupur Tract. The river Tista (Tri-srota) joined the Ganges through triple channels, the Purnabhava, Atrai and Karatoya, all of which were then important rivers. (See J. Fergusson, 1863, Pp. 321-354). About 200 years ago, the Padma did not join the Meghna and went straight to the sea¹. In the early Mughal period (16th and 17th centuries A.D.) the Padma flowed, or more correctly, branched into its more important distributary, the Dhaleswari.² Earlier still the main channel seems to

¹ See Rennell's Sheet.

² R. C. Majumdar (1940, P. 364), who bases his conclusion on the evidence of Mirza Nathan's *Baharistan-i-Ghaibi*, a contemporary work written locally,

have been the Buriganga (Vridhdha Ganga), on the northern bank of which Dacca now stands. But, Sonargaon was the most important river port in the 14th and 15th centuries, as attested by Ibn Battutah and the Chinese visitor Mahuan. Not only did sea-going vessels set out from Sonargaon (H. A. R. Gibb, 1929, P. 271), but it was also connected with the then capital, Pandua or Gaur, by the river Padma (P. C. Bagchi, 1945, Pp. 96-134). In the pre-Muslim period the course of the Padma is obscure, though, relying on Ptolemy's Geography, Dr. N. K. Bhattasali (1940, Pp. 233-39) has tried to throw some light on this problem.

The vagaries of the rivers have, however, not altered the deep-rooted sentiments and the social ties of the people living in the different sub-divisions of Bengal. The two most predominant social entities are the *Varendris* of North West Bengal and the *Radbis* of the South West. Both have a general contempt for *Bangala*, i.e. the people of Vanga (South Bengal). The region east of the Meghna is the land of Samatata and Harikela (For details see R. C. Majumdar, 1943, chapter I). The triangular high tract of Madhupur is the least known region in Bengal. So far research into the historical records have failed to produce any definite evidence of its past traditions. However, it is not unreasonable to suggest that its past is rooted in the history of the old capital towns, Vikrampur and Suvarnagrama, and in the lost language of the Dhakkiya Prakrit.

3. The Brahmaputra Valley

R. D. Oldham (1893, P. 439) points out, "The Assam Valley is a gigantic *khadar*, or strath, the greater portion being liable to flooding and consequently not in a habitable state. There are, however, higher tracts here and there, sometimes mere mounds, and sometimes small plains (sic), which may be considered as representing the extensive *bhangar* of the Gangetic plain. Along the foot of the hills are gravel deposits, but they do not appear to be very extensive." The southern boundary of the valley is marked by the detached Mikir and Rengma hills, and the Shillong Plateau, while on the north between the Himalayan foothills and the river the flat plain is cut up by numerous tributaries of the Brahmaputra.

This plain directly opens into the *dvars*¹ of northern Bengal, comprising the districts of Rangpur and Jalpaiguri and the former State of Cooch Behar. Both these regions have a common history under the name of Kamarupa-Kamata. This valley is under the direct political and cultural influence of northern India. Indeed the culture here has a greater link with the north Indian system than with the tribal life of the neighbouring southern hills.

4. The Orissan Coastal Plain

Three rivers, Baitarni, Brahmani and Mahanadi, combine to form the great alluvial plain of Orissa, stretching along the seaboard from the Chilka Lake to the Subarnarekha river. It consists of three distinct zones:

(i) A marshy woodland strip along the coast from three to thirty miles in breadth, narrowing at the Chilka Lake. This marshy strip resembles the Bengal Sundarbans as regards its swamps, dense jungle, and noxious atmosphere; but it lacks the dramatic forest scenery of the Gangetic delta. This strip is intersected by innumerable streams and semi-tidal creeks, whose sluggish waters deposit their silt and form morasses and quicksands. A hundred years ago cultivation did not begin till the limits of this dismal region were passed (W. W. Hunter, 1877, Vol. XVIII, Pp. 20-21). In the district of Balasore it is written off as "the Salt Tract". Towards the beach it rises into sandy dunes, from 50 to 80 feet high, sloping inland, and covered with a vegetation of low scrub jungle.

(ii) An intermediate arable tract of rice land in the older part of the delta stretches inland for about 40 miles. This occupies the country between the marshy sea-coast strip and the inland hills. It is intersected by several large rivers which emerge from the western mountains, and throw out a network of branches in every direction. As a whole, it is a region of rich rice fields, dotted with magnificent banyan trees, and thickets of bamboos.

(iii) Hunter's "Sub-mountain Tract"² consists of a country dotted over with

¹ *Dvara* is apparently a Sanskrit word, meaning gateway, here referring to the valley of the Tista through which runs the route to Tibet from Bengal. The antiquity of its use in this technical sense is not known. In Central Asia 'dara' is a common appellation for a river valley opening highways.

² The term, however, overdramatises the actual elevation of the western hills.

detached peaks and small ridges, which become more sparse and scattered to the east, being there separated from each other by plains of deep alluvium. Further to the west, the uplands are generally surrounded by laterite, which rises to a considerable height above the alluvium.

The geological feature of the western hills and the undulating alluvial plain is much the same as is found in the districts of Bankura and Midnapur. The more northern portion of the flats of Orissa province, i.e. the part extending from the Subarnarekha river to the Burhabalanga, belongs geographically to the Midnapur and Hugly region of Bengal. From Balasore, however, for about 20 miles to the south-west is a district of older alluvium. This is found throughout the northern parts of Orissa, but is not seen to the south of the Brahmani river.

The Orissan Nilgiri Hills, which touch the banks of the Burhabalanga river, consist of granitic rock. Near Jagjuri trap dykes appear, and also gneiss. In the gneiss are found bands of chloritic rock, serpentine in texture. Still further to the south-west and near the Splandi river, quartz schist appears. Gneiss is again seen along the Brahmani river, while the hills along the Mahanadi near Katak are of unidentified sandstone. Detached hills of gneiss, separated by laterite and alluvium, continue right upto the Chilka Lake. Laterite covers a very large area in the central and southern divisions of Orissa south of the Brahmani upto the Chilka Lake, and forms a raised terrace-like plain surrounding nearly all the hills, except a few isolated in the alluvium. It is also important to note that blown sand occurs along all parts of this coast which face the south-east. In some cases, these dunes cover a considerable tract, as near Puri, where they are two or three miles across. In the opinion of W. T. Blanford, each range of these dunes marks an old sea coast. (T. Oldham, 1859 b, P. 276)

5. The Sub-mountain Region of the Himalaya

The district of Darjeeling is the only region within our scope containing a small portion of the Himalayas. The mountains rise from the plains in a succession of bold spurs and ridges separated by deep valleys. On one of the ridges the hill station of Darjeeling is perched. This ridge is cut through by the Tista valley which extends into north Bengal, and thus opens up the great highway

from Bengal to Tibet through Darjeeling. The country at the base of the Himalayas is known as the *Tarai*, a marshy belt of land, notorious for its unhealthiness. In Bengal this part is known as the *dvars*. Culturally this is the meeting ground of trans-Himalayan intrusions and the neighbouring Indian provinces, distinct in language, tradition and culture.

6. The Chota Nagpur Plateau

This is a rugged region of great inequalities, consisting of a succession of plateaus, hills and valleys, drained by several large rivers, including the Damodar, Barakar, Subarnarekha, Brahmani, Baitarni and Mahanadi. The confused geography of this region has been summed up by O. H. K. Spate, who is here quoted in length: "Beyond the Behar tributary of the Son, however, we have firmer lines: a great rectangle of some 40,000 square miles, mainly Archæan gneiss forming rolling peneplains, bisected longitudinally by the fault-trough of the Damodar with its Lower Gondwana coal. Most of this area lies in the Chota Nagpur division of Behar, which extends beyond it into the Jamshedpur Gap.

"The Hazaribagh peneplain N of Damodar lies at about 1300 feet. Across it, and slightly diagonal to its E/W extension, runs the Hazaribagh 'Range', really a higher plateau (c. 2000 feet) with some monadnocks rising 2800 feet. The plateau on the whole is rather open, and there is a fair amount of cultivation. On the N it falls abruptly, but with many irregular spurs and outliers covered with open jungle, into the Gangetic Plain; to the S E the descent is more gradual and the upper Ajai and Damodar-Jamunia valleys provide routes across the plateaus giving Calcutta direct access to the Middle Ganges Plain. In the N E the Rajmahal Hills, highly dissected plateaus of basalts of Gondwana age, rise steeply from the alluvium in the great bend of the Ganges. Considering the terrain they are well cultivated and densely peopled; the Santals occupy the broader valleys, keeping large herds of buffaloes in the smaller side-valleys, while on the higher ground the Paharias ('Hillmen') cultivate remarkably steep slopes. . . . South of it (Damodar Basin) lie the Ranchi peneplains. In the E is the country of the *pats*: little plateaus, largely basalt, with intricately fretted and extremely steep sides, the relics of a peneplain at about 3600 feet. Some of their flat tops are cultivated, but soils are lateritic and their jungle-

covered walls make many of them practically inaccessible. The main peneplains are at about 2500, 2000 (the most extensive) and 1000 feet, the last bordering the Subarnarekha; open, broadly rolling country, with mature valleys (Sankh, S. Koel) bordered, however, by low gullied terraces, fantastic cones and domes of gneiss 'looking as if they had been excluded from the earth as gigantic bubbles that had become solid instead of bursting.' E of the Subarnarekha the plateau sinks gradually into the deltaic alluvium, and is generally veneered with laterite." (O. H. K. Spate, 1954, Pp. 585-586)

The valleys of the Damodar and Ajai have been utilised to make the most important route between Calcutta and the Middle Ganges valley, by cutting across the great Ganges bend. This route seems to have been utilised in the past by intrepid invaders, like Bakht-yar Khalji. (See *Tabaqat-i-Nasiri*, Pp. 146-57). Another important route lies through the Jamshedpur Gap along the valley of the river Sanjai, only 850 feet high, between the hills of Orissa and the spurs of Chota Nagpur. It is through this gap that a railway runs between Calcutta and Bombay via Nagpur. In the early eighteenth century A.D. the well-known raid of the Mahrattas into Bengal followed this route.

7. The Shillong Plateau and the Tertiary Ranges of the East

The Shillong Plateau (See map no. 1), which forms an elevated tract between the Brahmaputra valley on the north and the Eastern Bengal Plains on the south, is bordered along the southern edge by a fringe of Tertiary rocks (M. S. Krishnan, 1943, Pp. 6-7). Here the Archæans are represented by gneiss, schists and granites. The gneissic complex is apparently overlain by the Shillong series, which is regarded as younger (M. S. Krishnan, 1943, P. 129). This series "is a widely developed formation, consisting of a thick series of quartzites, slates and schists, with masses of granitic intrusion and basic interbedded traps." (D. N. Wadia, 1953, P. 104). This Shillong series is for the greater part of its extent overlain by horizontally bedded Cretaceous sand-stones.

In the Naga Hills the lowest Eocene beds are the *Disang shales*—a great thickness of very well-bedded dark-grey shales with well-cemented sandstones. Towards the interior of the hills, separating Assam from Burma, the shales become hardened and slaty, and are associated with quartz veins and serpentine. (D. N. Wadia, 1953, P. 338)

The Naga Hills are distinct from the Shillong Plateau and form a link with the Assam-Burma Ranges, which sweep in a long curve from the far north-eastern corner of Assam to Cape Negrais on the south-west coast of Burma. Different parts of this hill belt bear different names. The Patkoi Hills lie to the north, then follow the Naga Hills which enclose the Manipur Plateau, and southwards the Lushai Hills, Chittagong Hills and Chin Hills consisting of a succession of long parallel ranges separated by deep valleys. Still farther south the hill belt gradually narrows, forming the Arakan Yomas. The parallel arrangement of the long unbroken ridges is responsible for the inaccessibility of most of the region and the difficulty of communication between one valley and another. On the other side of the Irrawaddy stretches the Indo-Malayan mountain system, a geomorphological unit since the close of the Mesozoic, which includes the Yunnan massif, the Shan Plateau, the hills of Siam and the Annamite Cordillera, a long range giving off from the plateau of 'Haut Laos' towards the south-east and separating Annam from Laos.

Routes across the Assam-Burma Ranges were for the most part mere trails until the last war. The Hukawng Valley route, and the Tuzu Gap route a little to the south, lie in the northern part of Burma. An easy route leads through Manipur, whilst the An and Taungup passes link Central Burma and Arakan.

The distribution of the tribes in these hills is determined by geological and geographical factors. L. A. Waddell writes: "The relatively low rounded gneissic and limestone hills to the west of the Dhansiri River and Barail Range, and occupied by the Garo, Khasi, Jaintia, Mikir and Kachari, are more open to India, whilst the widely different geological formation to the east, belongs to the rugged Burmese mountain system and is chiefly peopled by the savage tribes broadly classed as Naga. The wilder tribes inhabit especially the labyrinthine glens and ridges of the upper valleys, whilst the more civilised tribes are mostly restricted to the bottom of the tropical central valley fringing the great river which connects them with the plains of India. The steep ridges and deep ravines in this area are exceptionally numerous and act as dividing barriers, partitioning off sharply the different tribes and clans and tribelets, and have clearly contributed to the formation of the latter." (L. A. Waddell, 1900, p. 8)

CHAPTER II

PALAEOLITHIC INDUSTRY IN EASTERN INDIA

No fossil remains of Pleistocene Man have so far been found in Eastern India, nor indeed in the sub-continent of India and Pakistan. W. Theobald once recorded the find of a human cranium, "supposed to have come from a conglomerate bone bed" of the Narbada (Theobald, 1881, p. 122). It was preserved and then lost in the museum of the Asiatic Society of Bengal. H. De Terra observes, "Theobald listed it as *Homo Sapiens*; hence it seems more likely that it was collected from younger deposits, perhaps from the cotton soil, in which we found late palaeolithic tools." (De Terra & Paterson, 1939, p. 313). In the Attirampakkam terrace near Madras R. Bruce Foote discovered a bone (now at Oxford) of a human skeleton seemingly washed out of the implementiferous conglomerate and associated with a large number of handaxes. This bone was examined by Professors Busk and Dawkins and recognised as possibly a human tibia although from which both the articulations were lost (Krishnaswami, 1947, p. 34). This lack of human remains stands in great contrast to the abundance of Siwalik fauna in which fossil primates predominate (P. Mitra, 1927, pp. 110-115). The migration of this Indian Siwalik fauna has been noted by Von Koenigswald (1939, pp. 28-53; See also De Terra, 1943, pp. 459-61) as far down as Java, an island lately regained from the ocean, and it is in this latter country that number of fossil homonids have been recovered (De Terra, 1943, pp. 437-51). The earliest skull, *Homo Modjokertensis*, has been dated to the first interglacial period (De Terra, 1943, p. 455; Zeuner, 1952, p. 280).

However, the presence of Pleistocene Man in India is known from the chipped stone tools left behind by him and discovered in many localities. The study of these tools and their geological association is still in its infancy in the Sub-continent. Though various types of palaeolithic implements have been found here, yet their exact relationship and the environmental background under which they were manufactured, are questions that remain to be answered.¹ The other

¹ Prof. F. E. Zeuner (1950) has given us for the first time the environmental background of the Gujarat industries.

important point that remains to be tackled is the nature of the raw material available, on which really depends the forms of the tools as well as the techniques employed for tool manufacture. This dependence of the form and the technique on the raw material has been ably shown by Prof. C. Van Riet Lowe (1945, pp. 56-59) on the evidence from South African material. In India quartzite was mainly used for tool manufacture. In what way it was available and what difference it made in the forms of the tools, are questions that remain to be answered. It is an established fact¹ that there is fundamental technological difference between the working of quartzite and flint. K. P. Oakley (1952, p. 20) points out, "The commonly used white vein-quartz, consisting of crystals matted together breaks irregularly, and is a most difficult stone to work."

In Eastern India palaeolithic tools have so far been found only in the Chota Nagpur Plateau (See p. 2 for its extent) (Map no. 2). V. Ball was the pioneer in this region as R. Bruce Foote was in South India. Ball observes, "I examined on the Theria (Jheria) coalfield, various heaps and spreads of pebbles derived from the conglomerates which are so characteristic of the Lower Damoodah series of rocks. These pebbles consist of gneiss, quartzite and sometimes even granite; a large portion of them are jointed, or perhaps to speak more correctly, cracked, the planes of easy fracture being inclined at a small angle to the major axis." (Ball, 1865, pp. 127-28). In association with these pebbles he discovered a handaxe (pl. 1, no. 7), made from a pebble of greenish quartzite, which was lying on the surface of the ground near the village Kunkune, 11 miles southwest of Govindpur on the Grand Trunk Road. In the same paper Ball noted the discovery by G. T. Hughes of a similar type of "pebble tool" made from micaceous quartzite on the Bokharo coal-field in Hazaribagh district. In 1867 Ball (1867, p. 143) reported the discovery of a third specimen, made of quartzite. It was found on the surface at an elevation of about 700 feet, near the village of Gopinathpur 11 miles S.S.W. of Beharinath Hill in Bankura district (pl. 1, no. 6). A fourth (pl. 1, no. 4) was found by Ball (1874, p. 96) in the Raniganj coal-field in Burdwan district on a laterite strewn surface. Four more specimens were reported by him (1876, Pp. 122-23) from Orissa. Pl. 1, no. 5 is of granular quartz

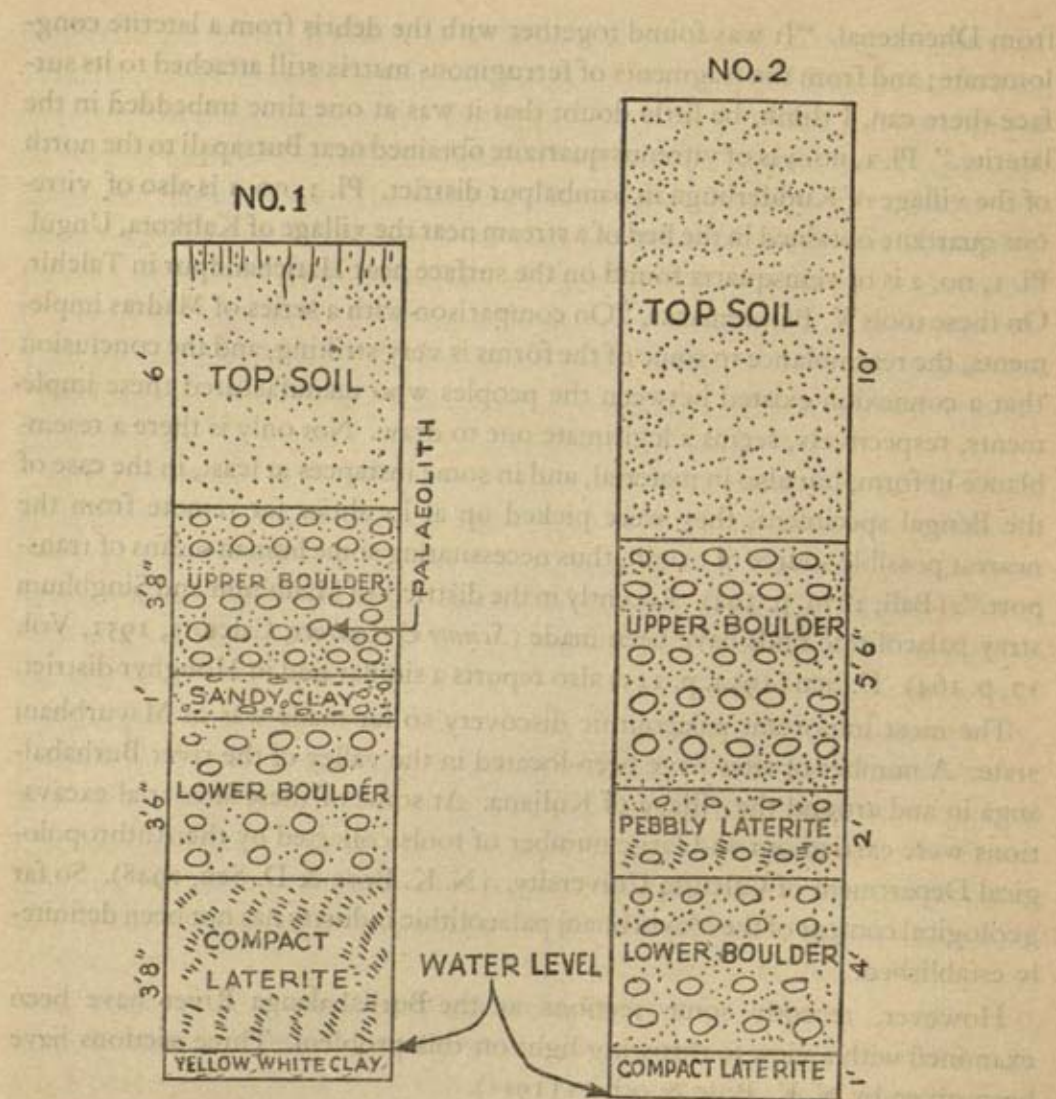
¹ For the controversy see M. C. Burkitt, 1936 a and b; Van Riet Lowe, 1936; and T. P. O'Brien, 1936.

from Dhenkenal. "It was found together with the debris from a laterite conglomerate; and from the fragments of ferruginous matrix still attached to its surface there can, I think, be little doubt that it was at one time imbedded in the laterite." Pl. 1, no. 3 is of vitreous quartzite obtained near Bursapali to the north of the village of Kudderbuga in Sambalpur district. Pl. 1, no. 1 is also of vitreous quartzite obtained in the bed of a stream near the village of Kalikota, Ungul. Pl. 1, no. 2 is of vein-quartz found on the surface near Harichandpur in Talchir. On these tools V. Ball remarks, "On comparison with a series of Madras implements, the resemblance to some of the forms is very striking, and the conclusion that a connexion existed between the peoples who manufactured these implements, respectively, seems a legitimate one to draw. Not only is there a resemblance in form, but also in material, and in some instances at least, in the case of the Bengal specimens, they were picked up at localities far remote from the nearest possible source of origin, thus necessitating some human means of transport." (Ball, 1879, p. 394). Recently in the districts of Manbhum and Singbhum stray palaeolithic finds have been made (*Science & Culture*, Calcutta, 1951, Vol. 17, p. 164). D. Sen (1954, p. 125) also reports a similar find in Monghyr district.

The most important palaeolithic discovery so far made was in Mayurbhanj state. A number of sites have been located in the valley of the river Burhabalanga in and around the village of Kuliana. At some of these sites trial excavations were carried out and large number of tools collected by the Anthropological Department of Calcutta University. (N. K. Bose & D. Sen, 1948). So far geological context of the Mayurbhanj palaeolithic industry has not been definitely established.

However, recently some sections at the Burhabalanga River have been examined with a view to throwing light on this problem. Three sections have been given by N. K. Bose & others (1951).

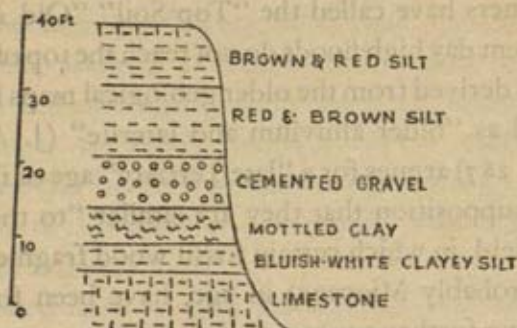
Section no. 1 (See fig. 1 on p. 20) is within half a mile upstream of Churgunia Ghat near the confluence of Burhabalanga with a small nullah. Of the six beds distinguished, the lowest is said to be of yellow white clay of unknown depth. The next bed is described as "compact laterite" having "a typical ferruginous lateritic appearance with characteristic vermicular structure," mottled in colour being red, yellow and dark brown in patches. Then follow "boulder conglo-



SECTION AT THE BURHABALANGA RIVER

(AFTER BOSE, SEN & RAY)

FIGURE 1



SECTION AT THE BURHABALANGA RIVER
(AFTER PROF. F. E. ZEUNER)

FIGURE 2

merates", separated into Upper and Lower beds by a thin layer of sandy clay containing "gravels of various sizes". The matrix of the conglomerates "shows some concentration of ferruginous material". The uppermost bed is called "Top soil" said to have been formed "by a thick deposit of alluvium". One core tool was dug out from the "Upper Boulder Conglomerate". Section no. 2 (See figure 1 on p. 20) is located further down stream. Here the yellow clay bed and a portion of the "compact laterite" are said to lie under water. This section agrees with no. 1, except that the "Lower Boulder" is said to have "a peletty lateritic structure, in which pebbles are embedded". Here in the "Lower Boulder" bed a "pebble tool" was found and in the Upper a "crude hand-axe", both showing "signs of rolling". Section no. 3 was located between sections 1 and 2 and is said to be "nearly identical with the previous two in character."

These sections may be compared with another from the same locality (See figure 2 on p. 21), given by Prof. F. E. Zeuner (1953, fig. 5). Here the underlying rock is limestone, over which lies "bluish-white clayey silt". Then follows "mottled clay" equivalent to the "compact laterite" of Bose and others. Next is shown only one bed of "cemented gravel", i.e., the "Boulder Conglomerate" beds of Bose and others have been integrated into one, the thin sandy layer being possibly considered as insufficient to demarcate the bed into two divisions. Prof. Zeuner divides the "Top Soil" of Bose and others into two beds.

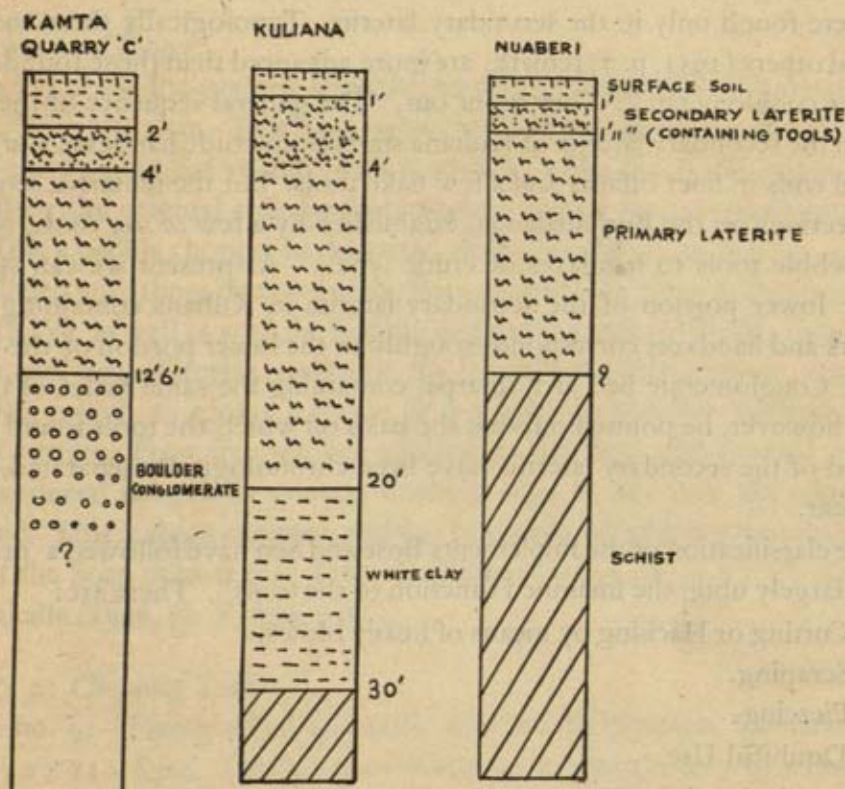
Bose and others have called the "Top Soil" "Old Alluvium" as they point out "even present day high floods do not reach the top of this bed". But it seems that the term is derived from the older geological maps in which these beds have been described as "older alluvium and laterite" (J. A. Dunn, 1933, p. 286). Dunn, (*Ibid*, p. 287) argues for a "late Tertiary" age of the "series of gravels and grits" on his supposition that they are similar "to the Durgapur beds of the Raniganj coalfield, in which certain fossil wood fragments, recently determined as Tertiary (probably Miocene) in age, have been found." Bose and others (1951, p. 5) have further suggested that the lower greyish clay bed may be of "post-Lower Miocene in age" as they observe it "is of the same appearance as the 'thinly stratified greyish white or very pale clays' found above the *Ostrea* beds at Mahula near Baripada by P. N. Bose (*Rec. Geological Surv. India*, Vol. XXXI, p. 168) which is of Miocene age." These geological observations are based on insufficient data. They remain to be verified and proved by further field work.

A general geological picture of this region has been given in chapter I. Against that background these sections, along with one (See figure 4 on p. 35) given in chapter III, should be examined. On correlating them it is observed that below the top soil has been found a deposit of microliths and neoliths, which are definitely known to be post-pleistocene on the evidence of the associated skull and teeth of a modern wild horse or ass. In the gravel bed of the Burhabalanga River have been found palaeolithic tools. So far no human remains have been found in the lower beds.

On the typology of the palaeolithic tools "collected from the boulder conglomerate section near Kamarpal" and "recovered *in situ* from the Uupper and Lower Boulder Conglomerates", Bose and others (1951, pp. 6-7) observe, "Most of the specimens are rolled and weathered and show a yellowish brown stain. The workmanship is generally crude and primary. The series includes both core and pebble tools and flake tools. The flake tools, however, are very few. The former comprise handaxes of early Abbevillian type and show crude form and workmanship. Most of them are of irregular outline, and flake scars being large and ill-defined. Often the butt is pebbly and much of the cortex remains unworked. Among these, a few crude peariform(sic) and oval or ovaloid handaxes can be roughly distinguished.

"The flake tools which comprise a few large and small specimens show poor and primary workmanship, sometimes with a little cortex remaining. The striking platform is plain and unfaçetted. Little secondary work of retouch is present. The working edges are rather irregular. Some crude scrapers and knives of irregular outline can be distinguished. The flakes recall Cromerian and pre-Soan types. A few of the flakes may, of course, be waste products from the manufacture of pebble and core tools.

"The handaxes and related tools on core described above resemble to some



SECTIONS BASED ON THE DESCRIPTION OF

BOSE & SEN (1948)

FIGURE 3

extent tools found from the boulder conglomerate at Vadamadurai near Madras". It is on this typological comparison that D. Sen (1954, p. 144) has tentatively ascribed these tools to Lower Middle Pleistocene.

A greater number of tools (totalling 663) were, however, obtained in actual excavations at and near Kuliana (Bose & Sen, 1948). The sections observed in their excavations are diagrammatically shown here (figure 3). These sections have not been correlated so far with those observed at the river bank. Bose and Sen (1948, p. 13) point out, "The boulder beds by the river bank could not again be satisfactorily equated with that found in Quarry C, south of Kuliana." The tools were found only in the secondary laterite. Typologically these tools, as Bose and others (1951, p. 7) remark, are more advanced than those found in the "boulder conglomerate". They point out, "The general sequence of the tools found in the secondary laterite of Kuliana starts from crude handaxes and choppers and ends in finer bifaces and a few flake tools. But the tentative sequence in the sections on the Burhabalanga, established by a few *in situ* tools, is from crude pebble tools to handaxes of crude type. . . At present we can suggest that the lower portion of the secondary laterite in Kuliana containing crude choppers and handaxes corresponds roughly to the lower portion of the Upper Boulder Conglomerate bed at Kamarpal containing the same facies of tools." It may, however, be pointed out that the basis on which the tools found in the sand bed of the secondary laterite, have been chronologically separated, is not at all clear.

In the classification of the implements Bose and Sen have followed a principle "based largely upon the imagined function of the tools". These are:

- A. Cutting or Hacking by means of heavy blows.
- B. Scraping.
- C. Piercing.
- D. Doubtful Use.

Such a principle is in this context hardly creditable, as the function of the tool is often anything but certain. In the typological description they have divided the tools under three categories: Pebble tools, core tools and flake tools. These three categories have been followed in the description given here. They have also made numerous groups and sub-groups of typological variations. We have

omitted all these ramifications. The main type followed here are (1) chopper, (2) chopping tool, (3) scraper, (4) handaxe, (5) cleaver, and (6) flake tool.¹

The percentage of the various categories, given by them, is as follows:

Pebble tools 12.21%

Core tools 81.29%

Flake tools 6.48%

A selection of the tools is given below under our main types.

A. Pebble Tools

Type no. 1: *Chopper*:

pl. 2, no. 8:—Fine-grained quartzite, moderate ferruginous incrustation. Not rolled. $8 \times 7 \times 4.1$ cm. This has a jagged margin formed by the irregularly disposed scars on the flat ventral (lower) surface, while the dorsal (upper) face is formed by the original rolled pebble surface, except for one shallow primary scar. It is a pebble chopper in the sense, defined by Movius (1948, p. 350), and is paralleled with the early types of the Soan culture (De Terra & Paterson, 1939, pl. XXXIV), as well as with the Kafuan tools of Uganda (O'Brien, 1939, fig. 6).

pl. 2, no. 10:—Greyish quartzite, no ferruginous incrustations, but slight stain. Not rolled. $10.2 \times 8.5 \times 4.2$ cm. It is roughly oval pebble with flat natural ventral surface. Four free strokes applied on this face and directed upwards have produced irregularly convex working edge at one side, the edge being scalloped. This is also a chopper, and can be compared with the rounded pebble types of the Soan culture (De Terra & Paterson, 1939, pl. XXVX). Compare also Sankalia (1946, pl. V, nos. 9-11).

Type no. 2: *Chopping Tool*:

pl. 2, no. 9:—Fine-grained quartzite with no ferruginous incrustation or stain. $13.2 \times 11 \times 6$ cm. This has been flaked at one margin only by a few alternate strokes to produce a slightly convex extensive cutting edge, which is jagged. Opposite lies the thick pebble butt. It is a chopping tool according to

¹ The terminology of Movius (1948, p. 350ff), though defective, has been followed in the following description.

the terminology of Movius, and has parallels in the Soan culture as well as in Oldowan pebble tools (Leaky, 1951, figs. 1-5).

Type no. 3: *Scraper*:

pl. 2, no. 13:—Quartzite, stained dark brown, but no ferruginous incrustation. Not rolled. $14.2 \times 12.2 \times 7.1$ cm. It is sub-triangular in form. The original pebble surface extends from anterior tip across right half of dorsal face to all over butt. Left margin is jagged while right is straight. This tool is classed by Bose and Sen as a knife with the left jagged margin serving as a working edge and the right one as the base for the finger. It differs from the side-chopper in possessing the latter characteristic and in not having a holder at the butt end. In this particular tool the lateral margins converge anteriorly though they do not meet at a well-defined point. This gives it the appearance of a crude handaxe. It might as well have been a scraper.

Type no. 4: *Handaxe*:

pl. 2, no. 14:—Quartzite, stained brown, no ferruginous incrustation. Not rolled. $13.3 \times 6.4 \times 5.3$ cm. This longish pebble has been worked into a crude handaxe. It has a long pebble butt with mid-rib (or spine) extending from the butt to almost anterior extremity on the dorsal face, while the ventral face is trimmed flat. The cross section is acutely triangular. This has a resemblance with the "pointed rostracinate-like digging tools" of the Singrauli basin (Krishnaswami & Saundararajan, 1951, nos. 3 and 4 in fig. 3 and pl. XVI).

pl. 2, no. 15:—Quartzite, stained brown with slight ferruginous incrustation. Not rolled. $15.1 \times 9.5 \times 6.3$ cm. This tool is a further development of the former variety. The upper face has pebble surface in the posterior portion while the other shows a low mid-rib as a result of two flakes which slope down laterally. The lower face is very irregularly flaked. The margins converge anteriorly to meet at a blunt point. The butt end is of a rounded outline. It is stated that secondary flaking in the form of small scars at the lateral margins is present. Compare Burkitt & Cammiade, 1930, pl. III; Sankalia, 1945, pls. IV-V, fig. 6.

pl. 2, no. 16:—Quartzite with no ferruginous incrustation. Not rolled. $14 \times 7.9 \times 5.1$ cm. This is another irregular type of biface made from a longish pebble. The upper face shows the pebble surface more than half its length,

while the lower face has an irregular mid-rib. The anterior is obtusely pointed. Left margin is alternately flaked, while the right is flaked only for a short length in the anterior portion. Compare Burkitt and Cammidae, 1930, pl. III.

pl. 2, no. 17:—Quartzite, stained brown but with no ferruginous incrustation. Not rolled. $11.2 \times 7.8 \times 4.2$ cm. An oval pebble has been utilised to form this handaxe. One face is entirely a convex pebble surface. The other is slightly convex, flaked all over.

pl. 2, no. 18:—Quartzite with slight ferruginous incrustation. Not rolled. $22 \times 11.9 \times 6.9$ cm. Another oval pebble of large size was selected to produce this handaxe. Here the original cortex is preserved at the butt end. The lower face has been entirely flaked, while the upper is convex with numerous flake scars shallow and extensive, except at the anterior tip, where they are shallow and small. The anterior is broad and convex. Compare Burkitt and Cammidae, 1930, pl. II, no. 10.

pl. 2, no. 19:—Fine-grained quartzite, moderate ferruginous stain and incrustation. Not rolled. $10.6 \times 6.6 \times 3.3$ cm. This is the finest type of handaxe of a truncated amygdaloidal shape made from a pebble. The pebble was first split and then the upper face was carefully dressed. Flake scars are generally shallow, regularly disposed on one lateral margin, irregularly disposed on the other. Stepped flaking and dressing prove the use of wood technique. The form resembles no. 46, fig. 5 of the Singrauli basin (Krishnaswami & Saundararajan, 1951), and also with no. 10, pl. VIII of Sankalia (1946).

Type no. 5: *Cleaver*:

pl. 2, no. 12:—Quartzite with no ferruginous incrustation. Not rolled. $9 \times 6.9 \times 6.1$ cm. This is a type of longish pebble tool. In this case the anterior edge is formed by alternate flaking. Consequently the edge is scalloped. It is stated that "heavy vertical blows have caused strong stepped platforms on both sides of the jagged edge," and hence it is surmised that it was "used as a chopper for dealing heavy vertical blows." But it has been included by Bose and Sen under the category of cleavers.

pl. 2, no. 11:—Quartzite with slight ferruginous incrustation. Not rolled. $17.3 \times 11.3 \times 5.8$ cm. This is also made from a longish pebble with its anterior

at right angles to the long axis, the working edge being formed by the intersection of two surfaces; the dorsal face is formed of the original crust, only the margins being coarsely trimmed, and the ventral face is mostly one major flake scar. It is a cleaver made on pebble and has several parallels in South India. (Krishnasvami, 1938, p. 72).

B. Core Tools

Type no. 4: *Handaxe*:

pl. 3, no. 20:—Medium-grained quartzite with moderate ferruginous incrustation. Not rolled. $12.61 \times 8.7 \times 5$ cm. This is the crudest example resembling an ovate handaxe. It is flaked all over, the two ends have been left thick and the margins are convex and sinuous.

pl. 3, no. 21:—Quartzite, brown stain which is light or dark in patches, no ferruginous incrustations. $13.5 \times 8.9 \times 4.5$ cm. An oval core is flaked to a flat ventral surface and a highly convex dorsal face, the latter showing a flat patch in the middle and a mid-rib ending in an anterior point. The posterior has also a rib. Flake surfaces are shallow, confined to the neighbourhood of the margins. Step-flaking is present on the anterior half of right margin. Compare Burkitt and Cammiade, 1930, fig. 1 no. 3. It is described as a rostrum-carinate type.

pl. 3, no. 22:—Quartzite, schistose, without ferruginous incrustation. Not rolled. $19.4 \times 11.8 \times 5.9$ cm. It is a large amygdaloidal form with thick butt unworked on the upper face. Original crust of rolled boulder extends on this face from butt to near anterior end. Lower face is slightly concave towards the anterior end. Lateral margins are straight when viewed from above. They end in a somewhat rounded butt. Secondary flaking is present at the anterior end.

pl. 3, no. 23:—Quartzite-schist, flaggy variety. Stained brown with heavy ferruginous incrustation. Not rolled. $19.4 \times 10.4 \times 6$ cm. This is a highly modified form of the previous example. In this case the anterior end is pointed and the butt is straight. Owing to its flaggy nature many of the larger fractures lie roughly parallel to one another. At both lateral margins there are numerous small secondary trimmings, most of which are free. The form compares well with no. 12, pl. XXI of Sankalia, 1946.

pl. 3, no. 24:—Quartzite, stained dirty brown. Not rolled. $12.7 \times 8.6 \times 3.6$ cm. This a still finer specimen of the previous form, with its pointed anterior end broken off. No cortex is visible. The lateral margins are unequally sharp, the left one is comparatively thinner and sharper, with numerous small step-flaking along its length. The right margin also shows some secondary retouch. The form is comparable with no. 48, fig. 5 (Krishnasvami & Saundararajan, 1951) and nos. 16 and 17, pl. XXI of Sankalia (1946).

pl. 3, no. 25:—Vein-quartz. Not rolled. $13.9 \times 9 \times 4.3$ cm. It is a rounded variety of the amygdaloidal form with the pointed end at the anterior. Primary strokes are very close. Both faces are of medium convexity. Secondary flaking is numerous along the margin, many being of a stepped character. It resembles no. 51, fig. 5 (Krishnasvami & Saundararajan, 1951) and no. 7, p. XXI, nos. 9-10, pl. XI of Sankalia (1946).

pl. 3, no. 26:—Quartzite, stained red with moderate ferruginous incrustation. Not rolled. $17.7 \times 11.8 \times 7.3$ cm. This handaxe is pear-shaped. Posterior portion is worked little, anterior comparatively thinner. Low mid-rib on dorsal face. Lateral margins are straight when viewed from above, sinuous when viewed in profile. No secondary flaking.

pl. 3, no. 27—Flaggy variety of quartzite, slight ferruginous incrustation. Not rolled. $9.8 \times 7.2 \times 2$ cm. It is an oval form of handaxe flaked all over. Large portions of both faces are flat as a result of fracture along joint planes. The margins show secondary flaking all over, some of the flake scars being of stepped character. It resembles no. 56, fig. 6 (Krishnasvami & Saundararajan, 1951), and no. 2, pl. XXI of Sankalia (1946).

pl. 3, no. 28:—Grey flaggy quartzite, no ferruginous stain, but some incrustation. $18.3 \times 10 \times 4.9$ cm. It is an elliptical biface with its lower end thin and broken at the extremity. Lateral margins are convex and they meet at a slightly rounded points. Secondary flaking is numerous along left margin and anterior.

Type no. 5: *Cleaver*:

pl. 3, no. 29:—Quartzite, stained brown, with ferruginous incrustation. $17.4 \times 8.5 \times 4.4$ cm. It is a cleaver with its cutting edge formed by the intersection of two extensive flake scars. The lateral margins are roughly parallel, though

slightly convex, and converge to meet the pointed butt end. Secondary flaking is present at the two lateral margins. The cross-section is a trapezoid. It can be compared with no. 5 fig. 8 (Krishnasvami, 1947).

pl. 3, no. 30:—Quartzite with some ferruginous incrustation. Not rolled. $18.7 \times 15.5 \times 5.6$ cm. This is a variant of the previous example with a U-shaped butt end, and the lateral margins diverging towards the working edge and thus producing a broad and sharp edge. No secondary flaking. Compare Krishnasvami (1938a) p. 72.

pl. 3, no. 31:—Fine-grained quartzite with some ferruginous incrustation. Not rolled. $17 \times 10.4 \times 4.5$ cm. It is a guillotine type of cleaver with rhomboidal section and pebble butt, and has a straight cutting edge, obliquely inclined to the long axis. It has many parallels in South India. R. B. Foote (1916), pl. 1, no. 2204; Krishnasvami (1938a) p. 72.

C. Flake Tools

The flake tools have been made from the chips of quartzite boulders, and they differ from the former two classes in so far as these show striking platforms either natural, unifaceted or multifaceted, and also a complete flake scar either on one or both faces and a prominent bulb of percussion. The technique is mostly clactonian and the angle of flaking is obtuse, though the preparation of the platforms speaks of crude resemblance to the levallois.

pl. 4, no. 32:—Quartzite, with slight ferruginous incrustation. Not rolled. $13.4 \times 8.9 \times 5.1$ cm. This is classed by Bose and Sen as a chopper, but could better be described as a scraper. It is made from a large thick flake. Plain platform makes an angle of 112° with ventral face, which has a prominent bulb of percussion. The working edge is produced by a few free and also resolved flaking directed from the ventral towards the dorsal face. The opposite margin retains the cortex.

pl. 4, no. 33:—Fine-grained quartzite without ferruginous incrustation. Not rolled. $13 \times 8.8 \times 4.2$ cm. It has also been classed as a chopper by Bose and Sen. It shows prepared unifaceted platform, the flaking angle being 128° , and hence the bulb of percussion is comparatively diffuse. One lateral margin is thick and

the other sharp. The working edge shows a few step fractures probably as a result of secondary flaking.

pl. 4, no. 34:—Quartzite with some ferruginous incrustation. Not rolled. $13.9 \times 8.2 \times 5.1$ cm. An oval core is struck from the parent boulder after preparation of the platform, the flaking angle being 114° . Secondary flaking is seen on the lateral margin. The sides are more or less parallel and sharp. Compare Sankalia (1946), no. 15, pl. V.

pl. 4, no. 35:—Quartzite with some ferruginous incrustation. $13.4 \times 9.2 \times 4.6$ cm. This is described as a handaxe of amygdaloidal shape. The ventral face is one flat flake surface with a bulb of percussion and a flaking angle of 114° . The dorsal face is flaked on its left half while the right half retains the cortex.

pl. 4, no. 36:—Finegrained quartzite with some ferruginous incrustation on the dorsal face only. Not rolled. $12.4 \times 8.9 \times 3.9$ cm. This is described as an ovate type of handaxe. The dorsal face is convex, having a slight patch of the cortex in the middle. The margins, which are convex, show both free and resolved flaking. It resembles no. 75, fig. 7 (Krishnasvami & Saundararajan, 1951).

pl. 4, no. 37:—Quartzite, stained brown, with no ferruginous incrustation. Not rolled. $10.1 \times 7 \times 3$ cm. This is a cleaver with working edge at right angle to the long axis, the edge being formed by the intersection of two large surfaces. The cortex is present at the butt end. It is trapezoidal in section. The bulb of percussion is very prominent on the ventral face. The flaking angle is 100° . Compare Krishnasvami (1947), no. 9, fig. 8.

pl. 4, no. 38:—Quartzite, grey, with ferruginous patches. Not rolled. $11.3 \times 9.5 \times 4.7$ cm. It is a side-scraper of rectangular shape, the working edge being formed by the intersection of a flake scar with the original crust surface on the other face. There is no secondary retouch. The opposite margin as well as the anterior are thick.

pl. 4, no. 39:—Vein-quartz, with ferruginous stain, but no incrustation. Not rolled. $9.6 \times 6.6 \times 3.6$ cm. It bears some resemblance to a handaxe, but has an obtusely pointed anterior end. The flaking angle is 124° . One surface is convex with flake scars spreading fanwise as a result of subsequent flaking. The anterior point is produced by secondary trimming.

pl. 4, no. 40:—Quartzite with some ferruginous incrustation. Not rolled. $12.5 \times 10.4 \times 4.9$ cm. It appears to be an ovate biface in form, and has been produced by a crude levallois technique. The dorsal face shows two flake scars, while the ventral is convex with a bulb of percussion. The platform is bifaceted and the angle is 135° . The margins are sharp. These flakes bear a general resemblance with the flakes of the Godavari industry. (Sankalia, 1952, figs. 12-19).

As has already been pointed out, the Kuliana industry shows varying traditions of stone working. The typological description, given above, makes it clear that the artifacts are a mixture of crude forms with well-made tools. It appears to be solely on this account that Bose and Sen have tried to make a chronological distinction between cruder and better forms. But there is no other evidence available to support this distinction. A calculation on the percentage basis may throw further light on this question, if and when comparable material is available.

Many similarities pointed out between the Kuliana tools and those of the Singrauli basin in Mirzapur district, of Gujrat and of South India, fairly well relate this industry with the Peninsular complex. Though a few chopper-chopping tools of the so-called Soan Industry have been found here, as also in Gujrat and Madras, these make only a minor feature in the local stone tradition. The evidence seems to make it clear that the assemblages of Eastern India are definitely related to those of the Peninsula.

CHAPTER III

MICROLITHIC INDUSTRY IN EASTERN INDIA

CAPTAIN Beeching (1868, p. 177) was the first person to report the discovery of chert flakes near Chaibasa and Chakradharpur in Singbhum district, Bihar. (See also Coggin Brown, 1917, p. 129, no. 51.) Later V. Ball (1870, p. 268) visited the locality and reported that he had "obtained what I believe to be strong evidence of the human origin of the flakes. Those at Chukerdharpur must have been transported at least three miles as the nearest source of the material, of which they are made, is situated at that distance. It is difficult to believe from the nature of the case, that the transporting force can have been other than human." (See also V. Ball, 1879, p. 394.) In 1887 W. H. P. Driver discovered another important site near Ranchi. J. Wood-Mason paid a visit to this site and collected numerous flakes, cores, and other neolithic tools (Wood-Mason, 1888, pp. 387-96). The whole material has been listed by Coggin Brown (1917, pp. 122-130). The third important site was brought to light near Durgapur on the bank of the river Damodar by N. G. Majumdar in 1937 (*An. Rep. A. S. I.*, 1937-38, *Revealing India's Past*, p. 116). E. F. O. Murray was the next person to collect flakes and cores in the Dhalbhum Pargana of Singbhum district while he was making a survey of ancient copper mining in this area (Murray, 1940, pp. 79-104). His small collection from Hartopa near Jamshedpur is in the British Museum. Recently another site has been discovered near Bongara in Manbhum district (G. S. Ray, 1954, pp. 16-19). P. O. Bodding, also, mentions the find of "chips and flakes" of flint, chert etc. in the Dumka sub-division of Santal Parganas (Bodding, 1904, p. 28). The discovery of microliths in Bankura district, West Bengal, has also been reported (Chakladar, 1952, p. 130). Recently the archaeological department of the Government of India carried out excavations at the microlithic site near Birbhanpur (formerly reported as Durgapur, *Times*, London, 15th March, 1954) in Burdwan district (A. Ghosh, 1954, p. 6).

All these microlithic sites are situated south of the river Ganges in Chota Nagpur Plateau, or its extensions into West Bengal (See map no. 2), a region well

known to be inhabited predominantly by aboriginal tribes. Referring to the find of the microliths in this region, Col. Gordon remarks, "In southern Bihar the majority of the microlithic sites are associated with the copper belt which starts 5 miles north of Chakradharpur and runs through Kharsawan and Saraikela and across Dhalbhum through the Rakha mines to Ghatsila on the Subarnarekha copper slag heaps and microliths are in close proximity, and the presence of microlithic sites from Chakradharpur to Ghatsila, including Talsa, Banabassa and Rakha mines, coincides so closely with the copper seam that it is difficult to suppose they were not associated." Again he adds, "In fact once away from the copper seam no microliths are to be seen." (Gordon, 1950, p. 83). This remark of Col. Gordon needs modification in view of the find of microliths in Ranchi, Manbhum, Burdwan and Bankura districts where no copper deposits have so far been reported. It must be pointed out that in this region of Chota Nagpur palaeolithic tools have also been found. Moreover in some of these microlithic sites neolithic artifacts, including coarse red or dark black pottery have been collected; but as all these are surface finds, nothing definite can be said about the relationship of the microlithic industry with the neolithic culture. Mr. Murray found cores, flakes and also neolithic tools in the neighbourhood of ancient copper mines, sometimes in deep pits (*e.g.*, at Porojarna Hill, Murray, 1940, p. 83). This fact suggests that the stone tools were in use at least among some section of the local people when these copper mines were being worked. This association may give us at least one chronological fix; but how far back the artifacts go and with what environmental conditions they were associated, are questions that cannot be answered in the present state of our knowledge.

There are, however, some reports of field observations available, which may throw some light on the problem if the material is re-examined actually on the sites. The first is that of C. W. Anderson (1917, pp. 349-62) who surveyed "the valley of the Sanjai and tributary streams from a point about two miles west of Lotapahar station on the Bengal-Nagpur Railway, north-eastwards to Sini, a distance of about 30 miles as the crow flies." This whole valley, according to Anderson, is in the process of denudation. With each monsoon more and more soil is washed towards the river beds, leaving isolated plateaus or table-lands

with more or less precipitous sides separated by rain gullies. The top level of these plateaus were found to be substantially the same as the plain level of the soil near Chakradharpur, suggesting that the soil nearabout is stable. It is "from stiff and undisturbed clay at or near these plateaux" that some tools were excavated indicating that they were deposited before the accumulation of the top soil, which is sometimes reddish and sometimes dark-coloured. Several sections observed by Anderson showed two main layers of gravel bed: one is a bed of 9 to 10 feet thickness at depths varying from 12 to 23 feet from the surface overlying whitish clay or schist, the second is a compact layer of 10 feet thickness of large water-worn pebbles at a height of about 10 feet above the level of the present bed of the river Sanjai. Anderson writes, "The level at which the stone implements were found coincides in the main with that of the last deposit of the

TYPICAL SECTION NEAR BIJAI RIVER

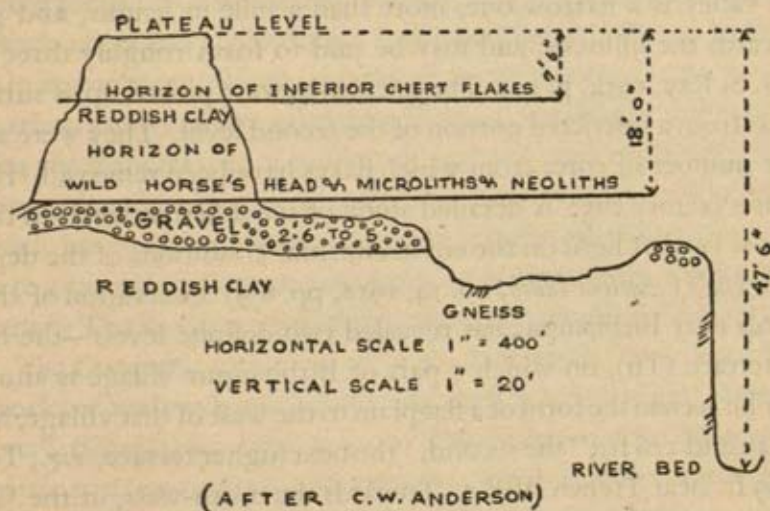


FIG. 4.

gravel. They are later than the gravel, for they are not in the least water-worn in the ordinary sense of the word; but with a few exceptions to be noted later, they were evidently deposited earlier than 18 feet of soil which covered that gravel." At this level well finished chert flakes were dug out from a clearly

marked line round the exposed sides of the plateaus. In the same level were found a skull and teeth of a modern wild horse or ass. The few exceptions refer to some "celts" and quantities of broken chert of inferior workmanship, which were found at 7'6" from plateau level. A typical section near Bijai River, a tributary of Sanjai, is given here (Fig. 4).

These observations of Anderson are important in so far as they indicate that different climatic and environmental conditions obtained in this region when these microliths were deposited. The 18 feet of soil overlying the microliths does not, however, provide a definite chronology unless the whole geographical and geological factors are properly re-assessed on the site.

The Bongara site is situated about three miles east of the Nimdih railway station, on a branch line of the Eastern Railway, connecting Tatanagar with Adra near Purulia. G. S. Ray observes, "The actual site is a valley formed between a hill range of about 2000 feet and a few hillocks which are about 1000 feet in altitude. The valley is a narrow one, more than a mile in length, and gradually slopes towards the hillocks, and may be said to form roughly three different levels." (G. S. Ray, 1954, p. 17). The microliths were picked up as surface finds more or less from a restricted portion of the second level. They were associated with a fair number of cores from which flakes have been removed. Hence it is regarded as a factory site. A detailed study of the different levels in this valley should throw further light on the environmental conditions of the deposit.

Mr. B. B. Lal's (*Ancient India*, no. 14, 1958, pp. 8-9) observation of the Damodar Terraces near Birbhanpur has revealed two definite levels—the first, "the youngest terrace (Tn), on which a part of Birbhanpur village is situated and which can be seen in the form of a flat plain to the west of that village, has a level between 220 and 226 ft.," the second, "the next higher terrace, viz., Tn-1, has a level of 269 ft. near Trench BBP-2. Towards the north-west, in the *Sal*-jungle, it rises to a maximum of 278 ft., while eastwards it slopes down to even lower than 250 ft. On the north, across the railway line, the level is somewhat higher than what it is near Trench BBP-2, but as one moves towards the river on the south, the level slowly but certainly goes down and, at a distance of about a hundred yards north of Birbhanpur, it suddenly falls from about 250 ft. to 230 ft., thus bringing the terrace to an end." Here the microliths have been found

only in the upper terrace. This is quite in keeping with the observations made by G. S. Ray at the Bongara site and by C. W. Anderson in the valley of the Sanjai River. Everywhere the tools have been found away from the recent alluvium and deposited in the older terrace or "plateau". This corroboration of the geological features, as observed by several field workers, is very significant in so far as it definitely suggests the antiquity of the materials discovered, but it is hard to be certain about a definite chronology, nor is it possible at this stage of our knowledge to distinguish between the period of the microlithic tools from that of the neolithic in this region.

The main material used for the microlithic industry is chert. C. W. Anderson writes, "The quality of chert varies considerably. It is often of grey or brown material cutting in straight smooth line and more rarely approximates to the true flint with its characteristic conchoidal fracture. The place of the chert is sometimes taken by agate or chalcedony obtainable from the cavities of the surrounding rocks." (C. W. Anderson, 1917, p. 353). In Ranchi the chief materials used were chert and chalcedony. J. Wood-Mason (1888, p. 395) adds, "There occur in abundance at Ranchi, in the soil with the implements, not only unworked quartz crystals, quartz of various kinds, chert, jasper and other stones, suitable for the manufacture of tools and weapons, and evidently collected for that purpose, as has already been stated, but also lumps of red earthy haematite, some of which have not been used, but some, on the other hand, have been rubbed down to a smooth surface on a flat stone or scraped in the production of the red pigment." The Bongara implements are mostly made of "flint of glassy variety" (*sic.*). The Durgapur specimens of N. G. Majumdar "have been chipped out of hard rocks of various beautiful colours, such as agate, chert, jasper, chalcedony, flint etc." (Chakladar, 1952, p. 133). The Durgapur specimens are "of various geometric patterns—triangular, crescent, rhomboidal, or trapezoid, while some have one end more or less elongated to a fine point." (*Ibid*)

Similar geometric types of microliths were found by T. N. Ramchandran in his excavation of the site at Nadiha in West Bengal (B. B. Lal, 1958, p. 16). But Lal's own excavation at Birbhanpur and exploration of the sites at Dijuri, Malandighi and Gopalpur produced different results. Lal observes that the microlithic industry in all these sites is identical. Summing up the evidence, he says: "The

surface collection from Birbhanpur included a large number of blades, lunates, points, borers, burins, and scrapers, but only one example of trapeze and a doubtful example of triangle. In the excavated trenches, however, no triangle or trapeze was encountered, although all the other types were found. While one should not set aside the single specimen of trapeze and the doubtful example of triangle, even though found on the surface, one cannot, at the same time, say with any degree of certainty that these two types did form regular constituents of the Birbhanpur microlithic industry. Thus pending a further investigation of the issue, all that may be said for the present is that the industry seems to be *essentially* non-geometric. Another noteworthy feature of this industry is the absence of any associated pottery.... Still another noteworthy point about the industry is the absence of the 'crested ridge'—a feature so typical of the microlithic industries of the chalcolithic period." (B. B. Lal, 1958, p. 35).

From these evidences B. B. Lal, though with caution, characterises the Birbhanpur industry as pre-pottery and pre-chalcolithic, and argues to correlate it with the similar industries from Langhnaj, Sangankallu (Phase I), Jalahalli, Khandivli and other sites in the Western Deccan. But while the chalcolithic culture is well defined there in relation to the microlithic, in this region of Bihar and Bengal we have so far found no definite evidence of a chalcolithic culture. The microlithic industry, as presented by Lal, is not altogether new in this region. As the analysis of the older finds in the next paragraph will show, the local microlithic industry has proved to be of this nature. The triangles and trapezes have been noted only at Durgapur and Nadiha—sites not far from Birbhanpur. Nothing definite can be said about the relation of these two types of microliths with the main industry. However, before we characterise this industry as pre-pottery and pre-chalcolithic, it is necessary to seek a better definition of this industry by further excavation and exploration in this region.

At Bongara 69 flakes and 24 cores were found. Out of these 37 are classified as being "micro-blades" with sharp edges: flakes which do not show any secondary retouch; one blade with secondary retouch on the two edges; 12 blades with blunted back. The remaining flakes are irregular points or scrapers. From Ranchi 57 microliths are listed in Coggin Brown's Catalogue (1917): 4 scrapers, 10 points, 13 lunates, 15 irregular flakes, 11 fluted cores

and 4 "rock-crystals". From Singbhum district no statistical figures are known as the collections have been made by several persons. A selection of microliths is described below:

Pl. 5, nos. 41-48:—Anderson's collection. Singbhum district. They are cores from which many flakes have been removed. Some of them, like nos. 46 and 48, have one end pointed. The stones are well chosen: chert, agate, or chalcedony.

Pl. 5, no. 49:—Murray collection in the British Museum. Hartopa in Dhalbhum. Greenish dolerite with black bands. It has a thick butt with the other end, now broken, probably pointed. Several flakes have been removed from the upper face and only one from the bottom.

Pl. 5, no. 50:—Murray collection in the British Museum. Hartopa in Dhalbhum. Black slate. The flake shows a median ridge or spine.

Pl. 5, nos. 51 and 52:—Murray collection in the British Museum. Hartopa in Dhalbhum. No. 51 of quartz and no. 52 of black slate. Both show flaked points with a median ridge or spine.

Pl. 5, no. 54:—Wood-Mason's collection from Ranchi. Chert core, measuring $37 \times 27 \times 17.8$ mm., from which rectangular flakes have been struck. Cores of quartz crystals and rock crystals also occur here.

Pl. 5, nos. 53 and 55-58:—Wood-Mason's collection from Ranchi. No. 53 of chalcedony measuring $38 \times 16 \times 8.5$ mm. No. 55 of black chert, measuring $34 \times 10 \times 4.2$ mm. No. 56 of black chert measuring $21.4 \times 16 \times 7.7$ mm. No. 57 of black chert measuring $20.4 \times 12.2 \times 4$ mm. No. 58 of chert deeply weathered, measuring $43 \times 24.5 \times 10.8$ mm. They are all worked points. Nos. 57 and 58 show notches.

Pl. 5, nos. 59-62:—Bongara in Manbhum district. They are also sharp-edged flakes with one flake removed from the underside and two or three from the upper.

Pl. 5, no. 63:—Bongara in Manbhum district. It shows retouch on both sides.

Pl. 5, nos. 64-65:—Bongara in Manbhum district. Both of them have blunted back.

Pl. 5, no. 66:—Anderson's collection. Singbhum district. It shows retouch on both sides.

Pl. 5, no. 67:—Anderson's collection. Singbhum district. It is described as a graver or "burin".

Pl. 5, no. 68:—Murray collection in the British Museum. Hartopa in Dhalbhum. It is a blunted backed knife.

Pl. 5, nos. 69 and 70:—Anderson's collection. Singbhum district. They are knives with slightly concave edge.

Pl. 5, no. 71:—Anderson's collection. Singbhum district. It is a burin.

Pl. 5, no. 72:—Anderson's collection. Singbhum district. Leaf-shaped flake.

Pl. 5, no. 73:—Wood-Mason's collection from Ranchi. Leaf-shaped flake.

Pl. 5, no. 74:—Bongara in Manbhum district. It is a lunate with its arc blunted.

Pl. 5, no. 75:—Wood-Mason's collection from Ranchi. It is a lunate with its arc blunted.

Pl. 5, nos. 76 and 77:—Murray collection in the British Museum. Hartopa in Dhalbhum. No. 76 of black slate, a flake with original cortex on one side and edge curved. No. 77 of translucent quartz, triangular in section.

So far microliths have not been found in northern Bihar (*i.e.*, north of the river Ganges), Orissa, East Bengal and Assam. In the mainland of South East Asia only in Burma a few flakes and scrapers were found by the American Expedition and in Malaya microliths have been reported only from one place. These appear to have no connection at all with the Eastern Indian microliths. Typologically, however, the latter fall in the same series as those of the Singrauli Basin in Mirzapur district (Krishnasvami & Saundararajan, 1951, pp. 40-65) and those found by Carlleyle in the Kaimur Hills (V. A. Smith, 1906, pp. 185-95), as well as those referred to by B. B. Lal as "non-geometric".

CHAPTER IV

NEOLITHIC CULTURES OF ASSAM

IN this chapter a thorough study of the stone tools, so far collected in Assam, is made. No account is given here of the many megalithic remains, cists, dolmens, menhirs and carved stones, which are commonly referred to as "prehistoric" in published literature. These monuments form a distinct class by themselves and much field-work is needed before any connected account and a chronological sequence can be given of them. One thing appears probable that the stone tools, of which the study is made here, can hardly be connected with them, since so far they have not been found in association with any megalithic remains.¹ Hence our object is purely the classification and typological comparison of the stone tools.

Sir John Lubbock (1867) was the first person to refer to the find of jade neolithic implements in Upper Assam. In 1870 E. H. Steel (1870, Pp. 267-68) reported the find of several more jade tools from the villages of Namasang Nagas. In 1872 Lt. Barron (1872, Pp. 62-63) figured and described two types of implements (belonging to "Facetted tool" according to the classification adopted in this chapter). Both of them came from the Naga Hills, and were reported to have been found "on ploughing a field". Several stray finds were reported thereafter. Of these only two collections are important for a general survey of the neolithic cultures in Assam. The first large find was made by Mr. W. Penny, a tea-planter of Bishnath, Tezpur district, while digging a ditch on his estate. They reached the Indian Museum, Calcutta, in 1908, through the Viceroy, Lord Curzon, to whom they had been presented. These have been listed by Coggin Brown in his *Catalogue* (1917, Pp. 131-33); and on them two separate articles, one by Coggin Brown himself (1914a, Pp. 107-9), and the other by H. C. Dasgupta (1913, Pp. 291-93) have been published. The other large

¹ J. P. Mills & J. H. Hutton (1929, p. 295) point out that throughout the area of megaliths in North Cachar stone adze heads are found, but it remains to be proved whether they are associated in any way. (See Hutton, 1931.) My recent exploration of the Jaintiapur menhirs produced not a single neolith.

collection is in the Pitt Rivers Museum, Oxford. This collection includes the materials presented to the museum by several persons, notable among whom are J. H. Hutton, J. P. Mills, G. D. Walker, J. H. Crace and C. R. Pawsey. Except for brief notes by J. H. Hutton and J. P. Mills no complete study of these tools has so far been made. Hutton in his article, "Prehistory of Assam" (Hutton, 1928, Pp. 228-232), has described only three types of tools besides dealing with megalithic remains. K. L. Barua (1939) in his paper, "Prehistoric Culture in Assam" has summarised the published material upto his time; while Pratap Chaudhuri (1944, Pp. 41-47) in his article, "Neolithic Culture in Kamarupa", has given a more general survey of the anthropological and archaeological data. In the Pitt Rivers Museum there are 385 specimens in all, and they come from almost all the regions of Assam. A study of this collection fairly well indicates the regional basis of the cultures of Assam.

The neolithic cultures in Assam follow a pattern dictated by geographical factors, and they can be best studied on a regional basis as each group of tools of a particular region show a distinct kinship in material and form. Such a study brings to full view a picture of secluded cultures with mutual inter-relations, clearly analogous to "the primitive cultures" kept up even now by the aboriginal tribes. Each region has a preference for its own material, probably dictated by availability, though there are intrusive elements which are easily detected. The technique of manufacture is common to all these regions though the forms of tools show some distinctive features from region to region. The nature of the material, which is generally obtained in the form of flat slabs probably from the bed of the streams, is such that there is actually very little need of prior chipping or flaking, a process which can be detected only in a few finished tools. Generally one notices only two methods,¹ battering or hammering, and grinding or smoothing, which were sufficient to produce the kind of tools found here out of the available materials. It therefore seems that a particular type of material has been sought for, out of which tools could be manufactured with as little effort as possible. Save for a few exceptions in which flaking appears, all the

¹ It may be pointed out here that E. C. Worman (1949) speaks of three processes, chipping, pecking and grinding, in connection with the neolithic tools of India. But, as far as Assam is concerned, the technique of pecking was not in use.

tools have been only hammered and ground. A similar technique of making adze-blades is described by Beatrice Blackwood in her "The Technology of a Modern Stone Age People in New Guinea" (1950, p. 15): "A stone of suitable shape and size is sought for in the bed of a stream, or a small boulder is cracked with a heavy stone and such of its fragments as are suitable are picked up, one of which is chosen for immediate use and the others put by until wanted. The blade is first shaped roughly by being struck with a hammerstone. Any stone of convenient shape and size to hold in the hand is used for this purpose. . . . The worker sits on the ground, either cross-legged, or with one or both legs extended. The hand holding the implement rests on one leg. Pieces are struck off both front and back of the blade by battering strokes, the hammerstone striking either the edge or the surface. The work is very rough, and no attempt at flaking is made at any stage. This may be connected with the kinds of stone used, most of which would not flake easily if at all. When the blade is thought to be sufficiently shaped, it is finished by grinding. The grind stone consists of any piece of suitable stone, which is found on the banks of the Watut river."

The neolithic cultures of Assam fall into six distinct zones:

1. Cachar Hills Zone,
2. Sadiya Frontier Zone,
3. Naga Hills Zone,
4. Khasi Hills Zone,
5. Garo Hills Zone, and
6. Brahmaputra Valley Zone.

1. Cachar Hills Zone

The main materials used in this zone are dolerite and a stone described as arenaceous clay (H. C. Dasgupta, 1913, Pp. 291-93), both of which, according to the geological reports, are locally available. Two specimens only are in fossil wood, a material which is plentifully found here as well as in north Burma. There is one specimen in gneiss, a rock fairly well distributed in the Assam Hills (See Pp. 22-23), while there is another of jadeite and a few of chert, neither of the latter materials being found in Assam. Generally the tools of this region

are fairly well manufactured and have regular forms and show a high degree of grinding. The types represented are remarkably like the developed neolithic tools of Upper Burma. (See Pp. 279-84.) The appearance of fossil wood tools further links the industry with that of Burma. There seems to be little doubt that the makers of these tools in the Cachar Hills and those of the developed neoliths in Burma were in communication probably through Manipur.

2. Sadiya Frontier Zone

In this zone the chief material is jadeite of one variety or another. This is not found locally. Its nearest source¹ is Yunnan in South West China. However, a few tools are of gneiss and dolerite, both local rocks, while there is one each of limestone and bone. The tools found here also show markedly regular forms though there is less typological variation than in the Cachar Hills. The "facetted tool" has the closest link with the types of tools known from Yunnan (See Pp. 79-84), while another type, the rounded butt axe, though also known in Yunnan, has a wider circulation in the Indo-Pakistan sub-continent. The prolific use of jadeite further strengthens the link with Yunnan. In fact, with the discovery of a specimen (pl. 8, no. 24) in the Mishmi Hill the cultural contact of this region with Yunnan can hardly be doubted. Indeed the main tool types of Yunnan and the Sadiya Frontier Zone are identical and the use of the common material, jadeite, firmly establishes the identity.

3. Naga Hills Zone

In the Naga Hills the chief material is a greenish variety of gneiss; more than half the tools collected from this region in the Pitt Rivers Museum are of this material. Sixteen per cent. of the tools are of dolerite and eight per cent. of jadeite. Other materials used are limestone, black basalt, slate, chert, sandstone and what is described as reddish stone. The tool types of the Naga Hills are very varied, but they have a certain distinctiveness of their own. Quite in

¹ The Upper Burma jade mines were apparently not worked in this period as no jade tools have so far been found in Burma.

keeping with the geographical position of this region we also find here the common tool types known in the Sadiya Frontier and Cachar Hills Zones. Besides these, we have here a distinctive type of tool, pl. 10, no. 44, which comes closest to "gouge adze type" (the so-called beaked adze), so abundantly found in Burma, Malaya, Siam, Laos and Cambodia. Other types of tools, distinctive of this region, are the tanged axe-blade and wedge blade, classed here under categories F and G, and generally of gneiss. J. H. Hutton (1921, Pp. 405-9) has divided them into three classes: A. "triangular celt", B. "wedge-shaped celt", and C. slightly shouldered celt. Hutton's type C is classed here as F, and types A and B as G. Hutton believed that "the triangular celts were fitted into a hole in a wooden handle, while the wedge-shaped celts were bound to crooked sticks." However, functionally there does not seem to be any difference between the two varieties. Hence they have been grouped here under one general class. Such wedge blades are also known from Burma (See pl. 55, no. 19). The other type F comes closer to a specimen from Yunnan (pl. 18, no. 22). Examples of this type are also known from upper Burma. Some of these are preserved in the Museum of Archaeology and Ethnography, Cambridge. The function of the miniature tools, pl. 17, nos. 11 and 12 and pl. 18, nos. 26-29 from Yunnan seems to be the same as that of the smaller varieties of F in the Naga Hills. John Anderson (1871, p. 411) considered them to be "charms to be worn without inconvenience". This supposition is contradicted by the use marks visible in most examples. Thus the Naga Hills Zone, besides showing the common types of the Sadiya Frontier and Cachar Hills Zones, has not only distinctive tool types of its own, but appears to have a direct communication with countries east of Assam, possibly through the route of the Hukawng Valley. (See p. 16.) The large number of jadeite tools, obtained here, again suggests a connection with Yunnan.

4. Khasi Hills Zone

This zone lies between the Cachar Hills and the Garo Hills. Very few specimens have so far been collected from this region. Only three tools are figured here, all of slate. The types are derived from the Cachar Hills.

5. Garo Hills Zone

This is the most westerly of the regions in Assam. The material used is mainly sandstone. Only two specimens in black basalt, two in limestone and a few in chert have been collected, but this last material is not local. All the examples in sandstone are thin while those in other stones are somewhat thicker and better formed. However, sandstone tools are markedly weathered and worn. Some of them are so deeply stained red that they appear to have been extracted from lateritised soil. Though the tools have been collected from various localities throughout the Garo Hills, the commonest feature is the weathered appearance of the sandstone. Indeed they can be easily distinguished even in a confused jumble of Assam neoliths. All the types known here have parallels in the Cachar Hills, though the change in the material has resulted in the deformation of the contours and a general thinning of the tools. Angularity of forms is observed only in rare examples, while large numbers of them show rounded corners and sides.

6. Brahmaputra Valley Zone

This is a long narrow plain extending from one end of Assam to the other, and is flanked on the south by the hilly regions noted above, while the outcrop of the Mikir and Rengma Hills further narrows its breadth at one point. The geography would therefore suggest that the culture represented in this zone should show a blend of those features already noticed in the isolated hill-tops and the plateaus to the south. But the materials available for study are few and far between. Save for two "celts" from Dibrugarh and Sibsagar, all other tools come from the chance-discovery of Mr. W. Penny in Tezpur district. The majority of Penny's tools are of sandstone. A good number are in quartzite, slate and a rock described as "decomposed volcanic ash" (Coggin Brown, 1917, Pp. 131-33), while there is one of gneiss and one of porphyrite. The sandstone examples are mostly smoothed fragments and pebbles. However, only three grooved hammerstones in this material are known, all other hammerstones are of quartzite. The tools, Coggin Brown's "celts", are made of slate (5 in all), gneiss or porphyrite. At least one "celt" appears to be of the wedge type so common

in the Naga Hills (Class G). Another is an irregular shouldered tool, a type well-known from the Cachar Hills (Class E). The small flat "celts" resemble those from the Garo Hills. But the grooved hammerstones are peculiar to this zone, that is to say, so far they have not been met with in the other regions of Assam. (For their distribution in other countries, See p. 54-55).

The typology of the stone tools

The typology¹ of the Assam tools is simple. The two predominant types in almost all the zones are facettèd tool and shouldered tool.

A. Facettèd Tool

This facettèd tool has a, more or less, rectangular cross-section. It is the type commonly termed in South East Asia "Quadrangular Adze" (Heine Geldern, 1928). Adzes are usually treated as being a specialised type of axe. In the words of H. H. Coghlan (1943, p. 29), "The adze may be defined as a tool for chipping or slicing away the surface of the wood. The cutting edge stands transversely, that is, at right angles to the handle. Its bevel is ground on the inner face only, while the entire outer face is slightly rounded." (Compare Childe, 1930, Pp. 60-61.) This definition is obviously derived from Petrie (1917, p. 5). It is difficult to be dogmatic about the use of these tools. It does not seem likely that their use was confined to wood-work or indeed that many of them are suitable for working wood. It is possible that they were also used as Hoes. To this day in the hilly areas of these regions Hoe-Terrace cultivation dominates. It is also important to note that the Hoe-Adze is the commonest tool in Assam, South East Asia and Yunnan. These tools are usually of a substantial thickness. Three of the sides are ground to a flat face, the fourth, which is always the upper broad face, is left somewhat curvilinear. The cutting edge is ground to this curvilinear face. It appears that these tools were first ground to a rough curvilinear shape. The narrow sides and one broad face were then ground to a flat surface (facet).

¹ The classification, so nicely given by E. C. Worman (1949), for the neolithic celt types in India, and also for South East Asia, is hard to reconcile with the actual tools found. It is purely academic and theoretical.

The cutting edge is then ground between the flat broad face and the curvilinear face, the flat face being underneath during the work. It would seem that three stages of grinding are involved. The primary grinding produced a roughly shaped curvilinear implement such as pl. 8, no. 24. The secondary grinding of the facets produced the normal unedged hoe. Tertiary grinding produced the cutting edge. If the broad face (primary grinding) is markedly curvilinear the tertiary grinding may result in a median¹ cutting edge. In pl. 6, no. 2 the median cutting edge has been produced by the tertiary grinding of both faces; any resharpening process would be likely to produce this result. It has repeatedly been asserted that an axe-blade has a median cutting edge and an adze-blade a unifacial cutting edge ("bevel"). It will be seen from the analysis given above that this distinction is not fundamental as far as stone tools of our region go. In discussing all types of tools it is necessary to consider the tool as a whole, that is to say, *haft and blade as used in the hand*. Moreover, it is necessary to envisage the total range of tools available in any culture. If adzes, which are carpenter's smoothing tools, occur, it presupposes some kind of axe or felling tool. Assuming that a median cutting edge is a criterion of an axe-blade, it would seem from the figures given at the end of this chapter (p. 78) that they are incompatible with axe and adze wood-work. It is therefore likely that this faceted type was an all-job-doer.

E. Shouldered Tool (*Hache à tenon*)

B. Laufer calls it "spade-shaped celt". It is also a faceted tool with the prolongation of the butt side into a tenon, thus giving a better haft. All the varieties of the former class are found in this type as well, except that the curved face examples are rare. The variation depends upon the regularity or the irregularity of the body, and the way in which the tenon is related to the body: in certain examples both tenon and body are square and the right angle between them is sharply cut by a process of wire (most probably of metal) cutting or sawing², while in others they are formed by more or less haphazard chipping

¹ "Median" is used in the same sense as Petrie has used it, *i.e.*, "equal edged" (Petrie, 1917, p. 5).

² V. Ball (1879, p. 397) suggested this process of sawing for the production of the shouldered tool as early as 1879. E. C. Worman (1949) does not talk of this process at all.

or grinding and the angle is obtuse, or at any rate the junction is curved. This type E has so far not been found in the Sadiya Frontier Zone. In this class there is one freak, pl. 11, no. 51, from the Naga Hills, which has a hole in one corner, suggesting that it was used as an amulet. The regular type is found only in the Cachar Hills Zone except for two specimens from the Naga Hills. Both the regular and irregular varieties are common in the whole of South East Asia as far north as Hong Kong (See chapter VI). Only two doubtful examples are known from Yunnan (Pl. 18, nos. 21 and 22), and this explains the absence of the type from the Sadiya Frontier Zone. It is therefore reasonable to suggest that it came to Assam most probably from Burma. From North China four specimens of the irregular variety much larger in size have been illustrated by J. G. Andersson (1943, Pl. XXIII, 3 and Pl. XXIV, 1-3). These all come from the province of Honan, and one of them is said to belong to "the Yang Shao Culture". But the commonest type is the "broad variety" (J. G. Andersson, 1943, pl. XXV), which is not found in Assam or in South East Asia at all. These come only from northern China, especially from the Mongol Zone¹ (See Appendix p. 79). J. G. Andersson rightly calls them "agricultural hoes". The regular variety in stone has not been found so far in the river valley cultures of North China, but in bronze several specimens are known. They are generally regarded as ceremonial axes.² Two specimens in iron have also been illustrated by Petrie (1917, Pl. II, nos. 98 and 99), both coming from Egypt. A slightly differing variety (with concave sides) is illustrated by Petrie in fig. 97, pl. II. It comes from Transcaucasia. Petrie (1917, p. 9) remarks, "These tanged axes may be all three Asiatic, from one source; such a fastening is unknown in Europe or Egypt otherwise."

This tool seems to be the prototype of the modern garden implement used in northern India, called *Kburpi*. George Grierson (1926, Pp. 12-13) writes,

¹ Teilhard de Chardin & Pei point out that these have been found at Hata and Kaokiatingze and also near about Jehol in large numbers. But they are not found in the south-east of the Mongol Plateau. (Teilhard de Chardin & W. C. Pei, 1944).

² V. Elisseeff, 1954, figs. 1-4; Leigh Ashton & Basil Grey, 1951, no. 2 b; B. Laufer, 1912, figs. 1-4 and 11-14; Percival David, 1952, pls. 4 and 5; P. Ackerman, 1945, pl. 63; Museum of Far Eastern Antiquities, Stockholm, Bulletin No. 2 (1930), Pl. V, 1 and 2; Bulletin no. 4 (1932), pl. I, 4.

"The खुरपा *Khurpa* is a sort of hoe used for loosening the earth round young plants or in weeding. . . . A smaller instrument for scraping grass or weeding is called, when the blade is curved, खुरपी *Khurpi*, and (south of the Ganges), when it is straight, पसनी *Pasani*. An optional name for the curved variety in Gaya is बंकुआ *Bankua*." An invariable companion of this tool is a hooked implement, called दरीती *Daramti*, the word being derived from the Rigvedic Sanskrit दातृ *Datri* (Rigveda, V.7.7.). If this modern garden implement is really a survival of the older tool form, then this should properly be called a Hoe rather than adze or axe, and the method of its hafting and use may have resembled that of the Indian *khurpi*. The tenon of the *khurpi* is fitted into a socketed wooden handle, which is generally round in section. The cutting edge is held away from the user, who sits on his feet. The movement is away from the body.

S. E. Peal long ago, in 1896, compared these tools with two iron hoes which he obtained in the Naga Hills (Péal, 1896, Pp. 20-24). Berthold Laufer fully agrees with Peal and connects them with the hoe-culture (Laufer, 1912, Pp. 73-79). Hutton and Mills (1929, p. 295) also connect them with iron hoes. This connection was suggested even by V. Ball (1879, p. 395).

D. Splayed Axe

The third type is so far known only from two of our regions, the Cachar Hills Zone and the Garo Hills Zone, though it is fairly common in Yunnan and other countries of South East Asia. It shows a bifacial median splayed cutting edge with concave sides terminating in a roughly cut narrow butt. The splaying of the edge due to the concavity of the sides is not natural to stone, that is to say, it does not necessarily result from the process of bifacial grinding. While speaking of the change from stone to copper celts, H. H. Coghlan writes, "An immediately noticeable feature is a gradual splaying out of the cutting edge of the axe: this was a natural result of the process of hammering the cutting edge of the copper in order to harden or temper the blade. When the cutting edge became notched or blunted in service, the owner (or more probably a copper-smith) would anneal the blade and afterwards treat it by hammering to restore

the edge and hardness; a succession of such operations would soon result in a well splayed-out blade." (Coghlan, 1943, p. 42). When only the cutting edge is hammered, the form of parallel-sided tools with expanded cutting edge results (See Petrie, 1917, pl. I, figs. 10-11, 24, 31-36). When the hammering starts much above the cutting edge, the splay is greater and the sides become curved. The advantage in this type is to have a narrow butt, which is easier for hafting, and a wider cutting edge. When casting came into general use, this splay form was copied in moulds. Such moulds have been found in the excavation of "The protohistoric site of the Hong Kong culture at Shek Pek, Lantau, Hong Kong" (W. Schofield, 1938, Pp. 248-251, pl. CIV). Such splayed axes, both in copper and bronze, are universal. It is from the metal type that the stone examples were copied, and this stone copy has a wide distribution in South East Asia and Eastern India.

It is important to note that all these three types have a wide distribution in South East Asia and Southern China (except the provinces of Kwangtung and Kwangsi, where exploration has hardly begun). The Assam specimens, no doubt, belong to this general complex, and the problem of their origin and age is linked up with the existence of these neolithic tool types in all these countries. This problem will be stated fully in the concluding chapter. It may, however, be repeated that the splayed axes presuppose the existence of metal originals. The faceted and the shouldered tools also appear to develop first in a metal form and then as copies in stone. The northern Chinese variety of the shouldered type is, no doubt, very irregular, but the large majority of the specimens found in South East Asia are so regular in form that they imply a process of wire-cutting in order to obtain sharp angles and straight sides. Such a perfection is not natural to stone grinding. It seems reasonable to suggest that this procedure was adopted because it improves the technical efficiency of the tool by producing a better fit for hafting. The origin of this tool must, of course be attributed to "Hoe-Terrace" cultivation as B. Laufer (1912, Pp. 77-79) argues, but its place of origin cannot be South East Asia, as he maintains; because, as will be clear from the evidence given in chapter VI, this type belongs to the developed neoliths of South East Asia, where they are found as intruders in a cultural context in which agriculture was hardly known. Such "barbarous" cultures prevailed as



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far north as the Kwangsi-Kwangtung-Szechwan region, south of the river Yangtze, in South China (See Teilhard de Chardin & Pei, 1944). Hence the origin of this type must be sought for in Honan and the Mongol Zone, where a few stone examples have already been found. From China proper, *i.e.*, the northern river valley cultures, only ceremonial specimens¹ in bronze have so far been recorded from graves. It is hard to believe that the Chinese would begin to bury these "ceremonial axes" in their graves without actually using them in life. It seems that this perfect type has been copied in stone in South East Asia with the only difference that the decorations of the bronze specimens have been omitted.

B. Rounded-Butt Axe

The next type is a form of long axe, varying from oval to lenticular in cross-section, with rounded butt sometimes narrowing to a point, the sides tapering slightly convexly, with one broad face almost flat and the other curved. The cutting edge is convex, usually unifacial, and very rarely medial. The majority of the specimens are thin, especially those found in the Garo Hills Zone. This type is also known from Yunnan and Burma. It is rare in Malaya and hardly known at all from other countries (mainland only) in South East Asia. On the other hand it has a very wide distribution in the Indo-Pakistan sub-continent (See the distribution map in *Ancient India*, no. 4, 1947-48; and no. 7, 1950, fig. 51), where it has been termed as "polished pointed butt stone axe". But this distribution map has to be re-checked as it does not take into consideration the important difference of the tool types of Assam. The technical difference will be discussed in the next chapter (See Pp. 91-94). Here it will suffice to mention that the rounded butt axe of Assam seldom has a median cutting edge and the longitudinal section is in almost all cases flat on one face and the other curved continuously from the edge to the butt. The cutting edge is formed by the junction of the ground curved face and the tertiary grinding of the broad flat face. This is the most common method of producing the sharp edge in Eastern Asia, and the

¹ It must, however, be noted that the Chinese examples are much larger in size like the Indian *Kudali*.

Assam tools belong to this general group. In Assam the rounded butt axe is poorly represented in the Naga Hills. Heine Geldern has termed this type as "Round Axe" (Heine-Geldern, 1935 b, p. 35). On the odd specimens found in Malaya Van Stein Callenfels remarks that "in later neolithic times, perhaps even in the beginning of bronze age, the use of round axe was brought over" from India to Malaya. (Proceedings of the 3rd Congress of the Prehistorians of the Far East, 1938, Singapore, Pp. 131-32).

C. Axe with broad cutting edge

This is a variant of the type B, with the difference that its sides taper more acutely and the cutting edge is very broad. This type is not found in the Naga Hills, but one specimen, pl. 11, no. 46, appears to be a copy of this type. It is most predominant in the Garo Hills, but is not met with in other regions of South East Asia, with the exception of one specimen, which is in the Beasley collection of the British Museum, no. 1.6.38 (4639B). It is of very thin slate, and is reported to have been found in the Malaya states. The examples pl. 6, no. 8 from the Cachar Hills and pl. 15, no. 93 from the Garo Hills, are typical of the large varieties, and they suggest a metal copy. Similar tools have been found elsewhere in India (See pl. 20, nos. 13-14). The "thin flat celt" type (no. 10) of Subba Rao (1948, Pp. 35-36) is similar to the Assam examples. Like these the Bellary specimens are also flat on one face and curved on the other (Subba Rao, 1948, XXI, nos. 9-13). But the Assam axes are different from the Bellary examples in so far as these are not made from flakes as the latter are. The extreme thinness of the tools goes against the possibility of their being used on wood. It is more probable that they were used on loose earth for weeding the grass. Major Godwin-Austen points out, "These softer kinds of stone implements ... were used as hoes, and some of the Kukis in the north Cachar Hills used a few years back stones set into a wooden handle in this way, for when the ground is soft during the rains they aid materially in tearing out the weeds. From the facility with which they can now get iron implements, stone will be scarcely or ever used. Col. McCulloch had told him that they are very frequently found in Manipur." (Godwin-Austen, 1875, p. 158).

F & G. Tanged Axe and Wedge-blades

These two types are known mainly from the Naga Hills Zone. They are peculiar to this region and stand as a distinct group by themselves. The tools of F type, which show slight shoulders at the butt, may have been influenced by the form of the shouldered tools. But, except for this apparent similarity, the two types are different in the actual form of the cutting edge as well as in technique of manufacture. Both types F and G hardly show any trace of flaking or even battering. The predominant feature in these tools is the mode of grinding. The cutting edge is produced by bifacial grinding of the greater length of the tool. In the case of type F the butt, termed here the tang, is further rounded by the same process of grinding and hence the general appearance is that of a shouldered tool. In other examples the original smoothness of the pebble surface is taken advantage of and left unground. These second type of tools form Class G. They may be either triangular in form or wedge-shaped according to the nature of the material originally selected. It is these two types of tools which have earlier been vaguely compared with some Yunnan specimens (See Pp. 44-45). It has not been possible for me to find parallels in India or in South East Asia, except in Burma. In other parts of India wedge-shaped axes have been found (See p. 94). But their form as well as the method of their manufacture are different from the specimens under consideration. It is possible that type F was used, hafted in a bamboo tube, as a digging stick. Coggin Brown (1931, p. 38) remarks, "The small implements were probably fitted lengthwise into a handle and used as a pud for digging holes in the ground for rice and other seeds, or for purposes of weeding."

H. Grooved Hammerstones

This type comes from only one site at Bishnath in Tezpur district. It has not been found anywhere else in Assam, nor is it known from South East Asia except for one example from Kim-B'ang in Annam (See pl. 38, no. 9). A single doubtful specimen is illustrated by J. G. Andersson (1943, p. 56, pl. XXIII, 3), while another of diorite from Shantung province is in the British Museum and illustrated by B. Laufer (1912, pl. XIII, 1). Some specimens are also known

from Hong Kong (W. Weinberger, 1948-49, pl. 18 b). Several examples have been found in other parts of India. Bruce Foote (1916, p. 86) found one at Hosahalli in the Kudlighi taluk. Subba Rao has illustrated several examples from Bellary (Subba Rao, 1948, pl. XXIII, 20-25). Several others have been collected from Banda district (Rivett-Carnac, 1883 b, Pp. 221-230). About the Assam specimens Coggin Brown (1914 a, p. 108) writes, "There are 6 specimens in all, 5 of which are made from a fine close-grained, greyish, bluish or reddish-grey quartzite; one from a dark, fine-grained, schistose diorite. Each specimen has been formed by splitting an elongated, ovoid, water-worn pebble into two pieces, across its transverse diameter, and then grinding down the fractured end until it assumed a smooth slightly convex surface. The groove or belt is cut into the implement roughly two-thirds of the distance between the face and the pebble butt. In each case it is broad and well-marked though not deep. In two of the quartzite hammers the groove forms a complete ring around the stone; in the other three, it is not continued round the edge which evidently faced the hand when the implement was held in its withy. In the case of the diorite hammer the belt is continued around one face and two edges but not around the other side. The largest specimen measures approximately 10 cms. long by 7 broad by 5 thick. The smallest 6.5 cms. long by 6 broad by 3 thick. The others are intermediate in size though usually somewhat thinner than the largest one."

Another exceptional tool is pl. 16, no. 104 from the Garo Hills. It has been flaked and shaped like an acheulean hand-axe without any trace of secondary retouch but with traces of grinding noticeable all over, more especially at the cutting edge.

Besides, we have 2 chisel-end tools from the Sadiya Frontier Zone, pl. 9, nos. 32 and 33, both of which are square in section and have sharp cutting edge at either end, one edge being perpendicular to the other. From the Naga Hills have been collected a few more types: 2 long whetstones obtained by J. H. Hutton; 2 so-called nut-crushers, which are merely oval pebbles with a depression on either flattish face; one pestle; and another pebble turned into a chisel end. From Bishnath in Tezpur district ordinary hammerstones have also been found.

The description of the tools follows region by region.

1. Cachar Hills Zone

Class A :—*Facetted Tool*:

The distinctive feature of these tools is the facets which show very clearly in all the specimens, and they are produced mainly by the process of grinding. The shape is more or less rectangular as also the cross-section. They are very thick except Pl. 6, no. 6. They have been divided here into 3 varieties on the basis of the cutting edge.

Variety A.I :—*Curvilinear Type*:

Pl. 6, no. 1 :—Collected by J. P. Mills. Kitau. 1937. Jadeite, with bluish stains. Correctly speaking it is trapezoidal in shape with facetted sides tapering towards the flat butt. The cutting edge is formed by the meeting of the ground convex face and the broad flat face showing tertiary grinding. It is ground all over but some roughness is still visible on the body. A typical example of the facetted tool so well known in South East Asia, it is the only specimen found in N. Cachar Hills.

Variety A.II :—*Bifacially ground median edged type*:

Pl. 6, no. 2 :—Collected by J. P. Mills. Thangpui. 1928. Gneiss. In this example the tendency has been to narrow the butt by additional grinding in its upper part. The butt end is square in section. The cutting edge is median produced by bifacial grinding. This is the only specimen found in N. Cachar Hills.

Variety A.III :—*Unifacially ground edged type*:

In this variety the cutting edge is produced by sharp unifacial grinding, commonly termed as "bevelled edge", giving the shape of the adze- or chisel-blades.

Pl. 6, no. 3 :—Collected by J. H. Hutton. Ranji. 1921. Dolerite. It is very broad and thick.

Pl. 6, no. 4 :—Collected by J. P. Mills. Pajja. 1928. Dolerite. It is also very broad and thick. The butt is little rough.

¹ The description first gives the name of the donor, then the place where it was obtained, next the date of its presentation to the museum, the material of which it is made, and finally the special characteristic.

Pl. 6, no. 5:—Collected by J. P. Mills. Lungkho. 1928. Dolerite. It is of a long sub-variety with straight edge. The butt is rough.

Pl. 6, no. 7:—Collected by J. P. Mills. 1929. Chert? It is very thin in section with the butt end snapped off. Its thinness links it up with a large number of such tools found in the Garo Hills.

These are the only 6 specimens in this Class out of a total of 28 tools in the collection of the Pitt Rivers Museum, Oxford.

Class B:—Rounded Butt Axe:

There is only one variety in this Class in this Zone. The cutting edge is always off the median, but is sometimes hard to mark because of the thinness of the section. The butt is rounded.

Pl. 6, no. 6:—Collected by J. P. Mills. Lungkho. 1928. Arenaceous clay (slate?). One face is somewhat flattish while the other shows grinding from three directions leaving a ridge in the middle.

There are two more examples of this type, 1 in arenaceous clay and the other in jadeite.

Class C:—Axe with broad cutting edge:

There are two varieties in this class distinguished on the basis of size:

Variety C.I:—Large type:

Pl. 6, no. 8:—Collected by J. P. Mills. Thaijuari. 1937. Sandstone. It is a large variety of this type with the sides and one broad face ground flat while the other is curvilinear. Some chips have been removed later. Marks of use are visible at the cutting edge. It is substantially thick and could well have been used on wood. It is the only specimen of its type in the North Cachar Hills.

Variety C.II:—Small type:

These are comparatively thinner in section.

Pl. 7, no. 9:—Collected by J. H. Hutton. Indulgo. 1929. Basalt. Its sides converge slightly convexly to meet the pointed butt. One broad face is irregularly curved while the other is ground almost flat with the cutting edge formed by unifacial grinding.

Pl. 7, no. 10:—Collected by J. P. Mills. Robi. 1928. Arenaceous clay. The two sides, which are ground flat, curve slightly to meet the flattish butt, and the two broad faces have also been ground almost flat, whilst the cutting edge is formed by unequal bifacial grinding.

There are 3 more specimens in the Pitt Rivers Museum, 1 in chert and 2 in slate.

One more specimen of this variety is listed in Coggin Brown's Catalogue (1917, p. 131, no. 866). It was collected by Mr. C. Brownlow at Terabeg, near Michabri, Cachar. Its sides and two broad faces have been ground flat, while the butt is worn and the shoulders are constricted.

In all there are 7 specimens in this Class so far known.

Class D:—*Splayed Axe*:

Pl. 7, no. 11:—Collected by J. P. Mills. Paija. 1928 slate. It is thin in section and asymmetrical in form. The cutting edge is produced by equal bifacial grinding and the sides inwardly curve to meet the rough butt at one end while at the other produce a markedly splayed cutting edge. This is the only specimen in this Class in this Zone.

Class E:—*Shouldered Tool*:

The varieties have been distinguished on the basis of the regularity or the irregularity of the tenon and the body, and secondly on the proportion of the length of the body to its breadth. Accordingly we have four main varieties: E.I, Regular and broad type; E.II, Regular and long type; E.IV, Irregular and broad type; E.V, Irregular and long type. There is one more variety in this Class, which we have called E.III, distinguished by its crescent-shaped body and long tenon.

Variety E.I:—*Regular and Broad Type*:

Pl. 7, no. 12:—Collected by J. P. Mills. Bara Hazlong (Naga village). 1937. Fossil wood. It is square in section with the tenon slightly inclined to one side. Both the broad faces are ground flat while the cutting edge is formed by unifacial grinding. The right angles between the tenon and the sides are sharply cut.

Pl. 7, no. 13:—Collected by J. P. Mills. Paija. 1928. Chert. Similar to no. 12 but smaller in size. The tenon is not exactly in the middle of the body while the sides are slightly divergent. The tertiary grinding in order to produce the cutting edge starts roughly from three-fourths the length of the body.

There are 2 more examples in this variety, 1 in limestone and the other in chert. These are smaller in size.

Variety E.II:—*Regular and Long Type*:

Pl. 7, no. 14:—Collected by J. P. Mills. Gunjong. Chert. The sides, which are divergent, make sharp angles with the tenon. The broad faces are ground flat, the cutting edge unifacial. Some chips have come away later.

There is one more example of chert in this variety. It is smaller in size.

Variety E.III:—*Regular with crescent-shaped body*:

Pl. 7, no. 15:—Collected by J. P. Mills. Paija. 1928. Chert. This is a unique specimen found in this region. It has a small crescent-shaped body bifacially ground to produce a sharp cutting edge. The tenon is square in section, slightly narrowing towards the butt. It is much longer in comparison to the body. The angles are sharply cut. Similar examples, though socketed, in bronze come from Burma and South East Asia. One example in the British Museum, numbered 1926, 2.10.4, comes from Trans-Salween. One stone example was found at Tham Pong in north Annam (E. Saurin, 1938, Pp. 81-82, Pl. XXII. 4).

Variety E.IV:—*Irregular and Broad Type*:

Pl. 7, no. 16:—Collected by J. H. Hutton. Waichong. 1929. Limestone. Very coarsely made. The sides are rough, and the angles are obtusely curved. It is thin in section.

Pl. 8, no. 17:—Collected by J. P. Mills. Chaikambo. 1928. Fossil wood. The shoulder is very irregular, the angles are very obtusely curved, while the body retains roughness. The cutting edge is produced by unequal bifacial grinding.

Pl. 8, no. 18:—Collected by J. P. Mills. Haflong. 1929. Slate. Very thin in section. The sides are ground flat. The tenon is negligible. The cutting edge is formed by unifacial grinding.

Pl. 8, no. 19:—This specimen has been described by H. C. Dasgupta (1913, Pp. 291-93). It came from Konarpara in Cachar. Arenaceous clay. The cutting edge is formed by unifacial grinding, while the shoulder is very irregular.

There are 2 more examples in limestone and 2 in arenaceous clay. Coggin Brown has listed a ring-stone (no. 6321) of "fine polished sandstone", collected by W. Townsend Smith in the jungle near Narainpur, Dewan Cachar.

In all 31 tools from this Zone are so far known:

Class A	...	6
Class B	...	3
Class C	...	7
Class D	...	1
Class E	...	13
Ring-stone	...	1

2. Sadiya Frontier Zone

Class A:—*Facetted Tool*:

In this Zone we have only two varieties, A.I and A.III corresponding with the types known from the Cachar Hills.

Variety A.I:—*Curvilinear Type*:

Pl. 8, no. 20:—Collected by J. P. Mills. Ningru, north of Noa Dihing river. 1933. Talcose rock, with serpentine veins, white in appearance. It is slightly longish in form with rectangular cross-section. The sides are ground flat. One broad face is also ground flat while the other is curvilinear, with the cutting edge produced by unequal bifacial grinding.

Pl. 8, no. 22:—Collected by J. H. Crace. 1935. Bone. Similar to no. 20, except that the sides are rounded. It is very finely ground, but the butt is rough. The cutting edge is obliquely convex.

Pl. 8, no. 23:—Collected by J. H. Crace. 1935. Black basalt. Similar to no. 22, but smaller in size with the difference that the cutting edge is less convex, and symmetrical.

Variety A.III:—*Unifacially ground edged type*:

Pl. 8, no. 21:—Collected by J. H. Crace. 1935. Black basalt. It is a broad sub-variety, with the faces ground flat, though one slightly curves near the cutting edge.

There is 1 more example of dolerite, variety A.I. In all there are 5 specimens in the Pitt Rivers Museum. Coggin Brown's no. 865 (1917, p. 131), collected by Mr. Healy of the Geological Survey, belongs to this Class, variety A.I. It is of streaked and mottled jadeite. The find-spot is not known. Typologically it appears to have come from this Zone.

Class B:—*Rounded Butt Axe*:

Three varieties have been distinguished in this Class on the basis of the cutting edge.

Variety B.I:—*Bifacially ground median edged type*:

Pl. 9, no. 25:—Collected by J. P. Mills. Tigra (Minyong) Abor Hills. 1937. Gneiss? It is of a long form, lenticular in section. The cutting edge is deeply crescentic. Some chips have come away later.

Pl. 9, no. 26:—Collected by J. H. Crace. 1935. Jadeite. It is a smaller variety of no. 25, with the difference that the sides are flat and the section rectangular.

Pl. 9, no. 28:—Collected by J. P. Mills. Ningru near Noa Dihing river. 1933. Jadeite, with bluish stains. It is a smaller variety of no. 25, lenticular in section.

Variety B.II:—*Unifacially ground edged type*:

Pl. 9, no. 27:—Collected by J. P. Mills. Ningru near Noa Dihing river. 1933. Gneiss. In cross-section it is lenticular, with broad faces ground slightly convexly.

Pl. 9, no. 29:—Collected by J. P. Mills. Ningru near Noa Dihing river. 1933. Jadeite, with bluish stains. It is a smaller variety of no. 27, but is slightly broader.

There is 1 more example of gneiss in this variety.

Variety B.III :—*Curvilinear Type*:

In this variety one face is ground flat and the other is curvilinear, with the cutting edge produced by tertiary grinding at the broad flat face.

Pl. 8, no. 24:—It is Coggin Brown's no. 993 (Brown, 1917, p. 133), and is illustrated by John Anderson (1871, pl. I. 4). It was found in the Mishmi Hills by Capt. Gregory. Its sides are rounded, while one face is ground flat and the other is curvilinear.

Pl. 9, no. 30:—Collected by J. H. Grace. 1935. Limestone. It is a roughly hammered pebble turned into a cutting tool by unifacially grinding the edge.

Pl. 9, no. 31:—Collected by J. H. Grace. 1935. Jadeite. Very roughly worked, showing battering scars on the body. The butt is pointed.

In all there are 9 specimens in this Class.

Besides these, 2 long implements with cutting edge at either end have been collected by J. H. Grace. Pl. 9, no. 32 is of gneiss and is little rough. The cutting edges, which are perpendicular to each other, are produced by unifacial grinding. Pl. 9, no. 33 is of jadeite, square in section, and completely ground. It was found at Ningru near Noa Dihing river. These appear to be altogether different from what is generally known as "bar-celt".

In all there are 17 specimens so far known from this Zone:

Class A ... 6

Class B ... 9

Miscellaneous ... 2

3. Naga Hills Zone

There are several tribes of the Nagas living on the hill tops, but there is hardly any distinction in the stone tools collected in different tribal areas. Archaeologically speaking, all these areas form one zone, and hence the whole collection from the Naga Hills is here dealt with together.

Class A:—*Facetted Tool*:

Besides the three varieties noticed in the Cachar Hills and Sadiya Frontier Zones, we have here 2 more varieties, one distinguished by side notches for hafting and the other a long variety with parallel sides.

Variety A.I.—*Curvilinear Type*:

Pl. 10, no. 34:—Collected by J. P. Mingsemdì, Ao country. 1923. Jadeite, speckled with yellow and black spots. Correctly speaking, it is trapezoidal in shape with the sides ground flat. The cutting edge is produced by tertiary grinding on the broad flat face.

Pl. 10, no. 35:—Collected by C. R. Pawsey. Sema country. 1926. Limestone. It is a narrower variety of no. 34 with the difference that the tertiary grinding on the broad flat face starts from about the middle of the body. The sides are ground flat.

Pl. 10, no. 36:—Collected by J. P. Mills. Lhota country. 1922. Jadeite. Similar as no. 35, but the sides are rounded and they taper more prominently to meet the flat butt.

Pl. 10, no. 37:—Collected by J. H. Hutton. Sema country. 1917. Gneiss. Very flat and thin in section. The sides have also been ground flat. It is much smaller in size.

Pl. 10, no. 40:—Collected by J. P. Mills. Lhota country. 1923. Gneiss. It is the smallest specimen in this variety with flat sides and cutting edge almost straight.

There are 5 more specimens of the bigger sub-variety: 2 of jadeite, 1 of gneiss, 1 of "reddish stone" and 1 of basalt. Of the smaller sub-variety there are 22 in all: 10 of gneiss, 6 of jadeite, 2 of sandstone and 4 of dolerite.

Variety A.II:—*Bifacially ground median edged type*:

Pl. 10, no. 38:—Collected by J. H. Hutton. Rokimi. 1929. Gneiss. It is trapezoidal in shape with rounded sides, flattened butt and faces ground flat.

Variety A.III:—*Unifacially ground edged type*:

Pl. 10, no. 39:—Collected by J. H. Hutton. Karami (Kalyokengyu country). Gneiss. It is of very thick and broad type. The butt is also very thick. The faces are ground unequally and hence the cutting edge is off the median.

Variety A.IV:—*Facetted tool with side notches*:

Pl. 10, no. 41:—Collected by J. P. Mills. Lazami (Sema country). 1937. This is the usual type of the facetted tool with rectangular section and unequally

ground broad faces, the cutting edge is off the median. In addition it shows semi-circular notches at either side, produced by grinding, in order to strengthen the hafting of the tool. These notches clearly show that the tool was hafted like an adze with the handle perpendicular to the cutting edge.

Variety A.V:—*Long Type with parallel sides:*

This type is illustrated by E. H. Steel (1870, Pp. 267-68). It has a bifacially ground median cutting edge with almost parallel sides and roughly flat top. There are 3 examples in all.

There are 35 tools of this Class in the Pitt Rivers Museum. 2 more have been illustrated by Lt. Barron (1872, Pp. 62-63), and 3 more by E. H. Steel (1870, Pp. 267-68).

Class B:—*Rounded Butt Axe:*

There are very few rounded butt type of axes found in the Naga Hills. They all belong to one variety, B.III, curvilinear type, the cutting edge is always unequally ground on the broad flat face and the curvilinear face. There is one exceptional variety, gouge adze, which has also been put in this class.

Pl. 10, no. 42:—Collected by J. H. Hutton. Phuyetomi. 1929. Slate. It is a long axe with rectangular cross-section and obliquely deep convex cutting edge. The butt is rough. Apparently it seems to be a faceted type of tool, but its extraordinary length in comparison to its width brings it closer to the tools of the present class.

Pl. 10, no. 43:—Collected by J. P. Mills. Tichipani (Sema country). 1923. Dolerite. This is the typical rounded butt type of tool, lenticular in section with the sides converging on to the rounded butt. The cutting edge is off the median. There are 2 more examples similar to this specimen, 1 of jadeite and 1 of dolerite.

Pl. 11, no. 45:—Collected by J. H. Hutton between Jorsama and Kohima villages (Angami country). Slate. It is of a pointed butt type with straight cutting edge, one face curvilinear and the other flat, the cutting edge is produced by tertiary grinding. There is one more similar example of dolerite.

Pl. 10, no. 44:—Collected by J. H. Hutton. Siromi. 1915. Gneiss. It is an exceptional type of tool with one broad face ground flat whilst the other, slightly

curving, shows deep tertiary grinding to produce the cutting edge. The final shape appears like a gouge adze except that the usual ridge is not seen here. It is rectangular in cross-section. This term, gouge adze, is given by H. D. Noon (1941, Pp. 215-16). Heine Galdern calls it pick adze (1945, p. 140). It has more vaguely been described as beaked adze. There is 1 more poor copy of this type in the museum.

In all there are 8 specimens in this Class, of which 2 are gouge adzes.

Class C:—*Axe with broad cutting edge:*

Only 2 doubtful specimens are placed in this class.

Pl. 11, no. 46:—Collected by J. P. Mills. Lhota country. 1925. Sandstone. It is a very broad type of axe with very thin section. The butt is broken. Both the broad faces show rough chipping. Later still some more chips have come away. Only the cutting edge is ground.

There is another example of sandstone, collected by C. R. Pawsey in Lazimi. One face is entirely chipped, while the other shows some grinding.

Class D:—*Splayed Axe:*

It is not represented here.

Class E:—*Shouldered Tool:*

Variety E.I:—*Regular and Broad Type:*

Pl. 11, no. 47:—Collected by J. P. Mills. Sanis (Lhota country). 1925. Chert. It is a well-cut tool, but the body is asymmetrical. The tenon is broad and makes a sharp angle with the sides. One face is slightly curving while the other flat, showing tertiary grinding at the cutting edge.

There is another better example illustrated by J. H. Hutton (1924, no. 15). It is of "reddish stone", and comes from Bapugwena. The body is a perfect square with some breakages at the corners. The tenon is small and narrow and makes a sharp right angle with the sides. One face is ground flat while the other is slightly curving. The cutting edge is produced by tertiary grinding on the flat face. Comparatively it is thinner in section,

Variety E.II:—*Regular and Long type:*

It is not represented here.

Variety E.III:—*Irregular with crescent-shaped body:*

Pl. 11, no. 48:—Collected by J. P. Mills. Tsingaki. 1929. Gneiss. Irregular in form, it has distant similarity with pl. 7, no. 15. The body is very irregularly formed and the tenon, which makes an obtusely curved angle with the sides, is narrow and comparatively long.

Variety E.IV:—*Irregular and Broad Type:*

Pl. 11, no. 50:—Collected by J. H. Hutton from the bed of Chebi river. 1915. Gneiss. The tenon is rounded by hammering. There is no proper angle between the tenon and the sides. The cutting edge is formed by the meeting of the curved face and the flat face ground at a slope.

There are 2 more examples of sandstone and 2 of basalt in this variety.

Pl. 11, no. 51:—Collected by J. H. Hutton. Lhota Country. 1935. Slate. It is a very flat variety of shouldered tool, very thin in section, with a circular hole pierced in one corner probably for putting a string through it. The whole make-up is very rough. It seems that it is a rough copy of the shouldered tool produced not very long ago.

Variety E.V:—*Irregular and Long Type:*

Pl. 11, no. 49:—Collected by J. H. Hutton. Intuma village. 1928. Dolerite. The butt is slightly rounded. There is no proper angle between the tenon and the sides. The cutting edge is produced by tertiary grinding at the broad flat face. It is almost straight.

There are 4 more examples of gneiss, 1 of sandstone and 2 of jadeite in this variety.

In all there are 12 specimens of this Class so far known from this zone.

Class F:—*Tanged Axe:*

This class includes a large number of small cutting tools with narrow, *i.e.* small, tenon. The cutting edge is formed by deep unequal bifacial grinding. In form they resemble the smaller shouldered tools. But the similarity is only superficial. (See comment on p. 54.) The tenons are mostly round in section, though some are square, while the body is roughly rectangular in shape. There is no proper angle between the tenon and the sides. The motive behind this

form was probably to have a narrow butt for hafting. Most of these are of gneiss. The cutting edge is almost straight in all cases. Four varieties have been distinguished.

Variety F.I:—*Broad Type with square or rectangular tenon:*

Pl. 12, no. 52:—Collected by C. R. Pawsey. Sema country. 1926. It is very irregular in longitudinal section. One face is bulging and the other is slightly concave. The shoulder is just noticeable.

Pl. 12, no. 53:—Collected by J. P. Mills. Seromi (Sema country). 1923. The tenon is square in section and the cutting edge is very broad.

Pl. 12, no. 56:—Collected by J. P. Mills. Lozami. 1925. Dolerite. The tenon is rectangular, and the cutting edge is formed by equal bifacial grinding.

Pl. 12, no. 57:—Collected by C. R. Pawsey. Lokhumi. 1926. It is thin and flat. The tenon is rectangular.

There are 24 examples in this variety: 16 of gneiss, 7 of dolerite and 1 of limestone.

Variety F.II:—*Broad Type with round tenon:*

Pl. 12, no. 58:—Collected by J. P. Mills. Okotso village (Lhota country). 1921. Black basalt. The cutting edge is unifacially ground.

There are 7 examples in all: 4 of gneiss, 1 of jadeite, 1 of dolerite and 1 of black basalt.

Variety F.III:—*Long type with flat topped round tenon:*

Pl. 12, no. 54:—Collected by J. H. Hutton. Seromi. 1917. The shoulder is well marked, and the cutting edge is formed by deep bifacial grinding.

Pl. 12, no. 55:—Collected by J. P. Mills. Sema country. 1925. The faces are unequally ground, and hence the cutting edge is off the median.

In all there are 8 examples in this variety: 5 of gneiss and 3 of dolerite.

Variety F.IV:—*Long or Broad with pointed tenon round in section:*

Pl. 12, no. 59:—Collected by J. P. Mills. Themokedima (Rengma country). 1921. Long body with unifacially ground edge.

In all there are 18 examples of this variety in the collection of the Pitt Rivers Museum: 15 of gneiss and 3 of dolerite.

To this may be added 1 illustrated by J. H. Hutton (1926, p. 133), copied here in Pl. 12, no. 60. Fossil wood. Found at the foot of the Naga Hills when making a road at Nichuguard. Size 4×2 .

In all there are 58 examples of this class.

Class G:—*Wedge-blades:*

This class includes a large number of tools all showing narrow rounded butt, naturally smoothed and very rarely dressed by hammering, and a broad or narrow cutting edge, generally produced by bifacial grinding. The majority of the tools have a rough triangular shape. They differ widely in size. Four varieties have been distinguished.

Variety G.I:—*Large in size with pointed butt:*

Pl. 12, no. 61:—Collected by C. R. Pawsey. Natami. 1929. Limestone. One face is slightly concave while the other is bulging.

Pl. 12, no. 62:—Collected by J. P. Mills. Pangti (Lhota country). 1925. Gneiss. It is triangular in shape.

Pl. 13, no. 63:—Collected by J. H. Hutton. Siromi. 1929. Dolerite. One face is curvilinear while the other is almost flat showing tertiary grinding at the cutting edge, which is broken. The butt is rounded.

In all there are 18 examples: 2 of dolerite; 2 of limestone; and 14 of gneiss.

Variety G.II:—*Medium in size with broad cutting edge and rounded butt:*

Pl. 13, no. 64:—Collected by J. H. Hutton. Yahemi (Sema country). 1917. Gneiss. One broad face is curvilinear while the other is ground flat showing tertiary grinding at the cutting edge. The butt is roughly shaped.

Pl. 13, no. 65:—Collected by J. P. Mills. Siromi. 1925. Dolerite. The cutting edge is formed by unifacial grinding.

There are 40 examples of this variety: 26 of gneiss and 14 of dolerite.

Variety G.III:—*Medium or small with straight cutting edge:*

This variety has its broad cutting edge straight. Some are thick with one face

curvilinear, while others are thin and have flat faces. They are triangular in shape. On the basis of size they fall into two sub-varieties:

Sub-variety G.III-a:—*Medium in Size*:

Pl. 13, no. 69:—Collected by G. R. Pawsey. Shahp-fini. 1926. Limestone. It is of flatter variety and is rather irregular.

Pl. 13, no. 68:—Collected by G. R. Pawsey. Sema country. 1926. Gneiss. It is very thick. The cutting edge is formed by unequal bifacial grinding.

In all there are 32 examples of this sub-variety: 30 of gneiss, and 2 of limestone.

Sub-variety G.III-b:—*Small in size*:

Pl. 13, no. 70:—Collected by J. P. Mills. Lazami. 1930. Gneiss. It is bifacially ground, slightly longish in appearance.

Pl. 13, no. 71:—Collected by J. P. Mills. 1925. Limestone. It is somewhat broad. The cutting edge is bifacially ground.

In all there are 8 examples of this sub-variety: 7 of gneiss and 1 of limestone.

Variety G.IV:—*Longish with parallel sides*:

These appear like miniature chisels with almost parallel sides. They are found in two sub-varieties:

Sub-variety G.IV-a:—*Narrow cutting edge*:

Pl. 13, no. 66:—Collected by J. P. Mills. Rochagahmi (Sema country). 1924. Gneiss. The cutting edge, which is straight, is unifacially ground. The sides are parallel and the butt is rounded.

There are 10 examples of this sub-variety: 8 of gneiss and 2 of dolerite.

Sub-variety G.IV-b:—*Broad cutting edge*:

Pl. 13, no. 67:—Collected by J. H. Hutton. 1915. Gneiss. The sides are divergent and the butt is rounded. The cutting edge is produced by unequal bifacial grinding.

There are 11 examples of this sub-variety: 8 of gneiss and 3 of dolerite.

Leaving aside the miscellaneous tools, the total number found in the Naga Hills is 236:

Class A	...	37
Class B	...	6 with 2 more gouge adzes.
Class C	...	2
Class D	...	
Class E	...	12
Class F	...	58
Class G	...	119

4. Khasi Hills Zone

Very few tools have so far been collected from this zone. The Pitt Rivers Museum has no specimen from this region. Only 4 implements have so far been published: 2 by Cockburn (1879, Pp. 133-43), 1 by V. Ball (1875, Pp. 158-59) and 1 by Godwin-Austen (1875, p. 158). They have also been listed by Coggin Brown in his *Catalogue* (1917).

Pl. 13, no. 72:—is a facettled tool of variety A.V. It is made of slate and has parallel sides with broken butt and a crescentic cutting edge produced by bifacial grinding. It is rectangular in section.

Pl. 13, no. 73:—It is an irregular and long variety of the shouldered tool. The butt is flat. It is made of slate.

Pl. 13, no. 74:—is a tool of class C, axe with broad cutting edge. It is very thin in section. The sides are ground flat. It is made of slate. One more example of this class is published by Godwin-Austen.

Class A	...	1
Class C	...	2
Class E	...	1

5. Garo Hills Zone

Class A:—*Facettled Tool*:

In this class we have here only two varieties, A.I and A.III, but owing to the change of material there is slight difference in form.

Variety A.I:—*Curvilinear Type*:

This is sub-divided into 2 sub-varieties on the basis of form:

Sub-variety A.I-a:—*Rectangular in shape:*

These have regular shape with rectangular cross-section, butt flat and cutting edge slightly convex. Angularity of the corners is well marked.

Pl. 14, no. 75:—Collected by G. D. Walker. Fakhre Adap. 1931. Basalt. The butt is rough. The cutting edge is off the median.

Pl. 14, no. 76:—Collected by G. D. Walker. Molmegiri. 1931. Sandstone. Similar as above but slightly thinner.

Pl. 14, no. 77:—Collected by G. D. Walker. Molmegiri. 1931. Sandstone. It is slightly broken on one side. The cutting edge is deeply convex and the sides are rounded.

In all there are 8 examples: 7 of sandstone and 1 of basalt.

Sub-variety A.I-b:—*Trapezoidal in shape:*

These vary widely in form. They have flattened butt and convex cutting edge, very thin in section. They degenerate into long varieties. All but one are of sandstone.

Pl. 14, no. 82:—Collected by G. D. Walker. Molmegiri. 1931. Slightly blackened by black soot. The sides are rounded. The cutting edge is less convex.

Pl. 14, no. 83:—Collected by G. D. Walker. 1931. It has a very narrow butt. The sides are ground flat and the cutting edge is deeply convex.

Pl. 14, no. 84:—Collected by G. D. Walker. 1931. It was found when old P.W.D. office at Tura was being demolished. The sides are ground flat.

Pl. 14, no. 85:—Collected by J. P. Mills. Rangop-Adingiri village. 1937. The cutting edge is slightly broken. Some chips have come away later.

Pl. 14, no. 86:—Collected by J. P. Mills. Adingiri village. 1937. It is very narrow at the butt and broad at the cutting edge, which is deeply crescentic.

Pl. 14, no. 87:—Collected by G. D. Walker. Rongjeng. 1931. Limestone. Similar as no. 86, but longer in size. The cutting edge is not so convex, while the sides are ground flat.

In all there are 29 examples in this sub-variety: 28 of sandstone and 1 of limestone.

Variety A.III :—*Unifacially ground edged types:*

Pl. 14, no. 78 :—Collected by G. D. Walker. 1931. Black basalt. It is rectangular in section with flat butt, rather broad in size.

Pl. 14, no. 79 :—Collected by G. D. Walker. 1931. Limestone. It is of longer variety. The sides are rounded and the cutting edge is almost straight.

Pl. 14, no. 80 :—Collected by G. D. Walker. 1931. Chert? Very worn, longish in size.

Pl. 14, no. 81 :—Collected by G. D. Walker. 1931. Sandstone. The butt is slightly narrow and the sides are ground flat.

There are 8 examples in this variety: 2 of limestone, 1 of basalt, 1 of chert (?) and 4 of sandstone.

Class B :—*Rounded Butt Axe:*

There is only one variety, B.III curvilinear type, found here. The cross-section varies from lenticular to oval. The most important distinguishing feature of the tools of this zone is that they are comparatively thinner and flatter.

Pl. 15, no 88 :—Collected by G. D. Walker. Molmegiri. 1931. Sandstone. It is very long with oval section. The cutting edge makes a deep curve continuous with the sides. There are 5 more examples of this long size: 1 from Rongkhon-giri, 1 from Fakhre Adap and others from Molmegiri. These are all of sandstone.

Pl. 15, no. 89 :—Collected by G. D. Walker. Molmegiri. 1931. Sandstone. It is a smaller variety of 88, lenticular in section and cutting edge less convex.

Pl. 15, no. 91 :—Collected by G. D. Walker. 1931. Sandstone. It is rather regular in form with the sides ground flat. The butt is rough. It is slightly thicker.

Pl. 15, no. 90 :—Collected by G. D. Walker. Molmegiri. 1931. It is asymmetrical, has a pointed butt and the cutting edge corroded.

Pl. 15, no. 92 :—Collected by G. D. Walker. Molmegiri. 1931. Sandstone. It is a smaller variety of no. 91. The butt is rounded.

There are 11 more examples in this class. All are of sandstone. They may be subdivided into 2 sub-varieties: (a) those having rounded sides, and (b) those having flat sides.

Class C:—*Axe with broad cutting edge:*

Both the varieties are extremely thin in section, and have rounded butt.

Variety C.I:—*Large Type:*

Pl. 15, no. 93:—Collected by G. D. Walker. Rongjeng. 1931. Sandstone. The cutting edge is corroded. The butt is very narrow.

There is 1 more example from the same locality in slate. A third specimen is of sand stone, slightly narrower at the cutting edge.

Variety C.II:—*Small Type:*

Pl. 15, no. 94:—Collected by G. D. Walker. Dilmagiri. 1931. Sandstone. It is a pointed butt. The cutting edge is produced by unequal bifacial grinding.

Pl. 15, no. 95:—Collected by G. D. Walker. Rongkhongiri. 1931. Sandstone. Similar as no. 94 but slightly thicker and broader.

Pl. 15, no. 96:—Collected by J. P. Mills. 1937. Sandstone. Similar.

In all there are 23 examples in this variety, all of sandstone.

Class D:—*Splayed Axe:*

Pl. 15, no. 97:—Collected by G. D. Walker. 1931. Sandstone. It is a rough copy of the splayed axe type. The cross section is lenticular. The cutting edge is produced by unequal bifacial grinding and the butt is also ground flat. There is one more example of sandstone, but the concavity of its sides is hardly noticeable.

Class E:—*Shouldered Tool:*

No regular variety of this class has so far been found in this zone.

Variety E.IV:—*Irregular and Broad Type:*

Pl. 16, no. 98:—Collected by G. D. Walker. 1931. Slate. The body is broader at the cutting edge, which is much corroded. The sides are rounded. One face is curvilinear and the other flat showing tertiary grinding at the cutting edge.

Pl. 16, no. 99:—Collected by G. D. Walker. Rongkhongiri. 1931. Slate. The tenon is very small and rounded while the angle is almost gone. It is thin in section.

Pl. 16, no. 100:—Collected by G. D. Walker. 1931. Sandstone. Smaller

in size. The butt is rounded. The sides curve inwardly to produce the narrow tenon. It is also thin in section. Some chips have come away later.

In all there are 10 examples in this variety: 3 of slate and others of sandstone.

Variety E.V:—*Irregular and Long Type*:

Pl. 16, no. 101:—Collected by J. P. Mills. 1937. Sandstone. The body is exceptionally long while the tenon is short and flat-topped. The cross section is lenticular.

Pl. 16, no. 102:—Collected by G. D. Walker. 1931. Chert, burnt black. The tenon is produced by rough chipping while the body is somewhat regular. The cutting edge is produced by unifacial grinding. It seems that an older faceted tool has been reshaped to produce the present form.

Pl. 16, no. 103:—Collected by G. D. Walker. 1931. Slate. The tenon is very thick and has a rounded top. The cutting edge is produced by unifacial grinding. The shoulder is just marked.

In all there are 6 examples: 1 of chert, 2 of slate, and 3 of sandstone.

There is one more exceptional type of tool, pl. 16, no. 104, of sandstone, a roughly shaped hand-axe, collected by G. D. Walker. It is chipped all over and shaped like an acheulean tool. It does not show any retouch, nor pecking, but bears traces of grinding all over. The cutting edge is produced by bifacial grinding.

9 more examples of nondescript type, roughly chipped, have also been collected in this region.

In all there are 120 tools so far known in this zone:

Class A	.. 45
Class B	.. 21
Class C	.. 26
Class D	.. 2
Class E	... 16 (Not a single one of regular variety).
Miscellaneous	.. 10

6. Brahmaputra Valley Zone

One so-called "celt" listed by Coggin Brown (1917, p. 131, no. 867) comes from Dibrugarh. It is of slate and of the rounded butt class (Class B.).

Another axe (Brown, *op. cit.*, no. 868), also of slate, was found 13' below the surface at Sibsagar. It is very thin in section and has a flat appearance. Other finds in this zone are Penny's tools, discovered while digging a trench at Bishnath in Tezpur district. These have been listed by Coggin Brown in his Catalogue (1917). The total number of finds made there was 156, counting each fragment as one. Of these 6 are described as "grooved hammerstones"; 3 ordinary hammerstones; 8 "celts" including one shouldered tool; 9 "small and flat ovoid pebbles of sandstone notched for binding"; 59 pieces of smoothed stone; 65 ordinary pebbles and 6 worked pieces.

26 are clearly recognisable as tools, including grooved hammerstones, ordinary hammerstones, pebbles with notches and the so-called "celts". The grooved hammerstones, which are illustrated here (pl. 16, nos. 105-111) have already been described (See Pp. 54-55). Of the "celts" one, pl. 16, no. 112, is an irregular and broad variety of shouldered tool type E.IV. Another, pl. 16, no. 111, is a wedge-blade, Class G. Both of them are of slate. A third axe is very thin in section and is of pointed butt type, Class B. There are 4 more examples of this class. The last specimen is an axe with broad cutting edge, Class C. The following main classes occur in Bishnath:

Class B .. 5

Class C .. 1

Class E .. 1

Class G .. 1

Summary and Conclusion

When the evidence of the tools, so far found in the various zones of Assam, is considered as a whole, some important conclusions can be tentatively drawn. In the chart given at the end of this chapter a statistical summary of the figures is given. The total number of tools is 575, of which 130 are merely pebble fragments. The actual tools known are 445. Of these 37 are of miscellaneous class of tools including hammerstones, nondescript types, whetstones etc., and 178 are of Class F and G, tanged axes and wedge-blades probably used for digging purposes, which are distinctive of the Naga Hills Zone except for one specimen which comes from Bishnath. The wedge-blades and tanged axes

are not found in South East Asia with the exception of Burma. Though some of them may be paralleled in Yunnan, it is fair to assume that these types are local to Naga Hills and Upper Burma. As has been pointed out before, in these examples the important technique is the process of grinding, and there is hardly any trace of flaking or battering. Technologically this tool type appears to be of a very late appearance. This fact is further supported by the fact that they are special to the Naga Hills Zone in Assam. The Indian type of wedge-shaped axes, as has been said before, is different in form and technique of manufacture.

Of the remaining tools, numbering 230, only 40% of the total, 39 are of Class C, an axe with broad cutting edge, a type which is not met with in South East Asia and Yunnan, except for one specimen in Malaya. But it has many parallels in other parts of India.

43 tools are shouldered, Class E.: 9 are regular in form and 34 are irregular, suggesting that these are rough copies of the original specimens. At least one of them, which has a hole (pl. 11, no. 51), has been used as an amulet. Its whole make-up suggests that it is a recent product. This type is altogether absent from the Sadiya Frontier Zone. In the Garo Hills the regular type has not been found. In the Cachar Hills more than half are of regular variety, while in the Naga Hills there are only 2 out of 12. On the other hand the shouldered tool class is absent from Yunnan except for 2 doubtful specimens. But in South East Asia it is the predominant type in the developed neolithic group. The regular variety is most common in Burma. It appears that the shouldered tool type came to Assam through the Cachar Hills Zone from Burma. In the interior it degenerated into the irregular variety as in the Khasi Hills, Brahmaputra Valley and the Garo Hills Zones.

Only 3 examples are of Class D, *i.e.*, Splayed axe type, which is accepted by all to be a metal copy. This type is known from Yunnan as well as from South East Asia. In India proper it comes from Bihar and Orissa. The Assam specimens are very rough and irregular. They come from the Cachar Hills and Garo Hills Zones.

98 examples are of Class A, faceted tool, of which 29 irregular specimens come from the Garo Hills Zone. Of the regular variety 40 come from the Naga Hills Zone, 16 from the Garo Hills, 6 each from the Cachar Hills and Sadiya

Frontier and 1 from the Khasi Hills. This faceted type is common throughout Eastern Asia. They have been found in large numbers in Chinese graves of the 1st millennium B.C. In India they are confined to the Eastern provinces.

The remaining tools, numbering 47, are of Class B, rounded butt axe. 2 of these are gouge adzes, the so-called "beaked adze" type. Only 3 of them show median cutting edge, 3 have unifacial ground edge and 41 are of curvilinear type. In the Naga Hills they are very poorly represented less than 4%. In the Sadiya Frontier they are more than 50%.

On the basis of the formation of the cutting edge the figures stand as follows. In Class A only 3 out of 98 have bifacially ground median cutting edge, 1 from each of the Naga, Cachar and Khasi Hills Zones. In Class B 3 out of 47 have bifacially ground median cutting edge, all of them coming from Sadiya Frontier Zone. In Class C and F none have median cutting edge. 1 in Class D and 1 in Class E from the Cachar Hills Zone show this cutting edge; while all the tools of Class G from the Naga Hills Zone show unequally ground bifacial cutting edge.

This analysis of tools suggests that the neolithic cultures in Assam, as represented by these stone tools, are of late origin. The earliest possible date is linked up with the chronology of the developed neoliths in the countries of South East Asia and Southern China.

APPENDIX TO CHAPTER IV

STONE IMPLEMENTS FROM YUNNAN

It has been remarked earlier (p. 44) that the stone tools of the Sadiya Frontier Zone in Assam have a marked resemblance with those from Yunnan, a province in South West China. In order to understand fully the relationship between the two regions, this appendix on the stone implements from Yunnan is added.

In 1868 John Anderson (1871, Pp. 410-15), who accompanied the British expedition under Major Sladen from Burma into Yunnan, was first to discover stone implements in Yunnan. About 150 specimens were obtained during this expedition by different members. Most of them were purchased in Tengueh (Tengyeh), and a few in the Sanda valley. Following in Anderson's track, in 1909 Coggin Brown (1909, Pp. 299-305; 1914 b Pp. 265-274) was able to procure numerous specimens of similar tools in Tengueh. A large collection was also made from other localities. From the available material and literature it seems that no other person has dealt with the neolithic problem of Yunnan. Teilhard de Chardin and W. C. Pei, in their work entitled *Le Neolithique de la Chine*, have divided the neolithic culture of China into three zones; Mongol Zone, Huangho Zone, and Yangtse Zone. In the last zone the cultures of the extreme south are included. They are referred to as "Primitive Culture and almost savage". Even this section includes only three regions: the region of Kwangsi cave, Szechwan, and Hsikang on the border of Tibet. The stone tools of Szechwan have been fully studied by Mr. Cheng Tek'un (1942, Pp. 1-16). In these three regions chipped "pebble tools" have been found along with ground tools. The backwardness of these regions in comparison to the river valley cultures of northern China is marked by their coarsely made stone tools and unpainted pottery. But that the influences from northern China was slowly penetrating into these far off regions, may be inferred from the find of painted sherds from Wei Chow (D. C. Graham, 1938, p. 229), as well as from the very technique of grinding and the better forms of ground tools which recall the specimens of the north.

NEOLITHIC FINDS IN ASSAM

Class A		Class B		Class C		Class D	Class E		Class F	Class G	Class H	Miscellaneous	Total
Regular	Irregular	Usual	Special	Large	Small		Regular	Irregular					
6	×	3	×	1	Cachar 6	Hills 1	Zone 7	6	×	×	×	1	31
6	×	9	×	×	Sadiya ×	Frontier ×	Zone ×	×	×	×	×	2	17
40	×	6	2	2	Naga ×	Hills ×	Zone 2	10	58	119	×	6	245
1	×	×	×	×	Khasi 2	Hills ×	Zone ×	1	×	×	×	×	4
16	29	21	×	3	Garo 23	Hills 2	Zone ×	16	×	×	×	10	120
×	×	6	×	×	Brahmaputra 2	Valley ×	Zone ×	1	×	1	6	Hammerstones 12+ Pebbles 130	158
69	29	45	2	6	33	3	9	34	58	120	6	31+130	575

As far as Yunnan is concerned, unfortunately only a partial picture of the neolithic culture is known to us. So far only well-developed ground tools have been made available. No field archaeologist has yet gone into the interior of the province to discover the neolithic sites; hence the "pebble tools" and pottery, which are likely to be found here, are not known to us.

The following study is based on the published materials and a few tools preserved in the British Museum and the Pitt Rivers Museum, Oxford. The classification, given here, follows that of Assam except the varieties of Class G.

Class A:—*Facetted Tool*: Variety A.I:—*Curvilinear Type*:

Pl. 17, no. 2:—This is Anderson's no. 9. Slate. It is trapezoidal in shape with irregular butt while body retains roughness. One face is slightly convex and the other concave showing tertiary grinding at the cutting edge.

Pl. 17, no. 3:—This is Anderson's no. 10. Black basalt. Similar to no. 2 but narrower, butt slightly rounded and one face flat showing tertiary grinding at the cutting edge.

Pl. 17, no. 4:—This is Anderson's no. 13. Dark reddish brown jade. Similar to no. 3 but smaller in size.

Pl. 17, no. 5:—This is Anderson's no. 15. Greenish speckled jade. It is a short and broad variety of this type with one face bulging to a curve and the other irregular.

Variety A.II:—*Bifacially ground median edged type*:

Pl. 17, no. 1:—It is from Major Sladen's collection in the British Museum. Jade with brown patches. The sides and the butt are ground flat while the faces have been unequally ground but edge median.

Pl. 17, no. 6:—This is Anderson's no. 3. Schist with faint traces of mica. It is a short and broad variety. The cutting edge is deeply crescentic produced by bifacial grinding.

Variety A.III:—*Unifacially ground edged type*:

Not illustrated here. Anderson's no. 18 is of this type. He describes, "It has divergent, slightly convex, flattened, ground edges, and an exceedingly narrow flat head."

Variety A.IV:—*Tool with side notches:*

Not represented here.

Variety A.V:—*Tools with parallel sides:*

Pl. 17, no. 7:—This is Anderson's no. 2. It is of bifacially ground edged type with parallel sides and faces flat and butt blunt.

Pl. 17, no. 8:—This is Anderson's no. 8. Slate. It retains the flaking scars on the body. The butt is broken. The parallel sides are ground flat. One face is flat showing tertiary grinding at the edge, and the other is slightly curving.

Variety A.VI:—*Short and Broad type trapezoidal in shape:*

This is a new variety in this class. In length it is very short. The cutting edge is broad and always off the median. It is found in various sizes, ranging from miniature to medium. This type has been found in Indochina. The smaller variety of Class C in the Garo Hills Zone comes closer to this type.

Pl. 17, no. 9:—This is Anderson's no. 16. He describes: "A very rough and seemingly unfinished implement of a highly calcareous, soft, shaly-like rock, of so little consistence that it is difficult to conceive to what practical use it could have been put. One side is slightly convex, but nearly straight, while the other is much divergent, forming an acute angle with the cutting edge. It is convex on one face and flat on the other above the sharpened edge, and the sides are more or less flattened."

Pl. 17, no. 10:—This is Anderson's no. 20, which he rightly recognised as allied to no. 9. He describes, "It is almost square and only a little longer than broad. Its sides are unequal, one diverging more than the other and both are ground to a flat surface. One face is not so convex as its fellow and is prolonged the cutting edge, while the opposite one is more convex and broadly ground off to it. This face also shows, besides the bevelled area, three distinct facets, the result of grinding probably of the stone against another."

Pl. 17, no. 11:—This is Anderson's no. 21. It is a miniature variety, with its sides symmetrical. One face is deeply convex while the other gently curves.

Pl. 17, no. 12:—This is Anderson's no. 22. Greenish jade. Sides are flat, one being more divergent than the other while the cutting edge is bifacially ground.

Class B:—*Rounded Butt Axe:*

There are only two varieties present here.

Variety B.I:—*Bifacially ground median edged type:*

Pl. 18, no. 13:—This is Anderson's no. 1. He describes, it "is distinguished from all others by its long, narrow, tapering form and by the convexity of its four surfaces, which make it almost cylindrical. The blunt end is also carefully rounded."

Variety B.III:—*Curvilinear Type:*

Pl. 18, no. 14:—This is Anderson's no. 5. He describes it as "an axe-edged tool, with parallel, faintly bulging, smooth sides, and a rounded, blunt end, flat on one face, but convex on the other. The cutting edge is worn away obliquely on one side." The flat face shows tertiary grinding at the cutting edge.

Pl. 18, no. 15:—This is Anderson's no. 6. It is a flattened broad axe of Lydian stone with ground divergent sides with deeply convex cutting edge and rounded butt. The cutting edge is produced by unequal bifacial grinding.

Pl. 18, no. 16:—This is Anderson's no. 11. He describes it as "a well-formed broadish flattened implement of Lydian stone, and is slightly convex on one side and more so on the other, which is more bevelled than the former, with its sides bulging and nearly equilateral".

Pl. 18, no. 17:—It is from Major Sladen's collection in the British Museum. Jade. It has a deeply convex cutting edge formed by unequal bifacial grinding.

Class D:—*Splayed Axe:*

Pl. 18, no. 18:—This is Anderson's no. 19. Dark bluish jade. It has a broad deep crescentic cutting edge formed by bifacial grinding. The sides are slightly concave and the butt is rough.

Pl. 18, no. 19:—This is Coggin Brown's (1914 b.) no. 15. Brownish volcanic rock. 10×7 cms. It has a broad cutting edge, almost semi-circular with concave sides, while the butt is rough.

Pl. 18, no. 20:—This is Coggin Brown's (1914 b.) no. 14. Greyish quartz porphyry. 15.5×10.5 cms. It has a broad deeply convex cutting edge produced by bifacial grinding. The butt is flat.

Class E:—Shouldered Tool:

We have here only two specimens so far known. Both show new varieties. They have been doubtfully assigned to this class.

Variety E.II:—Regular and Long Type:

Pl. 18, no. 21:—This is from Major Sladen's collection in the British Museum. Black basalt. It is a very long tool rectangular in section with a sharp uniaxially ground cutting edge. The tenon is slightly narrower than the body and the shoulder is just visible. Similar long type of shouldered tools have been found in southern Burma (See pl. 56, nos. 28 & 30). This type is not known in Assam.

Variety E.IV:—Irregular and Broad Type:

Pl. 18, no. 22:—This is Anderson's no. 24. Green Jade. It is flat on one face and curved on the other. The cutting edge is almost straight. The butt is rounded. This may belong to class F of Assam.

Class G:—Wedge-blades or chisels:

There are a number of miniature tools found in Yunnan with flat faces and uniaxially ground cutting edge, while the sides are (a) in larger examples parallel and (b) in smaller specimens slightly tapering. The cutting edge is always straight. Many of them appear to have been used for digging. Hence they have been classed as G, though in actual form they differ widely from the Assam tools of this class.

Variety G (a):—Those with parallel sides:

Pl. 18, no. 23:—This is Coggin Brown's (1914 b) no. 17. Indurated shale. It is thin and elongated.

Pl. 18, no. 24:—This is Anderson's no. 23. Quartz. It has rounded sides.

Variety G (b):—Short with tapering sides:

Pl. 18, no. 25:—This is from Major Sladen's collection. Jade. The cutting edge is formed by unequal bifacial grinding.

Pl. 18, nos. 26-29:—These are Coggin Brown's (1914 b.) nos. 24 to 27. He describes, it is "a type in which both back and front faces are ground down to

produce the blade. The sloping of the back face is done at a high angle, and it proceeds only a very short distance above the edge. The result is a straight remarkably sharp blade. The remaining portions of both faces are flat, though slightly bevelled off to meet the flat sides which taper a little towards the butt." They are all of slate.

Besides, 6 hammerstones and 1 polisher have been illustrated by Coggin Brown (1914b).

CHAPTER V

NEOLITHIC CULTURES OF BENGAL, BIHAR AND ORISSA

NEOLITHIC cultures of these provinces are said by H. C. Chakladar to be represented by ground tools, pottery and cultivation of cereals. The ground tools collected as surface finds in large numbers have been described by several persons. But so far no attention has been paid to pottery discovered in association with them, that is to say, no one has figured, analysed or properly described the types of pottery found. H. C. Chakladar writes, "Pot-sherds indicating pottery of two distinct types, one pretty thick and the other comparatively thin, have been discovered with the Neolithic implements at Baidipur in Mayurbhanj, and at other stations also. Pot-sherds collected with the tools in the valley of the Sanjai, show on examination that in the preparation of the paste for manufacturing pots, husks of grain (paddy) have been used with the clay for giving it greater binding strength." (Chakladar, 1952, p. 140). He further mentions on p. 162 (*ibid*), footnote 70, "Murray has found pottery in various well-authenticated strata with Neolithic artifacts, and in various stages of development." But from Murray's (1940, Pp. 87-95) own description it is clear that the pottery that he found, cannot be called neolithic. At one place (Murray, 1940, Pp. 87-88) the pottery relates to the burial urns of a late historical period,¹ and at three other places (*ibid.*, Pp. 90, 91 and 95) the pottery was found along with copper and iron slags, and apparently belongs to the period when the copper mines were worked. It is true that in the neighbourhood of the copper mines and along with the copper and iron slags some neolithic implements were also discovered by Murray, but as all these were surface finds, we can say nothing about the relationship of the burial urns or the pot-sherds with the ground tools. It is probably on account of the surface collections of ground tools in the neighbourhood of copper seams that Col. Gordon has called this complex "a chalcolithic culture similar to that of Maski and Brahmagiri".

¹ Murray speaks of the find of a Kushan coin inside a burial urn.

(Gordon, 1950, p. 83). While at these two sites Brahmagiri (Wheeler, 1947-48) and Maski (Gordon, 1943) actual excavations have produced evidence for the use of copper tools with the ground stone implements, in Bihar, Bengal and Orissa no such excavated material is available from any neolithic site. From the surface finds it is hard to draw any definite conclusion. Murray is inclined to believe that the copper mines were worked at least from the 3rd century A.D. (datable on the evidence of a Kushan coin obtained here). The presence of ground tools and microliths in the neighbourhood of these mines and some in the actual pits, does not necessarily imply a complex characterised by the use of stone and copper. This whole material has to be judged against the background of the Indian social and economic system, where, as Prof. K. de B. Codrington (1937, Pp. 70-99) has rightly put, the town, the village and the market play an important role, each maintaining their own way of life, with the market supplying the barest need of the village.

This suggestion implies the existence of communities of people in the neolithic stage at a late historical period. This is not purely hypothetical. Actual evidence has been produced by the excavations carried out at Bhita near Allahabad by Sir John Marshall and at Bangarh in Dinajpur district by K. G. Gosvami. Marshall observes, "A singularly interesting problem is presented by the discovery in this house of Naga as well as in several other buildings on the site, of a number of celts and other neolithic implements of slate, sandstone and diabase. They were found in the Kushana (2nd century A.D.) and Early and Late Medieval strata, and there can be no mistake as to the people which they belong." (Marshall, 1911-12, p. 35). At Bangarh the implement, pl. 23, no. 97, was found in a layer which was considered to be just below the Sunga level (2nd-1st century B.C.) (K. G. Gosvami, 1948, p. 32). These discoveries attest the prevalence of the use of ground tools in this region upto a very late historical time.¹ However, no stratified material is available from this region to fix the lower limit of the neolithic culture. In the absence of stratified data it is very difficult to associate pottery types with particular types of ground tools. However, recently Mr. M. N. Deshpande (A. Ghosh, 1955, Pp. 19-20) has

¹ Their scarcity suggests that their use must have been very limited.

produced stratified data by his excavation at Tamluk in Midnapur district, West Bengal. Here the lowest level has yielded "neolithic celts (facetted tool type) and an ill-fired pottery". In the next stage above this level has been discovered cast copper coins and terracotta figurines of decidedly Sunga style, which suggest a date not earlier than second century B.C. Hence the upper limit of the level is the end of the 3rd or the beginning of the second century B.C. As the materials still remain unpublished, it is not possible to give detail about the pottery discovered.

The distribution of ground tools is very significant. As the map (no. 2) shows, the main neolithic sites in this region lie south of the river Ganges in the forest belt of the gneissic plateau of Chota Nagpur and its extensions into West Bengal and Orissa. The exceptions are: (1) the neolithic finds in the district of Darjeeling, which form a separate group by themselves; (2) the solitary find of a rounded butt axe during the excavation of the historical site of Bangarh in Dinajpur district just below Sunga level; and (3) a "piece of fossil wood, pointed, elongated, one side flat, truncated butt, beautifully polished" (Coggin Brown, 1917, p. 130) from Sitakund¹ in Chittagong district. Leaving aside these exceptions, the northern boundary of the neolithic finds is Rajgir in Patna district (J. H. Hutton, 1931, p. 360), Sahebganj in Gaya district (Coggin Brown, 1917, p. 130) and Jamalpur in Monghyr district (Brahmachari, 1928, p. 136). The eastern boundary turns through the Dumka sub-division of the Santal Parganas and goes on to Raniganj in Birbhum, Durgapur in Burdwan, some sites in Bankura (not yet published, but referred to by H. C. Chakladar, 1952, p. 130), Tamluk (A. Ghosh, 1955, Pp. 19-20) and Bamal in Midnapur (D. Sen, 1948, Pp. 252-53). So far no neolithic finds have been reported from the banks of the Ganges River. The main river valleys, which have produced neolithic artifacts, are the Ajai, Damodar, Kasai, Rupnarayan, Suvarnarekha and its tributary the Sanjai, and the Burhabalanga, all of which originate in the high-land of Chota Nagpur. On the west this forested belt continues south of the Jamuna-

¹ There are four more specimens preserved in the British Museum. All are varieties of facetted tools of Assam. One is of limestone, another of chert and two of fossil wood. These examples suggest that this zone really belongs to the Assam culture complex. But the material is scanty, and it is hard to be dogmatic.

Ganges valley, incorporating the central ranges of the Kaimurs, the Vindhya and their offshoots, and the valleys of the rivers Son, Tons and Chambal. A glance at the map (Map no. 7) will show that the Ganges from Allahabad to Rajmahal and the Jamuna from Delhi to Allahabad flow close to the southern margin of the great alluvial plain, and mark a dividing line between the undulating hilly ranges of the south and the alluvial flat of the north. J. Cockburn (1894, p. 27) remarks, "All along the southern border of the Gangetic valley in the older alluvium fringing the Vindhians and the Kymores and as far south of these hills as I have been in Sergoojah and Rurah (possibly Rewa), the soil teems with fragmentary remains of ancient stone weapons." To the south of the hilly ranges of Orissa, again, the neolithic sites abound in the valleys of the rivers Godavari and Krishna, down to Kaveri. The only portion of the Peninsular region, which is so far blank, is the north-western Maratha block of Deccan trap, where microlithic industries predominate (Gordon, 1950; see his map), that is to say in the trap region no ground tools have been found. Further to the north west ground tools have been found at Burzahama in Kashmir, and in a late historical context at Taxila. It is clear that the distribution of neoliths in Peninsular India is almost continuous and homogeneous, with only rare gaps probably due to want of exploration. This distribution is founded upon a more or less homogeneous geographical and geological background (See map 7). Indeed this background must always be taken into account when considering the neolithic problem of India as a whole. On this basis as well as others, which will be discussed shortly, Sir R. E. Mortimer Wheeler's assumption from "the distribution of stone axes as plotted on the map as indicating a probable movement from north-east to the south-west" is hardly justifiable. (Wheeler, 1947-48, p. 295; Gordon 1950, p. 79).

The mode of the occurrence of ground tools in our region may also be noted profitably in order to get some idea of the environmental background. Captain Beeching (1868, p. 177), who was the first person to discover implements in Singbhum district, says, "They were generally to be seen on or near the banks of the river and attracted the eye at once by the striking difference they presented to the other stones lying near them. Some were lying loose on gravel, others in the sandy depressions and ravines near the river, and in one instance the

chips appeared to radiate from a small rocky mound, becoming more numerous as one approached the central part." This was later confirmed by V. Ball (1870, p. 268). C. W. Anderson made a detailed survey of this area in 1917 and reported the discovery of ground tools and microliths buried under a recent alluvial deposit about 18' thick (See Pp. 34-35). He makes the important observation that from the highest point near Chakradharpur a contour 18' below the level of the plateau, when followed, led to the discovery of many neolithic sites. D. Sen, again, visited this area and noted "a rich celt-site on the Sanjai valley four and half miles south-east of Chakradharpore, near the Barda bridge on the Sanjai by the Chakradharpore-Chaibasa road". (D. Sen, 1950, p. 1). He observes, "The celt-site is on a high ground above the alluvial flood plain, overlooking the river and is more than fifty feet above the present level of the river. The alluvial deposits which bank against the celt high-ground have not yielded any artifacts." This observation would seem to confirm Anderson's conclusion that the neolithic finds are not associated at all with the recent alluvium in this region. D. Sen makes a similar observation at another celt-site near the village of Bamal, about three miles south of Lalgarh in the Jhargram sub-division of Midnapur district. He says, "There is a deep meander of the Kasai River about a mile west of this place. The site is about 50' high above the present level of the river and the contour height round this place is 200' above sea-level. The soil is blackish at the top and seems to be fairly rich in humus and the soil below is reddish yellow. Gully erosion is fairly strong here, and it is possible that the tools have been eroded away." (D. Sen, 1948, p. 252). Two implements were found here in situ, one at a depth of 1' below surface and the other at 2' 10". Recently a microlithic site at Birbhanpur in the district of Burdwan was excavated. The implements were found to lie in the upper terrace away from the recent alluvial deposit (See Pp. 36-37). In Manbhum district near the village of Bongara, another neolithic site was discovered on a hill terrace, high above the surrounding flood plain (See p. 36). These observations indicate that the makers of the neolithic artifacts selected high plateaus and terraces above the flood level as their habitation sites and that since the occupation of these sites recent alluvium has been deposited by the later action of the rivers. If the observation of C. W. Anderson in the valley of the rivers Sanjai and Bijai is correct, one is

tempted to postulate an older land surface on which the neolithic people lived. In any case, all the observers agree on the point that the neolithic artifacts have not been found so far in the recent alluvium in this region.

Valuable information is also given by E. H. C. Walsh on the occurrence of neolithic artifacts in Darjeeling district. He writes, "Stone implements are fairly frequently found in parts of the Darjeeling district and in Sikkim. In the Darjeeling district they are most frequently found in the Kalimpong sub-division lying to the east of the Teesta river which formerly (upto 1865) was part of Bhutan. They are also found on the slopes of the hills which run down to the Teesta on its western bank. In other parts of the hill portion district they are found more rarely, as it was, doubtless, less inhabited by people using such weapons, and further down on the lower slopes of the hills in the Kurseong sub-division, and where the plains are reached in the Tarai they have, as far as I am aware, not been found at all." (Walsh, 1904, p. 20). This evidence is quite in keeping with what we know of the geology and geography of this part of the country. As in southern Bihar and West Bengal, here also neoliths are absent from the recent alluvium of the plains, but they abound on the hill terraces and slopes of the higher regions.

The concentration of neolithic finds, in this region, in the upland of the Chota Nagpur plateau (understood in its widest sense, *i.e.*, inclusive of its extensions into West Bengal and Orissa), and in the hill slopes of Darjeeling speaks of a homogeneity of geographical conditions (See chapter I for description). However, surface collections on the hill terraces or on the high river banks can hardly lead to any definite chronological conclusions. The age of the recent alluvium under which some of the neolithic finds have been made, may vary considerably in this part of the country. Large areas are still covered by the "Older Alluvium" of the Pleistocene and at places this is overlaid by the post-pleistocene "New Alluvium", which gives place gradually and imperceptibly to the recent alluvium.

The study of the materials collected under the conditions noted above does throw some light on their typology. This study is based on four collections: (1) Anderson's finds in the valley of the river Sanjai (Anderson, 1917, pls. 1-9) have been treated with some doubt as they include materials from under the

recent alluvium as well as those buried in the recent alluvium; (2) D. Sen's discovery in the same valley (Sen, 1950, nos. 1-26); (3) G. S. Ray's finds in the hill terrace near Bongara in Manbhum district (Ray, 1954, pl. II); and (4) implements collected at Bamal in Midnapur district by D. Sen (1948, Pp. 252-253). These collections will be referred to as group I.

The artifacts consist of axes, wedges, chisels, perforated stones, and hammer-stones or pounders. Three different techniques, chipping, pecking or hammering, as well as grinding,¹ have been used either singly or in combination to produce these tools. The implements found display various stages of manufacture. Some show merely chipping as in pl. 19, nos. 1 and 2; some are roughly shaped by chipping, dressed by hammering or pecking, while the cutting edge is formed by bifacial grinding, as in pl. 19, nos. 3 and 4. Still others are completely ground, as in pl. 20, no. 15. All these are finished tools as they show marks of use, and they belong to one and the same period as they have been found together. Col. Gordon (1950, p. 79) has rightly corrected the assumption of Dr. C. Von Furer Haimendorf (1948 b, p. 206) "that the chipped axes with only the cutting edge ground and polished preceded by sometime the axes ground and polished all over." Such an assumption is clearly groundless for this region.

The typology of these tools is given below:

Rounded Butt Axe with bifacially ground median cutting edge:

The predominant tool in the neolithic culture of this region (as well as in Peninsular India) is the axe form with its butt narrowed to facilitate hafting. All of them have the common characteristic of the narrow butt being rounded. Typologically they fall into two main classes: (I) Axe-blades with median cutting edge formed by bifacial grinding, and (II) Axe-hammers broad end flat or blunted. The axe-blade may be sub-divided into four sub-classes:

(I-a):—The predominant feature of this sub-class is that the rounded butt is somewhat pointed, as in the examples illustrated on pl. 22.

¹ The term, "polishing", which is generally used, and has been taken by D. Sen (1950) to be a distinct technique, is not considered suitable to describe the smoothing process shown by these tools. This depends upon the degree and extent of grinding rather than on actual polishing as this term is commonly understood.

(I-b):—In this sub-class the rounded butt is thick and blunt, as in pl. 19, nos. 8 and 9.

(I-c):—The distinguishing feature of this sub-class is in its cutting edge, which is exceptionally broad. The length of the tool is generally reduced, while the rounded butt is usually pointed. This type has been found in large numbers in the Kaimur Hills (Rivett-Carnac, 1883 b, pl. XIX, no. 12) and in Banda district (W. Theobald, 1862, pl. II, 1, 3-5), a region which lie to the west of Chota Nagpur.

(I-d):—This sub-class includes axes markedly thin in section, generally of slaty material (See pl. 19, nos. 5-7). It is because of this extreme thinness that they are usually found broken as in the illustrated examples. One such broken piece is figured by G. S. Ray (1954, pl. II), and two complete specimens by C. W. Anderson (1917, pl. VI, nos. 42 and 44).

The cross-section of these implements differs widely, being, of course, related to the wide selection of raw material used. The stones, most commonly used, are trap, schist, slate, and quartzite. Other stones used occasionally are basalt, epidiorite, sand-stone, gneiss, phyllite, hornstone and limestone. It is plain that the form in which these stones were obtained, generally dictated the shape of the tool. Hence the cross-section varies from ovoid to lenticular. The cross-section of some examples differs widely between the butt and the cutting edge. These can be described only as irregular.

Col. Gordon (1950, p. 79) makes a special reference to an axe found in the I-A, *i.e.* the lower stratum of the stone axe culture at Brahmagiri (Wheeler, 1947-48, pl. CXIII. 18), which, he describes as "a flat square-sided axe of the north-eastern type, deriving via Bihar from Burma and Malaya". On the same page he cites another solitary example from the Shevaroy Hills (Foote, 1916, p. 59, pl. 3, 97). He cites the authority of Dr. C. V. Von Furer Haimendorf (1948 b, p. 207) for considering them as of South East Asiatic type. But, as has been remarked earlier, the forms of these solitary examples are dependent upon the type of material available rather than on any particular model. The only Eastern Asiatic type which comes closer to them, is what we have called Facetted tool (See Pp. 47-48). The distinctive feature of this type of Eastern Asiatic tool is its method of manufacture, which involves a process of sawing.

Its cutting edge, which is always bifacial but unequally ground, is a characteristic common to almost all the neolithic tools of South East Asia. The Indian examples can hardly be said to be identical with this type. It should be noted that tools of this type have been found in Assam, but not in Group I in Bengal, Bihar and Orissa.

It is clear that the rounded narrow butt axe with bifacially ground median cutting edge is the predominant tool in the neolithic culture of India. This is the only type included in the collections of Group I made by C. W. Anderson, D. Sen and G. S. Ray. So far no adze form with a unifacially ground cutting edge (bevel) has been found. In the Brahmagiri excavation report (Wheeler, 1947-48) only one example is described as an adze, while Subba Rao (1948, pl. XXI, nos. 7 & 8) illustrates two examples of "adzes", one of which is broken towards the butt and the other hardly shows any "bevel". The only feature which is noticeable in these illustrated examples is the flatness of the underside. Whether this flat surface is obtained by primary grinding (See p. 47 for its definition), or is natural to the material selected, it is difficult to determine. I am informed by Subba Rao that in his examples the flatness is due to the flake surface, and not to grinding. In the Eastern Asiatic examples this lower surface shows primary grinding, the cutting edge being formed by tertiary grinding (See p. 47-48 for definition). Such a feature does not occur in the Indian examples quoted.

The rounded butt axe of the Indian type is present in Assam in very small numbers, and in the mainland of South East Asia it is exceedingly rare (See p. 52). This type is well-known in the river valley cultures of northern China (Anderson, 1943, pls. 8, 12, 13, 63-66), Szechwan, and also in Yunnan (See pl. 18). However, it must be noted that in these countries axe and adze forms are found together. As far as the available materials go, we cannot think of a separate axe or adze industry in these countries. On the other hand in India the axe¹ is the dominant tool in the neolithic culture, while the true adze is totally absent. Therefore E. C. Worman's (1949, p. 199) argument that China is the source of the Indian neolithic "celt" is hardly credible. If the neolithic cultures

¹ It may be pointed out that axe and adze blades have been distinguished on the basis of the cutting edge. However, it should be remembered that axe blades could be mounted as adzes, *i.e.* transversely to the haft.

of India and China were related at an early stage, we should expect to find in India adze blades along with axes so commonly in use. The available material contradicts this expectation. In the mainland of South East Asia adzes have been found along with axes, which have unequally ground bifacial cutting edge.

Wedge-shaped axe:

This appears to be a development from the earlier type of axe. It may be derived from (I-c) sub-class, which, like the wedge-shaped axe, is characterised by a broad cutting edge. The only difference is that the pointed butt end of (I-c) is chipped transversely and ground, thus producing a flat butt. The cutting edge is median and bifacially ground, and is generally straight, while the other axes usually have convex cutting edge. The cross-section is generally rectangular (See pl. 20, nos. 15 and 16) and the tools are well-formed. No. 17, on the same plate, most probably belongs to this type, though it shows a slight "bevel" at the cutting edge. This type is illustrated in reports from Bellary.

Chisel:

In this region the chisels are generally rectangular in cross-section with a flat butt (pl. 20, nos. 18-20), the cutting edge being bifacially ground, or rarely unifacially ground, as in pl. 20, no. 22. This last example has a pointed butt and was probably hafted. Pl. 21, no. 24 appears to have originally had a splayed cutting edge, like pl. 20, no. 21. The other type of chisel with oval cross-section is also known (See pl. 22, nos. 71-73). The chisels of this region, though formed mostly by chipping and edge-grinding, are generally different from the South Indian specimens, the Bihar and Bengal examples inclining to rectangularity.

Perforated Stones:

The perforated stones of this region are circular or oval flat stones with a hole in the centre made by working from both faces. They show hardly any grinding, their edges being blunt. Another type, known from South India is elliptical in form (Madras Museum, no. 176), triangular in cross-section, thus having an edge at both ends. Both these types differ from the Burmese (Coggin Brown, 1917, pl. IX, no. 10) and Malayan (M. W. F. Tweedie, 1953, figs. 28-30) examples, which are always circular in shape, uniformly thin in section and generally

have a sharp edge (one example from Burma is preserved in the British Museum). There are differences in the technique of manufacture as well. The Burmese and Malayan examples (except Tweedie, 1953, fig. 30, which is unfinished) are completely ground, and the regularity of their form suggests that they have been produced by sawing. They are most probably derived from the very similar jade ring-stones of northern China (See Andersson, 1943, pl. 1, nos. 1 and 2). Similar specimens have also been found from Graham's excavation at Hanchow in Szechwan (D. C. Graham, 1933-35, Pp. 114-131).

Hammerstones or pounders:

These are generally elongated pebbles which hardly show any working. However, C. W. Anderson (1917, pl. III, no. 27) has illustrated a well-worked pounder. In the Kaimur Hills, outside our region, a number of grooved hammerstones have been found (Rivett-Carnac, 1883b, pl. XVIII, no. 1 and pl. XX, nos. 12-16).

These are the only types known in the collections of Group I. However, when these are compared with others made by local purchase or by chance-find in the fields, we find, over and above them, a few altogether new types, which are fundamentally different from those described so far. These latter collections will be referred to as Group II. P. O. Bodding collected his specimens in the Santal Parganas. On pl. 22 are illustrated examples of rounded butt axes from Bodding collection. Pl. 22, nos. 49-62 illustrate various sizes of wedge-shaped axes from the same collection, and pl. 22, no. 70 is a thick butt axe; while pl. 22, nos. 71-73 are forms of chisel. The other examples from this collection belong to new types. From the Darjeeling collection of E. H. C. Walsh we get the rounded butt axe (pl. 23, nos. 84-86), wedge-shaped axe (pl. 23, nos. 77-78), chisel (pl. 22, no. 75) and hammerstones (pl. 22, nos. 74 and 76). Pl. 23, nos. 90-92 are broken specimens of thin sectioned axe. Others are of new types. The collection of S. C. Roy (1916, Pp. 61-77, pls. I-IV) shows the rounded butt axe, the wedge-shaped axe, the thick butt axe, perforated stones, hammerstones and at least one new type (facetted tool).

Among the new types three are most important: the facetted tool, the shouldered tool, and the splayed axe; and the fourth, the so-called "bar chisel", has

been found in some numbers in Orissa and Bihar. To these types may be added a fifth, the thin-sectioned broad axes from the Santal Parganas (pl. 20, nos. 13-14), so abundantly found in the Garo Hills of Assam, (pls. 14-15), recall the thin-sectioned axes of Group I of this region (already described). The "bar-chisel" (pl. 20, no. 23), which is generally produced by rough chipping, bears close similarities to the examples from Malaya (See Tweedie, 1953, figs. 5-8), with the difference that some of them in Malaya are ground. Tweedie calls them "neolithic adze". One fine unground specimen from Pahang (Malaya) is in the British Museum (no. 1935, 10.22.29). It is exceptionally long, about 19 inches. The Malayan examples are all surface finds as are those of Eastern India. Besides, there are three specimens from Lohadurga in Ranchi district in the collection of the British Museum, all three miniature variety of the facettled tool. They are made of green jadeite stone. They bear the British Museum nos. 90.7.19.1 to 3. One more miniature jadeite tool from India is in the Museum of Ethnography and Archaeology, Cambridge. Its locality is not known, but presumably came from our region. In the Indian Museum, Calcutta, some more whitish jadeite tools have been recently acquired. Nineteen of them were obtained from Ranchi district, of which 12 are facettled tools of the trapezoidal variety and 6 of the triangular variety, and 1 is a long nondescript type. Two more facettled tools (locality unknown) are preserved there. Such miniature varieties of jadeite tools have not been reported from India before. I have not seen any examples of this type in the mainland of South East Asia. In Yunnan as well as in the river valley cultures of Northern China this type occurs in large numbers. The Lohadurga specimens were, no doubt, imports probably from Yunnan as objects of trade. These jadeite miniature tools thus seem to establish a connection between Ranchi in Bihar and Yunnan in South West China. The thin sectioned broad axes, mentioned above, further links up the Santal Parganas with the Garo Hills. Similarly, the rounded butt axe of the Indian type, found in small numbers in Assam, speaks of a counter-influence from the main neolithic culture zone of India.

All these new types of tools are surface finds. None of them have so far been reported from the collections of Group I. It is, no doubt, that three important types of tools, mentioned above, came to India from outside. Before discussing

their chronology and context, further details concerning their occurrence in India are given below.

The facettèd tool with unifacially ground cutting edge (bevel) has been found in small numbers in the Santal Parganas, the Ranchi district and Mayurbhanj. The specimens from the Santal Parganas are illustrated on pl. 22, nos. 63-67. No information is given as regards the material of which they are made, it being merely said, "The implements are made of different kinds of stone, such as flint, porphyry, basalt and other hard kinds, mostly abundant in this district." (Bodding, 1901, p. 21). The Walsh collection from Darjeeling also includes this type (pl. 23, nos. 80-83, pl. 23, nos. 88-89). Two varieties of this type can be distinguished: (i) rectangular-shaped (See pl. 22, nos. 63-66), and (ii) triangular-shaped (See pl. 22, no. 67). Many examples of both these varieties are said to have been found in Mayurbhanj and deposited in the local museum, but they have not yet been published. The triangular variety has so far not been found in Assam, nor it has been reported from Burma, Malaya, or Siam. A single specimen is known from the Pho-Binh-Gia cave of the Bacsonian culture in Indo-China (pl. 32, no. 50). But the Bihar specimen can hardly be derived from the Bacsonian culture. It may, however, be noted that the Bihar specimen, except for its unifacially ground cutting edge (bevel), is hardly distinguishable from the rounded butt type of axe. The Mayurbhanj specimens are said by E. C. Worman (1949) to be rectangular in cross-section. It seems likely that the triangular variety developed from the local rounded butt axe as a result of contact with the rectangular variety of the facettèd tool. This suggestion is based on the fact that the distribution of this triangular variety is limited to Orissa, except for a single specimen from the Santal Parganas. The distribution of the rectangular variety is much wider. It is well-known in Assam (See chapter IV) and Darjeeling. Many examples have been found in southern Bihar and Orissa. Three specimens are in the Haimendorf collection of the Institute of Archaeology, London. The find-spots of these are not definitely known, as the whole collection was made in different parts of the Gondawana land in the district of Adilabad (Hyderabad). The distribution of this type, however, seems to be limited, more or less, to Eastern India. The materials of which they are made, are all local stones. It seems most probable that they were locally manufactured.

But the three jadeite specimens from Lohadurga in Ranchi district indicate the possibility of this type coming from Yunnan.

The splayed axe, of which three rough imitations are known from Assam (See pl. 7, no. 11 and pl. 15, no. 97), have not yet been reported from Bengal and Bihar. J. H. Hutton (1931, pl. 362, nos. 2, 4 and 5) has illustrated three examples of this type preserved in the Indian Museum, Calcutta. Their locality is unknown, but he doubtfully attributes them to Santal Parganas. Some examples have, however, been found in Mayurbhanj state, but they have not yet been published. On such scanty material it is difficult to establish the relationship of this type with similar types known from Yunnan, Burma and Malaya. But, as this type may well be a copy of cast metal originals, it could easily develop locally from the local flat "copper celts" of very similar form.

The shouldered tool has a very wide distribution (See map no. 7). As has been said before (See Pp. 48-49), it has two main varieties, regular and irregular. Both these varieties have been found in the Cachar Hills and the Naga Hills of Assam. From the Sadiya Frontier Zone the shouldered tool has not yet been reported, nor do we so far know any definite example (but see p. 83) from Yunnan. From the Khasi Hills, Garo Hills and the Penny's collection from Tezpur only the irregular variety is known. From Bengal proper, also, no specimen has so far been obtained. Several examples have been found in southern Bihar. P.O. Bodding (1904, Pp. 27-31) collected some specimens (pl. 21, nos. 26-28) from the Santal Parganas. These are all made of chert. In Bodding's first collection from the same district there are two examples (pl. 22, nos. 68-69) of this type. Bodding describes no. 68 as "one with a small notch on both sides, hence something similar to the shoulder-headed celts". (Bodding, 1901, p. 22). It is of regular variety. Pl. 22, no. 69 is very irregular. One example was obtained from the village of Bongara in Manbhum district by D. Sen (G. S. Ray, 1954). From Dhalbhum V. Ball (1875, Pp. 118-20) collected two specimens (pl. 21, nos. 29-30). The material of no. 30 is described thus: it "is formed of dark green, excessively dense and hard quartzite with a wavy structure and some included pebble-like masses of different composition." No. 29 is "made of black igneous rock". Ball further remarks, "in reference to the origin of these implements, their mineral composition is not, I believe, inconsistent with the view that they

may have been manufactured originally in the part of the country where they were found. The source of the material from which the flakes I formerly exhibited to the Society were manufactured, occurs within the district of Singbhum. It is a bed of chert-like quartzite and from it the material of the large adze might very possibly have been obtained. Again the very numerous dykes and intrusive masses of trappean rocks in Singbhum may contain a material identical with that from which smaller adze was manufactured." J. H. Hutton (1931, p. 360, no. 1) illustrates an irregular variety of shouldered tool from Rajgir in Bihar, and another (no. 2) of an exceptionally long and narrow blade from Madras, locality unspecified, Agency tracts (? Ganjam and Vizigapattam districts?). From the valley of the Godavari one regular type was found and illustrated by Burkitt and Cammiade (1930, Pp. 327-339). Some examples were also found on the surface inside the fortifications of Sisupalagarh in Orissa. From Mayurbhanj the regular variety has been collected. Another regular example, made of chert (?), was found by Cunningham as a surface find at Kausambi within the walls. It is preserved in the British Museum (no. 87, 717.178). One broken example of basalt "with a well defined shoulder" from Banda district is mentioned by Rivett-Carnac (1883b, p. 229). One small variety of limestone is listed by Coggin Brown (1917, p. 139, no. 1763) as coming from the river bank, Tambavati, Nagri, near Chitor. E. C. Worman (1949, p. 185) writes that he "found an apparently unfinished specimen in northern Mysore State in 1939", but this specimen has not been illustrated, nor the occurrence of this type in Mysore is noticed by any other writer. This distribution of the shouldered tool is almost co-extensive with the neolithic finds in Peninsular India, though it must be noted that it occurs only sporadically and in small numbers in India, except in Assam. It may also be noted that the majority of the Indian shouldered tools are made of chert or chert-like material. Another important feature is that in Peninsular India the majority of the shouldered tools found are of the regular variety, while in Assam this variety is known only in the Cachar Hills and Naga Hills. Elsewhere in Assam only the irregular variety has so far been found. It has been suggested before (p. 76) that the shouldered tool type came to Assam from Burma where only the regular variety is known (See the section on Burma). It must be noted that the exceptionally long variety from Madras, illustrated

by Hutton (1931, p. 360, no. 2), is also known from the southern districts of Burma (See pl. 56, nos. 28 and 30). If the shouldered tool types of Peninsular India came through Assam, as is generally supposed, it is hard to understand how only its irregular variety is found in the Brahmaputra valley, Khasi Hills and Garo Hills, *i.e.* those Zones which are further removed from the borders of Burma. On the other hand, in the Naga Hills and Cachar Hills, close to Burma, both regular and irregular varieties have been found. Can this be held to mean that the regular variety of Peninsular India was derived directly from the regular specimens of Burma? The answer to this question cannot be definitely given so long as details concerning the possibility of early communication between the Burma coast and the East Indian coast are not available. Such a possibility, however, should not be dismissed without further research.

The sporadic finds in India (except in Assam) of these three Eastern Asiatic types of neolithic tools are very difficult to explain in the present state of our knowledge. As these tools have not been found in excavations except at Tamluk, it is difficult to relate them archaeologically. But the occurrence of the shouldered tool inside the fortifications of Kausambi, Sisupalagarh and Rajgir is highly suggestive. In Assam, where these types are dominantly present, the available material suggests that they slowly permeated from the neighbouring countries into the hilly regions, where they were integrated with the local indigenous stone industry. The chance-discovery of three jadeite tools at Lohadurga in Ranchi district and other similar discoveries further suggest a connection with Yunnan, and it is possible that this connection was established through Assam. But the difficulties arise when other points are taken into consideration. These may be summed up as follows:

- (1) So far no distinct shouldered tool type has been found in Yunnan.
- (2) No miniature tool of green jadeite is known from Assam.
- (3) The regular variety of the shouldered tool is found only in the Naga and Cachar Hills of Assam, where they appear to have been derived from Burma.
- (4) In the interior of Assam, the Brahmaputra valley, the Khasi Hills and the Garo Hills, only the irregular variety of the shouldered tool is found. These apparently were local imitations of the regular variety found in the Naga and Cachar Hills.

(5) In other parts of India the majority of the shouldered tool found are of the regular variety and these show likeness with the shouldered tools of Burma, rather than with those of Assam.

(6) It is not absolutely true to say that the shouldered tool is limited to Eastern India.

(7) It seems that there is a concentration of these types in the highlands of Orissa, where, however, unfortunately, exploration is only in its early stages.

It would seem that the available evidence is not sufficient to draw a definite conclusion about the way these types came to India. One thing is certain that their appearance in India must be later than the time they are known in Eastern Asia. This is, to a certain extent, corroborated by the total absence of these types in the first group of neolithic collections made in Bihar and Bengal, which include only the typical neolithic tools of Peninsular India. The faceted tool discovered in the lowest level at Tamluk also suggests a date terminating at the end of the 3rd century B.C. The sporadic nature of the finds of these types in India further suggests that they may better be regarded as imports, or at best local imitations of foreign types rather than the products of a separate and distinct cultural grouping in India. In the absence of sufficient excavated material, it is, however, not possible to date the arrival of these foreign types in India with any accuracy. The evidence, as a whole, does indicate that both in Peninsular India as in South East Asia, neolithic cultures survived until a very late date.

In passing, it may be noted that historians have linked up the shouldered type of tools with the linguistic problem of the Austro-Asiatics. Some, like Von R. Heine Geldern (1932), have gone a step further and attempted to distinguish three cultures in South East Asia on the basis of three main types of tools, "Oval axe", "quadrangular adze" and "shouldered adze". But, as will be shown in chapter VI, the archaeological evidence is clear on the point that these three types of tools belong to one and the same cultural grouping. There is no evidence to show that any one type of these tools forms a distinct and separate culture by itself. Heine Geldern (1945) has also tried to date the appearance of the shouldered tool in India on the supposed connection of this type with the Austro-Asiatics. He writes, "The latter (*i.e.*, tanged adze) could, to a certain

extent, be dated, as it occurs, with other adze types of South East Asiatic origin, in the region of Munda languages of India. Therefore, it seemed probable that it had been introduced in India by the same people who had introduced the allegedly Austro-Asiatic Munda languages. Since we assumed that this Austro-Asiatic migration from South East Asia to India must have antedated the immigration of the Aryans in India, and as it was obvious that the development of the tanged adze in South East Asia must have preceded the westward migration of the Austro-Asiatics, both Van Stein Callenfels and the author came to the same conclusion, *i.e.*, that the migration of the Austronesians to Indonesia and the introduction of the full neolithic in the Archipelago could not have taken place later than around 2000 B.C." (Heine Geldern, 1945, p. 138). This dating assumes that the Aryan migration into Eastern India took place round about 1500 B.C. and hence the shouldered tool is dated round about 2000 B.C. As has been pointed out before, the archaeological evidence available in India hardly justifies a connection of these types of tools with the so-called "Austro-Asiatics". There is nothing in the nature of these implements or the manner in which they are found in India to show that they were introduced here before 1500 B.C., or, for that matter, before the migration of the Aryans. It is beyond doubt now that a neolithic culture in this region continued till long after the Christian era. Foreign neolithic types could have been imported or copied at any time in the obviously long duration of the neolithic culture of the Peninsular India and South East Asia. In fact, the available evidence suggests the appearance of these types of tools in India later than the local neolithic types.

Dr. C. Von Furer Haimendorf (1945, Pp. 73-85) has confused the specific problem of these tools with the question of the introduction of what he calls "the eastern type of megalithic ritual". He says, "this fully developed neolithic culture was probably responsible for the introduction into India of several elements of eastern origin, and in particular the eastern type of megalithic ritual." (Von Furer Haimendorf, 1948 b, p. 207). Without digression into the question of megalithic culture, which is beyond the scope of this thesis, it may be remarked that the neolithic association of the megalithic culture of Eastern India, or even of the countries of South East Asia, still remains to be proved. It is beyond dispute that the pottery types, iron tools and other datable materials associated

with the kinds of burial called "megalithic" in Peninsular India survived into the first centuries A.D. (F. R. Allchin, 1954, chapter II).

The tools illustrated on plates 19-23 are described below:

Pl. 19, nos. 1-4 are rounded butt axes from the valley of the river Sanjai in the district of Singbhum, Bihar. Nos. 1 and 2 show only chipping, while nos. 3 and 4 have their cutting edge ground bifacially.

Pl. 19, nos. 5-7 are thin sectioned axes from Singbhum, broken in the middle. No. 5 is made of slaty stone and is only edge-ground as is also no. 6. No. 7 shows grinding of the faces.

Pl. 19, nos. 8 and 9 are examples of thick butt axe from Singbhum. No. 8 is very regular, thin in section, while no. 9, which is broken at the tip, shows rough chipping.

Pl. 19, nos. 10 and 11 are examples of wedge-shaped axe. Both are surface finds. No. 10 from Ranchi still shows roughness on the body, and no. 11 from Singbhum is completely ground.

Pl. 19, no. 12 is made of trap rock and was found below the recent alluvium in the valley of Sanjai by Anderson. He describes it as an adze simply because the cross-section is flat on one face and curvilinear on the other. This form is probably more due to the material rather than to grinding as the rough chipping is seen all over the body except the cutting edge, which is ground. It should not be mistaken for the faceted tool of Group II.

Pl. 20, nos. 13-14 are examples of thin sectioned axes with broad cutting edge, both these are preserved in the Pitt Rivers Museum, Oxford. No. 13 is of sandstone and was collected by P. O. Bodding in the Santal Parganas. No. 14 is of slaty stone and was originally collected by S. C. Ray in Chota Nagpur.

Pl. 20, nos. 15-17 are very regular and symmetrical examples of wedge-shaped axe with rectangular cross-section. All of them come from Singbhum. The section of no. 17, as copied from D. Sen, is defective. It shows unifacially ground cutting edge (bevel).

Pl. 20, nos. 18-22 are examples of different varieties of chisels all from Singbhum. They have all been made by chipping. Only the cutting edge is ground. The striking feature is the rectangularity of their shape, which differentiates them from the South Indian chisels, which are generally oval in section (Subba

Rao, 1948, pl. XXIII. 1). No. 21 shows a splayed form, while no. 22 has a pointed end. Another example of splayed cutting edge is illustrated on pl. 21, no. 24. Pl. 20, no. 23 is the so-called "bar chisel" or "celt" formed entirely by chipping.

Pl. 21, no. 25 is a unique axe by itself. One of its sides is slightly concave while the body shows roughness. The median cutting edge is formed by bifacial grinding.

Pl. 21, nos. 26-28 and pl. 21 nos. 29-30 are regular type of shouldered tools from Bihar. Nos. 26-28 are of chert and were collected by P. O. Bodding in the Santal Parganas. No. 29 is of volcanic rock, and no. 30 of chert-like quartzite, both collected by V. Ball from Dhalbhum.

Pl. 22, nos. 31-48 are rounded butt axes from Santal Parganas collected by P. O. Bodding.

Pl. 22, nos. 49-62 are wedge-shaped axes from the same collection. Pl. 22, nos. 63-66 are unifacially ground edged (bevelled) faceted tool of rectangular shape from the same collection, while pl. 22, no. 67 is a triangular variety of the same type. Pl. 22, no. 68 is a shouldered tool of regular variety, and pl. 22, no. 69 is irregular variety of the same type. Pl. 22, no. 70 is a thick butt axe and pl. 22, nos. 71-73 are chisels.

Pl. 22, nos. 74 and 76 are hammerstones, no. 75 a chisel, pl. 23, nos. 77-79 wedge-shaped axes, nos. 80-83 are faceted tools of rectangular shape, all belonging to Walsh collection from Darjeeling district.

Pl. 23, nos. 84-87 are rounded butt axes, nos. 88-89 are faceted tools with unifacially ground cutting edge (bevel) and nos. 90-92 are broad type of axes, all from Walsh collection.

Pl. 23, no. 93 is a chisel and nos. 94-96 are rounded butt axes from Bamal in Midnapur district. Pl. 23, no. 97 is a rounded butt axe from Bangarh in Dinajpur district, found just below the Sunga level in actual excavation.

CHAPTER VI

"NEOLITHIC" CULTURES OF INDO-CHINA, SIAM, MALAYA AND BURMA

Introduction

THE cultures represented by a large number of stone tools, excavated mostly from caves and rock-shelters in the lime-stone massif of this region of South East Asia are usually designated "neolithic". Further implements have also been recovered from open air sites. Certain of these have been described as kitchen-middens, but most rank as surface finds in the fields. Their relationship with what may be called "the cave cultures" is not clear. As a whole, these stone tools are generally associated with the remains of a large number of animal bones, the animals mostly representing wild varieties of existing local species. Heaps of Melanian shells are frequent. There are, also, hearths associated with pottery in small quantities. So far cultivated food-grains have not been reported, nor textiles, but it may be that these have not been recognised. Wild berries occur plentifully. A tool with its base marked with little squares by cross hatching, found in various places, has been described as "bark-cloth beater".

These items hardly justify the appropriateness of the term "neolithic", the essential criteria of which "have always been held to be the domestication of stock, the cultivation of cereals, the making of pottery, and the manufacture of polished stone tools".¹ (*A History of Technology*, London, 1954, p. 501). The domestication of animals and the cultivation of cereals were not practised at all by these South East Asian "Cave" dwellers, since the fauna and flora found in the caves are undomesticated and uncultivated. However, hand-made pottery is frequently found though only in very small quantities. It must, however, be noted that most archaeologists suppose that the pottery was imported from more developed areas. The stone tools are, also, not always ground. Some of

¹ V. Gordon Childe in *Man Makes Himself*, Pp. 89-90 (See also Childe, 1953, p. 193), lays stress on "a self-sufficing food-producing economy".

them are very poor in workmanship, being, in fact, only oval river pebbles, crudely chipped on one or both faces. Some, though still unground, are flaked by the same crude technique but have more regular forms. On account of this crudity and the absence of grinding some writers (Van Stein Callenfels & Evans, 1928) have called these cultures "palaeolithic". But this term is hardly justifiable in view of the fact that all these cultures are known to be recent by their faunal association and other evidences which will be described later. Other authors (Heine Geldern, 1945, p. 130; M. W. F. Tweedie, 1953, Pp. 10-18) refer to the cultures represented by the crude industry as "mesolithic", probably intending to imply a much earlier date for them. But as the following analysis will show, there is hardly any justification for such an assumption. Poor workmanship with recent associations is, no doubt, a common denominator of all these "cave cultures". It is in contrast with them that we find, on the other hand, completely ground tools, as well as tools well-cut, probably made by a process of wire sawing, and regularly conforming to set shapes and proportions. The French archaeologists (Colani & Mansuy) have designated tools of the first class "Néolithique inférieur" and those of the second class "Néolithique supérieur". But in between these classes of tools, we find some edge-ground implements, which are placed in the first category by these authors, who, thus, in fact, assume a sequence of three stages. This assumption is based entirely on typological grounds. No stratigraphic evidence has so far been produced to prove the validity of such a sequence. No distinct strata have been detected in the excavation of the deposits of these caves. It is true that the depth of finds has been quoted to prove the correctness of this alleged sequence, but no reliance can be placed on these figures.

One gathers the general impression that the food-collecting crude-tool users lived side by side with those who used ground and sawn tools of specialised types, as well as various types of hand-made pottery. This suggests that the latter must have been "self-sufficing food-producing" group of people. However, it must be admitted that it is difficult to distinguish the social elements of which these cultures are a product. The customary distinction of primitive peoples into "food-collecting" and "food-producing" societies is obviously useful, but the evidence on which such a distinction rests is often vague. In

South East Asia it is clear that the majority of the cave sites show a homogeneous culture pointing to a single occupation without any break.

On the other hand, a survey of the material produced by the sites in Indo-China indicates regional distributions. There are three cultural regions there which may be called (I) Hoa-binh, (II) Bac-Son and (III) Somrong Sen. These regional names have been used by former authors, following the lead of Mlle. Colani, to indicate periods. An examination of the excavation reports makes it plain that this chronology has no basis in fact. On the other hand, the reports establish the cultural distinction of these sites, which may be regarded as cultural centres. In almost all the Somrong Sen sites copper and bronze objects have been found. Edge-ground tools, which are the chief feature of the Bac-Sonian sites, also occur in the other regions, though as a minor feature. The question, therefore, arises as to whether "neolithic" is a correct designation for these cultures.¹

The following analysis and description of the objects concerned are based on the published reports of the excavations and explorations carried out in the mainland of South East Asia. They have also been verified as far as materials are available in the British Museum, Pitt Rivers Museum, Oxford, and Musée de l'Homme, Paris. In the account given here the terminology of the excavators has generally been kept so that reference can be made to the original reports, if necessary. Our main purpose has been: (i) to put together in one place, as briefly as possible, materials scattered in various museums and journals; (ii) to make a systematic survey of the confused mass of materials hitherto unrelated; (iii) to provide a provisional classification which may serve as a guide to future excavators and explorers, and at the same time it is frankly admitted that the classification may need modification in the light of any new materials made available in future; and (iv) to outline the general course of the development of these

¹ Etienne Patte (1936, p. 283) prefers to call these cultures "énéolithique" meaning thereby that these cultures were partly contemporary with Bronze Age. He writes, "Il n'en est pas moins vrai, qu'à titre de survivance au moins, il y a des relations entre l'Indochine 'néolithique' et la Chine protohistorique. Pour toutes ces raisons, je suis persuadé, que la hache à tenon, et la on les civilisations qu'elle caractérise, sont énéolithiques, le terme d'énéolithique étant employé avec un sens plus ou moins élargi suivant le cas et pouvant s'appliquer à une de l'âge du Bronze."

cultures in chronological order as far as the present materials allow. It must, however, be admitted that more systematic work is necessary in this region, as well as in Southern China, before a clear picture of the "neolithic" cultures of this area can be given.

SECTION I

INDO-CHINA

As has been said, there are three important areas in Indo-China (See map no. 4), which have yielded materials belonging to the so-called "neolithic" cultures. The first area has its central point at Hoa-Binh, lying to the south-west of Hanoi. In its vicinity a number of caves have been discovered. Nine of them have been excavated and reported upon by Mlle. Colani (1927), who applied the term "Hoa-binhien Culture" to the assemblage of materials found in them. The second important area is the lime-stone massif in the neighbourhood of Bac-Son, north of Hanoi. Large number of caves have been explored, excavated and reported by Mansuy and Colani, who, in the same way, use the term "Bac-Sonien Culture". The third area is round about Somrong Sen in Cambodia. Here a few kitchen-middens and some open air sites have been examined, but the greatest number of objects known from this area are surface finds. These three broad headings have been kept in the following description: *viz.*

I. Hoabinhian Culture.

II. Bacsonian Culture.

III. Somrong Sen Culture.

To these regions may be added a fourth: the provinces of Than-hoa, Qui-dat and Quang-binh in Annam. Its geographical position marks it out as meeting ground of the northern (Hoabinhian and Bacsonian) and southern (Somrong Sen) cultures, and this is amply borne out by the evidence of the materials discovered. Culturally speaking it does not form a separate zone by itself. Hence, no attempt has been made to mark it out as a distinct culture.

The materials used for chipped tools are local pebbles of volcanic rocks, generally of coarse grain, like granite, rhyolite, porphyrite, while for the ground

tools fine-grained rocks like "phtanite", siliceous stone, basalt etc., have been used. Schist is rarely used.

I. Hoabinhian Culture

Mlle. Colani (1927) has distinguished three stages in the Hoabinhian Culture on morphological grounds: (a) Late, (b) Intermediate, and (c) Archaic. This classification takes into account the depth of the finds, but as the depth is not based on any intelligible stratification, it is clear that certain of the reported depths have been assumed to mark a stage in the development of the stone industries. Whether these three stages denote sequence in time or merely three facies of tool types will be discussed later. A complete description of the artifacts, found in the various caves, is given here cave by cave; but it must be confessed that Colani's plates are very imperfect, the material being preserved in Hanoi.

Sao-Dong

Reference: M. Colani, 1927, Pp. 7-18.

The archaeological deposit here was about 2 metre thick. No stratification was recorded, but a succession of five artificial layers was postulated purely on morphological basis. But of these, the first and the last were admittedly sterile as far as human artifacts are concerned. The three others are described below from bottom upward:

Stage C: *Archaic "period"*:

In this stage only stone tools were found without any association with bone implements or pottery. The tools are made of large river pebbles crudely flaked on one or both faces. No trace of grinding has been detected and secondary retouch¹ on the edges have rarely been noted. On the basis of appearance and probable use these tools are classed here in two groups:

¹ The term "retouche" is generally used by French archaeologists in Indo-China. It probably signifies secondary working, a process which has been observed by us in the examples preserved in the Musée de l'Homme. The term retouch for the purpose of sharpening the cutting edge has not been found at all in our examination of any of these tools.

Group I:—This group includes what may be termed pebble choppers, made of large oval pebbles, sub-triangular, sub-rectangular, round or oval, with the cutting edge formed by chipping out one or more large flakes on one or both faces (pl. 24, nos. 1-4).

Group II:—This group includes hand-axes, Colani's "coup-de-poing" (pl. 24, no. 6), amygdaloids (pl. 24, no. 7), ovals (pl. 24, no. 5), pyramids (pl. 24, no. 15) probably used as "percuteurs" (arms for throwing). There are also scrapers, square (pl. 24, no. 14), or "demi-ellipsoïde" (pl. 24, no. 16) in form. They are all core tools more or less chipped all over, although some retain traces of cortex.

All the tools, except the last one (pl. 24, no. 16) which bears secondary retouch, show crude chipping on one or both faces. This crude workmanship is the common feature of groups I and II, but the difference in the form and purpose of the tools is quite obvious. Technically speaking the forms of group II are better than those of group I; however, both types are found together and hence in point of time both must be taken to belong to one and the same period. We have here three types of stone tools; (i) Pebble choppers, (ii) Hand-axes, and (iii) scrapers. On the exceptional tool (pl. 24, no. 16), which Colani calls "hache courte", she remarks, "Cette pièce a pout être glissée d'un niveau supérieur pendant les fouilles" (1927, p. 10). How far this statement is true, cannot be verified. But it is important to note that retouch is not absolutely absent in this stage. The amygdaloid hand-axe (pl. 24, no. 7) also shows retouch on only one side, and this is also the case with the pyramidal tool (pl. 24, no. 15) which shows retouch on the periphery of the base. Thus, to be exact we can put forward a further sub-classification of this group II:

II-a:—Hand-axes showing rough chipping and no retouch (pl. 24, nos. 5-6).

II-b:—Hand-axes with regular forms, Colani's amygdaloid and pyramidal showing retouch (pl. 24, no. 7 and pl. 24, no. 15).

II-c:—Scrapers of crude workmanship without retouch (pl. 24, no. 14).

II-d:—Scrapers of regular form with retouch (pl. 24, no. 16).

The existence of certain hand-axes, retouched on only one side, throws doubt upon their function as hand-axes.

Stage B: *Intermediate "period"* :

In this stage almost all the older forms continue, but the size is diminished and the forms are less massive. On the other hand, the workmanship is more precise and careful, and some of the tools show a marked symmetry. Edge-grinding occurs in a few cases. Some sherds of pottery have also been discovered. Most of the tools have received fine retouch all round. Once again the function of the tools retouched in this manner may be queried. These tools have been classed here in three groups:

Group I:—This group includes pebble choppers of Stage C, group I, but two developments can be seen: firstly, well developed flaking is the characteristic of this stage, very little cortex being left; and secondly, some retouch is found on the cutting edge (pl. 25, nos. 20-23).

Group II:—Using Colani's rather vague terminology this group may be said to include hand-axes, the so-called "coup-de-poing" (pl. 25, no. 25), well-shaped amygdaloid (pl. 25, no. 26), ellipsoid (more appropriately extended ovals with flattened sides (pl. 25, no. 27), demi-ellipsoid (pl. 25, no. 34); discs (pl. 25, nos. 28-29), small points (pl. 25, no. 40) and scrapers (pl. 25, no. 35). Colani's small points show retouch all round, and therefore their function as points is also doubtful.

Pl. 25, nos. 26 and 27 recall in outline similar symmetrical types of the Bacsonian culture (compare pl. 25, no. 27 with pl. 31, no. 42) with the difference that the Bacsonian tools are edge-ground while here they are not. The so-called demi-ellipsoid tool has also its counterpart in the Bacsonian nos. 11 and 15 (pl. 29), which are also edge-ground. Hoabinhian pl. 25, no. 34 is retouched eccentrically on both faces and is rather a chopper than a hand-axe.

The main point to note is that Stage B marks an advance from Stage A, showing improvement in form and technique of manufacture. This may have been due to contact with the Bacsonian culture or such similarity, as exists, may be merely accidental. Group II may be sub-divided further into following sub-groups:

II-a:—Those tools which are improved forms of Stage C (pl. 25, no. 25), pl. 25, no. 35).

II-b:—Those which show resemblance with the Bacsonian tools (pl. 25, nos. 26-27, and pl. 25, no. 34).

II-c:—Entirely new types (pl. 25, nos. 28-29 & pl. 25, no. 40).

Group III:—This group includes ground tools which have no relationship at all with the types so far described. Pl. 26, no. 41 is probably a scraper. It has concave sides and convex cutting edge, the base forming a sector. Pl. 26, no. 42, has its parallel in the Bacsonian culture, pl. 31, no. 30, and seems to have been ultimately derived from that culture, if not actually imported from that region. These tools, which bring in the technique of grinding to this area, is very important in not only tracing the source of this technique but also fixing a chronological relationship with the Bacsonian culture.

Stage A: *Late "period"*:

In this stage the pebble choppers were not found. Instead many new types appear. The number of edge-ground and partially-ground tools has also increased, and these establish a definite link with the Bacsonian culture. Here for the first time we meet with small tools, which are exceptionally well-formed. Some hand-made pottery bearing simple cord-marked decoration has also been found. Melanian shells as well as mammalian bones have been discovered. The tools have been arranged here under three groups:

Group I:—This group includes tools which are improved forms of those occurring in the earlier stages. Pl. 26, no. 46 continues the archaic form of hand-axe (pl. 24, no. 5) but is somewhat symmetrical being almost rectilinear in form with the sides retouched all round. Pl. 26, no. 47 is a well-made hand-axe which may have developed from the earlier type (pl. 24, no. 6 and pl. 25, no. 25), though the dimensions in this case are much reduced. This type is described by Colani as "Chellean". Pl. 26, no. 48 marks another development. It is symmetrical in form with a thickened butt. Pl. 26, no. 49 is discoidal, worked flat, and is an improved version of pl. 25, no. 28. Pl. 26, no. 57 is a small version of the semi-circular scraper and is highly retouched.

Group II:—This group includes new types of tools which are small in dimension and of excellent workmanship. Pl. 26, no. 58 is a three-faced small point with thickened rounded butt. One of its faces shows the cortex. Pl. 26, no. 59 is

a very fine symmetrically worked tool, retouched all round, though the point seems to be broken. Pl. 26, no. 60 is another rectangular scraper with the sides finely retouched. Pl. 26, no. 61 shows fine retouch at the end and the sides. Pl. 26, no. 62 is described by Colani as crescent-shaped "hache courte". It is probably a knife, the convex edge being minutely retouched. Pl. 26, no. 63 is another unique tool, serving both as a scraper (or knife) and a point. The edge is slightly concave. Pl. 26, no. 64 is a triangular point with the sides and point worked. Pl. 27, no. 76 is a well-shaped pounding stone, the base of which is marked with red ochre.

Group III:—This group includes tools most probably derived from the Bacsonian culture. They are all ground. Pl. 27, no. 77 is triangular in form. It may be compared with Bacsonian pl. 32, no. 45. Pl. 27, no. 78 is an amygdaloid, a type well-known in the Bacsonian culture. Pl. 27, no. 79 is a very small tool, a smaller version of the Bacsonian, pl. 29, no. 10. Both of its faces are ground.

To sum up, the Sao-Dong stone industry shows a complex group somewhat variable in form:

1. The pebble choppers are met with only in stages C and B, but are absent in the last stage. The pebble tools of stage B show retouch at the cutting edge.
2. The hand-axes and scrapers continue through all the three stages, and irregular archaic forms along with regular shapes were found till the last stage though the better forms, symmetrically worked were predominant in the later stages.
3. Some new types like discs and points begin to appear from stage B, but they are markedly developed in the last stage.
4. Some of the tool types show resemblances with those of the Bacsonian culture, and it seems almost certain that the technique of grinding came to this place from the Bacsonian region as the ground tools are all of Bacsonian type. The ground tools begin to appear from stage B.
5. In the last stage we find another type of small, exceptionally well-made, tools.

6. Hand-made pottery is found in the last stage but not so profusely as in the Bacsonian sites. Some sherds have also been obtained in stage B. On the whole pottery is scarce in this culture.

7. The important point to note is that out of nearly 1000 tools, recovered here, only 11 showed grinding. This clearly indicates the "primitive" nature of the Sao-Dong industry. However, it need not be considered earlier in date on this account, a point which will be discussed later.

8. Red ochre was also commonly used here.

Whether we accept the artificial classification of this industry by Mlle. Colani into three periods, or not, the varying standard of workmanship is noticeable. In this variation, signs of evolution are clear.

X-Kham

Reference: M. Colani, 1927, Pp. 19-23.

As Mlle. Colani points out, "dans la grotte de X-Kham, comme a Sao-Dong il n'existe pas de stratification proprement dite." (p. 20). The archaeological deposit was about 1 metre thick. The finds here again fall into three stages:

Stage C: *Archaic "period"*:

Only stone tools have been found in this stage and, as at Sao Dong, they are here classed into two groups:

Group I:—This group includes pebble choppers of the type pl. 24, nos. 1-3. The workmanship is crude and no retouch is visible.

Group II:—This group includes hand-axes of the type pl. 24, no. 6, and Colani's pyramids of the type pl. 24, no. 15. Some new types appear in this cave. Pl. 24, no. 8 is described by her as having two points and being sub-tetrahedric in form. Pl. 24, no. 11 is described as "percuteur parallelopaedic" in form. Pl. 24, no. 12 is a "sub-rectangular percuteur". In this example the cutting edge is said to be crudely formed. Pl. 24, no. 13 is a sub-triangular point. Retouch is seen in the pyramidal tool, while the rough geometric forms are common to the Sao-Dong industry. No scrapers have been reported in this stage nor is there any trace of edge-grinding.

Stage B: *Intermediate "period"*:

In this stage also only stone tools have been found. No pottery and bone tools are reported. Pebble choppers are not found. The other two groups are represented.

Group II:—This group includes hand-axes of the type pl. 25, no. 25, discs of the type pl. 25, no. 28, and "haches courtes" of the type pl. 25, no. 35. Other variants of disc and "hache courte" also occur. But the most important additional type is pl. 25, no. 30, worked into an axe form. It shows regular flaking on both faces.

Group III:—This group includes a new type of ground tool, pl. 26, no. 45, a type occurring in the Bacsonian culture (pl. 30, no. 21 and pl. 32, no. 43). The present specimen triangular in form shows regular shape and careful workmanship, the cutting edge being ground on both faces.

Stage A: *Late "period"*:

In this stage some new types of tools again appear and one bone implement was also found. No pottery is reported. The general characteristics correspond with Sao-Dong stage A. The tools have been classed here under three groups:

Group I:—This group includes scrapers of the type pl. 26, no. 57.

Group II:—This group includes 2 new types: a sub-triangular point (pl. 27, no. 70) is ground on one face. Colani says specifically that it shows traces of sawing on the other. A bone implement (pl. 27, no. 71) is worked both at the thicker end, which is rounded, and at the cutting edge which is ground on both faces. The small tools of Sao-Dong type do not occur here at all.

Group III:—This group includes a small axe (pl. 27, no. 83), ground on both faces, and is of the type occurring in the Bacsonian culture (pl. 33, no. 58).

In general the stone industry of X-Kham agrees with that of Sao-Dong with the following exceptions:

1. The pebble choppers are not found here in stage B.
2. Hand-axes are absent in stage A.
3. A new technique of sawing appears in stage A, but Colani also points out

one tool of Sao-Dong as showing traces of sawing but unfortunately does not illustrate it.

It is also important to note that out of about 170 tools only 3 were ground, and out of these 2 are types derived from the Bacsonian culture, a point which confirms our conclusion that the technique of grinding came to this region from Bac-Son.

Trieng-Xen

Reference: M. Colani, 1927, Pp. 27-30.

No stratification was observed here. The archaeological deposit at some places is about 2 metre thick. The deposit contains numerous chipped stones, bone tools, shells of unionids and abundant remains of bones of animals, like elephant, rhinoceros etc. No pottery is reported. On the surface 3 or 4 completely ground axes were found but they have neither been illustrated nor described. The tools have been classified into 2 periods by Colani, corresponding to stages B and C. They are described here from bottom upward:

Stage C: *Archaic "period"*:

In this stage both stone and bone tools have been included. Along with the usual pebble choppers, hand-axes, scrapers and points we have here well-chosen hammerstones or rather pounders, one of which shows marks of use. The workmanship of the tools recalls that of Sao-Dong, stage C. They have been described here under two groups:

Group I:—This group includes pebble choppers of the type resembling pl. 24, nos. 2-4.

Group II:—This group is further divided into two sub-groups on the basis of material used.

Group II-a:—This sub-group includes only stone tools. We have here hand-axes, choppers and points. The oval type of axe no. 5 (pl. 24) occurs, here and there are other varieties of the same type. One scraper with retouch makes a rough rectangle. Two new types are also found: pl. 24, no. 10 is a well-worked point and the other pl. 24, no. 9 is a small three-faced tool with rounded apex.

Group II-b:—This sub-group includes only bone tools. All of them are long spatulas, and though the cutting is still somewhat rough, they show smoothing of one or other face. Pl. 24, no. 17 is thin and crude with one face partly smoothed. Pl. 24, no. 18 is another long spatula, the sharp edge being concave. Pl. 24, no. 19 is trapezoidal in section and the edge is straight. This is the only cave where bone tools have been found at such a great depth. Their association with other tools described is clearly established.

Stage B: *Intermediate "period"*:

In this stage as well stone tools, bone implements and pounding and grinding stones have been included. The tools vary a good deal.

Group I:—This group includes pebble choppers. Type nos. 20 and 23 (pl. 25) occur. A new type pl. 25, no. 24 is also found. All these pebble choppers show secondary working at the edge.

Group II:—This is again divided into sub-groups on the basis of material used:

Group II-a:—This sub-group includes stone tools. Here we have hand-axes of the type no. 35 (pl. 25) and new type of "pyramid" with a triangular base, pl. 25, no. 32; well-formed amygdaloidal axe of the type pl. 25, no. 26 and elliptical axe pl. 25, no. 27; semi-circular scraper of the type pl. 25, no. 35; triangular point, pl. 25, no. 33, which is an improved version of the one occurring in the earlier stage pl. 24, no. 10.

Group II-b:—This sub-group includes only bone implements. Pl. 25, no. 38 is a long spatula with almost regular sides, the edge being ground all round. Pl. 25, no. 39 is another such tool but one end is pointed and the blunt end is stepped. These bone implements are better worked and shaped than those of the earlier stage.

Group III:—This group includes beautifully ground axe, pl. 26, no. 44, which is obviously derived from the Bacsonian culture (compare pl. 30, no. 25).

To sum up, the stone industry of Trieng-Xen corresponds with that of Sao-Dong. The find of a Bacsonian type of ground axe again confirms the earlier conclusion that the technique of grinding was derived from that source. It is also important to note that out of about 170 tools only 3 were ground. Bone

implements form an important addition from the earliest stage, and they are skilfully smoothed from the beginning.

M-Khang

Reference: M. Colani, 1927, Pp. 31-35.

No stratification is noted here. The excavator points out that the lowest deposit was much disturbed, and hence it was not possible to separate the archaic period from the intermediate. The tools were, therefore described under two periods, Intermediate and Late, corresponding to stages B and A. The archaeological deposit is only 1 metre thick. Animal bones and Melanian shells were abundantly found here. Some potsherds are also reported. One bone implement was found. Rocks bearing cup-marks were noted in this region.

Stage B: *Intermediate "period"*:

The tools classed under this head have been found at two depths: one is reported as lying 1 metre below surface, and the other 70 cm. below surface. But both show a mixture of the earlier and later forms. The excavator is of the opinion that some kind of disturbance has caused this confusion.

Among the tools found 1 metre below the surface pebble choppers, hand-axes as well as scrapers occur:

Group I:—This group includes the archaic forms, pl. 24, nos. 1 and 4, as well as the improved form pl. 25, no. 22.

Group II:—This group includes the pyramid type, pl. 24, no. 15, disc type, pl. 25, no. 28, and a beautiful amygdaloidal type of hand-axe pl. 25, no. 26.

The tools found 70 cm. below surface also show a mixture of old and new forms.

Group I:—This group includes pebble chopper of the type, pl. 25, no. 24. Another rolled pebble said to be half chipped is not illustrated.

Group II:—This group includes a crude hand-axe of the type no. 6 (pl. 24), and another which is a variant of the type no. 11 (pl. 24). Pl. 25, no. 36 is a scraper with convex side worked. Another tool is similar to pl. 26, no. 41. One resembles the small ground tool, pl. 27, no. 79, which has been shown to be a miniature copy of the Bacsonian, pl. 29, no. 10.

Stage A: *Late "period"*:

In this stage have been found some sherds of pottery, one bone implement and various stone tools. The pebble choppers are not reported.

Group I:—This group includes disc of the type, pl. 26, no. 49, and small scraper of the type, pl. 26, no. 57, which is ground. Another scraper, pl. 27, no. 72, is of rectangular form, all three sides being retouched.

Group II-a:—This group includes a well-shaped triangular hand-axe of the type, pl. 27, no. 77.

Group II-b:—This group has a bone implement, pl. 27, no. 73, one end of which is rectilinear, the other terminating in a broken point, which is in section thickened. One face, when found, was covered with Melanian shells and traces of carbon, probably soot.

It must be admitted that the division into periods given by Colani is not very clear. But the absence of pebble chopper in stage A is significant, and also the presence of small tools and well-made hand-axes in this stage is noteworthy. It is important to note that only 2 ground tools out of a total of 150 were found here.

Som-Jo

Reference: M. Colani, 1927, Pp. 45-47.

In this cave the surface finds are said to include 2 completely ground axes, not illustrated, and some remains of pottery, unfortunately not described by the excavator. It is clear, however, that pot-sherds were found profusely at this site. The stone tools are all of well-developed types. No pebble choppers have been discovered, and the hand-axes do not show the crude workmanship of stage C. On morphological basis the tools have been placed under two stages A and B.

Stage B: *Intermediate "period"*:

In this stage discs showing fine retouch all round, which Colani calls "*hache courte*", and hand-axes have been found. They are classified here into two groups:

Group II:—This group includes a finely retouched disc, pl. 25, no. 31.

Another disc of the type, pl. 25, no. 29 was also found, and a third one which is said to be semi-elliptical. Colani's "haches courtes", which are probably scrapers, include the semi-circular type, pl. 25, no. 35, and also rectangular ones. One of them shows a little grinding.

Group III:—This group includes a ground hand-axe of triangular form, pl. 26, no. 43, the butt consisting of the natural cortex of the pebble. It resembles very closely the Bacsonian pl. 31, no. 35 which is obviously an unfinished tool.

Stage A: *Late "period"*:

In this stage small tool types are predominant, though axes and scrapers have also been found.

Group I:—This group includes a new type of scraper, pl. 26, no. 55, which shows grinding at the edge.

Group II:—This group includes small tools of the types, pl. 26, nos. 58 and 59.

Group III:—This group includes another small tool of the type, pl. 27, no. 79, and a ground axe pl. 27, no. 84, which resembles the Bacsonian, pl. 32, no. 52.

The percentage of the ground tools is not known in this cave.

Lang-Néo

Reference: M. Colani, 1937, Pp. 37-44.

Here we have a rock-shelter and a cave. The archaeological deposit was not very deep. Chipped implements were numerous on the surface and the deposit having a depth of approximately 60 cm. Pebble choppers, hand-axes, ground tools, bone objects, pottery and Melanian shells as well as human remains were found here. But the excavator has not been able to distinguish various periods on the basis of the depths of recorded finds and hence she observes: "Malgré la présence de quelques pierres polies, on peut affirmer que les premiers troglodytes, les plus anciens occupants de la grotte et de l'abri, avaient une culture paléolithique primitive. . . . Après que la grotte et l'abri sous roche eurent cessé d'être la demeure permanente de sauvages antiques, ils servirent d'aisle durant les époques troublées. En route de grande mammifères se réfugient

assez souvent la nuit dans la caverne. Quand nous y sommes entrée pour la première fois, une fosse, en forme de berceau, avait été pratiquée dans les dépôts de coquilles de *Melaina*; d'après les paysans, un cerf s'y était creusé la nuit. Hommes et animaux ont complètement remanié ce kjokkenmodding. Les objets préhistoriques gisant à une même profondeur n'appartiennent, le plus souvent, pas à la même période de l'industrie lithique hoabinhienne." (Pp. 38-39).

Colani's failure to arrive at usual stratification has resulted in a confused mixture of tool types which are assignable to different stages on the evidence of other caves. Hence the tools of this cave have been described here according to various types they belong to, and no attempt will be made to classify them under various stages.

Type no. 1:—This type has pebble choppers like pl. 24, no. 2 and pl. 25, no. 24.

Type no. 2:—Here we have included hand-axes and scrapers: coup-de-poing resembling pl. 24, no. 6, and another like pl. 25, no. 25. Another axe similar to pl. 24, no. 12. One is like pl. 26, no. 46; a rectangular scraper like pl. 24, no. 14, a truncated pyramid like pl. 24, no. 15, another retouched scraper like pl. 26, no. 60, a semi-circular scraper with concave base and one more rectangular type, pl. 26, no. 60, but bigger in size. We have also a pounder like pl. 27, no. 76 but bigger in size, and one more axe like pl. 27, no. 83 but not ground.

Type no. 3:—This includes discs like pl. 25, nos. 28 & 29, and pl. 26, no. 49.

Type no. 4:—This includes those tools which have close resemblance to Bacsonian tools: Pl. 27, no. 82 is a new type in the Hoabinhian region. It is a flat pebble ground on both faces of the cutting edge, and recalling the Bacsonian, pl. 31, no. 38. Pl. 27, no. 80 recalls the Hoabinhian pl. 27, no. 79. Pl. 27, no. 69 resembles the Bacsonian, pl. 29, no. 8. Pl. 27, no. 81 is a well-shaped bone implement with oblique edge, a close copy of the Bacsonian type. Another ground tool is similar to Bacsonian, pl. 31, no. 41. One completely ground tool has not been illustrated by the excavator.

Type no. 5:—Here we have well-made small tools: A crescent-shaped scraper or knife, pl. 26, no. 62, a variant of the "hache courte", pl. 27, no. 79; another resembling pl. 26, no. 59.

Type no. 6:—This includes various types of points: No. 65 unillustrated shows fine retouch. Pl. 26, no. 66, which is also finely retouched, has curved sides.

Another is like pl. 26, no. 56. Pl. 26, nos. 67 and 68 are simple flakes showing grinding and also, according to Colani, traces of sawing. One more piece, not illustrated, is completely ground.

To sum up, this cave is important in so far as the various tool types known from other caves are all represented here. Furthermore some new types occur, which typologically fall in stage A. On the evidence of this cave alone Colani's classification into stages ("Periods") representing a time sequence entirely fails. Two points are made quite clear by the evidence produced: (1) pebble choppers do not occur in stage A, and (2) small tools are not met with in stages B and C. These two distinct types probably therefore belong to two distinct traditions. The ground tools, however, are derived from the Bacsonian region, the earliest being found in stage B. All these three stages are mixed up in this cave. Other points are noted below:

1. Out of 600 tools found here only 10 were ground, the majority of them being derived from the Bacsonian culture, clearly indicating the source of the technique of grinding.
2. Traces of sawing were detected in three tools in this cave.
3. Pottery was found in profusion.

Lang-Vo

Reference: M. Colani, 1927, Pp. 49-50.

In this cave remains of hearths were found at numerous places, and also Melanian shells. The archaeological deposit is said to be completely disturbed. Pottery was found. The flaked tools were predominantly present, though a few ground tools were also recovered. Colani says that the majority of the tools show traces of sawing. They are 17 in all. Some animal bones were also found. The tools apparently belong to a single period deposit, though some are very crude. They have been classed here under two groups:

Group II:—This group includes hand-axes and scrapers. Pl 26, no. 51 is a new type, semi-elliptical, very carefully chipped on both faces and finely retouched. The side intended for holding is oblique. Colani sees in it an attempt at sawing, but it appears to be only broken. The type recalls Bacsonian, pl. 29,

no. 11. Pl. 26, no. 52 is said to be "percuteur", asymmetric, very carefully chipped on both faces, the sides being sawn (according to Colani) and not ground. Pl. 26, no. 53 is a side-scraper made from a flat pebble, retouched on both the long sides. The narrow ends are slightly ground. Pl. 27, no. 74 is sub-rectangular, the cutting edge being flaked on both faces. The butt is narrow and unflaked, but signs of retouch are visible. Two finely worked axes of the type, pl. 27, no. 77, were, also, found here.

Group III:—This group includes the Bacsonian types of tools. Pl. 27, no. 86 is made from a flat pebble. It is finely retouched on both faces and the edge is ground, recalling the Bacsonian, pl. 32, no. 54. Pl. 27, no. 87 is another small tool of the same type, recalling the Bacsonian pl. 29, no. 13. These tool types suggest stage A.

Lang-Bay

Reference: M. Colani, 1927, Pp. 51-52.

In this cave only 7 chipped tools and 1 axe of the Bacsonian type were found. In a small cave within it a huge quantity of Melanian shells and some pot-sherds were discovered. No stratification was observed here, and no distinction into "periods" has been made. The tools are described under two groups:

Group II:—This group includes 2 pebble tools, probably end-scrapers, the edge being finely retouched; a hand-axe, pl. 26, no. 54, retouched all round; a "hache courte", pl. 27, no. 75, one face preserving the cortex.

Group III:—This group includes a well-made axe, pl. 27, no. 85, described as being of crystal rock. The butt is formed of the naturally rounded pebble while both faces show grinding. It is a variant of the Bacsonian pl. 32, no. 51. The tool types suggest stage A.

Ha-Bi

Reference: M. Colani, 1927, p. 53.

It is a small rock shelter. Some Melanian shells and a few chipped tools have been found here. Only four tools have been described: a narrow butt "percuteur", a side-scraper, a sub-triangular point and one Bacsonian type of

axe, pl. 27, no. 88. It is not ground but only retouched. It resembles the Baconian, pl. 32, no. 46, but is smaller. The industry suggests stage A.

Conclusion

Colani sums up the evidence of all these caves in the following words: "Des neuf gisements préhistoriques décrits plus haut, sept seulement sont importants Sao-Dong, Lang-Néo, X-Kham, Trieng-Xen, Som-Jo, Lang-Vo, M-Khang. Les kjokkenmoddinger qu'ils renferment ont été les uns, trouvés là où ils avaient été déposés (Sao-Dong, X-Kham, Trieng-Xen et M-Khang), sans qu'il y ait eu déplacement notable ou inclusions étrangères; tandis que les autres ont subi quelques remaniements, probablement différentes époques, accompagnés de rares apports plus ou moins récents.

"Dans ces quatre stations archéologiques, on peut constater que les objets travaillés par l'homme gisent dans le même ordre, les plus grossiers, plus grands et plus massifs, dans les lits profonds. Ceux qui sont habilement façonnés plus petits et plus fins, se trouvent au voisinage de la surface. Non seulement les dimensions et la facture sont similaires, mais les formes se répètent. Entre ces types extrêmes se voient, dans les lits moyens, des types intermédiaires qui montrent que cette évolution s'est effectuée graduellement. Ces observations étant rigoureuses, indéniables pour ces quatre stations, ont une valeur incontestable. Pour la clarté de notre exposé nous avons catalogué les objets en trois groupes; ceux de la période archaïque, ceux d'une période intermédiaire et ceux de période moins ancienne. Pris dans un sens très large, ce classement est exact, il n'y a pas de limite, cela va sans dire, entre chaque période. En réalité le perfectionnement s'est fort probablement poursuivi d'une façon lente et assez continue; des persistences se montrent parfois, tel ou tel type primitif se rencontre à un niveau élevé; de rares apparitions prématurées de modèles moins antiques se voient aussi.

"À Lang-Néo, à Som-Jo, à Lang-Vo, à Lang-Bay et à Ha-Bi, les instruments de Sao-Dong et des trois autres stations se retrouvent; on raison des remaniements, ils ne sont pas restés à leur place les couches superficielles contiennent entre autres des pièces anciennes le mobilier des dépôts profonds

comprend quelques objets moins archaïques. Pour leur classement la stratigraphie ne peut pas entrer en ligne de compte, l'aspect et la facture doivent seuls être considérés." (Colani, 1927, p. 55).

These generalisations are calculated to substantiate Colani's postulates. No comparisons are made with the cultures of other areas. The main cultural features of Colani's stages are summed up below on the basis of our independent re-examination of her material.

Technique of manufacture:

(a) River pebbles and bones are the main materials chosen for the manufacture of tools. Bone tools are not very common. Only at one place, Trieng-Xen, they have been found down to the deepest level. However, the present review of the material has made it clear that the technique of working bone was known to the people of this region from the first stage.

(b) The pounding and grinding stones are well-chosen rounded or conical pebbles showing hardly any further working. They are common to all the levels and cannot be accepted as a criterion of any particular stage.

(c) The bone implements definitely show better workmanship than the pebble tools. It is noticeable that fine retouch is rare in the bone implements of stage C, where they are also very rare.

(d) The flaking of the pebble tools is coarse. In the case of pebble choppers the flaking is scanty and was probably done by block-on-block method. In stage C generally one face of the tools is flaked. Very rarely both faces show flaking. The shape of the tools is irregular and crude.

(e) The other group of tools, Colani's hand-axes and scrapers, is far more finished in appearance. The flaking, though coarse, is thorough, and an attempt is made to produce a definite form. These tools, which show secondary working, are definitely superior in form. One scraper, pl. 24, no. 16, is so much advanced that the excavator was led to doubt the depth at which it was actually recorded. The technique of "retouche" in order to give a proper finish to a tool is so rare in stage C that it could not have been locally invented. If the shapes, which show some regularity (compare amygdaloidal type), are any

indication of the source, the Bacsonian region is indicated as the channel of transmission of this finer technique.

(f) In stage B the flaking technique is still further improved. The forms show symmetry, and the result is technically more effective, especially in those tools which are bifacially worked and retouched.

(g) In stage B, again, we get ground tools, and the number of such tools increases in stage A. The majority of these are of Bacsonian type. There are very few local ground types. However, the percentage of ground tools is so low that it can be fairly well asserted that the technique of grinding was little known in this region. Such ground tools as there are, were most probably obtained from the Bacsonian area. The local products are poor imitations of these.

(h) The technique of sawing was still rarer. Only in one cave Lang-Vo the number of sawn artifacts was considerable. The product is far from satisfactory. So far no accurately-sawn tools of Pho-Binh-Gia (a) types of the Bacsonian region have been found in these caves. This technique is known only in stage A here.

(i) The appearance of small tools in stage A, which include fine points, "haches courtes" and scrapers, marks an intrusion of fresh cultural feature. Such small tools have also been found at Da-But in the province of Than-Hoa, Annam (E. Patte, 1932). This suggests that this technique came from the south, as also some other features did come from this southern region (See Section IV).

(j) In stage A pebble choppers are not found.

Pottery:

Hand-made pottery bearing cord-marked decoration has been found generally in stage A, though a few sherds were encountered in stage B as well. No evidence is available to show that the pottery was locally manufactured. Colani considers all the pottery to be imported.

Morphology:

It is important to note that we find here forms which are associated with a particular technique, and these forms continue as long as that technique is in use, *e. g.*, the pebble choppers are all so small that they were probably held in hand and struck by a hammerstone. This type continues only unto stage B. The

oval hand-axe, pl. 24, no. 5, which may be a product of anvil technique, continues right up to stage A (compare pl. 26, no. 46) in the same crude form, though secondary working is noticeable in the latter example. There are other new types which are associated with the appearance of new techniques of fine retouch and of grinding. The small tools, "haches courtes", points and scrapers are confined to stage A. The ground tools, which have been found in stage A and B, show Bacsonian tool types. It may be said that the local culture remained "primitive" throughout in the sense that the local stone industry hardly shows any signs of evolution. It is only the appearance of new types of tools associated with fresh techniques of grinding and fine retouch that add to the variety of the culture.

What has been said above, may produce doubts as to the validity of Colani's classification into three periods. To begin with, this classification is not based on stratigraphy. The only distinction between them is the appearance of fresh techniques and forms which are comparable with those of the Bacsonian culture on the one hand and on the other with the stone industry from Da-But in Annam. Even if Colani's periods (stages) are accepted, they cannot be separated chronologically by any great length of time, as the evidence from the Bacsonian region shows (See Pp. 144-ff).

II. Bacsonian Culture

H. Mansuy has distinguished two periods of culture in this area: one he calls "néolithique inférieur". This is characterised by edge-ground tools. The second, he calls, "néolithique supérieur". This is distinguished by well-cut and completely ground tools. He supports this division by citing the depth of finds, at two places, Pho-Binh-Gia and Dong-Thuoc. All other sites are single period deposits and they can be assigned to one or the other group only on morphological basis. In the following analysis the stone industry has been classified into four general stages, A, B, C and D, and further sub-divided into groups according to the technique of manufacture and the general forms and appearance. The depth of finds recorded by Mansuy has also been taken into evidence.

Kéo-Phay

Reference: H. Mansuy, 1924, Pp. 8-11; 1925 b, Pp. 7-11.

The archaeological deposit is only one metre thick and is composed of a single homogeneous layer of calcareous clay. Only stone tools have been found in this cave. No pottery is reported. The flaking technique is crude and rough. The tools show large deep flaking recalling the technique used in stage C in Hoabinhian culture. Secondary retouch has been profusely used to produce regular forms. Only two implements show edge-grinding. Compared with the Hoabinhian, the industry is still "primitive", in the sense that the predominant feature is that of unground tools which are large and crudely flaked. But no pebble chopper has been found in this deposit. This industry is assigned here to stage D, and the tools have been divided into two classes.

Class I:—This class is characterised by implements with coarse flaking. They fall into two sub-classes:

Sub-class I-a:—In the illustration these have been included under Group I. Here we have coarsely flaked hand-axes, approximating to well-known forms. Pl. 28, no. 1 has been described by Mansuy as an elliptical tool showing regular form. Pl. 28, no. 2 is irregular. Pl. 28, no. 3 is described as semi-elliptical with its butt irregular. Pl. 28, no. 4 is described by Mansuy as a coup-de-poing resembling a "Chellean" type.

Sub-class I-b:—In the illustration these have been included under Group II. This includes scrapers, pounding and grinding stones of generally well-chosen pebbles, pyramidal or conical in shape and some incised schistose fragments and polishers. The scrapers are generally semi-circular and frequently retouched at the edge. Some of them are made of flakes, and in the two examples illustrated (pl. 28, nos. 5 and 6) the bulb of percussion is further flaked, a method which is very frequent in Malaya, where they have been called "Debu" scrapers from the type-site of Gua Debu, where they were first recognised (H. D. Collings, 1936, Pp. 5-16). Pl. 28, no. 7 is another scraper showing profuse retouch at the edge.

Class II:—In the illustration these have been included under Group III. The chief characteristic is edge-grinding. Pl. 29, no 8 is a narrow butt edge-ground

axe, the edge being almost median produced by bifacial grinding while the main body shows massive flaking. Pl. 29, no. 9 is an unfinished tool with a notch on one side of the butt and a shoulder on the other a little lower down. It is profusely retouched at the edge probably prior to receiving further grinding. The type is entirely new. Pl. 29, no. 10 is a remarkable tool of altogether new type, having parallel sides, flat butt and convex ground edge. This is the only tool of its kind known at Kéo-Phay. The regularity of its straight sides suggests that probably it was cut in the fashion of the advanced tools in Pho-Binh-Gia (a) (See Pp. 134-35). Another elongated type of edge-ground tool with regular sides was reported in a later exploration (Mansuy, 1925).

To sum up, Kéo-Phay industry is mainly represented by flaked tools and scrapers. Ground tools are rare, but it must always be remembered that the available material is very scanty.

Dong-Thuoc

Reference, H. Mansuy, 1924.

In this cave molluscs and animal bones were discovered. Pottery was rare, but pot-sherds decorated with basket pattern (4 sherds have been illustrated by Mansuy, 1924, pl. XIV, 4-7) were found. Two levels were distinguished by the excavator though no stratification was recorded. The materials distinctly belong to two distinct groups. The one at the top is termed here Dong-Thuoc (a), and that found at the bottom is called Dong-Thuoc (b). They are described here from bottom upward:

Dong-Thuoc (b)

No pottery is associated with these tools. The flaking technique is still coarse recalling that of Kéo-Phay, though some signs of better workmanship are apparent. All tools are edge-ground. The following types occur:

Pl. 29, no. 11 is described as a semi-elliptical hand-axe (probably broken) showing coarse flaking. It shows skilful retouch on the sides. The cutting edge is ground.

Pl. 29, no. 12 is described by Mansuy as an elliptical hand-axe, a little irregular

in form, coarsely flaked, and showing grinding at the cutting edge. This type is also known from the Hoabinhian culture of stage A and B (pl. 24, no. 5 and pl. 26, no. 46).

Pl. 29, no. 13 is another tool of almost rectangular shape with its butt broken. It is completely ground on one face. Technically this tool is more advanced than others of this group. The regularity of its straight sides and the high degree of grinding marks it out as unique in this group.

Pl. 29, no. 14 is a long unfinished tool of the same type as the Kéo-Phay type, pl. 29, no. 9. It has a narrow butt, shows slight grinding at the edge and retouch at the sides.

Pl. 29, no. 15 is semi-elliptical in shape with crude workmanship and slightly ground edge.

Pl. 29, no. 16 is a crudely worked flake, probably a scraper.

All these tools belong to Class II. Typologically they may be sub-divided into three sub-classes:

Sub-class II-a:—Elliptical and semi-elliptical axes which are only edge-ground, the sides being retouched, deep flaking being still apparent on the body.

Sub-class II-b:—The flake scraper, pl. 29, no. 16.

Sub-class II-c:—The elongated axe, pl. 29, no. 14, which continues the Kéo-Phay type, pl. 29, no. 9. The rectangular shaped axe, pl. 29, no. 13, shows regular sides and a high degree of grinding. It has been doubtfully placed in this sub-class, though it recalls the technique of Class III.

Dong-Thuoc (a)

All these tools were found in association with pot-sherds, and there is, no doubt, that they belong to one and the same complex. The stone industry belongs to Class III, *i.e.*, completely ground tools. Typologically they fall into two sub-classes:

Sub-class III (a-i):—The distinguishing feature in this sub-class is that besides being completely ground, the tools show perfect angles straight sides which could hardly have been achieved except by wire-sawing probably used with an abrasive. But no such instrument has been found in this cave, or indeed elsewhere. The rarity of these tools in the caves suggests that they were probably imports.

Pl. 30, no. 17 is a shouldered tool of regular and long variety according to the terminology adopted in chapter IV. Pl. 30, no. 19 is another type of tool trapezoidal in shape, also found in Yunnan (See pl. 17, nos. 9 and 10). It has unifacially ground cutting edge. Pl. 30, no. 20 is similar to no. 19 but is narrower.

Sub-class III (a-ii):—In this sub-class we have two tools, one, pl. 30, no. 21, a narrow butt axe with sloping sides and convex cutting edge produced by bifacial grinding, and the other, pl. 30, no. 18, which is smaller and mutilated. The difference between the sub-classes III (a-i) and III (a-ii) is marked. The latter can be produced only by flaking and grinding, but the former needs the additional use of the sawing technique. By the process of grinding on a flat but hollow grind-stone, as appears to have been the general practice here, one can get regular sides, but the corners are generally rounded as in pl. 30, nos. 18 and 21 or in the Hoabinhian B. III and A. III tools. The perfect angles that we find in the Bacsonian pl. 30, nos. 17, 19 and 20, with straight sides, could hardly have been achieved by grinding alone. It has been suggested that they are copies of metal types and that the angles were probably sawn. The whole question will be discussed later. With these tools pottery has also been found.

Thus Dong-Thuoc (b) tools are marked by edge-grinding and coarse flaking; Dong-Thuoc (a-ii) is characterised by complete grinding; and Dong-Thuoc (a-i) shows a further process of sawing in its straight sides and perfect angles as well as grinding of the faces. The reports make it clear that both Dong-Thuoc (a-i) and (a-ii) were found together and hence contemporary, though the relation of Dong-Thuoc (b) with them is not clear. When we compare the tools of this cave with those of Kéo-Phay, we notice a similarity of technique and forms in the tools of Kéo-Phay and Dong-Thuoc (b), the only difference being that the latter have all their tools edge-ground, while Kéo-Phay has produced only four ground tools. Whether this difference is due to time-lag or is only a local feature, it is very difficult to say. But in this connection we should remember the Kéo-Phay tool, pl. 29, no. 10 and Dong-Thuoc, pl. 29, no. 13. The regularity of their sides and their forms mark them out as unique, and there is, no doubt, that they belong to the same type.

Provisionally we can speak of following groups of tools on the basis of the predominant features:

Stage D . . . Kéo-Phay group.

Stage C . . . Dong-Thuoc (b) group.

Stage B . . . Dong-Thuoc (a-i) and (a-ii) group. In the chart given at the end of this chapter (p. 148) this group has been called Pho-Binh-Gia (a).

But whether these groups, here arranged under different stages, can be referred to different periods, it is hard to say. The point can only be decided when all these groups of tools are related to a definite stratigraphical sequence. The present classification is put forward as a guide for reference in planning future excavations.

Naché

Reference: H. Mansuy, 1925 a, Pp. 11-12.

The archaeological deposit was not deep. It was full of shells, numerous rhyolite flakes and stones bearing traces of grinding. No pottery has been reported. Almost all the tools are edge-ground. The tool types correspond with Dong-Thuoc (b), and belong to class II. They are described below:

Pl. 30, no. 22 is made of a flat pebble with its convex cutting edge bifacially ground and the butt being slightly narrowed.

Pl. 30, no. 23 is another axe made on a flake, roughly flaked, only the cutting edge being ground.

Pl. 30, no. 24 is a unique specimen of bone, a faceted axe with the cutting edge produced by bifacial grinding. The butt is broken transversely.

Pl. 30, no. 25 is described as an elliptical axe (properly speaking oval in form) with its small cutting edge ground almost straight. Both the faces are flat. Another axe (Mansuy, 1925, a, pl. VII, 1) of this type is rougher, and Mansuy says that it shows deep flaking scar on the body. It does not seem to have received any grinding.

Pl. 30, no. 26 is another axe of similar type made of volcanic rock. Its proportion compares well with the type of Kéo-Phay axe, pl. 28, no. 1.

Pl. 30, no. 27 is an elongated axe with a narrow pointed butt, ground only at the edge. It recalls a tool of the next series (See pl. 32, no. 53).

Pl. 30, no. 28 is a small narrow axe, made of a pebble, with unifacially ground cutting edge, face being still rough. Another axe similar but with truncated butt is illustrated by Mansuy (1925 a, pl. VII, 5).

Mansuy also illustrates one so-called semi-elliptical axe (Mansuy, 1925, a, pl. VII, 7), and another made on eroded pebble, slightly retouched, (Mansuy, 1925 a, Pl. VIII).

The bone axe (pl. 30, no. 24) is an important feature of this cave. Pl. 30, no. 26 recalls the previous Kéo-Phay tool (pl. 28, no. 1), while another (pl. 30, no. 27) points to the next series, *i.e.*, Pho-Binh-Gia (a).

Binh-Long

Reference: H. Mansuy, 1925 a, Pp. 12-14.

It is stated that the surface of the deposit was covered with fine earth and "recent" objects. Nearby, to the east, shell deposits were noticed. In these shell deposits were found remains of hearths, incised pebbles and ground axes. Pottery was abundant. The tool types correspond with Dong-Thuoc (b), and belong to class II. They are described below:

Pl. 31, no. 29 is a big axe, almost rectangular in shape, showing rough flaking on the body, the cutting edge produced by bifacial grinding. There is another similar axe but smaller (Mansuy, 1925 a, pl. XIX, 4).

Pl. 31, no. 30 is made on an elongated pebble with rounded butt, the cutting edge produced by unequal bifacial grinding.

Pl. 31, no. 31 is a flake tool, which Mansuy describes as a "ciseau" (chisel). The cutting edge is ground.

Pl. 31, no. 32 is also described as a "ciseau", made from a pebble. It has curved faces and convex ground edge.

Pl. 31, no. 34 is an ovoid pebble without any retouch, only the narrow end being ground to a pointed edge.

Pl. 31, no. 35 is one of several examples of unfinished tools, which Mansuy describes as showing fine retouch.

Pl. 31, no. 36 is described as a "ciseau" made of schist. It is very narrow, with a rounded butt, and is ground all over.

Pl. 31, no. 37 is made of a triangular flake ground on both faces.

Pl. 31, no. 38 is described as an oval axe with its narrow end being ground.

Pl. 31, no. 39 is an unfinished flake tool with no trace of grinding.

Pl. 31, no. 40 is a flake, median ridged, with retouched sides.

It will be seen that the use of the term "ciseau" for pl. 31, nos. 31 and 35-37 is hardly defensible. It may also be noted that this type of tools is the chief characteristic of the next series, Pho-Binh-Gia (a) (See below).

Vo-Muong

Reference: H. Mansuy, 1925 a, Pp. 14-16.

The tools here correspond with Dong-Thuoc (b) in so far as the axes have regular sides and are ground only at the cutting edge, but coarse flaking recalls the workmanship of Kéo-Phay tools. The presence of cord-marked pottery is noted in this deposit, though it is alleged that it was found in disturbed layers. The tools belong to class II.

Pl. 31, no. 42 is an oval tool somewhat elongated, with its cutting edge produced by unequal bifacial grinding.

Pl. 31, no. 41 is similar but with almost straight sides.

Another axe, described as amygdaloidal type is illustrated by Mansuy (1925 a, pl. XVI, 2), still another of semi-discoidal type (Mansuy, 1925 a, pl. XVII, 9). A few side-scrappers of Kéo-Phay type were also found.

Pho-Binh-Gia

Reference: H. Mansuy, 1924; 1909, Pp. 531-43; 1925 a, p. 23.

Mansuy has described finds from this cave in three places. In his first publication he did not distinguish the tools, found, into "néolithique inférieur" and "néolithique supérieur". But in his second account he separated them in this fashion on typological basis. It is apparent that there is no evidence either of stratigraphy or of depth to prove that the one class came later than the other. They have been found together and hence they have here been assigned to stage B, to which also belongs Dong-Thuoc (a). The tools have been arranged here under two classes: Pho-Binh-Gia (a), which corresponds with Dong-Thuoc (a-i)

and belongs to class III, and Pho-Binh-Gia (b) which corresponds with Dong-Thuoc (b) and belongs to class II.

Class III: *Pho-Binh-Gia* (a):

This group includes accurately sawn and completely ground tools with unifacially ground cutting edge.

Pl. 32, no. 48 is a shouldered tool of regular and broad type according to the terminology adopted in chapter IV. One of its sides is little irregular.

Pl. 32, no. 49 is a faceted tool trapezoidal in shape.

Pl. 32, no. 50 is a triangular axe with unifacially ground cutting edge.

Class II: *Pho-Binh-Gia* (b):

This group includes edge-ground and completely ground tools with regular sides. The flaking techniques is not so crude as the earlier series. The tools have also been retouched profusely on flat surface.

Pl. 32, no. 51 is a long axe almost rectangular with a convex cutting edge. It does not show any grinding but is profusely retouched. It is said to have been found at the bottom of the deposit.

Pl. 32, no. 52 is similar but smaller and the cutting edge ground.

Pl. 32, no. 53 is similar but narrower and with almost straight cutting edge and pointed butt. Two more unfinished tools of this type were found. This is the type described as "ciseau".

Pl. 32, no. 54 has sloping sides, rounded butt and cutting edge produced by unequal bifacial grinding.

Pl. 33, no. 55 is another rounded butt axe, large in size, with regular sides and bifacially ground edge.

Lang-Van

Reference: H. Mansuy, 1925 a, p. 17.

In this cave cord-marked pottery in association with stone tools were found. They have been illustrated by Mansuy (1925 a, pl. XXII, 19-23). The tools do not show any trace of coarse flaking. The predominant type shows smallness of size, regular forms, and all-over grinding. Typologically they belong to the

category of what has been called "ciseau" type. They fall in stage B, Pho-Binh-Gia (b) group, and class II.

Pl. 33, no. 56 is similar to pl. 32, no. 53 but has a flattened butt. Pl. 33, no. 58 has slightly rounded butt. Pl. 33, nos. 57 and 59 are irregular with pointed butt, no. 57 showing the cortex on the butt.

Lang-Trang

Reference: H. Mansuy, 1925 a, Pp. 22-23.

Here tools with coarse flaking have been found with others showing edge-grinding. Along with them completely ground tools occur. Pl. 32, no. 43 recalls the workmanship of the completely ground tool, pl. 30, no. 21 from Dong-Thuoc (a-ii). However, the majority of the implements in this cave correspond with Dong-Thuoc (b). They have been classified here under two sub-classes:

Sub-class (a):—This sub-class includes the so-called sub-elliptical and sub-rectangular types with regular sides showing coarse flaking (Mansuy, 1925 a, pl. XXIV, 2-6). Another is a side-scraper (*ibid*, pl. XXIV, 7).

Sub-class (b):—This sub-class includes the completely ground axe, pl. 32, no. 43, with wide rounded butt, curved sides and the cutting edge produced by unequal bifacial grinding.

These two sub-classes really belong to two different stages, C and B, as adopted before. As such a mixture occurs in more than one cave. To this complex a distinct nomenclature, Lang-Trang, has been given by us. The caves have been provisionally assigned to stage B. The tools belong to class II.

Giouc-Giao

Reference: H. Mansuy 1925 a, Pp. 23-25.

This cave also shows a mixed group of tools: tools with coarse flaking of Kéo-Phay type have been found together with edge-ground tools recalling those of Dong-Thuoc (a-ii). Hence the cave belongs to Lang-Trang group. The stone tools have been divided here under two sub-classes.

Sub-class (a):—This sub-class includes one example of the so-called

sub-elliptical axe of Kéo-Phay type, pl. 28, no. 3 and two scrapers. Pl. 32, no. 44 has its edge retouched. Pl. 32, no. 47 is more regular in shape.

Sub-class (b):—This sub-class includes the well-formed axe, pl. 32, no. 45. Pl. 32, no. 46 is a long tool apparently of "ciseau" type. It has regular sides and convex edge. Both these tools are completely ground.

Bo-Ky

Reference: H. Mansuy, 1925, 2, p. 17.

This cave is very poor in tools. No pottery is reported. Only two types of tools have been found. Both of them are of Pho-Binh-Gia (b) type and belong to Class II. The cave belongs to stage B. One tool (Mansuy, 1925 2, pl. XXV, 10) is long, rectangular in shape, chipped unequally and the cutting edge produced by bifacial grinding. It resembles the Bacsonian, pl. 32, no. 51. Another is the so-called "ciseau" type (Mansuy, 1925 2, pl. XXV, 11) and resembles the Bacsonian, pl. 33, no. 56. One pounder, sub-pyramidal in shape, was also found.

Lang-Luc

Reference: H. Mansuy, 1925 2, Pp. 17-18.

There are here two caves, one lying to the east and the other to the west of Lang-Luc. Both the caves are poor in artifacts. No pottery is reported. The tools belong to the so-called "ciseau" type. One (Mansuy, 1925 2, pl. VIII, 3) is triangular. Pl. VIII, nos. 6 and 7 of Mansuy are similar to pl. 31, no. 36 and pl. 33, no. 56 respectively. The tools belong to Pho-Binh-Gia (b) group.

Co-Kho

Reference: H. Mansuy, 1925 2, Pp. 18-20.

The tool types of this cave are much diversified. Edge-ground tools are predominant showing both Dong-Thuoc (b) and Pho-Binh-Gia (b), and at the same time some tools recall Kéo-Phay workmanship in their coarse flaking. The cave belongs to Lang-Trang group. The tools are classified here under two sub-classes:

Sub-class (a):—Mansuy, 1925 2, pl. I.1 is the so-called long oval type of axe

recalling the Bacsonian, pl. 31, nos. 41 and 42. Mansuy, *ibid*, pl. III.2 is another oval hand-axe recalling the Kéo-Phay type, pl. 28, no. 2. Mansuy, *ibid*, pl. IX.8 is a side-scraper also of Kéo-Phay type, while Mansuy, *ibid*, pl. IX.9 is a semi-circular scraper.

Sub-class (b):—In this sub-class have been included both Dong-Thuoc (b) and Pho-Binh-Gia (b) types. Mansuy, 1925 a, pl. IX.3 is similar to pl. 33, no. 58; Mansuy, *ibid*, pl. IX.1 has truncated butt, while his pl. VIII.2 has straight edge and rounded butt, and his pl. IX.5 is very regular, but his pl. IX.4 is rough.

Hang-Oc

Reference: H. Mansuy, 1925 a, p. 20.

Very few artifacts were found here. One is a round side-scraper (Mansuy, 1925 a, pl. XXV.6), and the other (Mansuy, 1925 a, pl. XXV.5) is the so-called "ciseau" type of tool. Some pounders and polishers were also found. The cave falls under Pho-Binh-Gia (b) group.

Minh-Lé

Reference: Mansuy, 1925 a, Pp. 20-22.

There are two caves in the vicinity of this place and both show Pho-Binh-Gia (b) type. Mansuy, 1925 a, pl. XXIV.1 is an edge-ground tool, Mansuy, *ibid*, pl. XXIII.19 is an oval axe, and Mansuy, *ibid*, XXIII.7-9 are unfinished examples. But the so-called "ciseau" type is most predominant: Mansuy, *ibid*, pl. XXIII, no. 18 has rounded butt, no. 17 has pointed butt, and no. 2 is similar to the Bacsonian, pl. 33, no. 56, while his no. 3 is rectangular.

Khac-Kiem

Reference: H. Mansuy, 1925 a, p. 26; 1925 b.

This cave also produced Pho-Binh-Gia (b) types of tools. One side-scraper was also found, and another is similar to pl. 32, no. 53.

San-Xa

Reference: H. Mansuy, 1925 a, Pp. 26-27.

This cave has also produced Pho-Binh-Gia (b) types with artifacts similar to the Bacsonian, pl. 33, nos. 56 and 58. Some polishers were also found (Mansuy, 1925 a, pl. XIV).

Cou-Ke

Reference: H. Mansuy, 1925 a, Pp. 28-30.

In the vicinity of this place there are a rock-shelter and a cave. The artifacts found in the cave are slightly different from those found in the rock-shelter. The types include the typical forms of Kéo-Phay tools, Dong-Thuoc (b) and Pho-Binh-Gia (b). Both of them have been classed under Lang-Trang group.

Rock-shelter:—Mansuy, 1925 a, pl. II.2 illustrates a tool similar to Kéo-Phay, pl. 28, no. 1. His pl. X.4 is a rectangular variety of the "ciseau" type. Other types resemble pl. 32, nos. 52-53. Along with these have been found completely ground tools and cord-marked pottery.

Cave:—Mansuy, pl. V.2 is described as an amygdaloidal type of axe. It is similar to Kéo-Phay, pl. 28, no. 2. Other varieties also occur. One long tool resembles pl. 30, no. 27, but the butt is truncated. There is also a sub-rectangular side-scraper.

Lai-Ta

Reference: H. Mansuy, 1925 b, p. 12.

This cave has also produced Pho-Binh-Gia (b) types. The tools resemble pl. 32, nos. 52 and 53. There are two types of scrapers, an elongated type and an oval type, retouched all round.

Lang-Cuom

Reference: H. Mansuy & M. Colani, 1925, Pp. 25-27.

This cave has also produced Pho-Binh-Gia (b) types. One tool resembles

pl. 33, no. 58, another is like pl. 32, no. 52, a third like pl. 30, no. 27, a fourth like pl. 30, no. 24 and another a smaller variety of the last type.

Ba-Xa

Reference: H. Mansuy & M. Colani, 1925, Pp. 37-40.

There are two caves in the neighbourhood of this cave. Both show a highly developed type of tools similar to Pho-Binh-Gia (a), and hence are classed as stage B. In the deeper layers have also been found "haches courtes" carefully worked, one shell bracelet, bone objects and one terracotta disc. One noticeable type of tool is the faceted tool, trapezoidal in shape, similar to pl. 30, nos. 19 and 20. Another is the shouldered tool similar to pl. 30, no. 17. New types include two completely ground rectangular knives.

Suam-Son

Reference: H. Mansuy, 1925 a, p. 28.

This cave has produced a unique type of tool, pl. 33, no. 60, ground all over. It is a perfect specimen of the so-called "rounded axe" with proportions hardly comparable with any of the tools described so far. In its regularity and thickness it is much more advanced and seems to be of a much later date. It has been assigned to stage A.

Summary & Conclusion

A survey of the main sites in the region of Bac-Son has been given above. There are a few more sites recorded by Mansuy, but as they throw no new light on our problem, they have not been described here. In these cave excavations no stratigraphic evidence has been produced proving clear-cut periods in the development of Bacsonian tool types. Typologically the stone tools have been divided into three classes, each of them following distinct techniques of manufacture.

Class I includes tools which are made only by a simple flaking technique, though secondary retouch has also been used at the cutting edge and sides to

improve the forms. Retouch generally signifies secondary working as has been pointed out before (See p. 144). This is the characteristic of the Kéo-Phay industry, class I.

Class II includes tools which show additional use of the technique of grinding on a flaked core. According to the degree of grinding these may be sub-divided into two sub-classes: (II-a) those showing merely edge-grinding, a characteristic of the tools of Dong-Thuoc (b) group, and (II-b) those showing all over grinding to a greater extent including both faces. This is the characteristic of Pho-Binh-Gia (b) group. The tools of class I are naturally far better in form than those of class II. Some new types, like the so-called "ciseau" type, appear in this class. But the major differences of form and shape are due to the technique of grinding and the extent of grinding.

Class III includes tools which are of altogether new type. In their manufacture the technique of sawing was probably used. It is these tools which show grinding to the highest degree. It is not possible to derive them from the earlier two classes of tools. The chief features consist in the angularity of the corners and the straightness of sides together with unifacially grinding of the cutting edge. These types can be seen in Dong-Thuoc (a-i) and Pho-Binh-Gia (a). The rarity of these tools in the caves suggests that they were probably imports and this possibility should be borne in mind by future excavators.

It is fair to suggest that the tools of class II, which show more or less grinding, have been largely influenced by the tools of class III in so far as they have regular forms, some of them coming closer to the forms of class III. This influence of class III tools is noticeable in all the stages of the region of Bac-Son. At Kéo-Phay the tool, pl. 29, no. 10, is unique. It has no relationship with others found in this cave. In Dong-Thuoc (b) the tool, pl. 29, no. 13, is again unique in this cave. Both these tools would seem to belong to stage B. Their presence in stages D and C indicates that the comparatively inferior tools of these two stages were not far removed in date from those of stage B.

All these caves show a fairly homogeneous culture in their deposits, though the materials differ from one cave to the other not only in the types of stone tools but also in the variety of objects found, some producing only stone tools, others having pottery as well, while still others containing bone objects, terracotta

discs and bangles. It must, therefore, be admitted that the cave dwellers differed in their material needs and attainments. It is, also, obvious that we have not as much materials from some of the caves as we have from others. It must be admitted that the materials as a whole are scanty. However, the occurrence of crude tools in some caves need not prove them to be earlier in date. This conclusion is borne out by the group of caves, which we have termed Lang-Trang, which present features of Kéo-Phay, Dong-Thuoc (b) and Pho-Binh-Gia (b) together in one stratum, which is undisturbed and cannot be said to include materials of various dates. It is, therefore, reasonable to assume that while some of the cave peoples remained backward, others improved the forms of their implements and obtained a variety of other materials from elsewhere. There may be some time-lag in this process, but nothing more can be done at present than to distinguish the various groups as represented by the objects available to us. According to our analysis there are five groups leaving aside the late industry of Suam Son, which is distinct and characteristic:

- (i) Kéo-Phay group.
- (ii) Dong-Thuoc (b) group.
- (iii) Pho-Binh-Gia (b) group.
- (iv) Lang-Trang group.
- (v) Pho-Binh-Gia (a) group.

In the table (p. 193) these groups have been arranged under different stages on morphological basis.

Kéo-Phay group

So far this is known only from the type site Kéo-Phay. It is represented only by stone tools. Leaving aside the unique tool, pl. 29, no. 10, and another edge-ground tool, pl. 29, no. 8, the Kéo-Phay industry is represented by hand-axes and scrapers, both these showing coarse flaking with some retouch. These tools are not ground at all. But they are regular in form. Technically they fall in line with Hoabinhian stage C, Group II industry, but there is no doubt that the Bacsonian tools are far better in form than the Hoabinhian. The chronological sequence of this industry in relation to other Bacsonian industries is not

definitely known. However, on the basis of morphological analysis this has been assigned to stage D.

Dong-Thuoc (b) group

This is named after the type site Dong-Thuoc, where it is found at the bottom of the deposit. The other caves, showing this industry, are Naché, Binh-Long and Vo-Muong. Cord-marked pottery has been found at Naché. Except for the edge-grinding and secondary retouch at the sides, the general appearance of the tools is rough in so far as they are formed by coarse flaking. But the appearance of the so-called "ciseau" type of tools at Binh-Long and Naché correlates this industry with Pho-Binh-Gia (b) on the one hand and on the other distinguishes it from Kéo-Phay. The evidence of depth at Dong-Thuoc cave has been advanced to prove an earlier dating for this group than Dong-Thuoc (a) or Pho-Binh-Gia (a). This group has been assigned to stage C.

Pho-Binh-Gia (b) group

This is known from the majority of the caves excavated in the region of Bac-Son. It is at present represented mainly by stone tools. At Pho-Binh-Gia itself it has been found in association with Pho-Binh-Gia (a), where along with the stone tools hand-made pottery bearing cord-marked decoration has also been found. At Lang-Van this type of pottery has also been discovered. But from the majority of the caves only stone tools have been recovered. The characteristic tool of this group is the so-called "ciseau" type. It is assigned to stage B.

Lang-Trang group

This is named after the type site Lang-Trang. It is also known from the caves, Giouc-Giao, Co-Kho and Cou-Ke. The stone tools are diversified in techniques and form. Only in the rock-shelter at Cou-Ke hand-made pottery bearing cord-marked decoration was found. The group has been doubtfully assigned to stage B, as the features of Pho-Binh-Gia (b) are, also found here.

Pho-Binh-Gia (a) group

This is fully represented in the cave deposit at Ba-Xa where the stone tools are associated with bone objects, pottery, bracelet and terracotta disc. This is, no doubt, a poor representation of this complex. However, the variety of the objects found is somewhat richer than those of the other caves. This group, as has been shown before, was found in association with Pho-Binh Gia (b) and hence is definitely contemporary with it. In Dong-Thuoc cave the sequence of this group is above Dong-Thuoc (b). Whether the difference is due to time-lag or to the peculiarity of this cave, cannot be definitely said. This group is placed in stage B.

Pottery

Pottery and terracotta objects have been found principally at Ba-Xa, while pot-sherds have been reported from a few other caves. All these are of one type. They are hand-made and bear simple cord-marked decoration. The scarcity of finds in a few caves suggests that they were imports.

Bone Objects

Ba-Xa cave alone has produced bone objects in some quantity. In other caves just one or two bone tools have been found. From Naché comes a well-made bone axe of rectangular form (pl. 30, no. 24).

Comparison between Hoabinhian and Bacsonian Cultures

The analysis of the cultural content of the Hoabinhian and the Bacsonian, given above, indicates that these two regions were connected throughout the period of tool manufacture. The Bacsonian culture was technically more advanced than the Hoabinhian, and the new tool types and techniques in the Hoabinhian were mostly derived from the Bacsonian, though at present there is no evidence available to show the source of the small tools which are found in the Hoabinhian and in Annam at Da-But. Bone tools are also not so common in the Bacsonian while in the Hoabinhian they have been found in all the stages.

It may be that we have to look to some other region for the source of these small tools and bone objects. Pottery is of the same type in both the regions, and though it is much more common in the Bacsonian than in the Hoabinhian, it has been suggested that they were probably imported.

The comparison of stone tools is given below stage by stage:

Hoabinhian

Bacsonian

Stage A. Group III

Stage B

pl. 27, no. 83	....	pl. 33, no. 58	Pho-Binh-Gia (b) group.
pl. 27, no. 84	....	pl. 32, no. 52	"
pl. 27, no. 86	....	pl. 32, no. 54	"
pl. 27, no. 85	....	pl. 32, no. 52	"
pl. 27, no. 77	....	pl. 32, no. 45	Lang-Trang group.
pl. 27, no. 88	....	pl. 32, no. 46	"
pl. 27, no. 78 amygdaloidal type		Several not illustrated.	
Pl. 27, no. 82	pl. 32, no. 47	Lang-Trang group.

Stage C

pl. 27, no. 87	pl. 29, no. 13	Dong-Thuoc (b) group.
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Stage D

pl. 27, no. 69	pl. 29, no. 8	Kéo-phay, group III.
pl. 27, no. 79	pl. 29, no. 10	"
pl. 27, no. 80 is a variant of pl. 27, no. 79.			
pl. 27, no. 81 is a bone tool bearing general resemblance with the Bacsonian type.			

Stage A. Group I

Stage C

pl. 26, no. 51	....	pl. 29, no. 11	Dong-Thuoc (b) group.
pl. 26, no. 50 is derived from	....	pl. 31, no. 42	(see below)

Hoabinhian		Bacsonian
<i>Stage B. Group III</i>		<i>Stage C. Dong-Thuoc (b) group</i>
pl. 26, no. 42	....	pl. 31, no. 30
pl. 26, no. 44	....	pl. 30, no. 25
pl. 26, no. 43	....	pl. 31, no. 35
		<i>Stage B</i>
pl. 26, no. 45	....	pl. 30, no. 21	Pho-Binh-Gia (a)
<i>Stage B. Group II</i>		<i>Stage C</i>
pl. 25, no. 27	....	pl. 31, no. 42	Dong-Thuoc (b) group.
pl. 25, no. 36	amygdaloidal type.		several not illustrated.

From the above comparison it is clear that most of the tools of the Hoabinhian, stage A, group III, are similar to those of the Bacsonian, stage B, Pho-Binh-Gia (b) and Lang-Trang groups, though there are a few which bear resemblance to stage C tools of the Bacsonian culture. The tools of the Hoabinhian, stage B, group III, correspond with those of the Bacsonian, stage C, Dong-Thuoc (b) group. There are some unground tools which also bear resemblance to the Bacsonian types. Generally speaking, only the ground tools in the Hoabinhian culture appear to have been derived from the Bacsonian, and the number of these derived ground tools is far greater than those ground types which are local to the Hoabinhian. It seems, therefore, that the technique of grinding came to Hoa-binh from Bac-Son along with these tool types. The association of these ground tools with coarsely flaked tools enables us to correlate the Hoabinhian culture with the Bacsonian. The comparison now finally brings out that stage A of the Hoabinhian was more or less of the same category as stage B of Bac-Son; and stage B of the Hoabinhian is linked up with stage C of Bac-Son.

The only difficulty arises with the so-called "archaic" tools in the two regions. The pebble choppers of the Hoabinhian culture have not been so far found in Bac-Son. But the group II tools, stage C of the Hoabinhian, show the same technique of manufacture as Class I, stage D of the Bacsonian, though the latter are better in form and finish. It seems that this coarse flaking technique

was most commonly used by these "cave men" before the technique of grinding and the process of wire-sawing were introduced into these regions from outside. From form and appearance only we are not able to establish a close link between the "archaic" tools of the Hoabinhian and Bacsonian cultures. But forms depend, generally speaking, upon the materials used and the extant technical tradition, except perhaps in the case of very specialised tools. In this stage such specialised tools are not to be found. We must rely on technical comparison for any similarity that we see in the "archaic" tools of these two regions which are knit together geographically. The same level of achievement in both the regions leaves little doubt that there cannot have been much difference in time between stage C of the Hoabinhian and stage D of the Bacsonian. The general similarity between the Hoabinhian stage C, group II and the Bacsonian stage D, group I is probably due to similarity of the technique rather than to actual borrowing.

Thus, it would seem that there is no evidence to show that the Hoabinhian culture was earlier in date than the Bacsonian culture in any of the stages, even if we believe with Mansuy and Colani that these stages evidence a time lag in evolution. On the other hand the evidence from Bac-Son makes it quite clear that both these cultures were contemporary with the types of tools showing a high degree of grinding as well as in process of wire-sawing, the predominant types being facetteted tool and the shouldered tool. In other words, the Hoabinhian and Bacsonian cultures represent a stage which is "primitive" in character, but not necessarily early in date. Their chronology depends upon the dating of the two predominant types of tools, mentioned above, which are found sporadically in the caves of Bac-Son, and are known from a wider region in South East Asia, China and India.

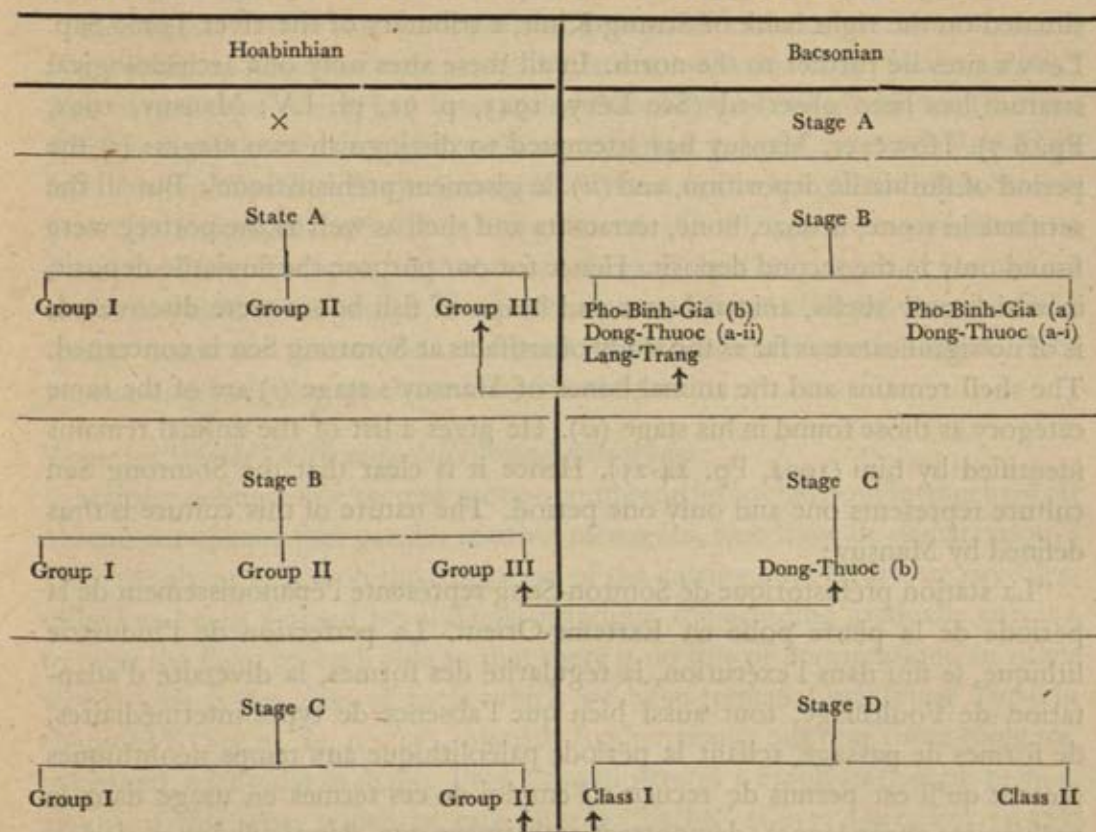
SEQUENCE IN THE HOABINHIAN CULTURE

Stage	Sao-Dong	X-Kham	Trieng-Xen	M-Khang	Som-jo	Lang-Nco	Lang-Vo	Lang-Bay	Ha-Bi
A	Group I Group II Group III	Group I Group II Group III	×	Group I Group II	Group I Group II Group III	Group I Group II Group III	Group II Group III	Group II Group III	Group II Group III
B	Group I Group II Group III	Group II Group III	Group I Group II Group III	Group I Group II Group III	Group II Group III	?	×	×	×
C	Group I Group II	Group I Group II	Group I Group II	×	×	?	×	×	×

SEQUENCE IN THE BACSONIAN CULTURE

Stage	Suam-Son group	Keo-Phay group	Dong-Thuoc (b) group	Pho-Binh-Gia (b) group	Pho-Binh-Gia (a) group	Lang-Trang group
A	Suam-Son	×	×	×	×	×
B	×	×	×	Pho-Binh-Gia (b) Dong-Thuoc (a-ii) Lang-Van Bo-Ky Lang-Luc Hang-Oc Minh-Le Khac-Kien San-Xa Lai-Ta Lang-Cuom	Pho-Binh-Gia (a) Dong-Thuoc (a-i) Ba-Xa	Lang-Trang (a) & (b) Giouc-Giao (a) & (b) Co-Kho (a) & (b) Cou-Ke (a) & (b)
C	×	×	Dong-Thuoc (b) Nache Binh-Long Vo-Muong	×	×	×
D	×	Keo-Phay	×	×	×	×

COMPARISON OF HOABINHIAN AND BACSONIAN CULTURES



III. Somrong Sen Culture

The culture is named after the type site, Somrong Sen, where it was first discovered in 1876 by M. Roques. Actually this culture is typical of the Great Lake region of Cambodia, though its northern extension into Annam has also been traced by various scholars, notably Mlle. Colani, Mansuy, E. Patte and Fromaget. Recently M. Paul Lévy has made an intensive study of this culture in the region of Mlu Prei, especially three sites O Yak, O Pie Can and O Nari. M. Paul Lévy also adds a chapter which provides a comparative study of the materials.

The village of Somrong Sen lies in the province of Kompong-Long, and is situated on the right bank of Strung-Kinit, a tributary of the river Tonle-Sap. Lévy's sites lie further to the north. In all these sites only one archaeological stratum has been observed (See Lévy, 1943, p. 92, pl. LV; Mansuy, 1902, Pp. 6-7). However, Mansuy has attempted to distinguish two stages: (i) the period of fluviatile deposition, and (ii) 'le gisement préhistorique'. But all the artifacts in stone, bronze, bone, terracotta and shell as well as the pottery were found only in the second deposit. Hence for our purpose the fluviatile deposit, in which only shells, animal bones and heaps of fish bones were discovered, is of no significance as far as the study of artifacts at Somrong Sen is concerned. The shell remains and the animal bones of Mansuy's stage (i) are of the same category as those found in his stage (ii). He gives a list of the animal remains identified by him (1902, Pp. 24-25). Hence it is clear that the Somrong Sen culture represents one and only one period. The nature of this culture is thus defined by Mansuy:

"La station préhistorique de Somron-Seng représente l'épanouissement de la période de la pierre polie en Extrême-Orient. La perfection de l'industrie lithique, le fini dans l'exécution, la régularité des formes, la diversité d'adaptation de l'outillage, tout aussi bien que l'absence de types intermédiaires, de formes de passage, reliant la période paléolithique aux temps néolithiques (autant qu'il est permis de recourir à l'emploi de ces termes en usage dans la préhistoire européenne), démontrent amplement que, depuis de longs siècles, l'homme était familiarisé avec le travail de la pierre. Cependant le bronze est rare, nous ne possédons que trois objets de ce métal qui nous ont été remis par les habitants; les fouilles importantes que nous avons fait exécuter ne nous ont fourni aucune pièce de ce genre. D'autre part, des haches avec soie d'emmanchement à section rectangulaire, forme considérée comme particulière à l'Extrême-Orient, ont été signalées sur divers points aux Indes" (Mansuy, 1902, Pp. 6-7).

Stone Tools

Mansuy has distinguished six types of stone tools at Somrong Sen (Mansuy, 1902, Pp. 10-12):

Type 1: *Shouldered Tool*:

He defines, "Nous plaçons le premier groupe les haches ayant une extrémité appropriée à l'emmanchement et nettement séparée de la partie active." This is the type which has been called Shouldered Tool in chapter IV. The different varieties of this type are illustrated on pl. 34, nos. 1-12. M. Paul Lévy calls this type "outils à tenon", and places them under his general class "outils à section rectangulaire" (Lévy, 1943, Pp. 16-18). Pl. 34, nos. 13-16 illustrate examples from his book. All these tools have their cutting edge formed by unifacial grinding. There is, however, a great difference in the length of the tenon. Some are shorter than the body while others are much longer. Both regular and irregular types are also found here.

Type 2: "*Hache*" with *unifacially ground cutting edge*:

Mansuy defines, "Le second groupe comprend les haches dont le tranchant est obtenu sur chaque face par des courbes ménagées, sans ligne de démarcation." Here the stress is laid on the formation of the cutting edge which we have described as being formed by unifacial grinding, the grinding gradually curving to meet the faces on each side so that there is no line of demarcation. In other words, this is the class of tools which we have termed Curvilinear Type in chapter IV (See pl. 34, no. 17). Mansuy further points out that these tools are, in general, triangular in shape. Prof. Lévy illustrates 2 examples (See pl. 34, nos. 18-19) of this type, which he calls simply "hache" (Lévy, 1943, Pp. 11-12). Both these tools show chipping in their upper half, their cutting edge being wholly produced by grinding. This type of tools is well known in the Bacsonian culture.

Type 3: *Adze blade or "bevelled" edge type*:

Mansuy defines, "Le troisième renferme les types dont le tranchant résulte d'un biseau plus ou moins oblique sur l'une des faces, ce type est de beaucoup le plus abondant." Later Mansuy explains that in this type of tools the convex face of type 2 gets more and more sharp till it makes an acute angle with the cutting edge, which he describes as a "biseau". The angle between the "biseau" and the face is about 50°. Pl. 35, nos. 20-25 (copied from Mansuy, 1923) illustrate this type. In point of fact this type of tools vary considerably in form as

well as in cross section. Prof. Paul Lévy calls them "herminette" (adze). Pl. 35, nos. 26-30 and pl. 36, no. 31 are examples from Lévy's illustrations.

Type 4: "*Hache*" with bifacially ground edge:

Mansuy describes the type as follows: "Le quatrieme réunit les instruments dont le tranchant est produit par la rencontre de deux plans obliques, un biseau se montrant sur chaque face." Unfortunately he has not illustrated this type in detail, making the longitudinal section clear, though he says that the tools (Mansuy, 1902, pl. II, 1 and 2), which are thick and faceted, i.e. rectangular in cross section, do show his "biseau".

Type 5: *Chisel Type*:

Mansuy describes, "Le cinquieme est constitué par une série de petits instruments proportionnellement longs et étroits, a sommet presque aussi large que le tranchant, nous considérons ces objects comme de véritables ciseaux; des formes intermédiaires les relient aux haches véritables." These are rectangular or trapezoidal in cross section with the sides slightly convex. Pl. 36, nos. 33-36 illustrate this type.

Type 6: *Gouge Type*:

Mansuy describes, "Le sixieme groupe comprend les gouges a tranchant creusé en gouttiere." Two examples of this type are illustrated (pl. 36, nos. 37-38). One important variety of this gouge type is the "gouge adze" or "pick adze" (the so-called beaked adze), illustrated on pl. 36, no. 41. No specimen of this type was found either at Somrong Sen or at Lévy's sites. The present specimen comes from Bien Hoa in Cochin China and preserved in the Musée de l'Homme (no. 32.94.44). It is made of limestone.

From Longprao Mansuy illustrates one more type of tool, which is lozenge-shaped (pl. 36, nos. 39-40).

Prof. Paul Lévy does not follow Mansuy in his classification. His description is primarily based on the cross section. To a certain extent he also takes into account the function of the tools. He enumerates the following varieties: herminette, herminette-ciseau, outil a tenon, hache, ciseau and hache-ciseau.

Mansuy (1902, p. 23) gives the following number of tools found in his excavation:

Hache avec soie d'emmanchement	..	37
Hache de type divers	..	198
Ciseau	..	28
Gouge	..	29

It should be noted that all the "haches" figured by Prof. Paul Lévy show unequal bifacial grinding of the cutting edge, but this is a general characteristic of mainland South East Asia. Moreover, some of these axes are also of our curvilinear type (See chapter IV).

The materials used are schist, siliceous or metamorphic, and also what has been called "phtanite". Quartz implements have also been illustrated by Prof. Paul Lévy (1943, pls. XI and XII). He also illustrates a few scrapers and knives (pls. IX and X). Other stone objects include grind-stones, hammerstones, discs, cylinders and polishers.

On the technique of manufacture Prof. Paul Lévy comments, "*Les techniques de fabrication de ces outillages sont diverses. Nous les avons reconnues au passage a propos des outils a section lenticulaire et quadrangulaire. Il nous a paru que le façonnage par éclats et polissage était usité a propos des premiers et d'une partie des seconds (i.e. quelques-uns des outils a section trapézoïdale): sciage et polissage étant presque exclusivement pratiqués a propos des outils (en partie) a section trapézoïdale et rectangulaire.*" (Lévy, 1943, p. 23).

It may be remarked that the stone tools of this culture are all highly developed. The crudely worked tools of Hoabinhian type are not found here at all. It is also noteworthy that only 2 edge-ground tools of Bacsonian type have been illustrated by Prof. Paul Lévy. The completely ground tools, which have been classified into six types by Mansuy, are here treated as falling into four main groups: (i) Facetted Tool, (ii) Shouldered Tool, (iii) chisel, and (iv) gouge. Prof. Paul Lévy has rightly pointed out that in the manufacture of tools with rectangular cross section the process of sawing was used. Out of these types the first three are also found in the Bacsonian culture, stage B, Pho-Binh-Gia (a) group, but no specimen has so far been reported from the Hoabinhian region. It may

also be noted that the tool types of the Somrong Sen culture vary more than those of the Bacsonian, and many new varieties are seen here for the first time. Moreover, these types common to both regions, are found only in Bacsonian stage B. Here in Somrong Sen region they are the only types known, except for 2 edge-ground tools and a few bronze implements.

Pottery

The richness of the Somrong Sen culture is evident from the abundance of the pottery found in all the sites. Pottery of this region, as preserved in the Musée de l'Homme, may be divided into two series. All of them are hand-made. None of them is painted, except that some of them show a dressing of haematite applied before firing. The firing in general is very poor.

Series I:—It consists of comparatively fine pottery, made of well levigated clay, that is to say, the pots are thin in section. They are usually decorated with incised patterns. Those which are dressed with haematite, show burnishing. They include only small sized bowls or cups with rounded or straight-sided body, with or without foot and almost rimless, though a few simple rims are present.

Series II:—It consists of comparatively heavy weight pottery of coarse body material, thicker in section, having no red dressing or burnishing. They fall into 2 groups.

Group II (a):—It consists of undecorated sherds or complete pots, three of them are crucibles (pl. 36; no. 42 is preserved in the Musée de l'Homme), one is a deep lipped bowl for pouring liquid (pl. 36, no. 44), another is a footed brazier. There are also numerous fragments of small bowls (pl. 36, no. 47).

Group II (b):—It consists of decorated pottery. The pots are mostly footed bowls (pl. 36, nos. 43, 45-46), storage jars, and globular vessels (pl. 36, nos. 48-49). One type is identical with the Duc-Thi earthen-ware jar (pl. 38, no. 25).

It is important to note that the decorations on these pots are entirely different from those appearing on the sherds of the Bacsonian and Hoabinhian cultures.

Besides the simple cord decoration, which is common with those regions, here we have incised geometric patterns as well as curved and wavy lines arranged in various formations. The whole decoration is certainly very sophisticated and quite distinct from the Hoabinhian and Bacsonian pottery. The nearest parallel is seen in the decorated pottery of the neolithic culture of South East China (Compare W. Schoffield, 1938, pls. CVII-CXV; and Lin Huisiang & others, 1938, pls. XLV-XLVI). Some of the forms are also identical (Compare Duc-Thi, pl. 38, no. 25 with the Fukien earthen-ware jar, Lin Huisiang & others, 1938, pl. XLIV; the footed bowls are also paralleled at Shek Pek, Schoffield, 1938, pl. CVI, nos. 1-3). These similarities suggest that the Somrong Sen cultural zone was directly in contact with the neolithic cultures of South East China, especially those known from the provinces of Che-Kiang, Fu-Kien and round about Hong Kong. Prof. Paul Lévy (1943, pls. XL-XLVII) has further compared the incised decorations occurring on the Somrong Sen pottery with the painted designs on the pottery of China and of western Eurasia.

Bronze and Iron Objects

Mansuy remarks, "Les rares objets en bronze nos stations préhistoriques ont été recueillis par les habitants, nous ne savons a que niveau on les a rencontrés." (Mansuy, 1902, p. 21). He enumerates one arrow-head (pointe de fleche), one small chisel (ciseau a section transversale semi-circulaire), one cylindrical rod and three bells. Prof. Paul Lévy also illustrates many bangles (pl. XXIV) both in sawn shell and in bronze as well as socketed splayed axes (pl. XXIII) and one saw. One iron chisel was found at O Pic Can.

Other finds

Numerous beads of shell and stone, terracotta discs bearing cross pattern, seal impressions, potter's dabbers, shell bangles, pendants, ear-ornaments and bone fish hooks were found in many of the sites.

Summary and Conclusion

Somrong Sen culture represents a highly developed stage of the neolithic

period, in which completely ground stone tools were in use. However, Prof. Paul Lévy's finds of metal objects in his sites and the existence of crucibles indicate that this stone culture was contemporary with the use of metals as has been said before. A few bronze objects and tools have been found in the sites representing this culture, and though their stratigraphic relation in most cases is not clear, it seems that metal was used in this culture though rarely. The stone tools are mainly of four types: (i) faceted tool, (ii) shouldered tool, (iii) chisels and (iv) gouges. There are also hammerstones, grinding stones, polishers, scrapers and quartz implements. Some of these types and their varieties only distantly resemble the well-cut tools of the Pho-Binh-Gia (a) group of the Bacsonian culture. The absence of the shouldered tool in Hoa-Binh suggests that this resemblance is not due to contact between the two regions. This suggestion is further supported by the difference of pottery types as well as from the variety of materials found in Somrong Sen but which are not known in Bac-Son or in Hoa-Binh. It would seem that the common tool types were derived from one common source. As far as the Somrong Sen culture is concerned, its tool types bear some affinity with the tools of the neolithic sites in South East China, especially with those of the so-called Hong Kong culture, known from Shek Pek and Wu-Ching in Fukien. It may be that a similar culture prevailed in the province of Kwang-Tung, though nothing about it is so far known. If this is true, the Bacsonian region, which is adjacent to Kwang-Tung, may have derived its well-cut stone tools from that Chinese province through the difficult hilly passages. This difficulty in communication may be responsible for the rarity of such stone tools in the Bacsonian culture.

So far as is known, the neolithic culture of South East China has produced evidence only for the sporadic use of metal. However, the bronze tools of the Somrong Sen culture show types similar to those found in Luang Prabang, Burma and Yunnan. Whether there was any connection with these regions is very difficult to say. The find of a gouge-adze at Bien-Hoa in Cochin China is worth noting. This type is so far not known from China, Bac-Son and Hoa-Binh, but it is widely spread in Laos, Siam, Burma, Malaya and Assam. Only one example is known from Japan. It is preserved in the British Museum.

Hand-made pottery has been found abundantly in the Somrong Sen culture, and, as has been said before, the ware and decoration indicate the source of their origin in South East China.

Harpoons and fishing hooks of bone and stone have also been found in these sites. Shell objects fashioned as ornaments are numerous. Stone beads were also found. Other objects included terracotta dabbers and seals.

The materials found here clearly indicate that the makers of this culture were stone-using agriculturists, and that they flourished at a time when the use of metal in this region was still rare (Mansuy & Fromaget, 1924, p. 7). The stone implements, pottery and other objects of this region can hardly be compared with those of Hoa-Binh and Bac-Son. A distant similarity of the stone tools of Somrong Sen and the accurately sawn implements of Bac-Son has been pointed out before, but, as has already been remarked, this similarity would seem to be due to a borrowing from a common source rather than to contact between these regions. As will be shown later, contact between the cultures of Hoa-Binh and Somrong Sen has taken place in Annam. The bronze tools of Somrong Sen contrast poorly with the highly developed bronze industry of Dong Son where the shouldered tool persisted. It may also be noted that the Dong Son bronzes have been found in association with pottery, coins and other materials datable to the Han period (Goloubew, 1929) but no such evidence has so far been found in Somrong Sen. E. Patte (1936, Pp. 299-304) has put forward arguments for an earlier dating of the Somrong Sen culture than the Dong-Sonian on the basis of his comparative study of the bronzes of the two cultures. It must, however, be borne in mind that since there is no demonstrable continuity in the bronze objects from Somrong Sen and Dong-Son, it is, in fact, impossible to argue priority on the basis of a comparative study as Patte has tried to do. The date of the Dong-Son material cannot be certainly established from present evidence, though the long awaited publication of Dr. Janse's excavations may throw further light on the problem. It can only be affirmed that Chinese material of the Han period gives one chronological fix in the Dong-Son culture, but the absence of Han objects from Somrong Sen cannot be adduced as evidence for the priority of the latter in view of the historical evidence for the southern boundary of Jih-nan being located well north of Cambodia. Similarly the fact

that communications between South and North Indo-China in the Han period are recorded as being maritime, there is no *a priori* evidence in the Chinese against the co-existence of Somrong Sen and Dong-Son. It would seem that in view of the very limited archaeological material a case may be made for the priority of Somrong Sen, but that there is insufficient evidence to show that the neolithic cultures of South East China did not persist side by side with the true Chinese cultures coming from north. Only further excavation can resolve this crucial problem.

IV. Haut Laos

Luang Prabang

Reference: H. Mansuy, 1920, Pp. 1-14.

All the objects found here are surface finds. They were sorted and selected and later classified by Mansuy into 12 types. These include ground stone tools and bronze implements. The types in stone include shouldered tools, pl. 37, nos. 1-2 and nos. 6-7; the so-called bar-chisels, pl. 37, no. 3; faceted tool, pl. 37, no. 4; and the gouge adze, pl. 37, no. 5. Among the bronzes can be seen splayed axes of different varieties, pl. 37, nos. 8-10; fishing hooks, pl. 37, no. 11; and arrow-heads, pl. 37, no. 12.

V. Annam

Annam has been divided into three main provinces, under which the neolithic sites have been described by Colani: (1) the province of Quang-Binh, (2) the province of Qui-Dat, and (3) the province of Than-Hoa.

The Province of Quang-Binh

Quang-Binh is the chief town of Dong-Hoi which is in Central Annam. There are 3 rock-shelters containing neolithic materials, and one open air site.

Minh-Cam

Reference: Etienne Patte, 1923, Pp. 5-30

Two deposits have been distinguished by the excavator: the uppermost,

calcareous clay containing artifacts, and the lower shell deposit having no artifacts. Both have been attributed to the same period. As Patte points out, "Nous avons de bonnes raisons de croire a la contemporanéité des deux dépôts Comme ces deux formations sont au meme terrasse, pourrait-on dire nous pensons qu'elles sont, au moins, a peu près contemporaines, et nous attributions le surcreusement a un phenomene d'érosion général du sans doute a un mouvement vertical du sol, plus probablement qu'a un changement de régime des eux car nous sommes bien près du niveau de base." (Patte, 1923, pp. 6-7). If the erosion, spoken of by Patte, occurred after the deposition of the archaeological materials, as seems likely, it may be possible to detect some of its signs in the tools themselves. At the same time it should not be very difficult to date this geological phenomenon on the basis of local changes in climate and fluctuations of the sea level.

Among the stonetools are shouldered tools (pl. 39, no. 31) completely ground, pl. 39, no. 29, a chipped variety; pl. 39, no. 30 is another chipped axe-blade, symmetrically worked, one face is slightly concave formed by the removal of a large flake, and the other face is curving and shows retouch. Several shell beads of varying sizes were found (pl. 39, nos. 33-35). Other finds include a perforated *kauri* (pl. 39, no. 36), a hexagonal pendant of ivory (pl. 39, no. 32) and other pendants of shell, one bead of green stone (pl. 39, no. 37) and plaques of shell and ivory. Numerous broken bones, some showing traces of use, were also found. The pottery is of very poor quality, but shows resemblances with that of the Somrong Sen culture.

Bau-Tro near Dong-Hoi

Reference: E. Patte, 1925, Pp. 5-33.

Tam-Toa is a small village at the entrance of Dong-Hoi. About 1800 metre north is a pagoda by the side of a lake called Bau-Tro. Near the pagoda is a deposit of dunes containing artifacts.

Among the stone objects found were many examples of shouldered tools (pl. 39, no. 43) and adzes (pl. 39, no. 38) formed by the technique of chipping. Blades and long flakes also occur (pl. 39, nos. 40-42). There are numerous remains of pottery fragments of a coarse fabric with incised ornamentation

familiar from the Somrong Sen culture. The type of pot, pl. 38, no. 26, is very common. Pl. 38, nos. 27 and 28 were found on the surface, no. 27 being paralleled at Shek Pek (Schoffield, 1938, pl. CVI, nos. 1-3).

The cave of Hang-Rao

Reference: Mansuy & Fromaget, 1924, Pp. 5-8.

The cave of Hang-Rao is one day's journey from Phong-Nha. The excavation here was carried down to 1m. 80cm. in depth. Three layers of "graviers" (gravels) separated by a layer of "limon" (clay) were recognised. The gravels produced mammalian bones of species which are still extant in this region. The debris of hearths on an agglomeration of shells (mollusc) contains fragments of pottery. These occur in all the layers. The stone tools are both chipped and completely ground. Pl. 39, no. 44 is said to be a flake chipped to make the tool. It shows no grinding. Pl. 39, nos. 45 and 46 are varieties of shouldered tools, completely ground. The pottery found shows the same characteristics of poor firing, coarse fabric and incised ornamentation as known from the Somrong Sen culture.

The cave of Khe-Tong

Reference: Mansuy & Fromaget, 1924, Pp. 9-12.

The cave of Khé-Tong is situated on the border of a principal route from Quang Binh to Khammon in Laos. This cave still serves as a shelter for the traders travelling between Laos and Annam.

Throughout the various layers (couches) distinguished by the excavators the stone industry and pottery are uniform. There is a great abundance of shouldered tools (pl. 39, nos. 48-50), both ground and chipped varieties. Flaked choppers (pl. 39, no. 47) are comparable with the Kéo-Phay type of the Bacsonian culture (pl. 28, no. 2). The pottery is ornamented with incised decorations.

In the opinion of Mlle. Colani all these sites in the province of Quang-Binh were refuge shelters as they all lie in thick forest in a mountainous region. She remarks that the people from Bac-Son and Hoa-Binh stayed here for sometime,

(Colani, 1930, Pp. 323-324). This conclusion is hardly justified by the evidence of the materials found in the caves. They definitely show a blend of the tool types from the Somrong Sen culture on the one hand and those of the Hoabinhian and Bacsonian cultures on the other. The pottery found in these caves definitely links up with the Somrong Sen culture. Hence it is possible that this was the region of the meeting of the cultures from the north and the south.

The Province of Qui-Dat

Qui-Dat is about 80 kilometre to the north-west of Dong-Hoi. There are three important stations which have produced materials comparable with the Bacsonian-Hoabinhian cultures. Colani also points out that three other caves show "néolithique supérieur".

The rock-shelter of Yen-Lac

Reference: M. Colani, 1930, Pp. 325-336.

The rock-shelter lies to the north of Song Nan and east of the village of Yen-Lac. The archaeological deposit here varied from 75 cm. to 2 m. 50 cm. Here pot-sherds were found on top of a hearth, but these are considered by Colani to be later in date, that is to say of "hommes porteurs de néolithes". Actually two completely ground tools of the faceted variety were found here (pl. 38, no. 1). These Colani considers to belong to a new wave of cultural contact.

The majority of the tools are of the Hoabinhian type. They include the following varieties. These have been illustrated on pl. 38.

No. 2 is said to be a "percuteur", very irregular. Large flakes have been chipped off from the pebble. The butt end, which is slightly prolonged, retains the cortex.

No. 3 has a pointed working end. The original cortex of the pebble is seen on the broader part of the body, except at the pointed working end, which shows deep flaking. There are two more specimens of this type.

No. 5 is a rounded butt axe with a median cutting edge formed by the meeting of two large flakes. One side is irregular, while the other is slightly curving.

The cutting edge is much worn, the butt being markedly wide. In cross section it is lenticular. It recalls the bifacially ground type of axes, but the present specimen is unground.

Another example (Colani, 1930, pl. XLII.7) is coarsely chipped, and resembles Hoabinhian, pl. 24, no. 6.

Another very thick tool (Colani, 1930, pl. XLII.3) with a large rounded butt is similar to Hoabinhian, pl. 26, no. 42 and pl. 26, no. 50.

Colani's semi-elliptical "hache" (Colani, 1930, pl. XLII.1), which is chipped on both faces with the cortex showing towards the butt end, is somewhat similar to Hoabinhian, pl. 24, no. 5.

No. 4 is described as "grande hache pointue". It is triangular in shape with the butt retaining the cortex and the working end chipped.

A pounder or milling stone, made of a long schist pebble is illustrated by Colani (1930, pl. XLII.10). It is described as being heavily patinated.

One side-scraper similar to Hoabinhian, pl. 26, no. 53, is also illustrated by Colani (1930, pl. XLII.5).

Only two edge-ground tools were found. One "hache", pl. 38, no. 6, has a thick butt showing chipping and a narrow cutting edge ground on both faces. Another "hache" (Colani, 1930, pl. XLII.5) resembles Hoabinhian, pl. 26, no. 45. Both these edge-ground tools have parallels in the Bacsonian culture.

Bone Implements:—A bone tool, described as a very crude gouge was found near the surface, while another bone point was found far inside the cave. One implement is described as being of "bois de cervides". There is, also, a fragment, which she calls a gouge. Another piece bearing a human figure is said to be a "spatule".

The Cave of Kim-Bang

Reference: Colani, 1930, Pp. 337-341.

This cave is about 500 metre south of the village of Kim-Bang. The archaeological deposit was composed of calcareous clay in which were found "coquilles de Gastropodes", bones and rolled pebbles. No edge-ground tool was reported, but three pieces showing marks of Bacsonian influence are said to have been found. These stones were stained red. The pot-sherds were scattered in various

places. Some sections show remains of hearths. The stone tools are of following types:

Pl. 38, no. 7 is described as "hache primitive". It has a thick rounded butt with large and deep flakes removed from the body. Another "hache" (Colani, 1930, pl. XLIII.8) crudely formed has one flake removed from the butt to facilitate gripping. The opposite end shows coarse flaking. One side-scraper is of the same type as Hoabinhian, pl. 26, no. 53.

Pl. 38, no. 9 is a grooved hammerstone, and is comparable with the Assam specimens (pl. 16, nos. 105-9). This is the only example so far known from this region.

Pl. 38, no. 8 is a bone implement.

The Cave of Xom Thon

Reference: Colani, 1930, p. 341.

It is about 300 metre from Song-Nan and about two hundred from Yen-Lac. From this cave were recovered some shells, rolled pebbles, bones of animals and stone tools. The latter is said to be similar to that of the above two caves.

Small Cave of Xom-Tham (no. 1)

Reference: Colani, 1930, Pp. 342-343.

This is situated at a higher level. The archaeological deposit consisted of very loose calcareous clay. On the surface were found numerous pot-sherds and rolled pebbles. Some pebbles showed human workmanship and some were stained red.

"Poicon en os", three complete pieces and one broken specimen were found (pl. 38, no. 16). One undoubted perforated canine tooth, one iron implement and one "pierre a cupule", which is an oval pebble bearing hollow marks (See below) were found.

Large Cave of Xom-Tham (no. 2)

Reference: Colani, 1930, Pp. 343-346.

It is situated 55 metres south-east of the preceding cave. The debris of hearths

is 80 cm. thick, containing Melanian shells. Some teeth of herbivores and unidentified calcined bones were also found. Other finds include milling stones, small discs of shell, four beads of blue stone, iron implements, one terracotta biconical bead, and decorated pottery. One shouldered tool (pl. 38, no. 15) is made of greenish stone. More than 378 crude shell discs (pl. 38, nos. 10-12 and 14) have been found here. Similar discs have also been found at Minh-Cam and at Ba-Xa. These are taken as currency by Colani.

The Rock-Shelter of Xom-Tham (no. 3)

Reference: Colani, 1930, Pp. 346-347.

It is situated very near the preceding cave. The objects found include 20 little discs, 125 middle sized discs and 3 of irregular shape, all in shell, 5 coloured beads and some iron implements were, also, found.

Pl. 38, no. 18, is made of iron, a long blade with a tang, apparently a spear-head, comparable to tanged or socketed spear-head from Malaya (Evans, 1931 b, p. 75, fig. 6). Pl. 38, no. 19 is a fish-hook of iron. Similar fish-hooks were found at Somrong Sen (Mansuy, 1902, fig. 13). Pl. 38, no. 20 is a rod, square in section, ending in a lance point.

In the opinion of Colani all these three caves were contemporary and the deposits therein are of the same time as the iron tools. "Les pieces en fer paraissent appartenir au meme temps que la reste des mobiliers".

The Rock-Shelter of Duc-Thi

Reference: Colani, 1930, Pp. 349-355.

It is situated 90 kilometre from Qui-Dat and 20 kilometre S.S.W. of Dong-Hoi. In this rock-shelter along with the neolithic tools were found pebbles of variegated colour, objects of shell, small and large discs, perforated *cowries* and pottery, "des tessons a decoration et en facture variées analogues a ceux des stations de Xom-Tham." One broken footed vase (pl. 38, no. 25), decorated with basket pattern, was found. Similar earthen-ware vases have been found in Fukien (Lin Huisiang & others, 1938, pl. XLIV). One shouldered tool (pl. 38, no. 21) is made of fine green stone. It is ground all over. Pl. 38, no. 22 is a small chisel with two triangular lateral faces. Pl. 38, no. 23 is another chisel

broken at the working end. Large pebbles of sandstone with cupola (*grands galets gréseux à cupules*) were also found (pl. 38, no. 24). No metal was found here. But the pottery and the tool types definitely relate them to the same cultural grouping as those of Xom-Tham.

The Province of Than-hoa

This is the most northerly province of Annam touching the borders of Tonkin. On the Tonkin side lies the cultural zone of Hoabinhian, from which Than-hoa is separated by a calcareous chain. The river Song-Ma flows through this province. Numerous important prehistoric sites lie in the valley of this river. Only a few representative sites have been selected for description here. In all these sites stone tools and pottery were recovered. Occasional metal, bronze or iron, has also been found. The pottery is said to be "*peu ancien*", but a few sherds illustrated by Colani and those preserved in the *Musée de l'Homme* are of the same category as that of the Somrong Sen culture. The material used for the stone tool is a greenish or greyish stone, called by Colani "*roche éruptive*", obtained in the form of flat slabs. Consequently all the tools have a flattish appearance and in section they vary from thin to medium size. The tools were made mostly by the technique of chipping, a process which is common with that of the Hoabinhian culture, though a few edge-ground tools and rarely completely ground ones have also been found.

The Rock-Shelter of Lang-Bon

Reference : Colani, 1930, Pp. 362-375.

It is the most westerly of the sites situated on the right bank of the river Song-Ma. The objects found in this rock-shelter include as many as 2378 samples of bone and shell. Many of them were "*coquilles de Melania*". The stone tools show careful chipping on one face only. There are not many variations in type. We have here "*percuteur*", discs, "*amygdaloides*", "*haches courtes*", some crude side-scrapers, edge-ground tools of the Bacsonian type (pl. 40, no. 51), yellow and red pieces of stones apparently ferruginous, pieces of haematite, hammerstones of natural pebbles and numerous bone implements. Some completely ground tools and bicone beads are reported to have been near the surface, but these have not been illustrated.

The chipped tools have been called by Colani "paléolithes", probably on the ground that they do not show any trace of grinding. Though some of the forms represented here are typical of the Hoabinhian culture (Colani, 1930, pls. XLV-XLVII), the chipping being coarse, still these tools do not merit the name "paléolithe". It is probably owing to the nature of the material that the tools show chipping only at the sides and cutting edge. On the other hand there are some tools which definitely show the influence of the ground tool tradition. One such tool figured here (pl. 40, no. 53) is preserved in the Musée de l'Homme (no. 32.94.112). It is chipped on both faces at the marginal ends while the type which comes closest to Colani's "amygdaloïde", but its form has, no doubt, been influenced by the beautifully ground neolithic axe.

Such influence can be traced even in the province of Hoa-Binh itself. One such tool (pl. 41, no. 57) from the site of Lang-Vanh in the province of Hoa-Binh is preserved in the Musée de l'Homme (no. 32.94.96). It is also made of a flattish slab of "roche éruptive", and the cutting edge is produced entirely by chipping on both faces, the tenon and greater part of the tool retaining the cortex. In accordance with the terminology of Colani this tool should be called a "paléolithe". However, she includes this site under the Hoabinhian culture (Colani, 1930, p. 300). No one can mistake this tool, which is nothing but a crude variety of the shouldered type.

Another tool (pl. 41, no. 58) comes from Da-Phuc and is preserved in the Musée de l'Homme (no. 32.94.129) and is of the same material. It appears that an older edge-ground tool has been reformed into a variety of the shouldered tool simply by chipping at the shoulders. The site Da-Phuc is in the province of Hoa-Binh and is treated by Colani as falling under the Hoabinhian culture.

From the site of Lang-Bon some edge-ground tools have also been recovered. They are called by Colani (1930, pl. XLVIII, 9-12) "protonéolithes". One of them figured here (pl. 40, no. 51), preserved in the Musée de l'Homme (no. 32.94.124), also shows chipping at the sides, while the cutting edge is formed by grinding. Another example, pl. 40, no. 52 (Musée de l'Homme no. 32.94.87) shows the cortex on one face, while the other is chipped at the marginal ends. The rectangular form of this tool suggests influence from the faceted tool type.

Among bone tools there are various forms: Colani's "gouge", pl. 40, no. 56; "demi-hache", pl. 40, no. 54; and "petite-hache", pl. 40, no. 55.

Caves at Dien-ha

Reference: Colani, 1930, Pp. 375-378.

These caves are situated less than 4 kilometres S.S.W. of Lang-Bon. Colani says, "L'outillage en pierre est purement paléolithique; il se compose de pilons, de percuteurs, de disques, de pièces atypiques. Aucun instrument en os." In other words only chipped stone tools have been found here. A few potsherds have also been reported. One iron tool (not illustrated) is said to have been found at a depth between 50 and 60 cm.

The Rock-Shelter of Chom-Dong

Reference: Colani, 1930, Pp. 378-382.

This is situated in a narrow valley through which flows a tributary of the Song-Ma River. There are two rock-shelters, western and eastern. In the western one were found (in the words of Colani), "quelques pierre taillées, deux haches polies l'une à tenon d'emmanchement; quelques tessons peu anciens". In the eastern shelter were found chipped stones, haches, haches courtes, percuteurs and 4 "haches bacsoniennes".

The Cave of My-Té

Reference: Colani, 1930, Pp. 392-397.

This cave lies to the north of Than-hoa, in the great massif separating Annam from Tonkin. The materials of this cave consist of:—

- (a) "pièces néolithiques, hache polie, polissoires, tessons de céramique,"
- (b) "pierre taillées, objets atypiques, percuteurs, pointes, tranches de galets, haches, haches courtes, disques, racloirs."

Colani adds that the objects of the first category (a) have been found near the surface though she makes no stratigraphic distinction in the archaeological deposit.

Summary and Conclusion

Throughout the region of Annam, which lies in between two cultural zones, Hoabinhian on the north and Somrong Sen on the south, the archaeological finds demonstrate clearly the local traditions of both zones. Colani suggests that these sites were refuge centres, where the people from Hoa-Binh flocked probably when pressed by the arrival of new elements among them. This suggestion implies that chronologically these deposits are later in date than those of the Hoabinhian region. This supposition has no foundation at all. Probably it is dictated by the fact that along with the chipped tools in these sites completely ground tools have also been found. From a few sites metal has also been recovered. But some examples of tools from the sites (Lang-Vanh and Da-Phuc) in the Hoabinhian region itself have been cited before (Pp. 165-66) as showing close correspondence with the more advanced tool types in the Annam and Somrong Sen cultures. These tools suggest two things: (i) the Hoa-Binh region was backward in the sense that there the only technique practised was chipping; (ii) the influence of the Somrong Sen culture seems to have reached as far north as the Hoa-Binh region. This fact belies the assumption of Annam being the refuge centre. The evidence outlined above suggests that Annam was the meeting ground of the Hoabinh chipping technique and the culture of Somrong Sen with the techniques of grinding and sawing. But these two cultures may have existed side by side for part, at least, of their existence.

SECTION II

SIAM

Prehistoric research in Siam is only in its preliminary stage. Except for the work of Fritz Sarasin and his collaborators and chance-discoveries made by Van Heekeren and I. H. N. Evans, no serious attempt has been made to unravel the neolithic problem of this country. Surface finds have added some ground tools and shouldered tools to the Bangkok Museum. From these materials only a very rough outline can be given.

The presence of "prehistoric" caves in the limestone hills of Siam was long known. Fritz Sarasin (1933 a) writes, "The caves which abound in the limestone hills are not seldom quite beautiful, forming enormous domes adorned with mighty stalactites. Others are only like narrow passages, and still others are simply shelters with overhanging rocks. The prehistorian meets in Siam for his research work with very great difficulty that all the caves promising good results have been transformed into Buddhist sanctuaries. They usually contain only one enormous statue of the great teacher. Others, however, are richly decorated and contain a number of images and altars of offerings. Many of these sanctuaries have a floor made of stone slabs or of cement. Quite frequently a brick wall with a door closes the cave from the outside. Needless to say that in these sanctuaries it is absolutely forbidden to undertake any research work. Other caves serve as dwellings for hermits." (Sarasin, 1933 a, Pp. 172-73).

Sarasin's work can be divided into two parts: one, relating to the caves located in North Siam, and the other, those located in South Siam.

Evidence from the Caves in North Siam

At the foot of the cave not far from the village of Chom-Tong, 58 kilometres to the South of Chiangmai (See map no. 3), a tool described as *coup-de-poing* (pl. 42, no. 1) was found. No excavation was carried out here. This tool is made of rhyolite pebble, chipped only on one face while the other retains the cortex. The flaking technique is coarse similar to that of Hoabinhian stage C. The tool roughly recalls Hoabinhian, pl. 24, no. 6 but is somewhat broader.

The most important excavation was done in a cave called Tam-Pra, situated

to the west of the town of Chiengrai, near the boundary of Luang Prabang. It really consists of two caves, a principal one, now turned into a sanctuary, and a minor one, which was alone excavated. In the words of Sarasin, "Near the entrance of the cave a longitudinal ditch 2 metres long and 1 metre broad was cut out. The profile was a most simple one. A superficial layer, about 20 cm. deep was formed by sand mixed with fragments of bricks. Then followed a layer of about 80 cm. consisting of earth coloured gray by ashes. In the upper part of this layer some sherds of plain and cord-marked pottery were found, a little deeper a certain number of crude implements of palaeolithic character, made from rhyolite and other eruptive rocks, also some round pebbles having been used as hammerstones, some lumps of red ochre and some broken bones of mammals. Beneath this gray deposit the earth became yellow, frequently mixed with fragments of limestone but without any sign of human workmanship. The rocky ground of the cave had been reached at the depth of 1.60 m. A second ditch, perpendicular to the first one, made the following day, gave the same poor results." (Sarasin, 1933 a, Pp. 175-76). From this description the following sequence can be made:

Sequence at Tam-Pra Minor Cave

20 cm.	Sand mixed with bricks.	
80 cm.	<div> <div>Plain & cord-marked pottery.</div> <div>.....</div> <div>Crude implements & round pebbles.</div> </div>	Gray earth ash-coloured.
60 cm.	Yellow earth mixed with limestone fragments. No tools.	

This section clearly gives two strata of human occupation: the middle one, when the "prehistoric" people occupied the cave, and the top stratum, consisting of brick fragments, presumably of Buddhist occupation. There is no evidence to show that the crude implements were earlier in date than pottery. But the presence of only a few sherds in the upper layers of the middle stratum does imply that pottery was very scarce in this culture. The tools are described below:

Pl. 42, no. 2 is a longitudinal pebble worked at the broader edge, made of green pebble of fine-grained diabase. Type same as Hoabinhian pl. 24, no. 1.

Pl. 42, no. 3 is a quadrangular pebble worked along two sides, made of green slate. Type same as Hoabinhian pl. 24, no. 14.

Pl. 42, no. 4 is a small disc of white chert, round in shape, with marks of use at the edge. Type same as Hoabinhian pl. 23, no. 28.

Pl. 42, no. 5 is a rounded pebble used as hammerstone. Many other examples of this type are known.

Pl. 42, no. 6 is a triangular-shaped stone having regular sides. On the lower side a cut piece is supposed to be grip mark.

Pl. 42, no. 7 is a small point of bone with base cut in the shape of a semi-circle.

This cave also produced lumps of ochre, a certain number of bones of deer and a vertebra of crocodile. Shells were very scarce.

Evidence from South Siam

To the west of the little town of Rajburi there is a big cave, called Khao-Tam, situated at the foot of the rocky hill, now turned into a Buddhist sanctuary. Digging in one corner of the cave produced a rounded pebble tool.

An important sequence was found in a small rock-shelter above the bottom of the valley Tam Fa To. The archaeological deposit was a little disturbed. The sequence was as follows.

1. On the top fragments of bricks were mixed with superficial layers.
2. The pieces of plain, cord-marked, and basket-pattern pottery was found to a depth of 50 cm.
3. At the bottom were found lumps of red ochre, tools of limestone, a few bones of mammals, some marine shells and a great number of land-shells. The tools are described below:

Pl. 42, no. 8 is described as a knife blade from a long limestone. It has a concave cutting edge and a finger rest, the ends being chipped transversely.

Pl. 42, no. 9 is a point, made from a triangular limestone, much weathered. Type same as Hoabinhian, pl. 24, nos. 10 and 13.

Another crude scraper made of limestone resembles in its form with the scrapers from Tam Kradam (see below).

In a limestone hill, called Suam Cheng in the vicinity of Lopburi, there is a cave called Tam Kradam, in which excavation of the two niches at the back of the cave proved very fruitful. In the words of Sarasin, "The soil of this part of the cave to the depth of 1 metre and more was literally filled with numberless shells of *Cyclophorus*, intact or intentionally broken. The use of ochre was clearly shown by the red colouring of some of the stones; but the most welcome discovery was the fact that I found here quite a number of implements of decidedly palaeolithic character made of rhyolite, green-stones and other eruptive rocks. Flakes and shapeless pieces of these rocks, without or almost without trace of workmanship, were plentiful in the deposit, bones of mammals very scarce. Like all the implements found in the other places, not a single one showed the slightest trace of polishing. Fragments of pottery were only found on the surface." (Sarasin, 1933 a, p. 178). The sherds are made of yellow ochre clay with much grit. One piece appears to be a fragment of what Tweedie (1953, Pp. 52-53) calls a "turn table", but which could be a footed vase. The following tools were found.

Pl. 42, no. 10 is a crudely chipped tool, made of a block of rhyolite, of oval shape, a rough pentagon. The anterior is worked into a point but is damaged. Another of a similar type but the base has a triangular form. Pl. 42, no. 11 is also of a similar type with a flat triangular base. These three implements have been worked on one face only like the so-called 'Sumatra' type of Malaya. They resemble the Malaya type, pl. 44, no. 3 from Gua Kerbau, but the latter is more developed. Similar specimens also come from the Hoabinhian culture.

Pl. 42, no. 12 is a thick pick-like point, made of rhyolite, much weathered, the base being an irregular rectangle, while the point forming a regular triangle. Type same as Hoabinhian, pl. 24, no. 13. Another point is in the shape of a leaf, only the upper part being chipped. There are several other points, being

simply sharpened flakes of rhyolite without any trace of secondary working. Pl. 42, no. 13 is one such point. Pl. 42, no. 14 is another crude point of limestone.

Pl. 42, no. 15 is a scraper, only the edge being worked. Such scrapers have also been found in the Hoabinhian culture.

Pl. 42, no. 16 is another point of limestone, besmeared on four sides with red colour.

The above description apparently makes three stages in the cave deposits of Siam, both in the north and south.

I. The top layer containing brick-bats most probably belongs to the Buddhist occupation.

II. A pottery-bearing layer.

III. A layer of crude implements.

It has been remarked earlier that the pottery-bearing layer does not make a clear-cut stratigraphic difference from that containing the implements. There is no evidence in these caves to show that pottery was made here and that it came into use after the crude implements had gone out of vogue. On the contrary the scanty finds of the sherds and the nature of the cultural level in the caves suggests that the pottery was obtained from more developed areas.

On the character of the stone industry Sarasin remarks, "The stone implements present a purely palaeolithic character. Not the least trace of polishing is to be found on them. They are without exception very coarsely and primitively chipped. Their form is only approximately comparable with the skilfully executed implements of the classic palaeolithic cultures of Europe. One is even frequently tempted to look for their relation with pre-Chelleian cultures. By a few coarse chips, perfectly natural stones have been transformed into primitive implements, using as little labour as possible. The "Siamian" as I shall provisionally call it, is a palaeolithic culture of the most primitive nature. It is a culture of hunters and collectors of food without the possession of any domestic animals and without the knowledge of agriculture." (Sarasin, 1933 a, p. 194). Technically this industry is in the same level as those of the earliest stages of the Hoabinhian and Bacsonian cultures, and a few resemblances, pointed out above, though they may be accidental, support the hypothesis that the cultural level of these cave dwellers was very low. But this "primitive" charac-

ter does not prove their long antiquity, nor the term "palaeolithic" is suitable for this industry. In all probability they were contemporary with the ground tools, to be noticed shortly, at least in their later stages, and it is probably from the latter culture that pottery and bone tools were derived. From the cave deposits it is clear that this "primitive" cultural life continued till they were superseded here by the intrusion of the Buddhist hermits. But what was the effect of this change in the cultural life of this whole region, cannot be answered at present.

One collection of ground tools has been described by I. H. N. Evans (1931 c). In a tin mine at Ban-Na (See map no. 3), Surat province, 5 stone "celts" and 2 pounders were found. The tools are described below:

Pl. 43, no. 17 is a gouge adze (or pick adze, the so-called beaked adze), 10.9 cm. in length, of yellowish stone, trapezoidal in section. Such gouge adzes are very common in Malaya.

Pl. 43, no. 18 is a facetted tool 6.6 cm. long, probably unfinished. It is of the type well-known from Malaya (compare pl. 51, no. 161).

Pl. 43, no. 19 is a type of splayed axe, 9.85 cm. long, again of the type well-known from Malaya (compare pl. 51, no. 157).

Pl. 43, no. 20 is a facetted type of tool with slight splaying at the cutting edge. It is of the same type as the Malayan tool pl. 51, no. 148 from Kuala Nyong.

Pl. 43, no. 21 is a broader example of splayed axe of the Malayan type.

Pl. 43, nos. 22 and 23 are two pounders with longitudinal flutings or grooves on their body. They show pecking marks. At this very site cord-marked pottery was found. It has also been described by I. H. N. Evans (1931 d). This pottery is of the same type as that found by Sarasin in the caves. Another find of five ground tools was made at Chong in South Siam (Evans, 1926). These implements are made of rhyolite.

Pl. 43, no. 24, no. 25 and no. 26 are facetted type of tools, identical with the Malayan examples (compare Tweedie, 1953, figs. 12-13). Pl. 43, no. 27 is a splayed axe of a slightly different variety, found in Malaya (Tweedie, 1953, fig. 10), Burma (See pl. 56, no. 24) and India (See pl. 7, no. 11). Pl. 43, no. 28 is a gouge adze of the type found at Kuala Nyong, Malaya (See pl. 51, no. 147).

These ground tools and the pottery belong to a developed neolithic culture,

and they bear closest relationship with the Malayan developed neolithic culture. The workmanship is similar to the ground tools of the Somrong Sen culture and the Pho-Binh-Gia (a) group of the Bacsonian culture, but the types represented here are slightly different. They fall in line with the Malayan examples.

Van Heekeren (1948) collected artifacts from the cave near Wan-Po in Siam (about 21 miles north-west of Bhan-Kao). They were found in association with "an agglomerate of sand, bone fragments, ashy material and fresh water molluscs." Pl. 43, nos. 29-31 come from this find. These are "crudely worked core implements chipped along one surface only, the ventral plane being flat and unworked." The workmanship of these tools are far better than those discovered by Sarasin in the caves. They also show some regularity of form. Pl. 43, no. 29 is of rectangular shape, and pl. 43, no. 31 is of almond shape. Pl. 43, no. 32 is a faceted tool of curvilinear variety, found in association with the piles of sand along Bhan-Kao railway. Van Heekeren reports many others of this type from this area. In the vicinity of Nom-Pladuk, near Ban-Pou, a beautifully ground shouldered stone tool was found. It had a broad rectangular section.

Technically these chipped tools of Van Heekeren compare well with the Kéo-Phay industry of the Basconian culture (See Pp. 128-29) on the one hand and on the other have relationship with the chipped tools of Malaya. The regularity of the forms suggests that they have been influenced by the forms of the ground tools, and hence they belong definitely to a different grouping from those discovered by Sarasin in the caves of north and south Siam. Provisionally we can speak of three groups of stone industry in Siam:

I. Coarsely chipped tools of irregular shape discovered by Sarasin in the caves.

II. Chipped tools of regular shape discovered by Van Heekeren.

III. Ground tools discovered by Van Heekeren and I. H. N. Evans.

These three groups do not imply any chronological differentiation. If the evidence from Indo-China and Malaya can be cited, one may suggest that these possibly represent three cultural groups in Siam.

SECTION III

MALAYA

Neolithic materials in Malaya have mostly been obtained from cave excavations, mainly carried out in the central and northern regions. Only one kitchen-midden site at Guak Kepah in the province of Wellesley and one open air site at Nyong in Pahang have been excavated, while a number of surface finds in the fields have also been collected, the most important being in the vicinity of Baling in the province of Kedah and in the district of Kuantan in Pahang (Collings, 1937 b, Pp. 124-37), the former producing the well-developed ground tools and the latter large-sized chipped artifacts. In the extreme south at Tanjong Bunga (in Johore) one site has been excavated (M. W. F. Tweedie, 1953, Pp. 84-85), where ground tools of the developed type along with flakes and other materials have been found. (See map no. 6). Unfortunately the system of recording in these excavations is based on level of finds. This level method, however accurate it may be, can hardly define an archaeological stratum, much less it can establish the relationship of the objects in a particular culture. H. D. Collings, who himself excavated a number of sites in Malaya, has given us a description of the method of recording followed in Malaya. He writes: "The measurement of non-architectural archaeological sites by means of tacheometer has found favour with some prehistorians who have used this method extensively in Malaysia during the last decade, and the writer would like to offer a few criticisms of the system.

"The method used is to set up the instrument, some 15 or 20 metres from the site, and to mark out the area to be excavated, then the deposit is removed in layers of some 5 or 6 cms. at a time, and objects found are measured with the tacheometer and numbered for reference. The positions of the objects are then plotted on two maps to the scale desired, one being a plan, and the other a composite vertical section. It is claimed that the survey gives the position of each object with the highest degree of accuracy, both in the horizontal and vertical planes, and that the charts show the archaeological details with equal accuracy, although on a reduced scale, also that the cultural significance of the site can at once be determined by looking at the charts." (H. D. Collings, 1935).

The one exception is the recent excavation carried out at Gua Cha (formerly called Gua Menter by Noone), where the stratigraphy has been established and two definite cultural stages: one of the chipped stone tool complex ("Hoabinhian") and the other of the true "neolithic" complex have been distinguished, but so far only a partial report has been published. The stone industry remains to be studied. Under the circumstance there is hardly sufficient stratigraphic evidence available for tracing the development of neolithic cultures in Malaya. However, the study of the artifacts suggests that these caves were characterised by a common assemblage of materials, and when these materials, as a whole, are placed in their proper context, it is possible to give a fair idea of the cultures. These cultures have been tentatively placed in sequence order mainly on the basis of the depth record.

The stone tools of Malaya, fall into three main classes: Class (I) tools which are produced only by coarse flaking. These have been divided into two sub-classes: (I a) the so-called "Sumatra type" of tools, which are flaked on one face only and retain the cortex on the other; (I b) tools which have been flaked on both faces. Class (II) the so-called "proto-neoliths", which have their cutting edge produced by grinding and the main body by flaking. Class (III) includes tools which are completely ground. These three classes correspond with those already noted in Tonkin (See Pp. 142-43).

A general account of "The Stone Age in Malaya" has been ably given by M. W. F. Tweedie (1953).¹ We have here tried to study the materials as they were found in actual excavations as we believe that the objects need to be related with their archaeological context, and only then it will be possible to throw some light on the neolithic problem of Malaya. The description is given here site by site.

Excavations in Perak

Perak is in central Malaya, lying to the western side of the limestone massif. Three important caves have been excavated in this province, Gua Badak, Gua Kerbau and Gol Ba'it. A fourth cave explored is Gunong Cheroh.

¹ In his recent publication (*Prehistoric Malaya*, 1955) Mr. Tweedie gives a summary of his earlier article with the addition of a brief account on "The Excavation at Gua Cha".

Gua Badak

Reference: Van Stein Callenfels & Evans, I. H. N., 1928, p. 151.

The excavation was not carried out completely in this cave. The excavators note, "In excavating a sector of this cave to a depth of some feet, we found chips and other implements in the various layers, but, on the whole, results were so poor that we stopped work.... However, attention must be drawn to the fact that in the Gua Badak, from the same layer and even lying quite near one another, we got cord-marked pottery and two pieces of a polished implement belonging to an upper neolithic culture. The connection between cord-marked pottery and the upper neolithic established by the French for Indo-China is now proved also to have existed in the Peninsula by these finds at the Gua Badak."

The conclusion drawn by the excavators is not above suspicion. The "polished neolith" probably signifies completely ground tools of our class III. We do not know what was the relation of these tools with "chips and other implements in the various layers", probably of class I. As none of these implements have been illustrated, it is difficult to ascertain the culture represented in this cave.

Gua Kerbau

Reference: Van Stein Callenfels & Evans, I. H. N., 1928, Pp. 151-59.

Gua Kerbau rock-shelter lies on the east side of a very precipitous limestone mass, called Gunong Pondok (Hut Hill). Only one archaeological deposit was noted in this rock-shelter. The following materials were found:

- (a) Stone tools, both chipped and edge-ground.
- (b) Pottery, plain and cord-marked.
- (c) Red ochre found in lumps, and also sticking to the grinding slabs.
- (d) Food consisted of fresh-water molluscs as well as marine shells, and also animal flesh. The remains of bones appertain to deer, wild ox, pig, porcupine, bamboo rat, monkeys, small carnivores, python, soft turtle, fish, the species of animals extant in the country today. Some of the bones were blackened by burning while almost all were broken probably for extracting marrow.

Stone Tools

We have here two main classes of tools: Class I, chipped tools, and Class II, edge-ground tools. A third group consists of grinding stones and slabs of natural pebbles.

Class I: *Chipped Tools*:

The raw material used is the river pebble. The flaking is coarse, similar to that noticed in the Hoabinhian stage C of Indo-China. But the tools have regular forms, and they can hardly be equated with the earliest stage in the Hoabinhian and Bacsonian cultures. Both the "Sumatra types" as well as the bifacial implements show regular forms. The following varieties have been found:

(i) *Points*:—Pl. 44, no. 3 is a fine point of triangular shape made from a big flake of schist. It is comparable in general form to the Hoabinhian pl. 24, no. 10, and Siamian pl. 42, nos. 9 and 12-14, but the latter are pebble tools.

(ii) *Hand-axe*:—Pl. 44, no. 5 is sub-triangular in form resembling the Hoabinhian pl. 26, no. 47. Pl. 44, no. 7 is discoidal and pl. 44, no. 8 is sub-rectangular. Pl. 44, no. 9 is of an elongated type, and pl. 44, no. 10 is almond shaped and has several parallels in the Hoabinhian (pl. 24, no. 7) and Bacsonian cultures. Pl. 44, no. 11 has a narrow butt similar to the Hoabinhian pl. 24, no. 6. All these tools have been worked on both faces.

(iii) *Scrapers*:—They are generally in the form of discs. Pl. 44, no. 4 retains the cortex on one face and also much of it on the other. Only the edge is chipped.

(iv) Pl. 44, no. 1 is a typical "Sumatra type" of tool worked only on one face, its length being almost double the breadth.

(v) *Digging tools*:—Pl. 44, no. 2 is made from a pebble and retains the cortex completely on one face and to a large extent on the other. Only the pointed edge is chipped. Pl. 44, no. 6 is an advanced type showing regular sides produced by bifacial chipping. These digging tools come closer to the edge-ground tools in form.

Class II: *Edge-ground tools*:

These tools differ from those of Class I not only in the grinding of their cutting

edge but also in general workmanship and appearance. These are far better in form and product. All of them have been bifacially worked and show further retouch on the sides.

Pl. 45, no. 14 is an elongated type bifacially ground. Pl. 45, no. 15 is lozenge-shaped. Pl. 45, no. 16 is probably a broad type of axe broken in the middle. Pl. 45, no. 16 a, is rectangular in shape and has a bifacially ground cutting edge. Pl. 45, no. 17 has bifacially ground median cutting edge. The last two examples, pl. 45, nos. 18 and 19, are irregular.

There is also a group of grinding and pounding stones made from water-worn pebbles without any further workmanship. However, great number of them have "grip marks" on one or both faces. Along with them must be mentioned grinding slabs which are mostly large stones with one flat surface, while their undersides rest easily on the ground. All these stones show marks of use, and they have been found throughout the deposit.

Pottery

It is stated that the pottery was found only in the upper layers (layer here simply signifies one dig), but out of seven digs, they have been found as far down as no. 5. This depth has no significance as the materials found in different digs do not show any cultural break. The pottery is either plain or cord-marked, but some sherds are decorated with parallel, wavy lines, small squares or simple incisions. No complete pot was found.

To sum up, this cave deposit was characterised by two technical traditions of stone working. But as the number of edge-ground tools was comparatively much smaller than coarsely flaked tools, it is fair to say that the technique of grinding was not much in vogue in this cave. The scarcity of pot-sherds also indicates the poverty of this cave. The general trend of the culture represented by the artifacts and food remains suggest simple food-gathering. There is no hint or sign of food production.

At the end it may be mentioned that right outside the shelter were found fragments of thin metal vessel and two pieces of iron knife. One piece was also found right inside the cave.

Gol Ba'it (Sungai Siput)

Reference: Van Stein Callenfels & Noone, H. D., 1938, Pp. 119-25; H. D. Collings, 1938, Pp. 126-30; C. A. R. D. Snell, 1949, Pp. 1-25.

Gol Ba'it is a very spacious rock-shelter. It seems that the archaeological deposit appertains to one complex. The evidence available from the report does not support the theory of the excavators that three clear-cut "anthropological" strata are to be found here. The so-called human burials are not above suspicion. The three groups of human remains, called by them "extended burial", "secondary burial", and "flexed burial", and referred to different strata, does not show, according to the analysis of Dr. Snell, any anthropological difference, nor have they been associated with any grave furniture. Dr. Snell further doubts the nature of some of the burials, especially the so-called "secondary burial" is considered to be just vestiges of cannibalism.

Leaving aside the doubtful question of these burials, the shelter has produced following materials, which apparently relate to a single complex.

(a) Stone tools, mainly chipped. Only 1 edge-ground and 2 ground tools were found.

(b) Bone tools.

(c) One shell implement.

(d) Beads.

(e) Pottery.

(f) Melanian shells and animal bones.

(g) Red ochre.

Stone Tools

The majority of the tools show poor workmanship, though some exceptionally regular forms (like pl. 45, no. 28) have been produced, the regularity probably depending on the choice of the material rather than on the skill of the worker.

Class I: Chipped Tools:

Sub-class (a): Sumatra Types:

Pl. 45, nos. 20-26 illustrate the various forms of this sub-class. It is stated that they have been found in the lowest layers. They are generally made from

non-fissile rocks, like quartzite, chert. Some of the tools can be compared with the Hoabinhian types, but this incidental resemblance is more due to the similarity of the technique than to any intentional copy.

Sub-class (b): Bifacially worked tools:

Pl. 45, no. 27 is probably a chopper. Pl. 45, nos. 28 and 30 are probably hand-axes. Pl. 45, no. 29 is a disc. These have been made from schistose rocks and found throughout the deposit.

Class II: Edge-ground tools :

We have only one edge-ground tool found in the lower layer in association with pottery and other tools of class I. This type, pl. 46, no. 31 has a median cutting edge produced by bifacial grinding.

Class III: Completely ground tools :

We have here only two examples. Pl. 46, no. 32 is a faceted tool of long variety, and pl. 46, no. 33 is another example of the same type, trapezoidal in shape with straight cutting edge and truncated butt. These were found in the upper layers according to the excavators.

Grinding and pounding stones and slabs have been found throughout the deposit. They have also "grip marks". (pl. 46, no. 37).

Bone Tools

Pl. 46, nos. 34 and 35 are made of mammalian bones and have chisel edge. Pl. 46, no. 36 is a point made from a bird's bone. It might have been used as an awl. These are said to have been found in the upper layers.

Shell Implement

A single implement, pl. 46, no. 38 a, made from shell was found. It is triangular in shape with the base sharpened into a cutting edge. It was also found in the upper layers. H. D. Collings (1938, p. 130) mentions two more shell knives.

Bead

Only one glass bead, pl. 46, no. 38, and two beads made from cowrie shells were found in the upper layers.

Pottery

Pot-sherds occurred through almost all the layers of excavation, and this fact suggests that the materials belong to a single culture complex. The sherds are either plain, cord-marked or burnished. H. D. Collings has reconstructed some of the sherds, and the following is taken from him:

Pl. 54, no. 10 is "part of a large and fairly shallow bowl of grey ware with coarse sand tempering. The cord marking is in irregular patches."

Pl. 54, no. 11 is "very coarse dark grey ware, coarse sand tempering, the surfaces are very uneven with indistinct parallel cord marks running in what is best described as a north-east south-west direction and at an angle of about fifty degrees to the rim."

Pl. 54, no. 12 is "fine grey ware, fine sand tempering, the inside has been burnished, fine cord marking. . . . It is very common and typical Malayan Cave culture type."

Pl. 54, no. 13 is a "bowl of grey ware, fairly fine sand tempering, and with very close and fine cord marking."

Pl. 54, no. 14 is "fine grey ware, very fine sand tempering. Lines on the surface suggest that it may have been made on a turn-table; the shape is too uneven for it to be a product of the potter's wheel. The only decoration is an irregular row of burnished lines roughly at right angles to the rim."

Pl. 54, no. 18 is a "brown ware, coarse sand tempering. There is perhaps a slip inside and out. The outside is yellow, with black "smoke marks" towards the base, and is quite smooth with no decoration. The inside is black and has been burnished."

Pl. 54, no. 19: "This is a composite reconstruction of the remains of two pots found by I. H. N. Evans at Lenggong, Upper Perak. . . . Several small sherds of similar texture were found in Gol Ba'it. The paste is grey to brown in colour, with fine sand tempering containing a lot of gold coloured mica. There is a slip on the outside which is terracotta coloured and is well burnished." (Collings, 1938, Pp. 127-129). M. W. F. Tweedie has given another reconstruction of these sherds (pl. 53, no. 9), and has called it a "turn table". But Collings doubts this reconstruction.

To sum up, the stone industry of this rock shelter mainly shows coarse flaking technique. The presence of some sherds and one edge-ground tool right at the bottom help in dating this industry to a late period. In the later stages the cave deposit was enriched by the addition of completely ground tools, bone and shell implements and beads.

Summary of the Archaeology of Perak

1. The cave dwellers were food gathering people living on shells, fish, or bones of those animals that they could lay hold upon in the neighbourhood. They were mainly equipped with stone tools, coarsely flaked on one or both faces, but probably they were in contact with the people, at least in later stages, who were using ground tools, pottery, bone and shell implements. There is no clear evidence to show that the latter people also lived in the caves. The Gua Badak material is not conclusive. Presumably it would have produced a mixture of stone industries if the excavation there had been successfully carried out. The use of red ochre was known to these people. Nothing at present can be said definitely regarding the burial practice.

The link with the Hoabinhian culture of Indo-China is to be sought in the similarity of the flaking technique rather than in the forms, which, given the same type of material and the same method in a common environmental background, would naturally bear resemblance.

The presence of potsherds in all the caves and through all the layers is very important in establishing chronological relationship of these cave deposits. The predominant pottery is black or grey ware, plain or decorated. A new type of red slipped ware was found at Gol Ba'it.

Excavations in Kelantan Province

Kelantan is in northern Malaya, lying to the eastern side of the limestone massif. Four important caves have been excavated here, Gua Menter, Gua Madu, Gua Musang and Gua Cha. The excavation in the last cave has been briefly reported recently.

Gua Mentery or Gua Cha

Reference: H. D. Noone, 1939, Pp. 170-174; M. W. F. Tweedie & G. de G. Sieveking, 1955, Pp. 405-7; G. De. G. Sieveking, 1954, Pp. 75-138.

This rock shelter is situated on the western bank of the river Nenggiri. In the first excavation by Noone only two trial trenches were dug in this shelter. "Trench no. 1 was prolific in broken sherds of pottery, but in trench no. 2 they were less numerous. Burials were found in both trenches, and so were ruddle, pounding and grinding stone, and other stone artifacts." (Noone, 1939, p. 170). The excavator has given the following section in his report:

9'	Fine yellow sand			
6"	Grey clay with red stain			
3'	Polished axes, abundant pottery B	C		
2'6"	Numerous flakes & rough artifacts and pottery. A			
1'6"	Small Hoabinhian implements, pottery scarce. D			
2'	Hoabinhian implements, rough and large; no pottery.			
4'	Sterile.			

Burials:

C: nest of complete pots.

B: alignment of pots.

A: pots.
D: no pots.

Numerous
Ash-layers

It is difficult to make an intelligible interpretation of this section. Apparently it seems that certain depths have been assumed and regarded as marking a stage. If this drawing is really representative of the archaeological deposit, two strata

may be distinguished: no. 1, the upper series showing numerous ash layers, and no. 2, the lower one in which ash layers are absent. No. 1 may be divided into two sub-stages: (1 a) the lower series in which pottery was scarce, and (1 b) the upper series in which pottery was found in some quantity.

Stage No. 2: It is characterised by what is called "hoabinhien" type of implements of rough and large shape. No pottery is associated nor any human burial is known. The tools have not been illustrated, but it is reported that they are bifacially worked implements of the usual Malayan type. Such types have been found in Gua Kerbau and Gol Ba'it in association with pottery and edge-ground tools. It is difficult to ascertain the exact chronological significance of this stage.

Stage I (a):—This stage is distinguished from the lower one by (i) the occurrence of ash layers, (ii) the presence of small stone tools, chipped on both sides, and (iii) pot-sherds. With these should really be bracketed the finds of numerous flakes and rough artifacts, as in both these layers pottery is not "abundant" and the "polished" tools are absent. The nature of the human remains found in both layers is not known. The tools fall in the following groups:

(i) *Small tools:*—Pl. 47, no. 60 is a "hache courte" resembling Hoabinhian pl. 26, no. 59. Pl. 47, no. 61 is another of ovate type, showing fine retouch at the sides. Pl. 47, no. 62 is of cordate form.

(ii) *Axes:*—Pl. 47, no. 63 is one of the two examples of oblong unfinished "neoliths". Pl. 47, no. 64 is called a "bent axe".

(iii) *Scrapers:*—Pl. 47, no. 65 is one of the two examples of side-scrapers found here.

Stage I (b):—It is related with stage I (a) in having the same ash layers and also the pottery of the same type, though here complete pots in association with human burials have been found. Fully developed ground tools have been met with, but these have their counterparts in the unfinished "neoliths" of stage I (a). The following types have been found:

Pl. 46, no. 39 is a gouge adze of black stone. Pl. 46, no. 40 is a miniature tool of the faceted type, made of green stone. Pl. 47, no. 50 is called a "waisted"

axe with a notch on either side near the butt. This tool is said to have been found in the "top layer", and hence stratigraphically should be associated with this stage, but the excavator himself likes to assign it to an earlier stage. Two more "waisted" axes were found in the neighbouring gravels of the field. Such axes have been found in large numbers at Guak Kepah. 2 hones for polishing stones were also found here.

There were three human burials encountered in this excavation. The skeletons were lying east-west with the feet towards the east. Unfortunately no details of these burials are available except that they were accompanied with complete pots as grave furniture, about 8 in number. In one case (*c*) they were lying at the feet. The burials have been found in stage I (*b*).

The pots are all hand-made, and except two they bear cord-marked decoration. They are all different types of bowls, three are illustrated here. Pl. 53, no. 1 is a multi-rimmed bowl. Pl. 53, no. 2 has a footed base, and pl. 53, no. 3 is a shallow bowl. One bowl is burnished giving the appearance of "shiny black". The sherds are decorated with little "squares", zigzag lines, twisted rope, incised lines and chevrons.

This Gua Menterī cave has been properly excavated recently by Sieveking and Tweedie. Great importance attaches to this excavation, as it is for the first time in Malaya that true stratigraphy has been established. The report of the excavation has been partly published by Mr. Sieveking (1954), and this report clearly explains the meaning of the layers recognised by Noone in his trial excavation. Sieveking has been able to correlate human deposits with natural accumulations caused by the occasional flooding of the river Nenggiri and has shown, below the historical deposit, (characterised by Chinese glazed pottery), three strata: the lowest of chocolate brown earth characterised by "Hoabinhian tools" and "contracted or flexed human burial" (already noticed before at Gol Ba'it, see p. 181); the second is called "neolithic flake layer" when "poorly made cord-impressed pottery of relatively primitive design was in use, quadrangular stone axes and adzes were being manufactured, though no completed example of this type of tool was recovered, and the sole representatives of the finished stone industry consist of two simple rings of polished stone, and a single long polished axe with a lenticular cross-section". The third is a "black and strong

layer" said to contain the main neolithic occupation, noted "for the rich grave furniture associated with its burials, and among these associations may be recognised pottery vessels of many different designs comparable to those which have been recovered from other caves and rock shelters in various parts of Malaya, as well as a class of bracelets of advanced design . . . The beaked adze and bark cloth beater are two additional types, traditionally recognised as part of the Malayan Neolithic industry, which are found in supposedly late Neolithic associations at Gua Cha. Beaked adzes are of advanced design, and have been found elsewhere—at Bukit Tenku Lembu. (Williams-Hunt, 1951)—in what appears to be a very late Neolithic association, since a black pottery vessel believed to be imported from Greece in the third or fourth century B.C. was discovered at this site." (Sieveking, 1954, p. 107). Two forms of burial—dismembered burial and extended burial—have been noted in this phase. The pottery found shows great improvement and it is suggested that they might be an imitation of metallic forms. In this connection one pot (Sieveking, 1954, fig. no. 9, no. 2) is very important. It is a beaker with flared mouth and bowl-like base, decorated with incised lines. The bowl portion shows volutes and the upper part has complex lines. The decoration recalls the pottery from Shek Pek in Hong Kong culture (Schoffield, 1938). Among the polished tools the most remarkable is the discovery of a flanged bracelet worn in the hand. It is of the same type as the ring-stones of Burma (see *supra*), and its proper use is now revealed.

On the question of stratigraphy Mr. Sieveking notes a break between the Hoabinhian stratum and the two neolithic layers and opines that some time must have elapsed between the two occupations. The real nature of Sieveking's early and late neolithic complex is not quite clear. The early phase may be an attempt made by a few adventurers from the main neolithic stock, as there does not appear any fundamental difference in their way of life and that of the late neolithic. The late neolithic has been correctly dated by the so-called "Greecian" black pottery. How far back the "Hoabinhian" culture goes, is a matter of conjecture. Sieveking believes it "may well be at least 5000 years old." (p. 104). Thus this last excavation at Gua Cha has for the first time furnished us with the true stratigraphy in Malaya.

Gua Madu

Reference: M. W. F. Tweedie, 1940, Pp. 3-10.

This large rock-shelter is situated on the western side of the limestone hill, Batu Gua Madu, which lies to the south of Batu Papan. It is $3\frac{1}{2}$ miles from the Gua Musang. The archaeological deposit in the rock-shelter was largely removed by the local cultivators. Only an isolated area left in the middle was excavated.

No stratification was observed in the excavation. The following materials were found:

(a) "Hoabinhian" type of stone implements, about 600 in number.

(b) A few edge-ground and completely ground tools.

(c) Some examples of "round axe".

(d) One bone implement.

(e) Bark cloth beater.

(f) Pounding and grinding stones and slabs.

(g) Some pot-sherds.

(h) 2 doubtful burials.

(i) Red ochre and food remains. Among the animal remains the following have been identified: wild ox, goat, antelope, barking deer, sambhur deer, wild pigs, pig-tailed macaque, langurs, bamboo-rat, and Malay bear.

The burials were incompletely preserved: one is supposed to be dispersal and the other extended. No grave furniture is reported.

Stone Tools

Nearly 400 "Hoabinhian" type of tools were picked up on the surface and among piles of stones left by the cultivators, and half as many were found in the excavation. Tweedie remarks, "They range from crudely worked pebble tools, hardly distinguishable from the most primitive palaeoliths, to well-finished ovate or discoid implements, flaked on both sides over the whole of the surface." (Tweedie, 1940, p. 3). In a small cave above the shelter a few "Hoabinhian" implements were found in association with a faceted tool, pl. 48, no. 88, described as "neolithic adze", and a fair amount of pot-sherds. The tools have been described under following categories:

(i) In this category we have bifacially worked implements but without any secondary working. Pl. 47, no. 73 is almond-shaped; pl. 47, no. 74 is discoidal; pl. 47, no. 75 is sub-rectangular; pl. 47, no. 80 is a scraper with curved edge. It is said that these have been found at the bottom of the deposit.

(ii) This category includes better formed implements with secondary working at the edge. Pl. 47, no. 76 is an elliptical axe; pl. 47, no. 77 is a well-formed handaxe; pl. 47, no. 78 is another axe with regular sides and curved edge; pl. 47, no. 79 is a semi-circular side-scraper; pl. 47, no. 81 is another handaxe recalling the types occurring in edge-ground tools.

(iii) This category includes edge-ground tools. Pl. 48, no. 83 is an elongated type, and pl. 48, no. 82 has a median cutting edge.

(iv) This category includes the so-called "round axe", *i.e.*, the rounded butt axe of the Peninsular India. Pl. 48, no. 85, which has unequally ground bifacial butting edge, was found on the surface. Two more broken examples of this type were found in actual excavation (See Tweedie, 1940, pl. IV, 3 and 4).

(v) This category includes completely ground tools. Pl. 48, no. 84 is an unfinished example of faceted tool. The butt side is still rough. Pl. 48, no. 88 is a faceted tool with median cutting edge.

Pl. 48, no. 86 is a well-made bone implement of rectangular shape. Pl. 48, no. 87 is very distinctly "grip-marked", having an artificial depression on one side made by hammer dressing. A cross-hatched artifact, usually regarded as bark-cloth beater, was found in an undisturbed deposit.

To sum up, Gua Madu rock-shelter represents a complex predominantly characterised by coarsely flaked tools, use of red ochre. With them have been found tools which are edge-ground or completely ground. One bone implement and some potsherds were also found. A new type of tool called by Tweedie "round axe" was also found here. It is somewhat similar to the rounded butt axe of Peninsular India.

Gua Musang

Reference: M. W. F. Tweedie, 1940, Pp. 10-22.

High up in the steep side of the limestone hill overlooking Gua Musang

railway station is an extensive system of caves, approachable by a long and narrow cleft in the rock. In one of the caves largely exploited by the local cultivators some potsherds and 3 completely ground tools were found. A little excavation in an undisturbed area showed that the sherds came mainly from a thin layer of ash and charcoal 10 to 15 centimetres below the surface. Another smaller cave was also excavated. It produced abundant potsherds with a shallow layer of ash. "Altogether over two thousand potsherds were found in this cave with five typical and four atypical neolithic implements and one broken chipped implement of Hoabinhian type."

Stone Tools

The three ground tools of the larger cave fall into two varieties: (i) pl. 48, no. 90 is a facettled tool of rectangular shape; and (ii) pl. 48, no. 89 has sloping sides and a broad cutting edge. Both of them show flaking marks on the body.

The second cave has produced four ground adzes of the facettled type, pl. 48, nos. 91-94; another ground but broken tool (pl. 48, no. 95); 2 awls or borers (pl. 48, nos. 96-97); and a smoothened piece of limestone (pl. 48, no. 98).

Pottery

In contrast with the implements the pottery is abundant. No complete pots were found. Tweedie remarks, "Two very distinct types of ware occurred. The most abundant is black or dark brown in colour, variously ornamented, and with the smooth parts often burnished or polished. Exceptionally sherds of this ware are light brown or dull reddish in colour, probably due to heating under oxidising conditions, either by accident in the process of baking or during use as cooking vessels. The ware is always coarse in texture and is tempered with large grains of sand and grit. The other type of ware has a smooth surface of a deep red colour. It is generally thicker than the black and is never ornamented. Its internal texture is similar to that of the dark coloured ware. The sherds of this ware all appear to be fragments of a single peculiar type of object." (Tweedie, 1940, p. 12). A fragment of this red ware is shown on pl. 53, no. 8, and Tweedie's reconstruction is given on pl. 53, no. 9. He regards it as a "Turn

table" and compares it with similar type known in Sumatra. But H. D. Collings gives another reconstruction of similar sherds from Lenggong and Gol Ba'it (See pl. 54, no. 19). In the latter case they are to be taken as footed bowls. However, Tweedie's name of "turn table" has been retained to describe such fragments.

The pot from Gua Musang illustrated are all reconstructions made by Tweedie. Pl. 53, no. 4 is a trebble rimmed vessel. Pl. 53, no. 5 is a broad vessel with concave sides. Pl. 53, no. 6 has rounded bottom. All these appear to be cooking vessels. Pl. 53, no. 7 is a shallow bowl.

One reconstruction of dark-coloured ware gives a type similar to the so-called "turn table" (See Tweedie, pl. XII, 1). Several sherds of this type were found. A few fragments of what appears to be thick, cylindrical objects of baked or burnt clay were also found.

To sum up, Gua Musang caves show a culture characterised by completely ground tools and prolific pottery of dark grey ware and red ware. The scarcity of ground tools is conspicuous. Whatever may be the nature of the deposit, it is clear that pottery was the essential part of the ground tool tradition. Tweedie surmises that the cave might have been used for ritual purposes, or, as he believes, only for making pottery in its neighbourhood. He does not think that it could ever have been inhabited by the neolithic people.

Summary

To sum up, the caves in the Kelantan province show two distinct types of cultures; Gua Musang supplies the evidence for what has been called "developed neolithic culture" with completely ground tools and pottery; while Gua Madu mainly represents a complex with chipped tools though some ground tools and pottery have also been found. Gua Menteri (Gua Cha) places these complexes in successive sequence. The associated materials at Gua Cha indicate that the latter complex existed round about 3rd-1st centuries B.C. and that in this particular cave it continued till at least the arrival of the "glazed ware" assignable to Tang period of China. Thus the evidence obtainable in this province suggests a definite change in the equipment of the cave dwellers towards

the second half of the first millennium B.C. The excavators claim that this change was due to the arrival of a new "race" of people. However, one thing is clear that along with this "developed neolithic culture" the indigenous culture continued in other caves and regions as is proved by the occasional find of ground tools and pottery in an assemblage of chipped tools as at Gua Madu or in the province of Perak.

Excavations in the province of Perlis

Perlis is the northernmost of the Malay states. It is bounded on the north by Siam, on the east and south by Kedah and south-west by the Straits of Malacca. A great massif of limestone forms the boundary between Perlis and the Siamese province of Setul. There are also a number of limestone hills in the province, which are honeycombed with caves. They were all found disturbed and the materials removed by local cultivators. Only two caves, Gua Bintong in Bukit Chuping and Gua Berhala, were found intact. Gua Berhala produced Buddhist materials. Tweedie and Sieveking (1955) mention that a neolithic cemetery was discovered in 1951, where along with ground tools "fragments of black ware, Greek or Attic" were found. The material is still unpublished.

Gua Bintong

Reference: H. D. Collings, 1937 a, Pp. 94-114.

Gua Bintong is situated on the western side of Bukit Chuping at the foot of the hill opposite the fourth milestone on the road leading from Mata Ayer village to Bukit Jerneh. It is the southernmost extension of a large rock-shelter from which all the deposit had been removed. Large part of this rock-shelter had been dug away by local cultivators, who had left heaps of materials, including pot-sherds, stone tools, animal bones, and mollusc shells. An area of 27' x 16' was dug in the undisturbed part of the cave near the mouth.

No stratification was observed, the deposit being of the usual very fine powdery grey cave earth. In the deposit were large number of mollusc shells used for food: both sea, fresh-water and swamp-dwelling species were represented in about equal numbers, together with great quantities of broken mammalian

bones. Many of them were smashed, apparently to get out the marrow, and others burnt, but no large pieces were found. The mammalian remains included large bovine, large deer, barking deer, wild pig, bearded pig and monkeys.

The archaeological deposit was homogeneous throughout. The complex is predominantly marked by flakes, scrapers, bone and shell implements, beads and pottery. Two coarsely flaked tools were found at the bottom of the deposit and two completely ground tools in the upper layers. Pounding and grinding stones and slabs as well as red ochre were found through all the layers. One bronze object was found in the top layer.

Stone tools

Class III: *Completely ground tools:*

Pl. 46, no. 41 is a faceted tool of fine-grained speckled grey shale with unifacially ground cutting edge (bevel). It was found in the middle of the deposit and is identical with the Gol Ba'it specimen, pl. 46, no. 33.

Pl. 46, no. 42 is an unfinished axe with narrow butt and wide cutting edge.

Class I: *Chipped tools:*

Pebble tools:—Pl. 44, no. 12 is a large handaxe of shale flaked on both faces, the two ends and one side being sharp, the other side blunt. Traces of step fracture at the edges are visible. Pl. 44, no. 13 is another tool of shale flaked only to make the edge. Both these tools were found at the bottom of the deposit.

Scrapers:—Pl. 47, no. 66 is a scraper of white chert (?) made on a flake. Pl. 47, no. 67 is another scraper of black and white stone made on a flake. Pl. 47, nos. 68-70 are scrapers of shale, also made on flakes. Pl. 47, no. 71 is a scraper of black crystalline stone. It retains the cortex on one face. Pl. 47, no. 72 is a scraper of black shale, made from a large pebble, only the upper face being flaked. All these scrapers show signs of retouch at the cutting edge.

H. D. Collings remarks, "The essential characteristics of these scrapers is that there are signs of wear showing that they have been used on the upper surface of the prepared part leading to the edge, and not, used as usual in European

neolithic scrapers with the sharp edge in contact with the thing to be scraped. In fact, in the smaller specimens made from flakes, there was often no attempt made to sharpen the edge at all. In other words, these tools were perhaps used as graters or files rather than as true scrapers used in softening skins. These tools are typical of the Malayan cave culture, and I have been able to identify them, in the collections in the Perak Museum, as coming from nearly all the cave sites, amongst which are Gunong Pondok, Kota Tongkat and Gunong Sennyum. Nevertheless they have not been mentioned before my report on the Gua Debu excavation and I therefore propose the name of 'Debu scrapers' to describe them." (Collings, 1937 a, p. 105).

Bone Implements

The bone tools have been described under following groups after Collings:

(a) *Axes*:—Pl. 46, no. 43 is a solid bone or antler with straight cutting edge, butt unground. Coarse scraping marks all over. Pl. 46, no. 44, is another antler with straight cutting edge but is unevenly shaped. Pl. 46, no. 45 is made from a split bone, has straight cutting edge produced by bifacial grinding. It was found at the bottom of the deposit. Pl. 46, no. 46 is also made from split bone and is gouge-shaped. The cutting edge is ground. Pl. 46, no. 47 is of similar type but slightly thicker. Pl. 46, no. 51 is unevenly shaped with straight cutting edge and unground butt. Pl. 46, no. 52 is another well-shaped axe of bone. Pl. 46, no. 53 is of similar type. It was found at the bottom of the deposit. Pl. 46, no. 48 has its cutting edge produced by grinding, while the body retains roughness.

(b) *Awls*:—Pl. 46, nos. 54-56 are typical well-shaped awls and no. 50 is irregular ground only at the point.

(c) *Bone beads*:—Pl. 46, nos. 57-58 are made from fish vertebrae, the edge produced by grinding and holes drilled.

Shell Implement

One tool (See Collings, 1937 a, fig. 4, nos. 17-18) is made from pieces of Cyrenid shells.

Terracotta

Pl. 46, no. 59 is a round terracotta ball.

Pottery

The pottery is mostly of dark grey ware or coarse black ware with some kind of tempering, either sand or charcoal. Many rim fragments of bowls or cooking vessels were found. Some have fine black slip or are highly burnished. Rim fragments of fine grey ware with fine sand tempering were also found. These have brick-red or red-yellow colour outside. They were probably wheel-made.

There were also several thick hard earthenware sherds which were parts of a very large pot or jar of pinkish yellow paste, sand tempering, green glaze outside, inside rough surface with irregular streaks of white, green and terracotta red, the green being probably due to glaze. They were generally found in the upper layers, and appear to be pieces of Chinese oil jars (?). From the same top layers came a few small sherds of thin blue and white glazed "Chinese-type ware", probably about tea-cup or small bowl size. There were several pieces of coarse black ware with charcoal and sand-tempering, burnt yellow on the surface, with a deep red and burnished slip on the outside.

Carnelian Bead

In a small undisturbed site at the back of the cave, a small spherical carnelian bead typical of the carnelian bead in Malaya was found in the upper layer. This layer was separated from below by a sealing of stalagmite. H. C. Beck (1937, p. 93) dates the bead between 1 and 400 A.D.

Summary

To sum up, Gua Bintong deposit for the first time has produced a complex dominated by bone tools and stone scrapers found through all the layers. With them was associated pottery. At the bottom of the deposit two flaked tools were found and at the top two completely ground tools together with a few fragments of glazed ware. The carnelian bead cannot be said to be contemporary

with this complex as it was separated from it by a layer of stalagmite. But what was the relation of the glazed ware with this complex cannot be definitely stated. If they were not contemporary with this complex, they seem to be not far removed in date.

Gua Alik

Reference: H. D. Collings, 1937 a, p. 114.

One carinated vessel was found in this cave (See pl. 54, no. 16). It is handmade, of black ware and burnished. It is said that this cave produced human bones, pottery and iron tools similar to those found in the grave complex of Malaya.

Gua Bukit Oban

Reference: H. D. Collings, 1937 a, p. 115.

Two pots were recovered from this cave. Pl. 54, no. 17 is of grey ware mixed with coarse sand tempering; uneven firing has made the outside colour red with small patches of grey and black, burnished. Pl. 54, no. 15 is also of coarse grey ware, coarse sand tempering, cord-marked.

Summary

The evidence from Perlis is unfortunately inconclusive. The materials from Gua Bintong suggest that the indigenous complex of chipped tools and scrapers was enriched by bone and shell implements, completely ground tools and a rich pottery, both hand-made and wheel-thrown. With these new additional materials has been found green glazed ware, apparently of Chinese origin. If the evidence of the carnelian bead is to be believed, this whole complex was earlier than at least A.D. 400. The publication of the newly discovered cemetery may clear the ground further.

Excavations in Kedah

South of Perlis is Kedah bordering on Perak on the south and Siam on the north-east. There are many caves and rock-shelters in the isolated limestone

hill, Gunong Baling. Many of these rock-shelters were inhabited by "pre-historic" men. Most of the cave deposits were disturbed or destroyed by the local cultivators. The most important rock-shelter was Gua Debu.

Gua Debu

Reference: H. D. Collings, 1936, Pp. 6-10.

Gua Debu rock-shelter is in the eastern part of the hill. A single habitation layer was reported in this rock-shelter. The layer consisted of very fine evenly coloured dark brown powder. A small cave was observed in one side after the habitation layer was cleared. It was probably a remnant of some bigger cave later filled up by rock debris.

The following objects were found:

(1) stone tools, 32 chipped and 1 ground; (2) 60 scrapers; (3) 250 flakes; (4) 34 hammer and grinding stones; (5) 6 grinding slabs; (6) lumps of red ochre; (7) 15 pieces of pottery; (8) shells; (9) broken bones; (10) hearths and charcoal.

Stone tools

Class I: *Chipped tools*:

Pl. 49, no 99 is oval handaxe made from a pebble. Pl. 49, no. 100 is similar but slightly broader. Pl. 49, no. 101 is narrower at the butt end. Pl. 49, no. 102 is roughly discoidal. Pl. 49, no. 103 has truncated butt. Pl. 49, no. 105 is made on a flake.

Class III: *Ground tools*:

Pl. 49, no. 104 is a facettted tool, found 9" below the surface in absolutely undisturbed earth. Its cutting edge is produced by unequal bifacial grinding.

Scrapers

They are usually made on flakes. (Pl. 49, nos. 107-110). There are some which are made on core, like pl. 49, no. 106. The ordinary small scraper is just a flake with the bulb of percussion end chipped to make the scraping edge.

Pottery

The body material is fine grey or yellow with fine sand tempering. Some of the sherds are much blackened. One painted sherd was found in the little cave. It is of fine yellow ware with fine sand tempering. The outside has a design painted in red (See Collings, 1956, pl. VII, 23).

Summary

H. D. Collings concludes, "The Gua Debu industry is in type a primitive one. With the exception of pottery, the polished axe and the squared stone, the tools have a palaeolithic aspect. . . . The use of handaxes and scrapers only suggests that the people were in a primitive state of culture. . . . Furthermore, the absence of many mammalian remains points to a food gathering than to a hunting society.

"The presence of a neolithic axe and fifteen sherds of well-made pottery makes the dating of the site difficult. These objects were in undoubtedly undisturbed ground and in the case of pottery, it does not seem reasonable to suppose that the holes of burrowing animals could account for all the sherds being found in an otherwise undisturbed deposit. Furthermore, the large piece of painted pot was found in the deposit in the Little Cave, the entrance to which was sealed by the undisturbed outside Habitation layer.

"In view of the evidence I would suggest that the makers of the Gua Debu industry were living as neighbours of a people of neolithic culture, and that they sometimes had opportunities of obtaining possession of the latter's ground and polished stone tools and pottery." (Collings, *ibid.*, p. 10).

Gua Kelawar

Reference: H. D. Collings, 1936, Pp. 11-13.

It is situated in the north-eastern arm of the hill about a quarter of a mile south of Kampong Bawah Gunong. Along with the stone tools many Melanian shells and broken mammalian bones were found. Numerous fragments of pottery were also obtained.

Stone tools

Class I: *Chipped tools*:

Pl. 49, no. 111 is of coarse grey shale. Pl. 49, no. 112 is also of the same material and has regular sides. Pl. 49, no. 113 is of amygdaloidal shape and has grey patination. Pl. 49, no. 114 has its underside flaked. All these tools show secondary flaking at the sides and the edges.

Class II: *Edge-ground tools*:

Pl. 49, no. 115 is partly flaked with the cutting edge bifacially ground. Pl. 49, no. 116 is made from shale pebble and shows traces of grinding on the body. Pl. 49, no. 117 has its butt side flaked and the cutting edge ground.

The presence of a large smoothing slab near the cave suggests that the tools were ground locally.

Pottery

It is of the usual black ware with sand tempering. The usual cord-marked decoration occurs. A few fragments of red ware have also been found. The neck-fragment of the so-called "turn table" (Collings, pl. XIII, 1) has also been found. Two painted sherds like the Gua Debu one were also discovered.

To sum up, Gua Kelawar shows a culture complex where chipped tools have been found along with edge-ground tools and pottery. The presence of painted sherds help in correlating this cave deposit with Gua Debu remains.

Gua Pulai

Reference: H. D. Collings, 1936, Pp. 13-14.

Gua Pulai is situated in the southern arm of the hill near the village Kampong Pulai. This cave is a very large one but much disturbed. Stone tools and pottery were collected in this cave.

Stone tools

Some of the tools are ground, while others have been flaked without any further grinding. Pl. 50, no. 118 is flaked on one face only and the cutting

edge is ground. Pl. 50, no. 119 has its cutting edge ground. Pl. 50, no. 120 is flaked, and does not show any grinding.

Pottery

It is generally a black ware, decorated with cord marks and incised lines, sometimes burnished. One fragment of yellow painted ware was also found here.

Summary

To sum up, in Kedah caves chipped tools are predominant, though edge-ground tools have also been found. Except for the grinding these tools are not much different from the chipped varieties. The existence of a smoothing slab near Gua Kelawar cave suggests that the tools were ground locally. Along with the usual black ware pottery some painted sherds have also been found, probably obtained from neighbouring cultures.

Province of Wellesley

The province of Wellesley lies to the south-west of Kedah. In the northern part of the province there are sandy ridges generally running north and south, a few feet higher than the surrounding country. These sandy ridges are thought to be old sea-beaches.

Guak Kepah

Reference: Van Stein Callenfels, 1936, Pp. 27-37.

The shell heaps of Guak Kepah are situated at the end of one of these sandy ridges. They are the remains of kitchen-middens, partly made on the greenish blue clay. In each of the three shell heaps a sector of roughly ten metres square was excavated.

All the heaps consisted of the shells of Kepah together with a few shells of other species. Mammalian remains were rare. Far more common were fish bones.

The shell heaps produced the Malayan type of the "Hoabinhian" complex. Material for making red paint was found in every square foot. The grinding

stones, slabs and pounding stones were found in all the three heaps. On some of these stones traces of red paint were observed.

Stone tools

Among the chipped tools pl. 50, no. 121 is flaked on one face only, and pl. 50, no. 122 is flaked on both faces.

The most interesting discovery was a special type of "neolithic axe", markedly oval in section, with its chief characteristic, a "waist" to facilitate hafting. Pl. 50, nos. 124 and 125 are oval in section; pl. 50, nos. 126 and 128 are roughly rectangular in section; pl. 50, no. 123 is nearly square in section and the body below the notches is rectangular in shape, bearing a general similarity with the faceted tools. Van Stein Callenfels thinks that they presuppose the existence of the "quadrangular adzes" (*i.e.*, faceted tools).

Pottery

Throughout the deposits of the three sites pottery fragments were encountered. The pottery was either plain or cord-marked, with exceptionally developed decoration on two sherds.

Beads

In all the three sites beads made from fish vertebrae occurred. Some were ground and others were so big that one might suppose them to have been used, not as beads, but as ear-plugs.

From a few skeletal remains it is conjectured that "secondary burial" was the general practice here. Powdered haematite was strewn over the face and lower jaw bone.

Excavations in Pahang

Pahang lies in central Malaya on the eastern side of the limestone massif. Its northern boundary is common with Kelantan.

Bukit Chintamani

Reference: M. W. F. Tweedie, 1936, Pp. 17-25.

Bukit Chintamani is a limestone hill about eleven miles south-east of Bentong in Pahang. The caves which were explored are situated in the eastern face of the hill about 100 feet above the base at the top of a steep jungle-covered scree slope. These caves are large and high and extend far into the hill.

The excavator speaks of stratified layers in the excavation. But a scrutiny of the description makes it clear that the actual "habitation" layer was only one, just below the superficial accumulation of the leaves and other surface material. From the habitation layer ash pockets and probably some objects had percolated into the lower red earth deposit. Below this deposit was noticed a layer of fine, graded white quartz sand, probably deposited by running water. Thus actually the objects found in the cave belong to a single period of occupation. The following objects were found.

Stone tools

Except two all the tools were coarsely chipped without any further grinding applied to them. They are mostly oval or oblong in shape and worked only at one end. The flattened sides are only partially worked. Some of the implements approach true "Sumatra" type.

Pl. 50, no. 130 is worked all over with secondary working at the sides. Pl. 50, no. 131 is similar. Pl. 50, no. 132 is narrower and shows retouch. Pl. 50, no. 133 is discoidal in form. Pl. 50, no. 134 is regular in shape and worked all over. One edge-ground tool is not illustrated here. Pl. 50, no. 135 is a limestone chopper found on the surface. It is lenticular in section. Pounding and grinding stones were also found.

Pottery

Numerous fragments of pottery were found. All of them were ornamented, usually with oblique cross hatching forming a rough diamond pattern, others were cord-marked.

Red ochre

Pieces of red ochre were of frequent occurrence throughout the habitation layer. Some stones had red paint sticking on to them.

Food remains

Charred and broken bones of animals, mostly mammals, with a few tortoise and fish, were abundant. Some shells were also found.

On the top some broken pieces of iron vessel were found.

Kuala Nyong

Reference: I. H. N. Evans, : 1928 a, Pp. 133-35; 1928 b, Pp. 143-44; 1929, Pp. 175-76; 1931 a, Pp. 51-62; 1931 b, Pp. 71-76.

Kuala Nyong site is about one and half miles below Kuala Taban and on the right bank of the Tembeling River. The site was accidentally exposed during the heavy floods of 1926-27, when a grass plain, which formed a promontory in the river, was cut through by the floods. The implements and pottery were recovered both from the new bed that the Tembeling River had torn for itself and also from the runnels in the adjacent bank. Later on excavations were conducted by I. H. N. Evans, whose description shows apparently two archaeological strata: (i) the top layer contained the materials of iron-using complex with coarse pottery and (ii) bottom layer contained the true "neolithic" complex.

In the first find 15 ground tools were obtained. Nine of them have been illustrated by Evans (1928 a, pl. LII). Pl. 51, no. 146 is a long chisel; pl. 51, no. 147 is a gouge adze; pl. 51, nos. 148-151 are faceted tools. One bark cloth beater was also found. Another important discovery was a chipped tool of amygdaloidal shape (pl. 51, no. 151 a). These were found in association with cord-marked pottery. An isolated find of a socketed iron axe (pl. 51, no. 151 b) is also reported from the same site.

In actual excavation the following materials were found in the bottom strata:

Stone tools

A number of stone adze-heads and axe-blades were found. The commonest

type was the long chisel already illustrated. Pl. 50, no. 142 is the smallest specimen of this type. Pl. 50, no. 140 is an unfinished specimen showing the flaking marks and wavy outline. Pl. 50, no. 136 is called "bent" axe. Pl. 50, no. 141 is one of the two examples of pointed stone instruments.

The most distinctive tools are, however, the stone knives. Five of the six specimens have been illustrated here (pl. 50, nos. 137-39, 144 and 145). Four of these have a distinct notch proximal to the cutting edge. Perhaps the blades were inserted in wooden handles. No. 138 is not ground at all, while no. 137 has only been sharpened partially.

Quoit-discs were also found. Grinding stones and slabs were also discovered. Pl. 50, no. 143 appears to be a legged grinding slab.

Pottery

Pottery bearing cord marks, banded ware, grooved ware with a herring bone pattern, chevron ornamentation was found. These were of coarse black ware.

Another type was of red ware. The specimens illustrated by Evans (1931 a, pl. XVIII, 5) appertain to the so-called "turn table".

From the top layers the objects recovered are very divergent. These comprised iron slags, Chinese porcelain, a couple of pieces of iron of somewhat indefinite nature and some earthenware fragments of different types. They are of blackish material, some washed outwardly with orange colouring and ridged longitudinally, the ridge having stripes on one side and diamonds on the other. Small pieces of plain reddish or brownish ware were also found.

To sum up, Kuala Nyong gives evidence of two periods of occupation: the bottom was characterised by a "neolithic" complex, though one chipped tool was also found; on the top was found a heterogeneous amalgam of objects which in any case cannot be dated earlier than the appearance of iron in this region. The evidence appears to show that the "neolithic culture" was in existence here when iron was introduced. But how far the use of metal became common in the Peninsula is difficult to say. It is more likely that the "neolithic culture" persisted in certain regions or at least among certain sections of people even when iron and Chinese glazed ware had arrived in the Peninsula.

Excavations in Johore

Johore is the southernmost province of Malaya. Very little is known of the sites in this province. Only one site has so far been excavated and reported.

Tanjong Bunga

Reference: M. W. F. Tweedie, 1953, Pp. 84-85.

Tanjong Bunga is situated on the mainland coast of the Johore Strait opposite the mouth of the River Berih on Singapore Island and about ten miles west of the causeway. An area about 40' wide and extending back from high water mark 20' was excavated by H. D. Collings. His section is reproduced here (See fig. 5 below), and the following description is based on his account.

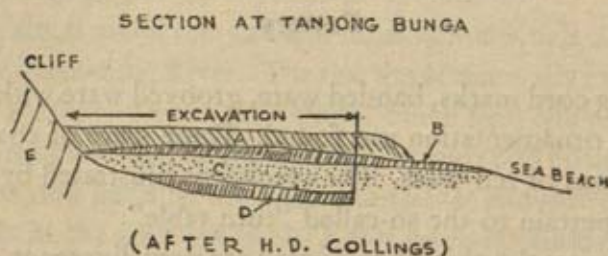


FIG. 5

The third layer C is at a depth of about 3' from the surface and consists of beach sand, taken by the excavator as being "formed as a shore deposit during a slight temporary advance of the sea". This sandy layer overlies a mangrove peat bed D and is also underlain by a peaty layer B. It is in this sandy layer and in the lower peaty bed that the stone implements were found. The sandy layer produced "small ground neolithic axes, flakes, pieces of haematite, resin and quartz microliths. Two more round-axes were found on the beach but none occurred in the excavation." It is also recorded, "From the lower peaty layer of the excavation four implements are in the collection. Two of these are small neoliths, one a blank, the other with a well-fashioned ground working edge."

In the illustrations given by Tweedie (1953, pls. 9 and 10) one can recognise the rounded butt axe, the faceted tools and flakes. No "microliths" have been illustrated. The excavator concludes, "The composition of the culture

found at Tanjong Bunga is completely different from any encountered previously in the Peninsula. Ground neolithic axes of rectangular shape are well-known, but have not been found before in association with round axes, which are rare in this country. The microliths are the first in Malaya and may possibly, have some cultural affinity with the obsidian microliths found near Bandung in Java."

Several more "round-axes and falkes" have been collected by Sir Williams-Hunt (1951, p. 191) on Ubin island, which lies in the eastern part of the Johore Strait. "Round axes" have also been found at Gua Madu in association with other ground tools (See pl. 48, no. 85). The nature of the microliths is difficult to ascertain. It may be simply quartz flakes. The excavator compares them with the microliths from Java. It seems that from that very source the "waisted" axes of Guak Kepah in the province of Wellesley were derived. Mr. M. W. F. Tweedie remarks, "The resemblance of the smaller implements to neolithic adzes is too strong to be coincidental, and there must be some connection with the Neolithic."

The classification of the ground tools in Malaya

H. D. Noone (1941, Pp. 210-17) has given a "classification of Malayan polished stone implements" but his classification is based on the assumption that the various types of the ground tools have originated from one common type, commonly known as "quadrangular adze" and that the evolution took place in Malaya. A general survey of the material in southern and eastern Asia shows that the evidence is not sufficient to justify any such assumption. What we can do in the present state of our knowledge is to recognise the existence of various types of tools and finally make a typological comparison. These completely ground tools of Malaya belong to the same category of tools referred to as Class III in Tonkin and Siam. They also occur in Burma, Assam and in the collections of group II from Bengal, Bihar and Orissa. But there are regional differences. This classification is given in order to understand the differences of types occurring in different regions.

The Malayan ground tools have also been placed under Class III in the description given above. The classification is based on the excavated material

as well as on the surface finds, especially made in the neighbourhood of Baling in Kedah by H. D. Collings (1936, Pp. 14-16). Large number of tools are also preserved in the British Museum, the most important among them are the shouldered tools of the irregular type, which are for the first time noted here. Five of these were collected for Henry N. Ridley by A. D. Machadeo on the east coast of the Malaya Peninsula in Pahang and Kelantan. Two more were obtained from Ulu Lipis in Pahang.

The tools have been divided into following sub-classes:

Sub-class (a): *Facetted tools*:

A general description of these tools has been given before (See Pp. 47-48). There are two main varieties of this type in Malaya:

(i) *Long and narrow type*:—Pl. 51, nos. 158-161 are examples from Baling. These are of the same type as those found at Kuala Nyong and other sites in Malaya and Siam. This is the predominant variety in Malaya. But such long and narrow varieties are extremely rare in Burma and India.

(ii) *Short and broad type*:—This variety has been found mostly in the province of Kelantan, and the best illustrated examples are known from Gua Musang and Gua Cha.

The cutting edge is produced by unifacial grinding (bevel) or by unequal bifacial grinding. There are rare examples of equal bifacial grinding (See pl. 51, no. 160).

Sub-class (b): *Shouldered tool*:

A general description has been given on Pp. 48-50. They have been found in two main varieties in Malaya: Generally speaking, they are very rare here.

(i) *Regular variety*:—Pl. 51, nos. 155 and 156 are examples from Baling. So far this variety has not been found in actual excavation.

(ii) *Irregular variety*:—Tweedie (1953, fig. 17) has illustrated one example from River Tembeling, Pahang. It is fairly regular but does not show properly sawn faces and angles. It has doubtfully been placed in this variety. But good examples of this variety are preserved in the British Museum. These are illustrated here: Pl. 52, no. 162 (B.M. no. 1951, 7.25: 62); pl. 52, no. 163 (B. M. no. 1951: 7.25:61); pl. 52, no. 164 (B.M. no. 1951: 7.25: 59); pl. 52,

no. 165 (B.M. no. 1951, 7. 25: 64); pl. 52, no. 166 (B.M. no. 1951: 7. 25: 60). Pl. 52, no. 167 (B.M. no. 1926: 2.10: 30); pl. 52, no. 168 (B.M. no. 1926: 2.10: 14). This variety has, also, not been found in the excavation.

Sub-class (c): "*Round Axe*":

A general description has been given before (See pp. 52-53 and 91-94). Typologically the Malayan examples are different from the rounded butt axe of the Peninsular India where the cylindrical variety, which is the only type known in Malaya, is rare. The Malayan examples are known from Gua Madu (pl. 48, no. 85), Tanjong Bunga and Ubin Island. This variety is also known from the Indonesian islands.

Sub-class (d): "*Splayed Axe*":

A general description has been given before (See Pp. 50-52). In Malaya they are found in two varieties:

(i) This is the usual variety found in most countries. It has concave sides and splayed edge produced by bifacial grinding. (See Tweedie, 1953, figs. 4 and 10).

(ii) This variety has straight tapering sides with only the cutting edge slightly splayed (pl. 51, no. 157; Tweedie, 1953, figs. 14-15). This variety is so far known only from Malaya and Siam.

Sub-class (e): "*Gouge Adze*":

Heine Geldern (1945) calls it "Pick Adze", but more generally it is described as "beaked adze". The term "gouge adze" is given by H. D. Noone. This type is apparently derived from the ordinary gouge without the scoop that occurs in the underside of the latter. The examples are illustrated on pl. 51, nos. 153-54. This type is also known in Siam, Burma, Haut Laos, and rarely in Assam and Cochin China. One example is known from Japan.

Sub-class (f): "*Gouge*":

Actual examples of gouge with scoop at the underside have been found in Malaya (See Tweedie, 1953, figs. 23-24). Examples are also known from Burma and Somrong Sen culture of Indo-China.

Sub-class (g): *Chisels*:

These have been found in two varieties:

(i) Completely ground specimens with unifacially ground edge (bevel) (pl. 51, no. 152). This variety is also known from Burma, Eastern India, and Somrong Sen culture of Indo-China.

(ii) Chipped variety of long tools, commonly called "bar chisels" or "celts" (See Tweedie, 1953, figs. 5 and 6). Two good examples are in the British Museum. (B.M. no. 1935: 10.22: 17 from Ulu Lipis, Pahang; B.M. no. 1935: 10.22:29 from Sungei Lepis, Pahang). This variety has also been found in Orissa and Bihar (See pl. 20, no. 23).

Sub-class (h): "*Waisted*" *Axe*:

This type has been found in large numbers at Guak Kepah (pl. 50, nos. 123-128). Some have been obtained at Gua Menterri (pl. 50, no. 129). No examples are known from other regions of South East Asia. But in Java they have been found (Heine Geldern, 1925 b).

Sub-class (i): *Knives*:

Knives have been found in excavation at Kuala Nyong (pl. 50, nos. 137-39, 144-45). These have a notch at one end for hafting. This type is also peculiar to Malaya.

Sub-class (j) *Ringstones*:

M. W. F. Tweedie (1953, figs. 28-29) calls them "perforated stone disc". A few examples were obtained in the recent excavation at Gua Cha, where they have been termed as "flanged bracelets" as they were found on the wrists of the dead bodies discovered. Similar ringstones have been found in Burma and China (See next section). Tweedie and Sieveking also note that similar examples are known from Indo-China, but I have not seen any from that country. This type is absolutely different from the perforated stone disc of India (See Pp. 94-95).

Summary and Conclusion

There is a marked regional difference in the stone age complex of Malaya.

In the province of Kelantan completely ground tools and pottery are predominant; in Perak chipped tools have been found in large numbers along with a few ground tools and some pot-sherds; in Perlis and Kedah along with ground tools chipped implements and flakes have been found. In the pottery collection glazed ware is known from Perlis and some painted sherds from Kedah; in the province of Wellesley along with ground and chipped tools an important discovery was of "waisted" axe; in Pahang a mixed industry is known; while in Johore only ground tools with flakes have been found.

It is only from the Kelantan province that a sequence of two complexes is known: the lower characterised with chipped tools and no pottery and upper with ground tools and pottery. The excavators claim that these sequences lay under a complex in which Chinese glazed ware has been found. But in Perlis this glazed ware has been reported in the second sequence. At Kuala Nyong in Pahang, the lower stratum appears to be of the same complex as the upper one of Kelantan. The upper stratum of Nyong has produced a complex in which iron tools have been found. The Johore finds and Guak Kepah complex appear to be of the second sequence.

The dating of these sequences is not very easy. M. W. F. Tweedie (1953, Pp. 63-64) has relied on the chronology of Heine Geldern (1945, Pp. 138-139) and dated the beginning of the neolithic complex between 2500 and 1500 B.C. But we have already shown that the arguments of Heine Geldern are not sound (See Pp. 101-2). The other clue is given by the find of a typical highly polished black ware, said to be "Greek or Attic" and dated between 4th and 2nd centuries B.C. The details about this pottery is not yet known. Its date may even come down to 1st century B.C. or A.D. if it is of the same type found at Arikamedu in South India. A few sherds of this pottery have been found in the second sequence at Gua Cha in Kelantan. The evidence from Gua Bintong in Perlis further suggests that in that cave at least this complex continued even when Chinese glazed ware was introduced there, while Kuala Nyong suggests that this complex underlay the materials containing iron tools of the type found in Malayan grave complex.

SECTION IV

BURMA

Introduction

Neolithic culture of Burma is represented mainly by stone tools. Recently "matt or cord-marked ware" has been found in association with ground tools by the American Expedition. According to the description given, "the ware is of a coarse texture, comprises numerous grits and is a light brown or reddish color." (De Terra & Movius, 1943, Pp. 381-82). This pottery is hand-made, and though its forms are difficult to determine from a few fragments illustrated (See *ibid*, fig. 74, nos. 106-8; and fig. 75, nos. 116-17), it appears that in general it is of the same type as that found in Malaya, Tonkin and Siam.

Classification of tools

As in Indo-China, Siam and Malaya, the stone tools have been divided here into three classes: I. chipped tools; II. edge-ground tools; and III. completely ground tools.

Class I: *Chipped tools*:

This class includes tools which were produced only by the technique of chipping, the technique being inherited from the palaeolithic times. The distinction between the Old and New Stone Age is thus set forth by Movius: "The material associated with the old land surface at the base of the top soil at Kyaukpadaung, and with the Magwe sand on the left bank of the Irrawaddy, marks the first really significant typological break in the Stone Age sequence of Upper Burma. Whereas during Palaeolithic (Anyathian) times large tools, generally made on cores, are typical, the post-pleistocene development witnessed the introduction of a blade and flake technique, with the result that most of the implements are small. It therefore seems evident that a new culture replaced the Anyathian. Now for the first time the extensive outcrops of fine-grained silicified tuff in the Mt. Popa region were exploited, and other materials such as vein quartz were used as well. Of the latter rock there is an abundant supply

in the Irrawaddian beds, but the fine-grained silicified rock was brought from the vicinity of Mt. Popa. Fossil wood continued in use. Owing apparently to its inherent properties rather than to a continuity of tradition, types of hand-axes and scrapers are found similar to those of Anyathian. Indeed, as has been pointed out, implements made of fossil wood are of the same fundamental type in Upper Burma from Lower Palaeolithic times down to the period when stone tools went out of common use. The fact of their late survival is demonstrated by the presence of pottery and polished stone at several of the sites." (De Terra & Movius, 1943, p. 386).

Class II: *Edge-ground tools*:

This class of tools is akin to those of class III in so far as same materials have been used in both, and the types of this class are also derived from them with the difference that perfect straight-sided varieties are not known here. This difference is due to the techniques used in the manufacture of these tools. Here we find only two processes: chipping which produced the rough shaped tool, and grinding which is used for producing the cutting edge. The grinding hardly extends over the faces and the butt always remains rough. The sawn tools are absent from this group. The main type occurring in this class is a rough copy of the faceted tool.

Class III: *Completely ground tools*:

This class differs completely from class I in the types of tools preferred, the materials used, and the techniques followed. On the materials used, Movius remarks, "The polished stone tools are mainly of metamorphic rocks—fine-grained schist and slate—as well as basalt which have been heavily weathered." (De Terra & Movius, 1943, p. 380). T. O. Morris has given further details on this point: "The materials of the three hundred or so implements of these types which I have examined in various parts of Burma are apportioned thus:

Silt stones	... 70 per cent.
Schists	... 10 per cent.
Dolerites	... 10 per cent.
Porphyries	... 4 per cent.
Sandstones	... 6 per cent.

"It is noteworthy and rather peculiar that the felsite pebbles of the terrace gravels, so much used by the chipped implement makers, should have been practically neglected in Neolithic times. I have seen only two or three neoliths, from Burma proper, made of felsite; yet this material would have been quite suitable for the manufacture of the common types of ground and polished implements. The majority of Mr. Braybon's specimens from Mergui district, however, are made from somewhat similar (chalcedony etc.), derived from the granite intrusions of that region." (T. O. Morris, 1935, p. 9). In view of our knowledge of the ground tools from Indo-China, Siam and Malaya, we should not be surprised with the evidence of materials available from Burma, as they are almost identical in those countries.

This class consists of the following types of tools: Facetted tool, Shouldered tool, Splayed axe, Wedge, Chisel, Gouge, Gouge-adze, ring-stone and hammer-stone. These types fully agree with the neolithic implements found in other countries of South East Asia. They have no connection at all with the tools of class I.

In the manufacture of these tools the most important process is the technique of grinding which covers the whole tool from the cutting edge to the butt. It completely smooths down any roughness which might have been visible on the body of the tool. But before this process of grinding was applied it appears that a rough shape was first produced by the simple technique of chipping. The pecking technique is hardly noticeable on these tools. Moreover, the square-cut forms of the facetted and shouldered tools further indicate that a process of wire-sawing was used in their manufacture. This point was realised by Morris and he has suggested that the ring-stones were used for this purpose. He writes, "It would be impossible to pass anything larger than a very small child's hand or foot through the central hole of any of the four Burma ring-stones under discussion. It seems much more probable that these latter were used as slitting, grinding and polishing discs for the manufacture of the late Neolithic shouldered adzes etc. The ends of linear notches, such as would be made by a sharp-edged ring-stone mounted on a lathe, often remains at the intersection of shoulders and tang of the shouldered adzes, and it requires but little experience of lapidary work to realise that without some such rotary abrasive assistance it would have

been an extremely difficult and laborious task to produce the perfect rectangular form, plane faces, and high polish." (Morris, 1935, Pp. 11-12). Morris is right when he says that the sharp angles and perfect straight sides could not be produced only by the process of grinding, but it is hard to agree with him when he attributes to these tool makers the art of rotary motion since so far no wheel-made pottery has been found in association with these tools in Burma, nor have we any evidence for the use of wheeled vehicle in this region at this time. On the other hand, even today at Agra (India) the process of wire-sawing is used with an abrasive to cut pieces of precious stone for filling into the flowery grooves of Taj Mahal. At Dacca in Bengal the same process is used now by a people called *Sankharis* to cut and shape shell bangles and beads and other ornaments. The ring-stones have now been proved to be used as bracelets by the recent discovery at Gua Cha (Tweedie & Sieveking, 1955, fig. 21).

Distribution and Stratigraphy

The tools have been collected mainly from three natural regions of Burma (for natural regions of Burma, see Dudley Stamp, 1952, Pp. 361-65): (1) The northern hills including much wild country sparsely inhabited by Kachins and Shans; (2) The Shan Plateau which coincides with the Federated Shan states and is a continuation of the Yunnan plateau of China and northern Siam. It is sparsely inhabited by hill-tribes, of which the Shans are the chief, but which include also Kachins, Palaungs and Was; (3) The Dry Belt occupying the heart of Burma, where numerous neolithic finds have been made in and around Prome, Thayetmyo, Magwe, Yenangyaung, Mount Popa and in the districts of Myingyan and Mergui. So far no search has been made in the lime-stone caves of Burma (Annandale & others, 1913, Pp. 391-424).

Most of the finds are surface collections. One of the early collectors, Mr. Mackenzie, remarks, "The implements were usually turned up by the plough when the cultivators ploughed their fields. It is hopeless to try to dig for them." (Quoted by Coggin Brown, 1931, p. 39). T. O. Morris was the first person who attempted to relate them to geological sequence (Morris, 1937). But the definite proof of such a correlation was for the first time supplied by the American Expedition, which examined the sites along the Irrawaddy, between Magwe

on the south and Nyaungu on the north. It is reported, "Here implements and charcoal were found at the base of a deposit of loose red sand, which may attain a thickness of 4-5 feet. According to De Terra, this sand, because of its structure and grain size, is of eolian origin, and it has been called the Magwe sand. Not only is it found on the surface of the plateau, but in places it overlies the Nyaungu Red Earth. In addition to Magwe, Neolithic material was found at Minbu, Yenangyaung, Chauk, Pagan and Nyaungu; in the vicinity of Kabani, east of Nyaungu, several typical implements were collected at the base of small gullies carved into the Nyaungu Red Earth. These had apparently been washed down from the surface of the deposit. At the Kyaukpadaung site which is at the base of Mt. Popa near the village of Sebauk in the valley of a small stream, the Sai Chaung, a tributary of the Taungzin Chaung, the archaeological horizon is at the base of a soil similar to the Magwe Sand and of similar age. It is 2-7 feet thick and composed of loose brown silt containing volcanic ash. Below is a second layer of brown ash from Mt. Popa overlying a bed of light gray volcanic material containing silicified tuff—one source of the raw material used by Neolithic man. These deposits are clearly exposed along the eastern side of the Sai Chaung Valley. On the opposite side of the Valley there is a deposit of brown sandy silt containing bands of black clay, where we collected bones and teeth of Horse (? Ass), Deer, Antelope, and Bos, possibly of banting type." (De Terra & Movius, 1943, p. 378).

On the basis of this stratigraphy it has been shown that what T. O. Morris (1935, Pp. 5-7) assigned to the Upper Palaeolithic period on consideration of his typological study, really belongs to post-pleistocene times. But while this main point was established, the importance of the ground tools and pottery, which were found in association with this so-called "blade and flake" industry, was left over in a general statement of the position of the New Stone Age in Indo-China and Malaya. The completely ground tools have nothing in common with the chipped class. These two classes of tools belong to different traditions: the chipped tools continuing the local tradition from the palaeolithic period, and the completely ground tools appearing suddenly in this region from outside. The edge-ground tools have closer affinity with those of class III in the use of the same material as well as in the technique of grinding applied to

their cutting edge, but they have also some relationship with the chipped tools as chipping can still be seen on their body. Whether there is any difference in the methods of chipping in the tools of classes I and II, is difficult to say. The association of the edge-ground tools with the chipped tools definitely fixes the date of the latter to a very late date almost synchronous with the existence of the completely ground tools. This conclusion is further supported by the find of a ring-stone at Minbu in association with the tools of classes I and II (De Terra & Movius, 1943). This ring-stone is said to be of the same type as found by T. O. Morris. It has been shown before that this was really a flanged bracelet, and it belongs to class III. Hence we can speak of two traditions of stone working flourishing side by side in Burma, though they may have belonged to two different communities of peoples. This conclusion is also borne out by the evidence from Malaya, Siam and Indo-China.

The tools are described below:

Class I: *Chipped tools*:

There are many types of tools in this class, some of which show affinity with the local palaeolithic implements, while others are entirely new.

Variety (a): *Chopper-chopping tool*:—Pl. 55, no. 2: This is Movius (De Terra & Movius, 1943, henceforward referred to simply as Movius) pl. 75.112. Silicified tuff. Magwe, locality 1. It is described as a "chopping tool" and is said to be "typical of this locality". Such tools also occur in Anyathian (See Movius, fig. 65). Similar specimens have also been found in the Hoabinhian culture of Indo-China (See pl. 24, nos. 1-4 and pl. 25, nos. 20-24).

Variety (b): *Hand-adze*:—Pl. 55, no. 8: This is Movius, fig. 73.83. Fossil wood. Kyaukpadaung. Movius is doubtful whether it should be "classified as a small hand-adze or a large scraper" but compares it with the palaeolithic tools (Movius, fig. 59.10 and 12). The latter are described as medium-sized hand-adzes.

Pl. 55, no 12:—This is Movius, fig. 74.99. Kyaukpadaung. This type is described as "concave scrapers probably used for fashioning wooden or bone shafts". But it is similar to the palaeolithic tool, Movius, fig. 60.19, which is described as "concave-ended Hand-adze".

Variety (c): *Pick or digging tool*:—Pl. 55, no. 1:—This is Movius, fig. 73. 81. Kyaukpadaung. This is described as a “pick, roughly flaked and with a triangular section”. But it is similar to the palaeolithic type, Movius, fig. 58. 3, which is described as “pointed double-sided chopper”. This type is very common in South East Asia, and has been found in Siam (pl. 42, nos. 9, 11-13) and in the Hoabinhian culture (pl. 24, no. 10; pl. 25, no. 33 and pl. 26, no. 64).

Variety (d): *Scrapers*:—These are entirely new types:

Pl. 55, no. 3: This is Movius, fig. 73. 82. Kyaukpadaung. It is described as a scraper of large form extensively worked on one side and across one end.

Pl. 55, nos. 6-7: These are Movius, fig. 73. 90 and 92. Kyaukpadaung. These are described as small end-scrapers made on flakes, the bulbar portion of which is usually broken off.

Variety (e): *Used flakes, blades and flake tools*:—These are new types.

Pl. 55, nos. 4 and 5:—These are Movius, fig. 73. 85-86. They are described as small flakes showing use marks.

Pl. 55, no. 11:—This is Movius, fig. 77. 139. Minbu. Silicified tuff. It is described as “a perforator with inverse retouch”.

Pl. 55, no. 13: This is Movius, fig. 77. 140. Minbu. Silicified tuff. It is described as “a blade implement with a deep notch on the right side”.

Class II: *Edge-ground tools*:

Pl. 55, no. 15: This is Morris (1935), pl. VI. 2. It is a roughly shaped axe of green silt-stone, from Taungle, Prome district. Only the cutting edge shows grinding, while the body retains roughness.

Pl. 55, no. 16: This is Morris (1935), pl. VII. 2. It is little better formed than the previous example. The cutting edge is broader, produced by unequal bifacial grinding.

Pl. 55, no. 9: This is Movius, fig. 74. 105. Material described as “fine-grained, metamorphosed, light green stone, of the slate variety”. The butt still shows chipping marks and the cutting edge produced by grinding. Found at Kyaukpadaung in association with chipped tools.

Pl. 55, no. 10:—This is Movius, fig. 75. 109. Basalt. Magwe. Movius remarks, “Its round edge as well as one side have been sharpened by the removal

of short flakes subsequent to the original polishing." Does it mean that it was re-used later?

Pl. 55, no. 14:—This is Movius, fig. 77. 136. Schist. Minbu. It is of rectangular shape with one end broken.

Class III: *Completely ground tools*:

Variety (a): *Facetted tool*:—Pl. 55, no. 17: This is Morris (1953), pl. VII, no. 4. Thakat in Patolon Chaung, Lower Chindwin district. Green silt stone. It is trapezoidal in shape with its cutting edge produced by bifacial grinding.

Pl. 55, no. 18: This is Morris (1935), pl. IX, no. 1. Mansingale in Katha district. Green silt stone. It is of broad type with almost parallel sides and the cutting edge produced by unequal bifacial grinding.

Pl. 55, no. 21: This is preserved in the British Museum (no. 55, dated 5.4.1953). Collected at Mogok by a missionary. It is of a long and narrow type with parallel sides and unifacially ground cutting edge. The type more or less resembles the Malayan long variety, class III (a-i).

Pl. 55, no. 22: This is also from the British Museum, no. 53, from Mogok. It is slightly broader than the previous example.

Variety (b): *Splayed axe*:—Pl. 56, nos. 23 and 24: These are Morris (1935), pl. X, nos. 1 and 2. Porphyry. Kachin Hills. N. G. Cholmeley collection, British Museum. No. 24 is more splayed than no. 23. Both have bifacially ground median cutting edge.

Variety (c): *Gouge-adze*:—There are many examples of actual gouges in the collection of the British Museum. The following differ from the gouges as they do not have scoop at the base.

Pl. 56, no. 25: This is Morris (1935), pl. X, no. 3. Chalcedony. Leipok Chaung in Mergui district. Morris describes it as "pointed adze".

Pl. 56, no. 26: This is in the British Museum, no. 52, obtained from Mogok.

Variety (d): *Shouldered tool*:—In Burma only regular type has so far been found. They fall into two sub-varieties: (i) Those with broad body, (ii) those with exceptionally long body.

Sub-variety (d-i): Pl. 56, no. 27: This is in the British Museum, no. 54, from Mogok. Greenish gray stone. The cutting edge is unifacially ground (bevel).

Pl. 56, no. 29: It is from Coggin Brown (1931). It is the smallest variety of this type.

Pl. 56, no. 32: This is Morris (1935), pl. VII, no. 6. Thakat in Patolon Chaung, Lower Chindwin district. It has unifacially ground cutting edge.

Pl. 56, no. 31: This is also Morris (1935), pl. VII, 5. Dolerite. Magyebin, Maton Chaung, Thayetmyo district. The cutting edge is slightly convex and unifacially ground.

Sub-variety (d-ii): Pl. 56, no. 28:—This is Morris (1935), pl. IX, no. 2. Monbin, Patolon Chaung, Lower Chindwin district. Dark green silt stone. It has also unifacially ground cutting edge.

Pl. 56, no. 30: This is Morris (1935), pl. IX, no. 3. Yaguay, Tavoy district. Fine-grained slate. It is also unifacially ground edged type.

Variety (e): *Wedge*:—Pl. 55, no. 19: This is Morris (1935), pl. VIII, no. 2. It is described as a wedge of dolerite from Monbin, Patolon Chaung, Lower Chindwin district. The cutting edge is formed by bifacial grinding. The butt is flat. It has some resemblance with the wedge-shaped axes of India (See P. 94), but its cutting edge is not so broad. The wedges from the Naga Hills in Assam are very rough. There only the cutting edge is produced by grinding.

Variety (f): *Chisel*:—Pl. 55, no. 20: This is Morris (1935), pl. VIII, 4. It is described as a chisel-blade of green silt stone from Pwinga, Patolon Chaung. It may be a miniature faceted tool. Such a small chisel is not known in this region.

Variety (g): *Tanged Axe*:—In the Museum of Archaeology and Ethnography, Cambridge, some examples of this type are preserved. Their technique of manufacture is exactly the same as the tanged axes of Assam (See P. 54).

Movius (fig. 76.134) illustrates one "spindle-whorl" from Magwe. So far no other spindle whorl is reported from any other country in South East Asia.

Ring-stones have not been illustrated here. One was found at Minbu in association with chipped tools (Movius). Others have been illustrated by T. O. Morris (1935), Coggin Brown (1917) and Theobald (1873). These ring-stones have their edges sharp like the Chinese jade specimens (See Anderson, 1943,

pl. I, nos. 1-2). Similar examples have also been found in Hanchow excavation, Szechwan, by D. C. Graham (1933-35, Pp. 114-131). The evidence from Gua Cha (Tweedie & Sieveking, 1955, fig. 21) proves that they were used as bracelets.

Summary and Conclusion

The neolithic culture of Burma belongs to the same general type as is found in other countries of South East Asia. But there are regional differences. The chipped tools of Burma form a different group by themselves, though there are a few examples which bear resemblances with the types in Indo-China and Siam. Very few edge-ground tools have been so far found. The completely ground tools have many varieties common with Malaya, but all the types of Malaya do not occur in Burma. The completely ground tools of Assam appear to have been derived from Burma, but regional differences are, again, marked.

CHAPTER VII

CONCLUSION

EASTERN India is not a homogeneous zone having any distinctive cultural grouping of its own. It is comprised of several natural regions falling today into two broad divisions: (1) centripetal areas of the river basins, and (2) refuge areas of the hills and plateaus. These areas have been exploited differently by man at different times, influenced as they were by monsoonic climate.

However, Eastern India is a part of the Indo-Pakistan sub-continent, and has through all the periods of human history shared the cultural life of the sub-continent. There is a land connection with South East Asia, and the Tertiary Ranges form transitional zones, now occupied by several hill tribes whose cultures show evidences of such contact. The Bay of Bengal could, again, serve as a sea-way but only after a knowledge of the monsoonic winds had been gained. The relationship of Eastern India with South East Asia has been correctly put by F. J. Richards (1933, p. 235) thus: "The eastern frontier is difficult; true the Burmese and Shans have ravaged Assam, and the Arakanese East Bengal; but the flow of Indian influence is eastward, penetrating Indo-China and the isles as far as Borneo. The meeting points of Chinese and Indian cultures are in Turkistan and North Annam."

It has been shown in chapter II that the palaeolithic industry of Eastern India is related to the Peninsular complex, and has no affinity at all with the Anyathian of Burma. So far no microliths comparable to Eastern Indian industry have been found in the mainland of South East Asia, except a few unpublished quartz flakes, called "microliths", at Tanjong Bunga in Malaya (See Section on Malaya). As far as the Neolithic is concerned, our knowledge in Eastern India is limited to ground stone tools, while in mainland South East Asia pottery has also been found and in Malaya and Indo-China we further get bone and shell implements and ornaments, beads, pendants, bracelets, earplugs, terracotta balls and discs, seals and seal-impressions, dabbers and bark-cloth beaters, besides heaps of shells and bones found in midden remains.

The Eastern Indian neolithic complex can be broadly grouped under two heads: (1) the Bihar-Bengal-Orissa culture complex, and (2) the Assam culture complex. As has been shown in chapter V, the first has two groups of tools: group I consists of typically Indian types; and group II shows a mixture with foreign types that are well-known in South East Asia. Though stratigraphic evidence is lacking, field-observations suggest that the group I tools are possibly earlier than the group II tools. The Assam materials can also be classed broadly into two groups: group I including indigenous tool types almost restricted to the various zones of Assam; and group II including common types, wholly foreign, identical with some of the types of Yunnan and Burma. Apparently there is no chronological distinction between these two Assamese groups. On the other hand, evidence has been quoted in chapter IV that stone tools, to a certain extent, continued to be used by the hill people as late as the beginning of the last century.

It is the appearance of the foreign types in Assam, Bengal, Bihar and Orissa that has led scholars to propound various hypotheses, two of which are important: (1) E. C. Worman writes, "Indian smoothed stone celts of 'Neolithic' type, regardless of their cultural affiliations, appear to be derived from the eastward." He further says, "The eastern half of India belonged to a fairly large south and east Asiatic area throughout which the evolution of post-pleistocene prehistoric cultures was apparently more or less similar. In the early periods, this area seems to have included much of India, Burma, south east Asia, and southern China. In the later ones, it was apparently confined in the west to the easternmost provinces of India but expanded in the east to include parts of north as well as south China." (Worman, 1949, p. 199). (2) The other is the well-known theory of the shouldered tool being brought to India by the migration of Austro-Asiatics.

Evidence has been given in chapter V suggesting that Indian neolithic complexes are fundamentally different and in their early stage show no influence at all from the East. In a later stage foreign types begin to appear, but they occur in a context that is wholly Indian. Their appearance does not prove any cultural affiliation of Eastern India with South East Asia, but at best establishes contact and borrowings, natural to countries so close to one another. It has

also been shown (See Pp. 101-2) that the archaeological materials in India do not justify linking up these foreign types with the migration of the so-called Austro-Asiatics. These points are further clarified when we survey the "neolithic"¹ cultures of mainland South East Asia.

The "neolithic"¹ cultures of this vast area fall in five broad divisions: (1) Bac-Son, (2) Hoa-Binh, (3) Somrong Sen, (4) Siam-Malaya, and (5) Burma. In almost all these divisions we find two concurrent cultural traditions persisting side by side: (i) the cultures using predominantly chipped stone tools in a stage of food gathering; and (ii) the cultures using predominantly ground and sawn tools along with pottery and other essentials of life in a stage of food production. The first, as has been shown in the case of Burma (where alone the palaeolithic industry has been properly studied), continues the tradition from the Old Stone Age, but its early dating is still a matter of doubt. It may, however, be assumed that it was the main cultural tradition obtaining in these countries before the appearance of the second type of cultures. The second type of cultures show greater homogeneity in their technical achievement but in their material equipment they differ from division to division. Hoa-Binh is the most backward area, while Bac-Son has produced some recognisable features of this cultural type. It is mainly in Somrong Sen and Malaya that it is fully represented, while Siam and Burma are backwaters. This picture may be due partly to uneven research done in these areas, but the present evidence is highly suggestive.

However, it is now clear that these are two predominant cultural traditions in mainland South East Asia. The other minor features, like the edge-ground tools are a by-product of the intermingling of these two traditions. It is also clear that the second cultural tradition is not native to South East Asia. A complete change from the food-gathering stage to a food-producing economy with a material equipment having no connection at all with the first type of cultures, suggests an intrusion from outside, from a region where such economies must have already existed. It is not easy, however, to find such a region and demonstrate the way in which the new cultural type or ideas reached here from that region.

¹ Reference should be made to Pp. 105-107 for the use of this term.

A study of the materials in the Somrong Sen culture indicates a link with the Hong Kong culture of South East China, while Malaya follows a close second in this link, though there are some distinctive types, like the splayed axe (class III *d* ii, see p. 209), that are peculiar to Malaya, and there are other features, like the "waisted" axe, that seem to relate Malaya with the Indonesian Islands. On this evidence sea communication seems likely.

On the other hand, Yunnan, Laos and Burma have produced some materials which are technically of the same nature and show typologically some resemblances to the types in Somrong Sen and Malaya. Nevertheless there are differences, *e.g.*, the shouldered tool and the gouge-adze are absent from Yunnan, while these link Laos and Burma with Malaya and Siam. There are, thus, some hints for cultural infiltration directly by an overland route. But the poverty of the materials from Bac-Son and Hoa-Binh, even as far north as Kwangsi and Kwangtung, must be borne in mind, before any hypothesis is put forth. Most of these types disappear when we come to Assam, where only two main types, the faceted and shouldered tools are present. In other parts of India the shouldered tool is known, while the faceted tool and splayed axe are limited to Eastern India.

It must also be pointed out that in South East Asia we have a distinct cultural grouping of the materials related to the second type. Stone tools are one of the features of this cultural grouping. From this complex a single type of tool, such as the shouldered tool, cannot be torn of its context and attributed to the so-called "Austro-Asiatics".

The most important point to realise is the fact that the square-cut implements like the faceted tool or the shouldered tool require a particular technique for their manufacture. Such square-cut forms are not easy to obtain by the ordinary processes of chipping and grinding. In order to get right angles at the corners and perfectly straight sides, one must use a sawing technique, using at least a wire and an abrasive. Without some such process it is difficult to understand how these perfect forms could be produced? The examination of the specimens shows that this process was actually used. Such a degree of perfection in stone working is hardly justifiable unless one is copying a metal form. The earliest evidence of the shouldered type in bronze comes from Anyang where they have

been dated to the Yin dynasty (1300-1028 B.C.: Bernard Karlgren, 1945, Pp. 101-143). These bronze specimens have invariably been found in graves, and hence they are generally known as ceremonial axes. It is hard to believe that such axes should be found in graves without their being actually used in life. So far we know of very few specimens in stone outside the grave finds, and these come from Honan (See chapter IV, and also Andersson, J. G., 1947, pl. 57, 1-8, and pl. 122. 4). These stone specimens are very irregular, and both J. G. Andersson and Bernard Karlgren believe purely on typological basis that the bronze specimens are perfected copies of the stone type. But it is noteworthy that the stone specimens have been found so far only on the surface. From this very cultural area of China comes the faceted tool, termed by J. G. Andersson the "square-cut" axe or the "pen" (See Andersson, 1947, pls. 125-126). Examples have been obtained from a context in which metal was in use.

The infiltration of this northern Chinese culture into the south is known from the excavations carried out in Szechwan (D. G. Graham, 1933-35, Pp. 114-131) in south west China and in Fukien province of south east China and Hong Kong. There is, no doubt, that it penetrated further south into our region, where it is recognised as "developed neolithic cultures" of the coastal plains and the river valleys.

It follows that the appearance of this cultural tradition in South East Asia is hardly likely to be earlier than the date assigned to it in Anyang. On the other hand, the evidence from Hong Kong, Somrong Sen and Malaya indicates a date somewhere about the second half of the first millennium B.C. for its existence in these regions. The persistence of this tradition in these regions even when iron and bronze were introduced, is known from several sites in Indo-China and Malaya.

The foreign types, appearing in India, are traceable to secondary sources in Burma, Yunnan and Malaya, and hence the date of their appearance may be even later, and well within the historical period, or what we have preferred to call in the title of our thesis, the protohistoric period. The evidence from India is, therefore, quite in keeping with this late dating.

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B.D.C.R.I.	Bulletin of the Deccan College Research Institute, Poona.
B.E.F.E.O.	Bulletin de l'Ecole Francaise d'Extreme Orient, Hanoi.
B.G.S.C.	Bulletin of the Geological Society of China, Peking.
B.M.F.E.A.	Bulletin: Museum of the Far Eastern Antiquities, Stockholm.
B.R.M.	Bulletin of the Raffles Museum, Singapore.
B.S.A.P.	Bulletin, Societe d'Anthropologie de Paris.
B.S.G.I.	Bulletin du service geologique Indochine, Hanoi.
G.R.I.	Geographical Review of India, Calcutta.
J.A.R.S.	Journal of the Assam Research Society, Gauhati.
J.A.S.B.	Journal of the (Royal) Asiatic Society of Bengal, Calcutta.
J.B.O.R.S.	Journal of the Bihar and Orissa Research Society, Patna.
J.B.R.S.	Journal of the Burma Research Society, Rangoon.
J.F.M.S.M.	Journal of the Federated Malaya States Museums, Singapore.
J.M.B.R.A.S.	Journal of the Malaya Branch of the Royal Asiatic Society, Singapore.
J.M.G.A.	Journal of the Madras Geographical Association, Madras.
J.R.A.I.	Journal of the (Royal) Anthropological Institute, London.
J.S.S.	Journal of Siam Society, Bangkok.
J.W.A.S.	Journal of the Washington Academy of Sciences.
J.W.C.B.R.S.	Journal of the West China Border Research Society.
M.G.S.I.	Memoirs of the Geological Survey of India.
M.S.G.I.	Memoire du service geologique Indochine, Hanoi.
P.A.S.B.	Proceedings of the Asiatic Society of Bengal, Calcutta.
P.C.P.F.E.	Proceedings of the Third Congress of the Prehistorians of the Far East, Singapore.
P.I.S.C.	Proceedings of the Indian Science Congress.
P.P.S.	Proceedings of the Prehistoric Society, London.
P.R.G.S.	Proceedings of the Royal Geographical Society, London.
P.R.I.A.	Proceedings of the Royal Irish Academy, Dublin.
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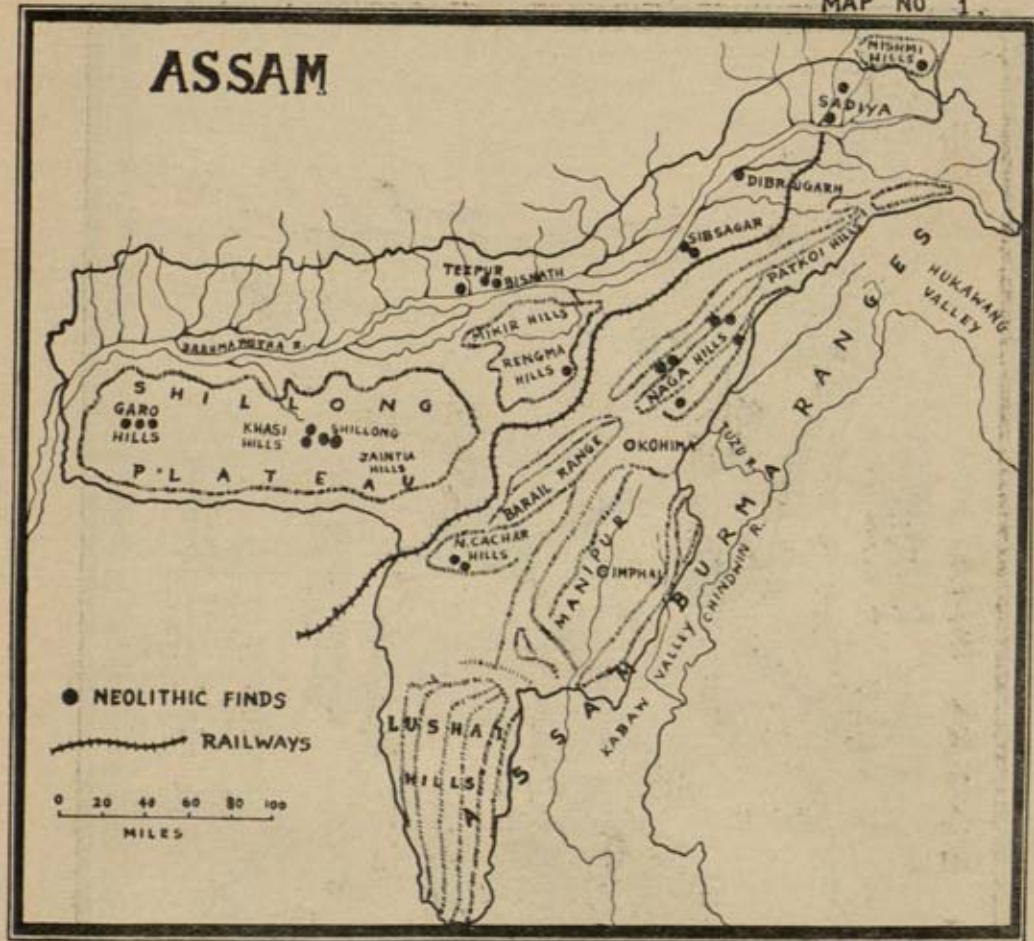
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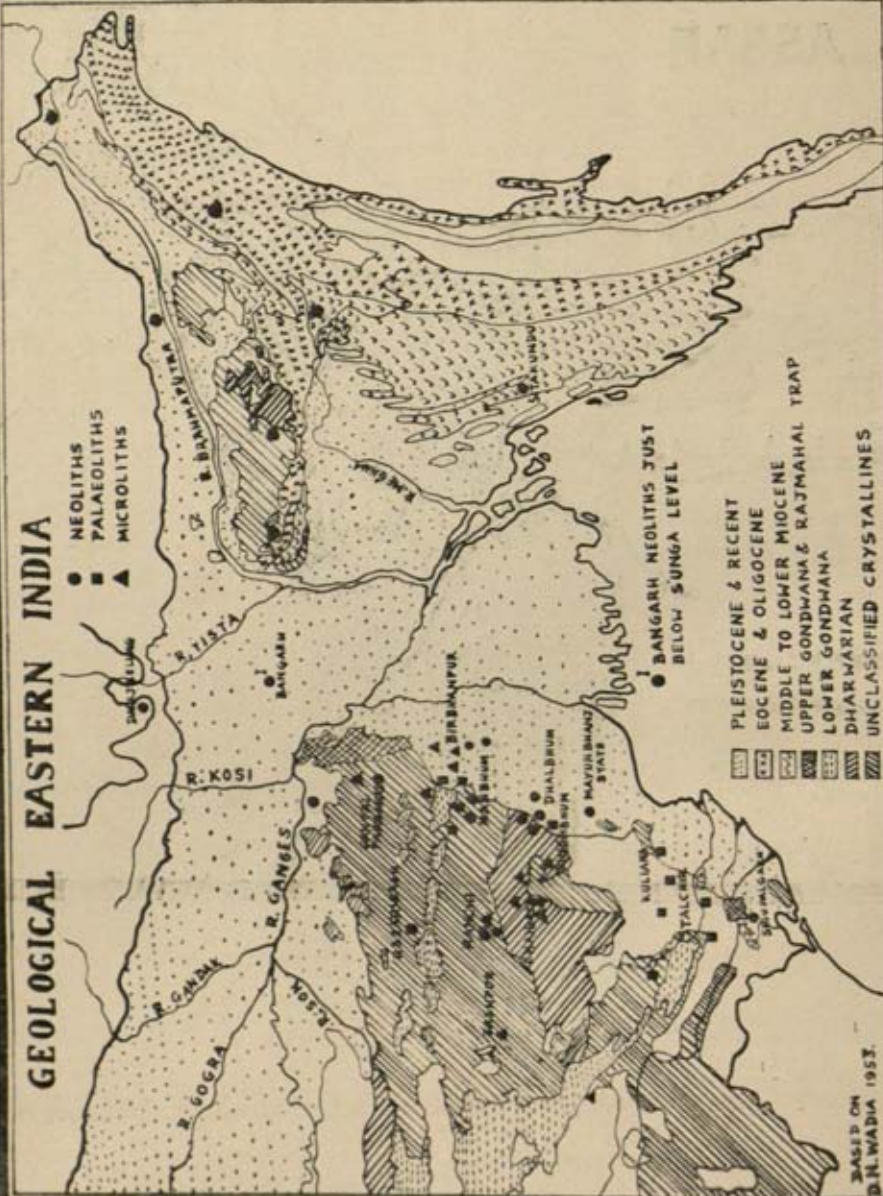
ASSAM

PLATES

ASSAM

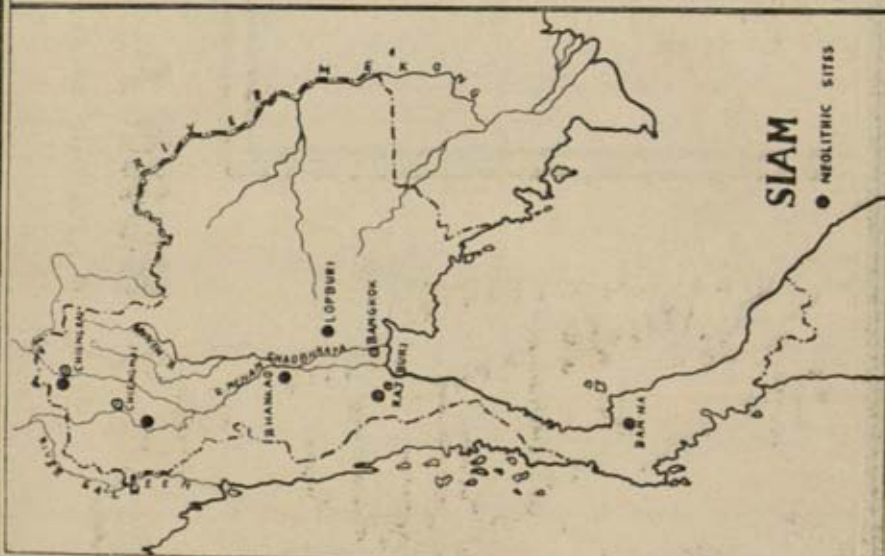


GEOLOGICAL EASTERN INDIA

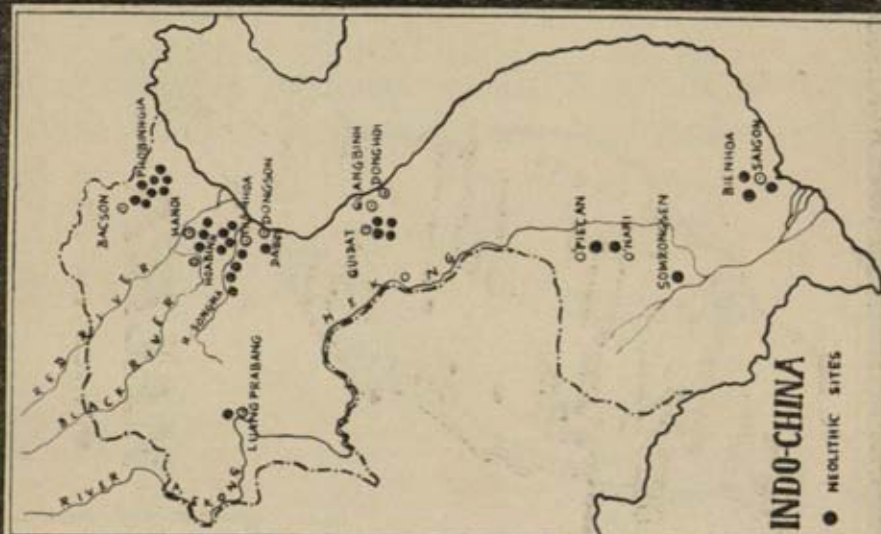


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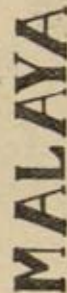
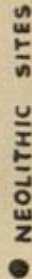
MAP NO. 3



MAP NO. 4



MAP NO. 6



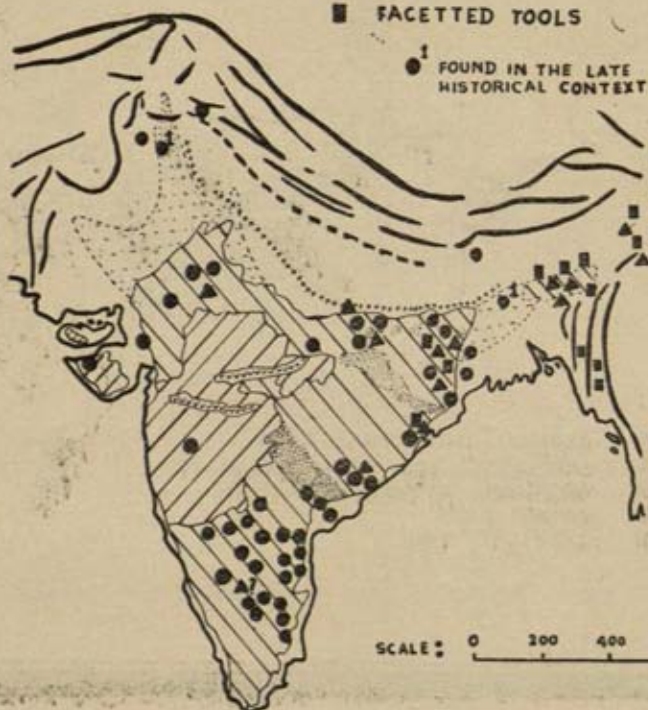
● NEOLITHIC SITES

INDIA AND PAKISTAN

STRUCTURAL BACKGROUND SHOWING NEOLITHS

- ▲ SHOULDERED TOOLS
- AXES
- FACETTED TOOLS

① FOUND IN THE LATE HISTORICAL CONTEXT



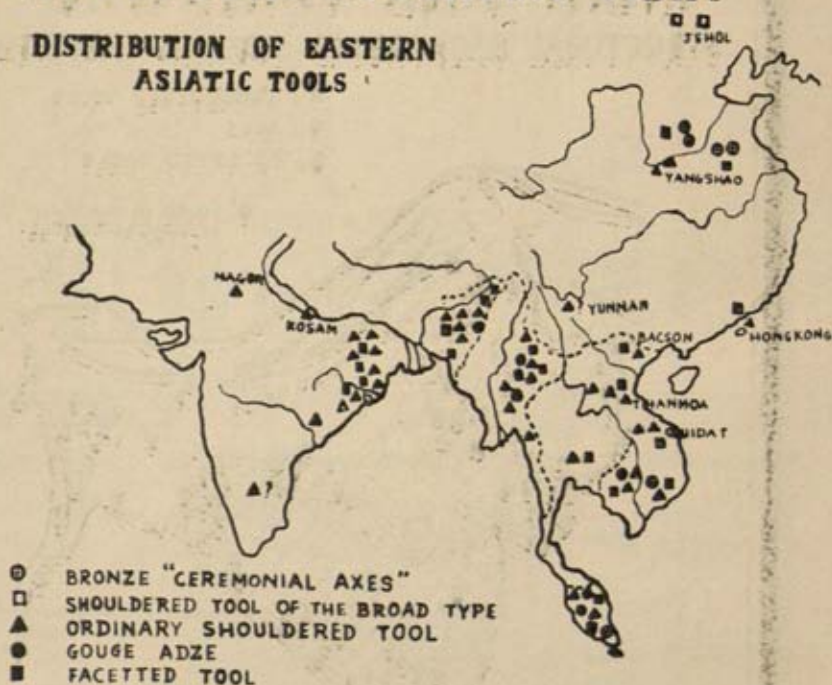
SCALE : 0 200 400 600 MILES.

- ~ TERTIARY RANGES
- BOUNDARY OF INDO-GANGETIC TROUGH
- /// PENINSULAR BLOCK
- CONCEALED EXTENSION OF PENINSULAR BLOCK
- /// DECCAN LAVAS
- /// GONDWANA TROUGHS
- /// NARBADA AND TAPTI TROUGHS

MAP AFTER O.H.K. SPATE.

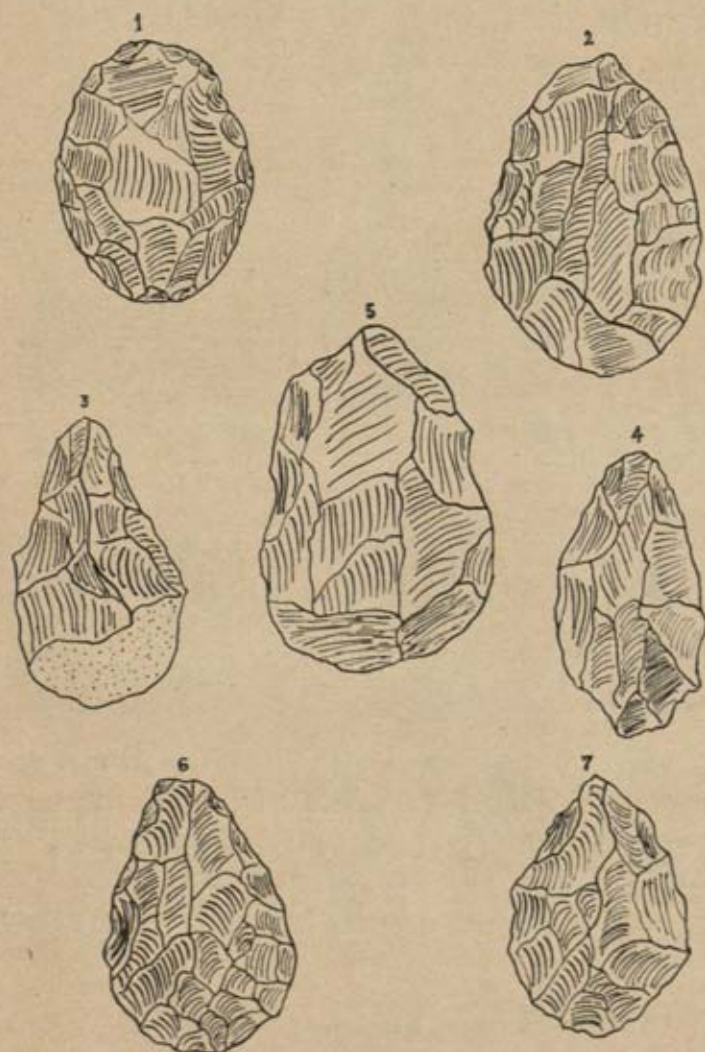
EASTERN AND SOUTHERN ASIA

DISTRIBUTION OF EASTERN ASIATIC TOOLS



PALAEOLITHS FROM BENGAL, BIHAR & ORISSA.

PLATE 1.

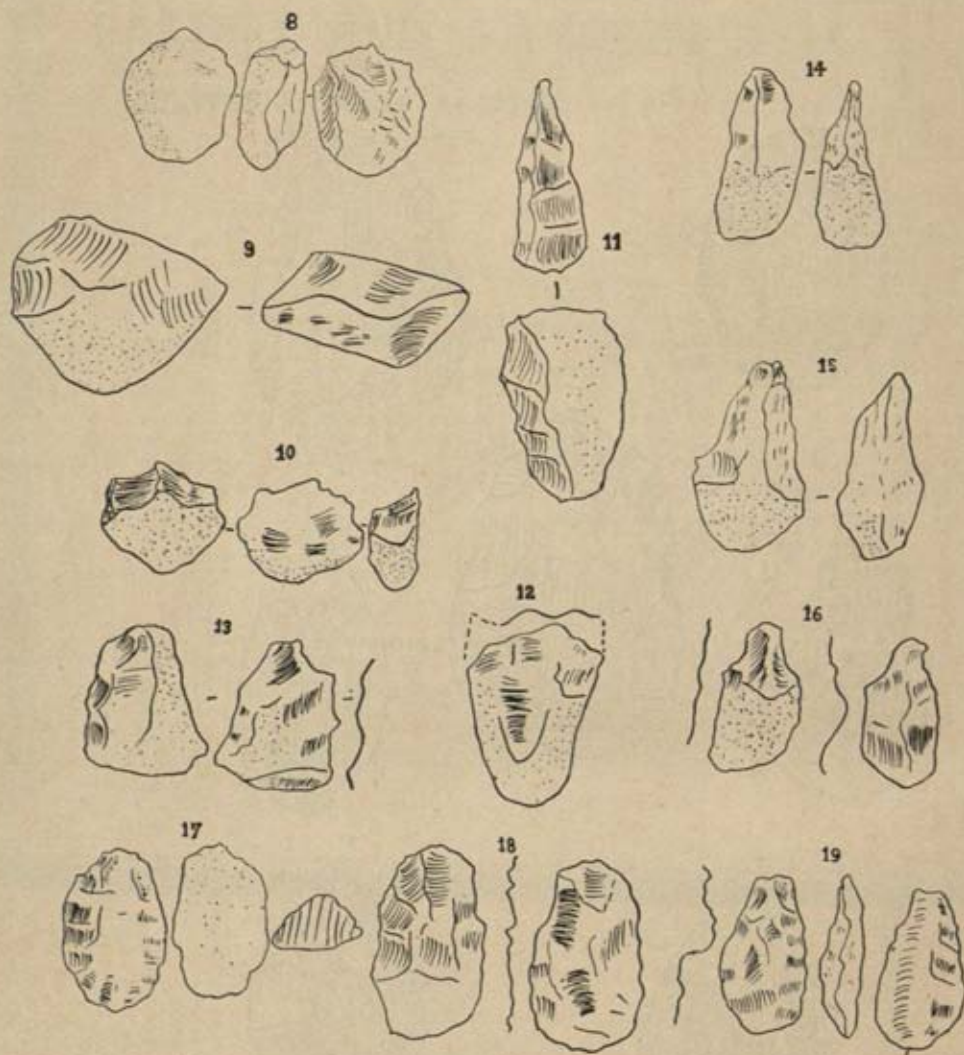


SCALE 0 2 4 6 8 10 CM.

NOS. 1-7 AFTER BALL

PALAEOLITHS FROM MAYURBHANJ

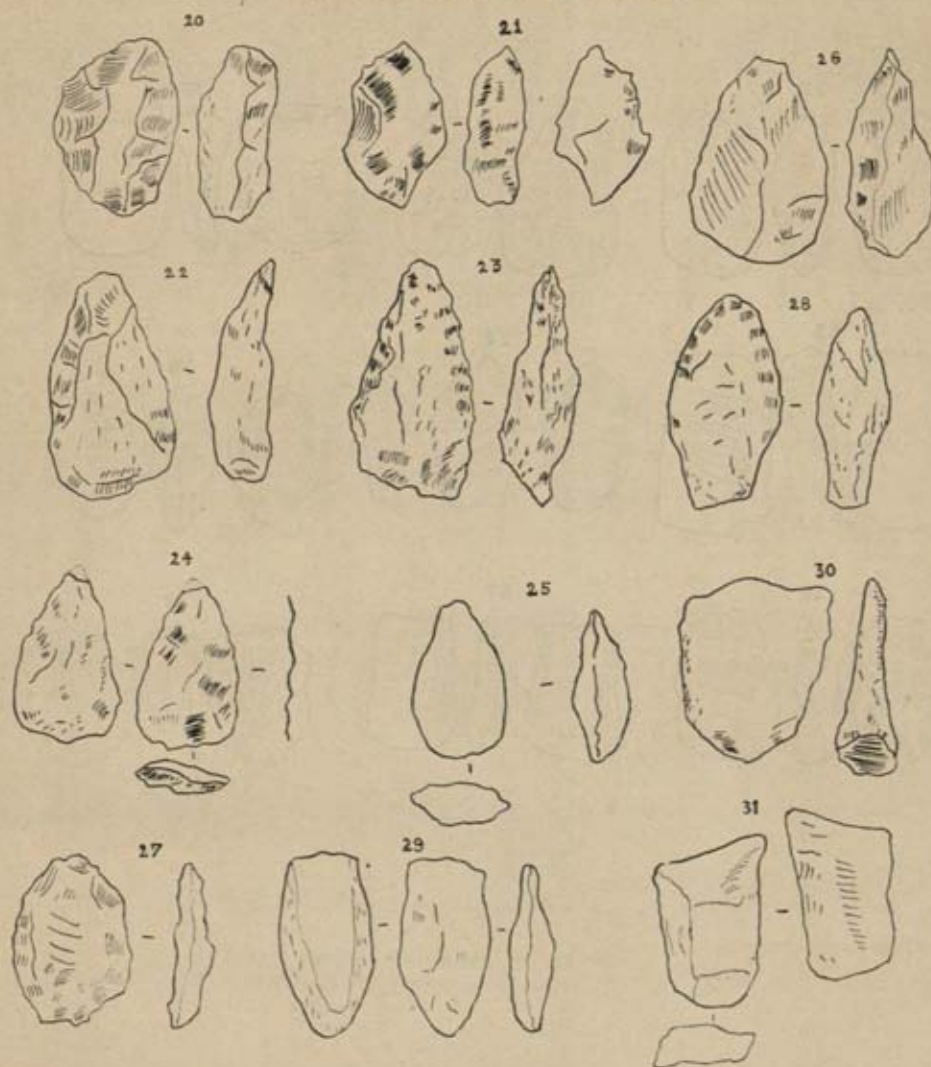
PLATE 2



NOS. 8-19 AFTER BOSE & SIN,

PALAEOLITHS FROM MAYURBHANJ

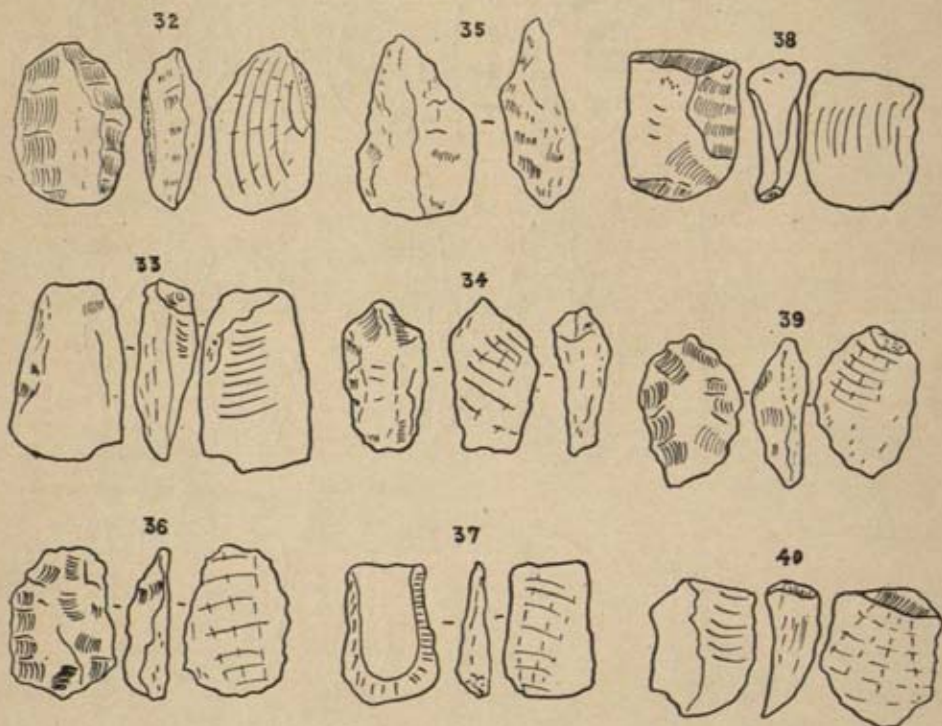
PLATE 3



NOS. 20-31 AFTER BOSE & SEN

PALAEOLITHS FROM MAYURBHANJ

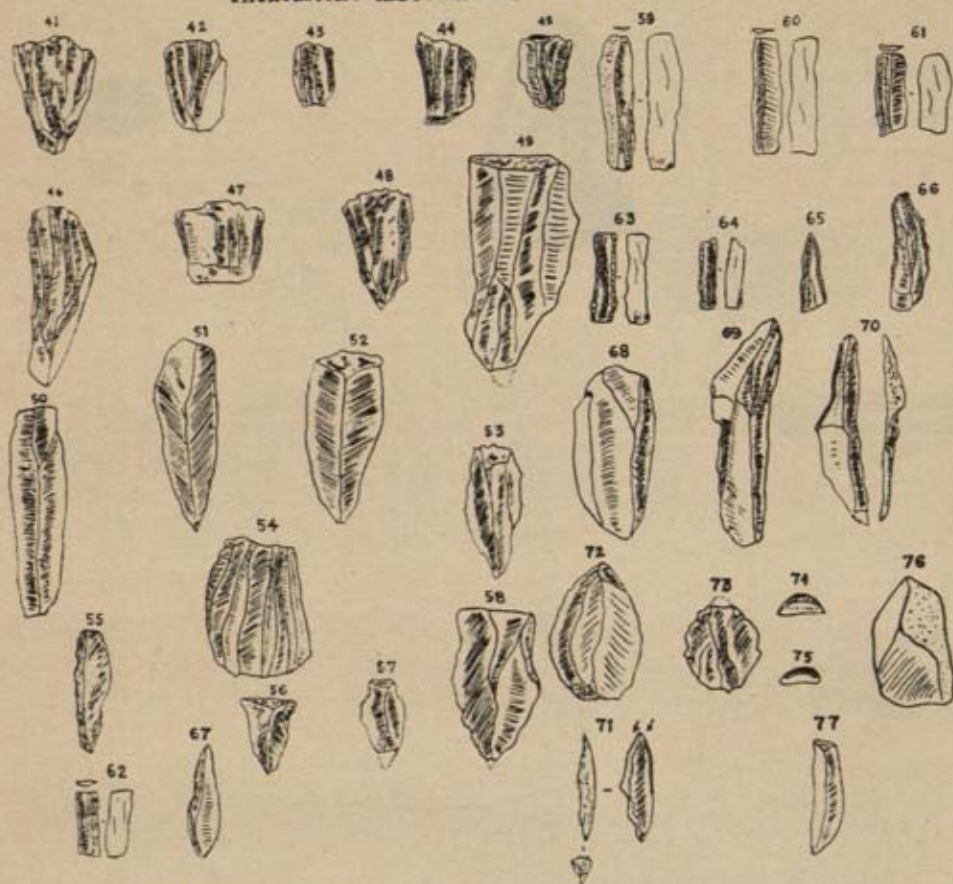
PLATE 4.



NOS. 32-40 AFTER BOSE & SEN

MICROLITHIC INDUSTRY OF BIHAR

PLATE 5.



NOS. 41-44, 46-48, 66-67 & 69-72 SINGBHM AFTER ANDERSON

NOS. 45, 53-58 & 73 RANCHI AFTER WOOD-MASON

NOS. 49-52, 68 & 74-77 HARTOYA (DHALBHUM)

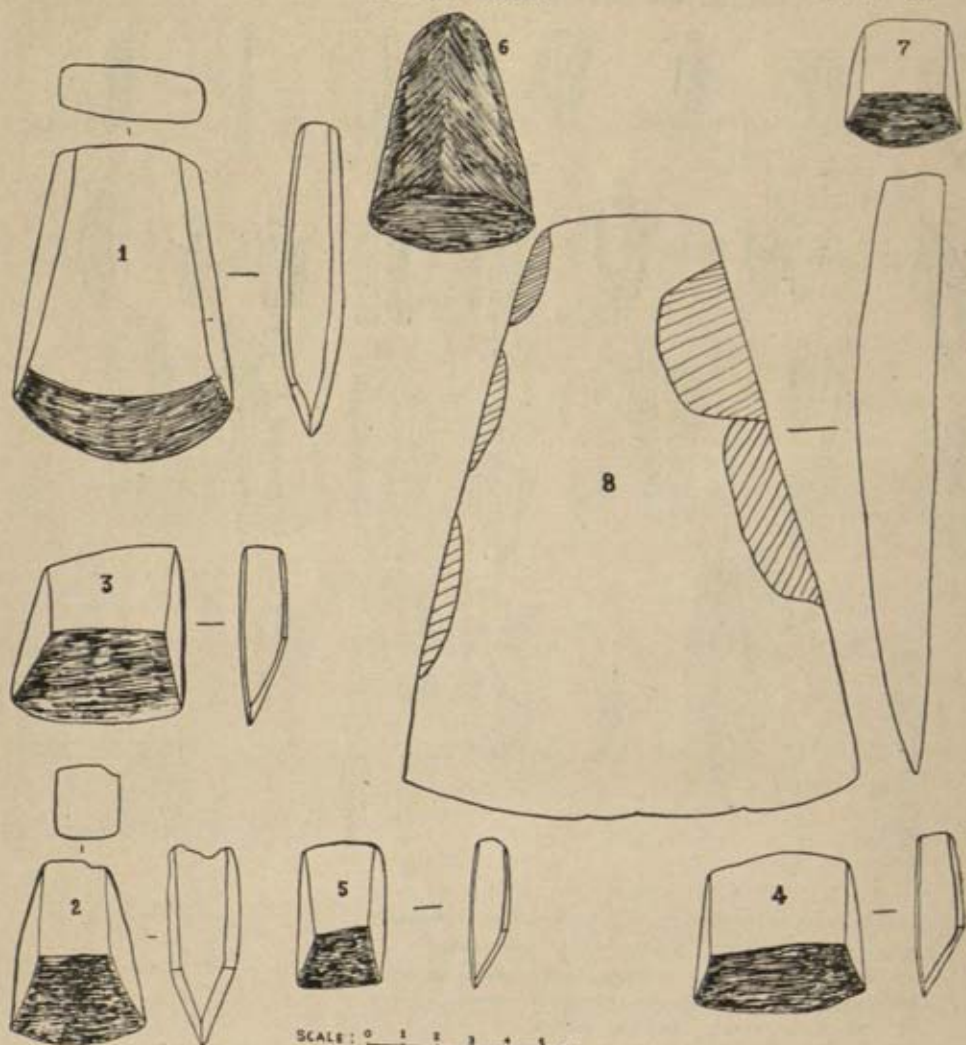
NOS. 59-65 & 74 BONGARA (MANBHUM) AFTER G. S. RAY

NO 75 AFTER COGGIN BROWN

NOT TO SCALE

NEOLITHS FROM ASSAM

PLATE 6.

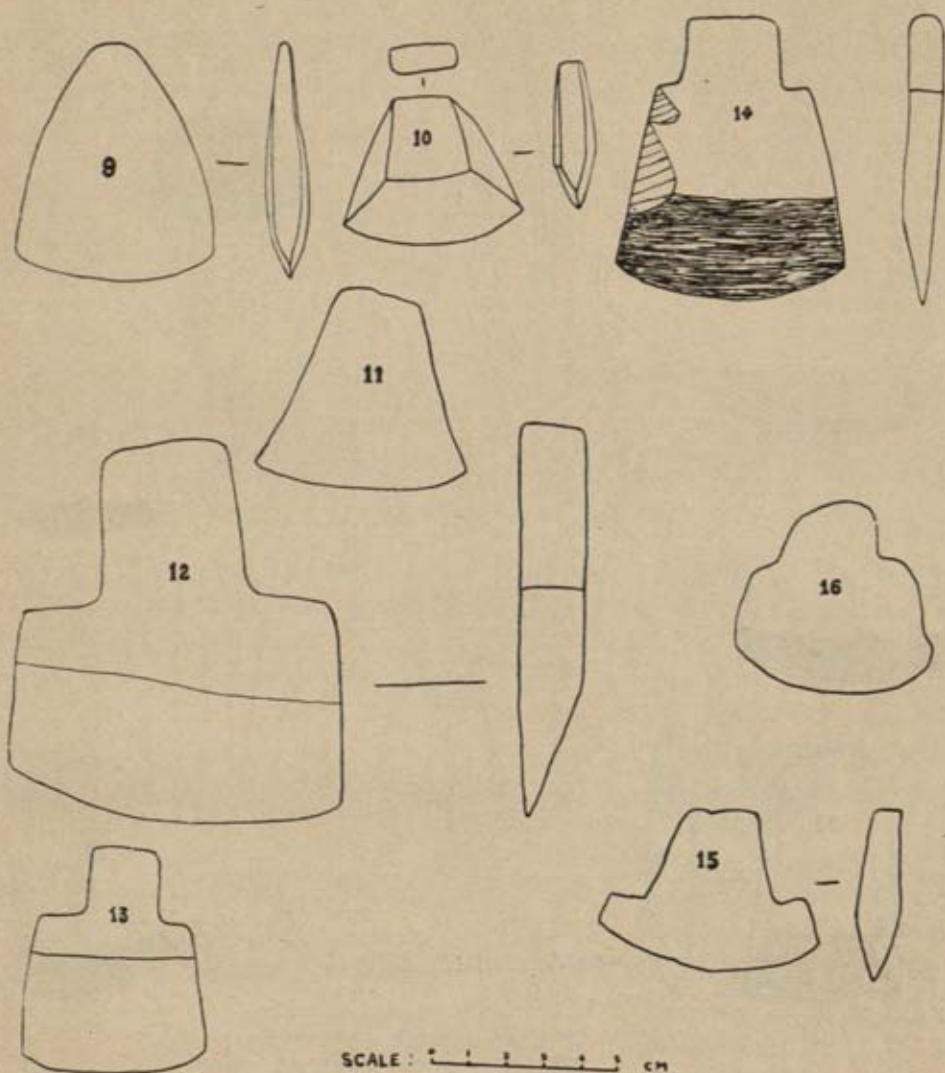


SCALE: 0 1 2 3 4 5 CM

NOS. 1-8 NORTH CACHAR HILLS

NEOLITHS FROM ASSAM

PLATE 7.

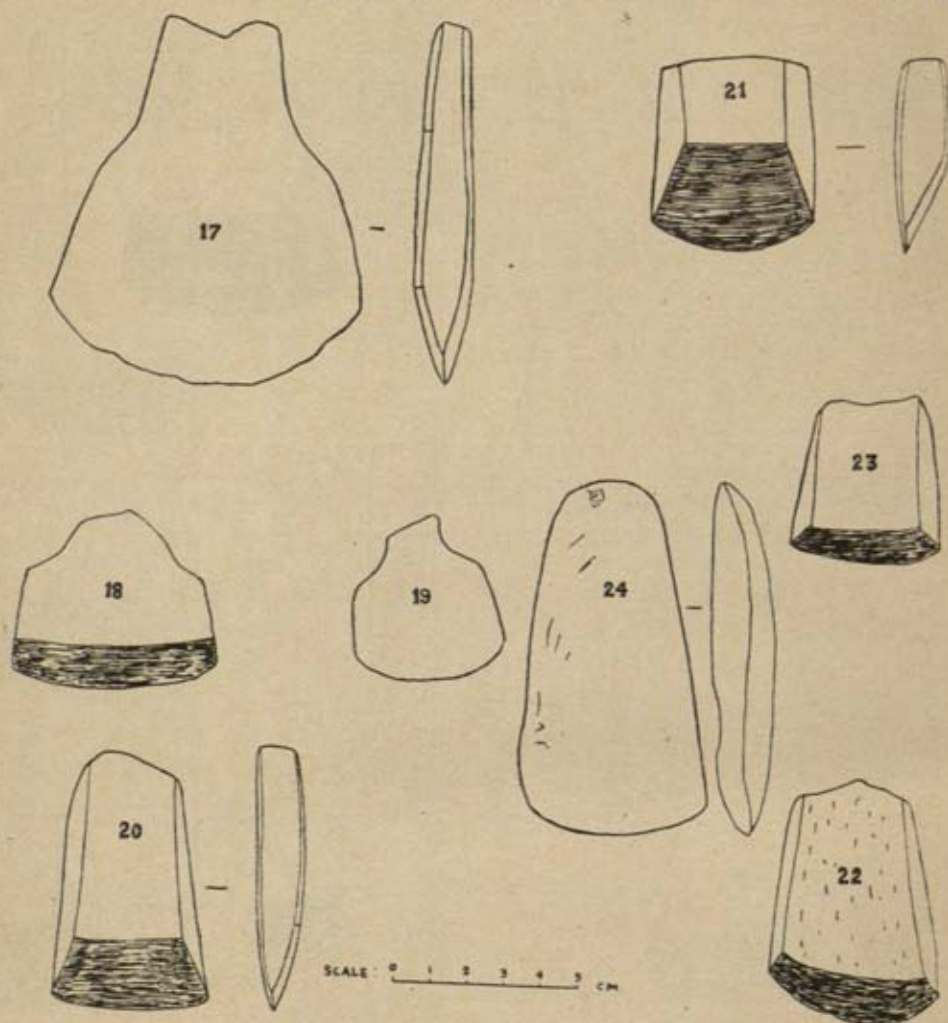


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NOS. 9-16 NORTH CACHAR HILLS

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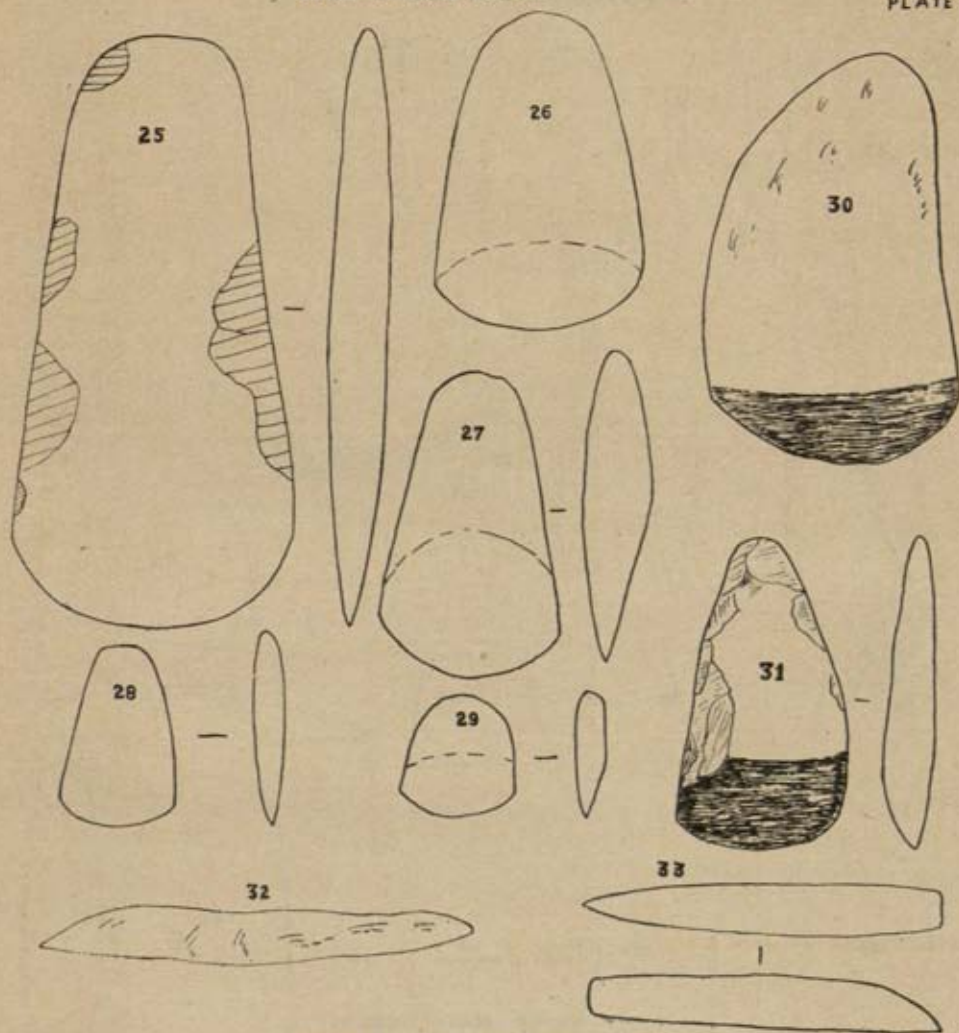
PLATE 8



NOS. 17-19 NORTH CACHAR HILLS
 NOS. 20-23 SADIYA FRONTIER TRACT
 NO. 24 MISHMI HILLS (AFTER ANDERSON)

NEOLITHS FROM ASSAM

PLATE 9

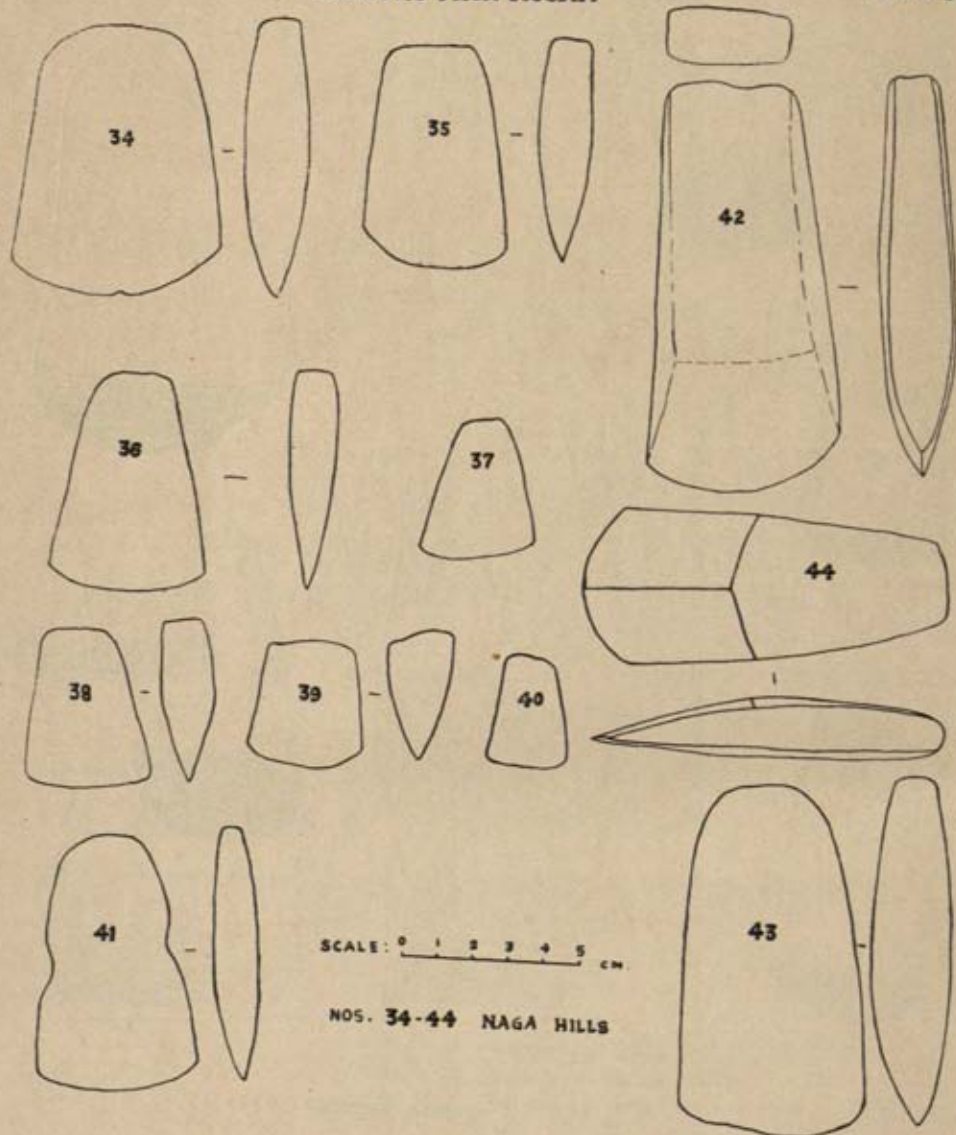


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NOS. 25-33 SADIYA FRONTIER TRACT

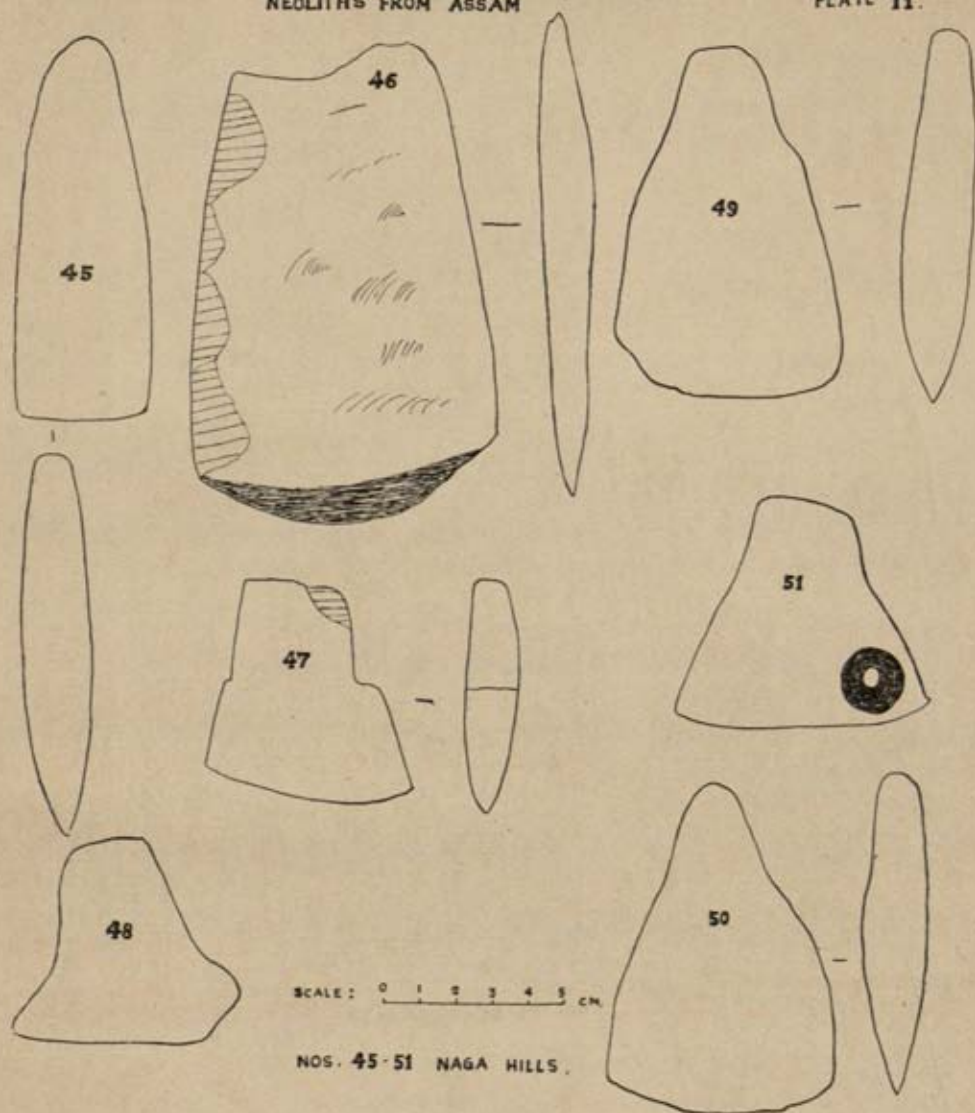
NEOLITHS FROM ASSAM

PLATE 10.



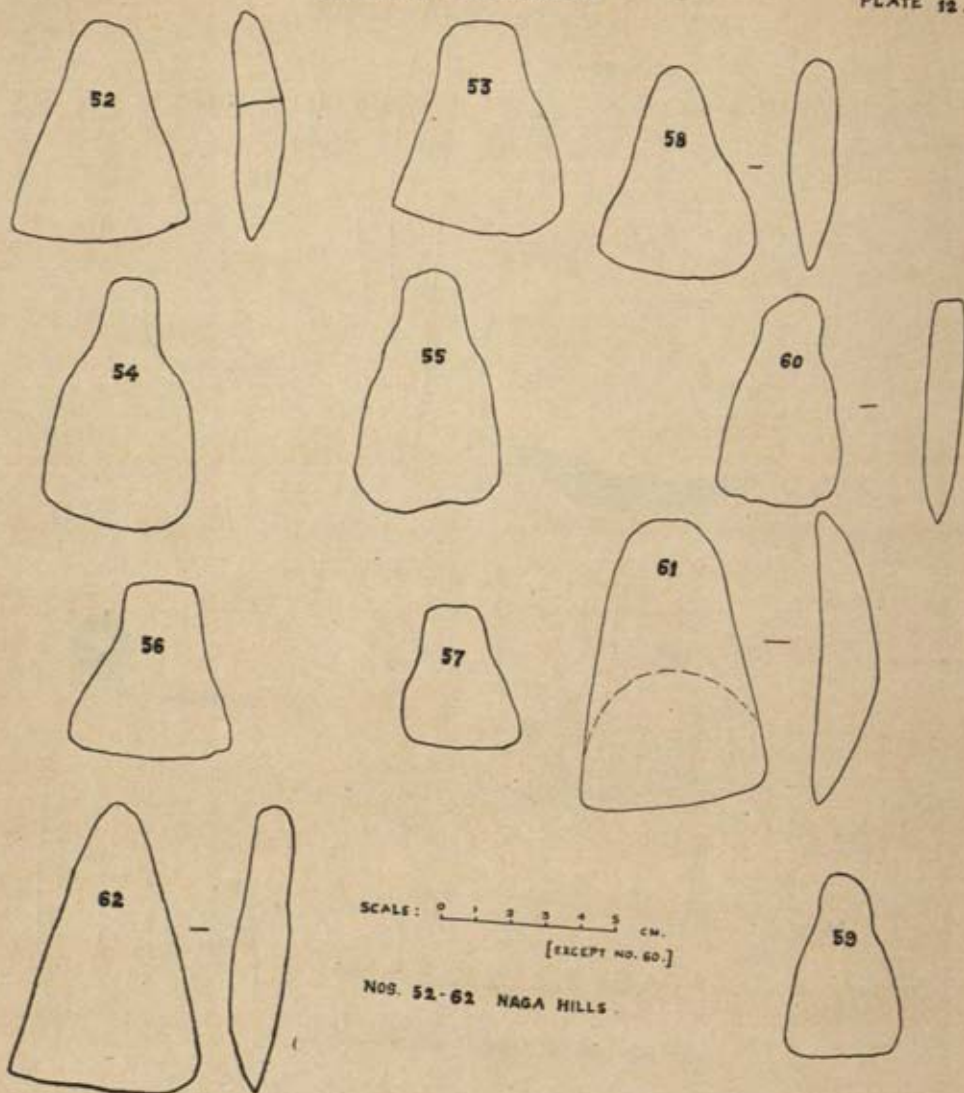
NEOLITHS FROM ASSAM

PLATE 11.



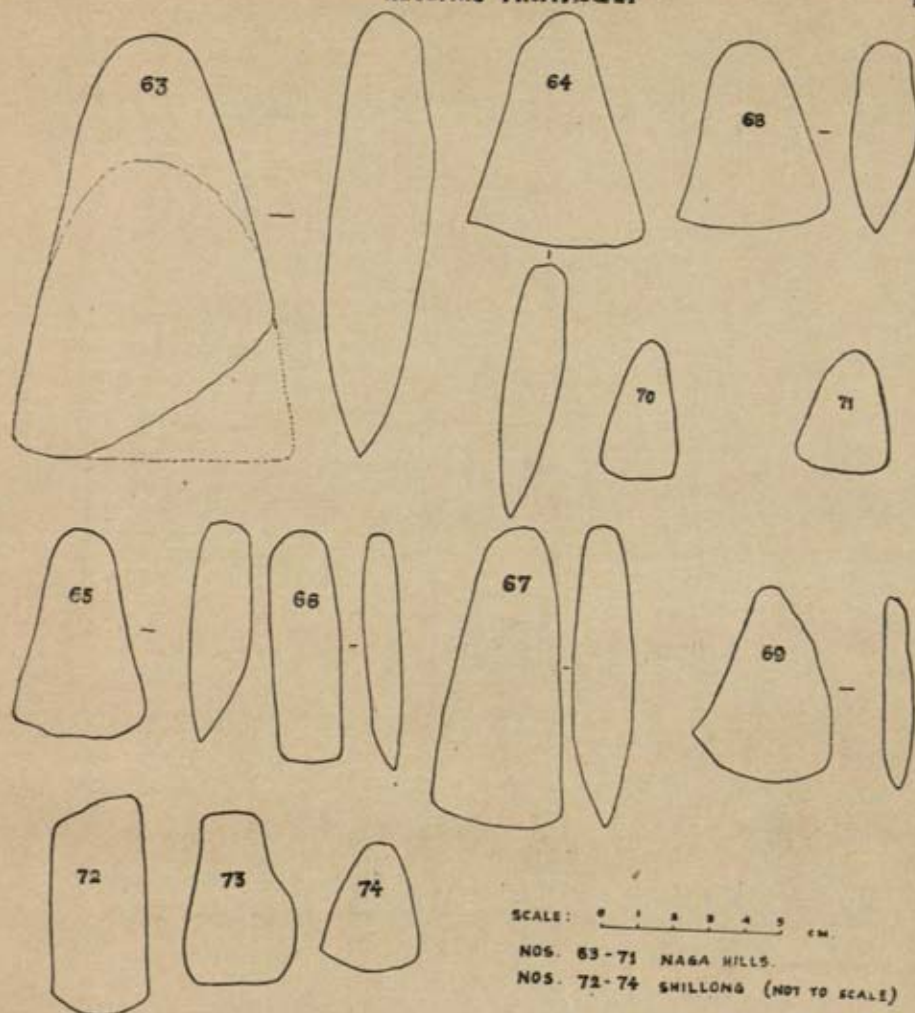
NEOLITHS FROM ASSAM

PLATE 12.



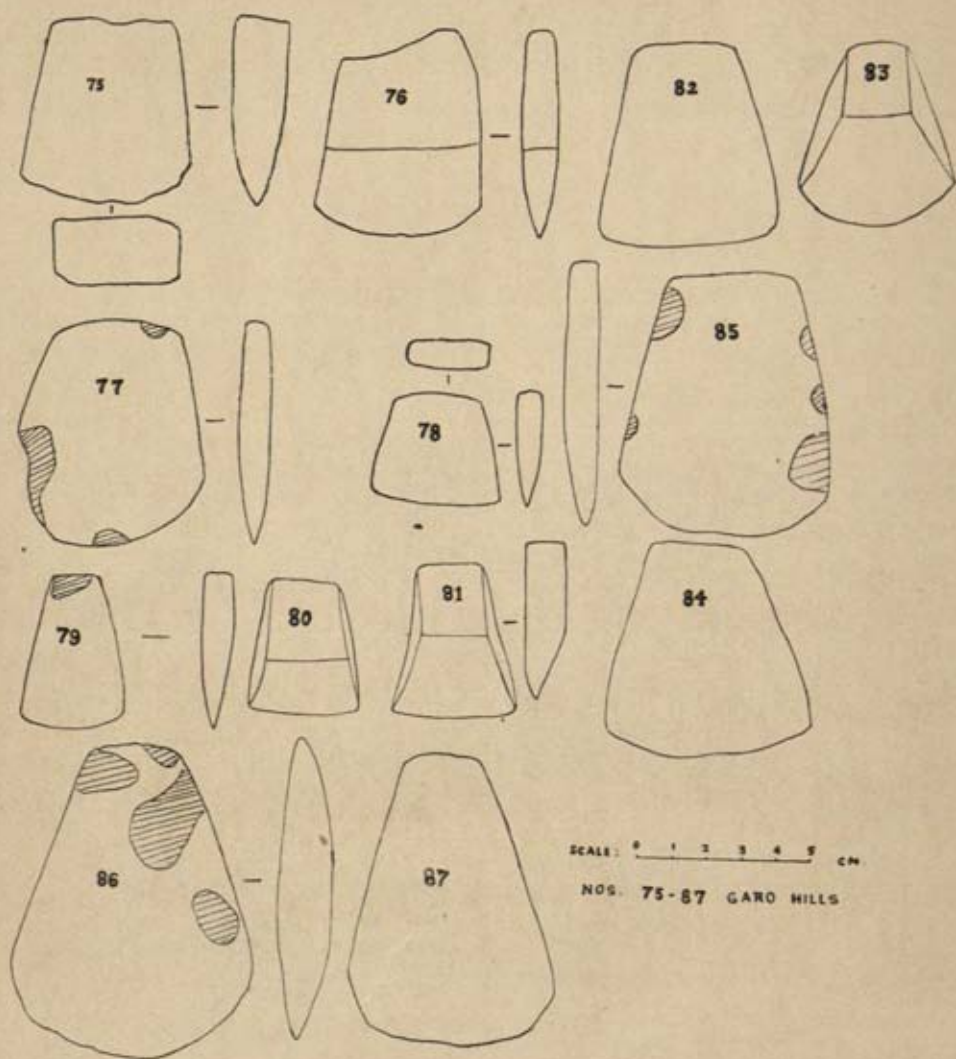
NEOLITHS FROM ASSAM

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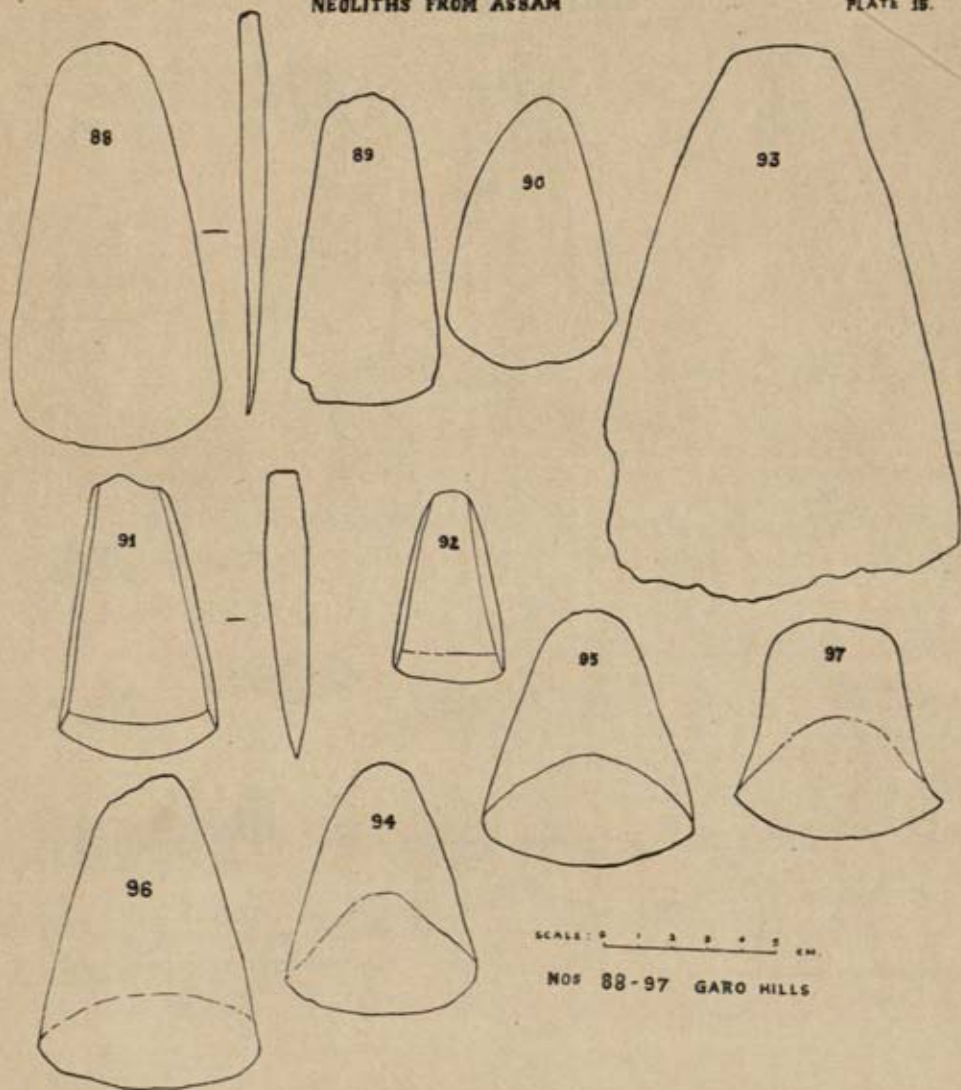
NEOLITHS FROM ASSAM

PLATE 14



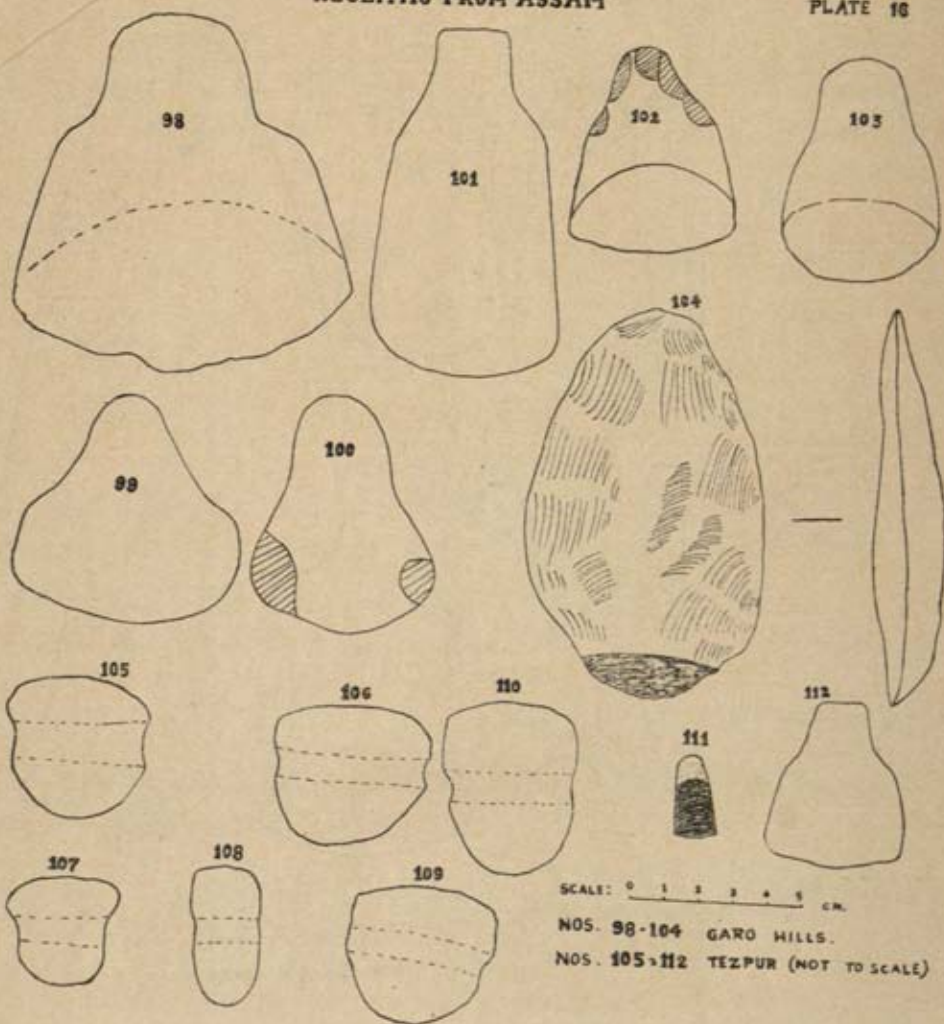
NEOLITHS FROM ASSAM

PLATE 15.



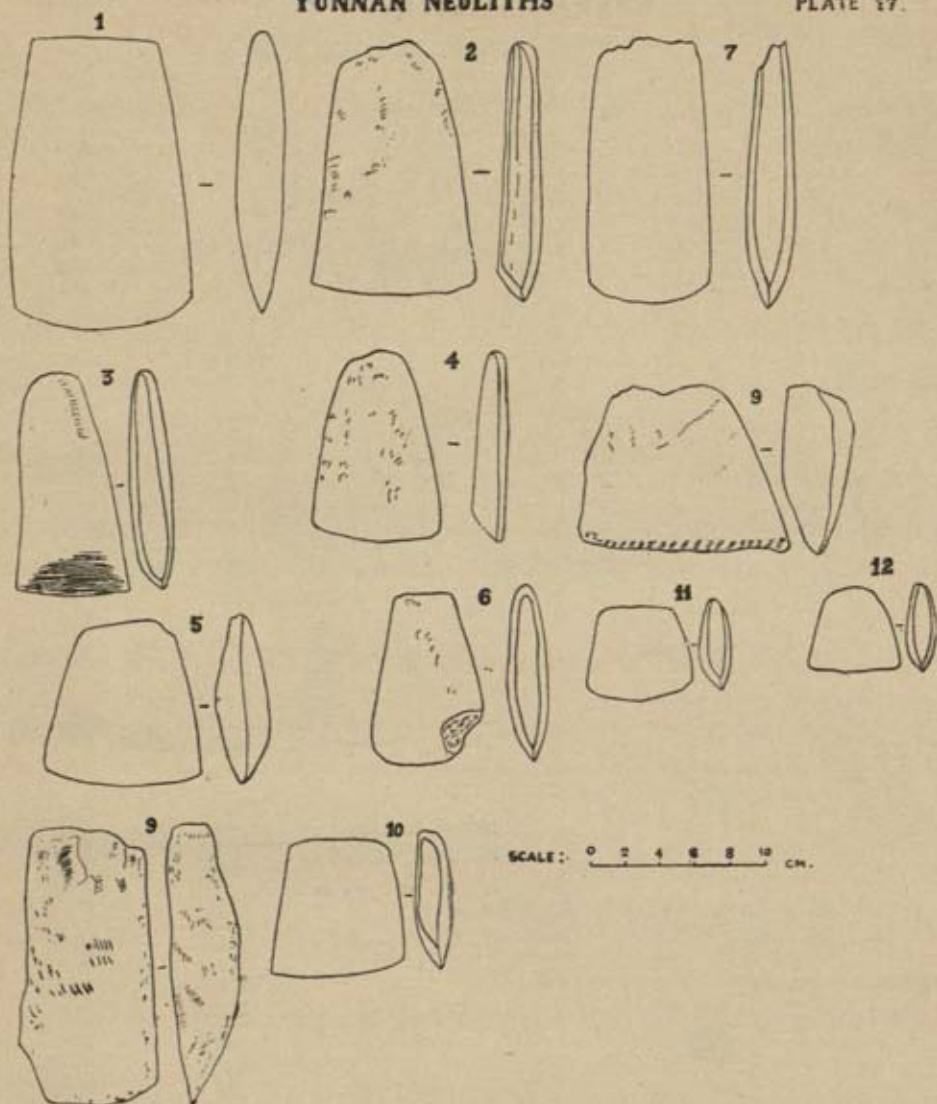
NEOLITHS FROM ASSAM

PLATE 16



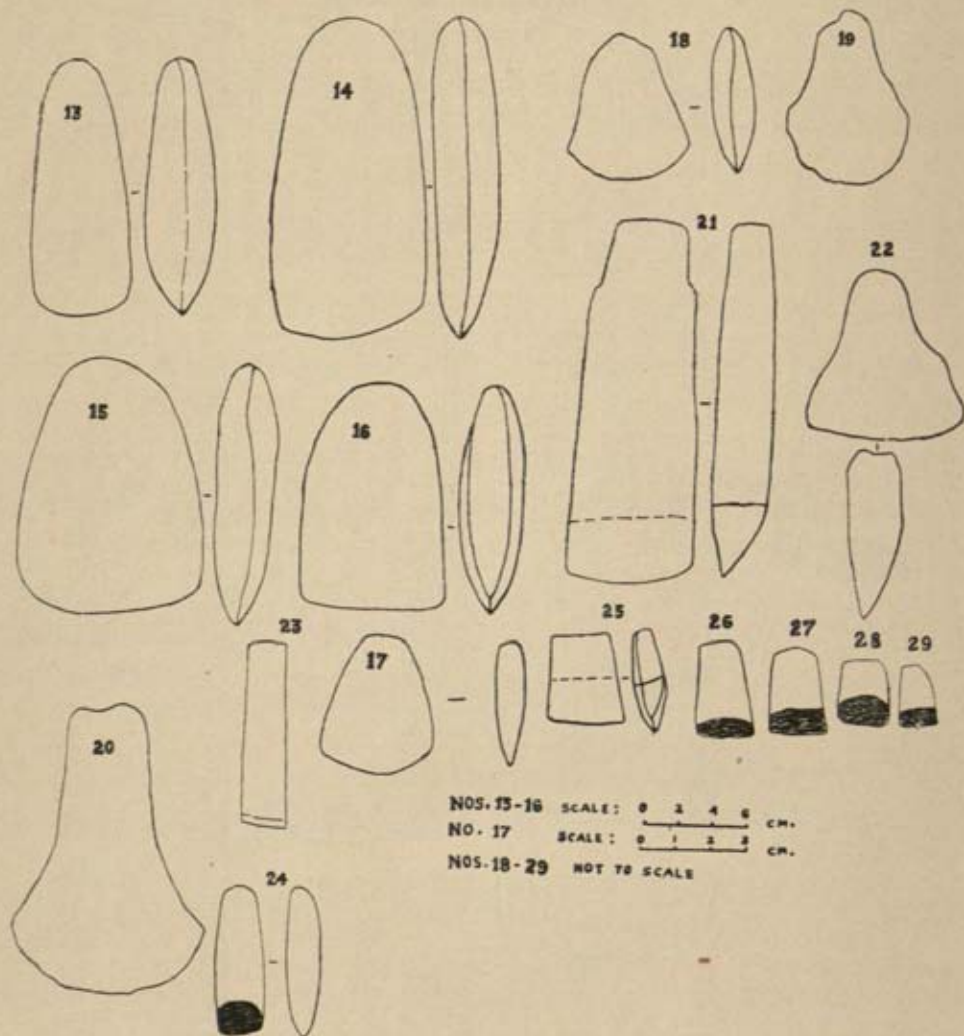
YUNNAN NEOLITHS

PLATE 17.



YUNNAN NEOLITHS

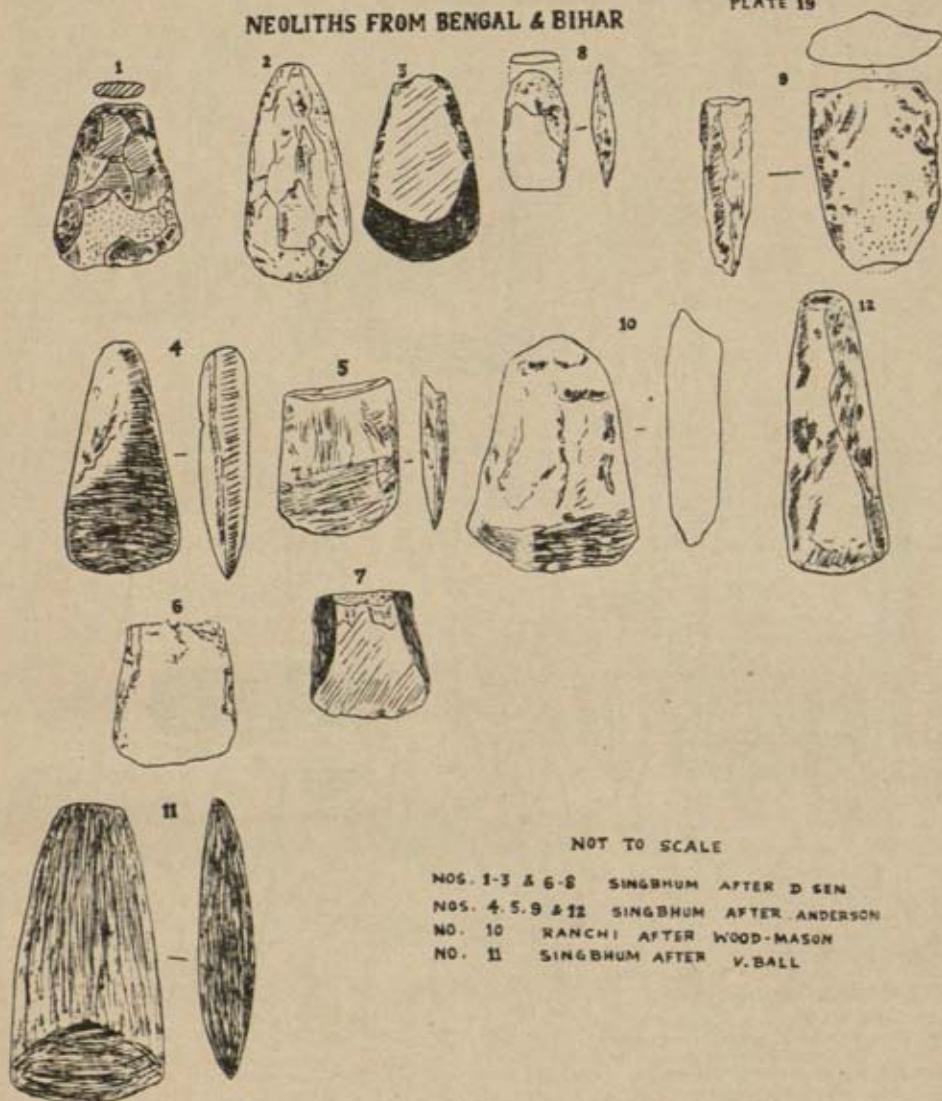
PLATE 18.



NOS. 13-16 SCALE: 0 2 4 6 CM.
 NO. 17 SCALE: 0 1 2 3 CM.
 NOS. 18-29 NOT TO SCALE

NEOLITHS FROM BENGAL & BIHAR

PLATE 19

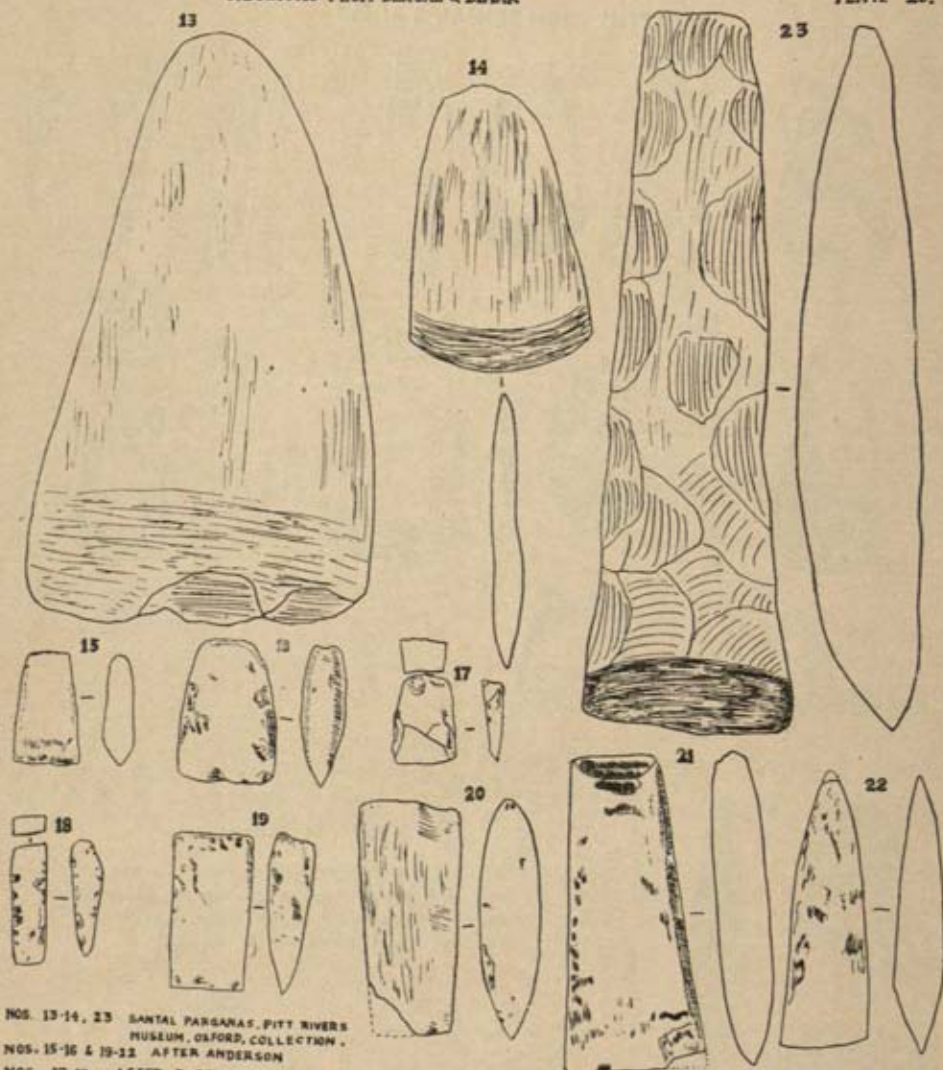


NOT TO SCALE

NOS. 1-3 & 6-8 SINGBHUM AFTER D SEN
 NOS. 4, 5, 9 & 12 SINGBHUM AFTER ANDERSON
 NO. 10 RANCHI AFTER WOOD-MASON
 NO. 11 SINGBHUM AFTER V. BALL

NEOLITHS FROM BENGAL & BIHAR

PLATE 20.

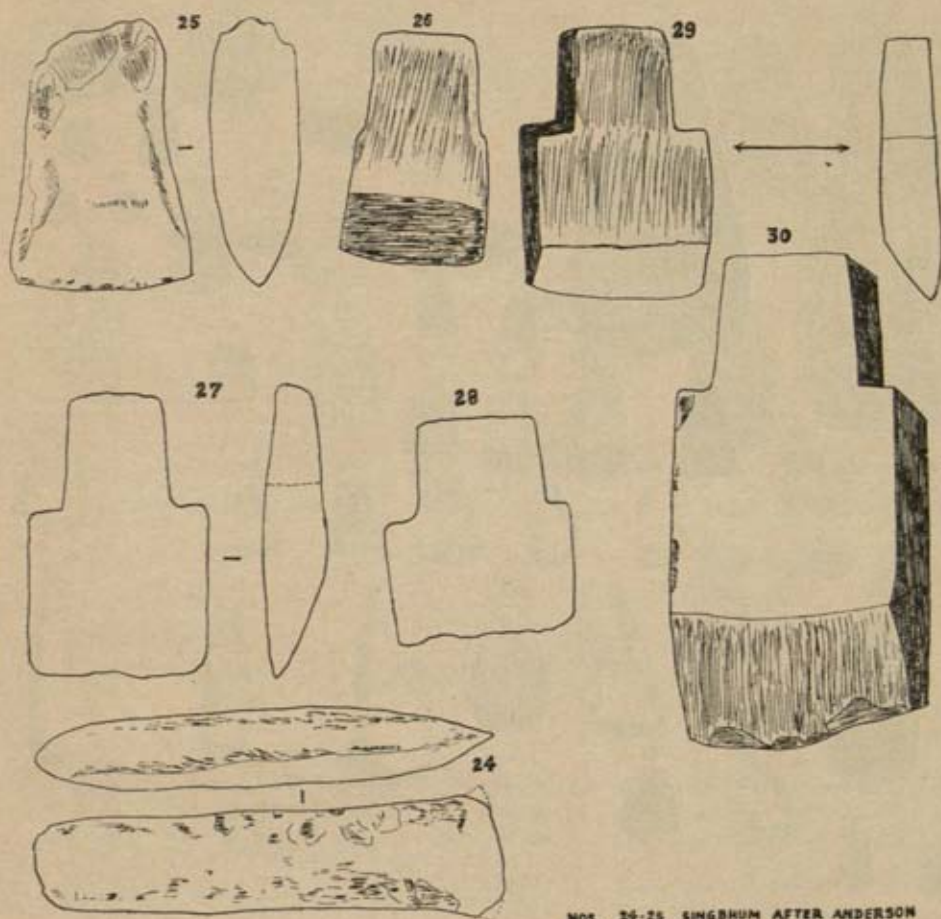


NOS. 13-14, 23 SANTAL PARGANAS, PITT RIVERS
MUSEUM, OXFORD, COLLECTION.
NOS. 15-16 & 19-22 AFTER ANDERSON
NOS. 17-18 AFTER D. SEN

SCALE : 0 1 2 3 CM.
NOS. 15-16 NOT TO SCALE.

NEOLITHS FROM BENGAL & BIHAR

PLATE 21.

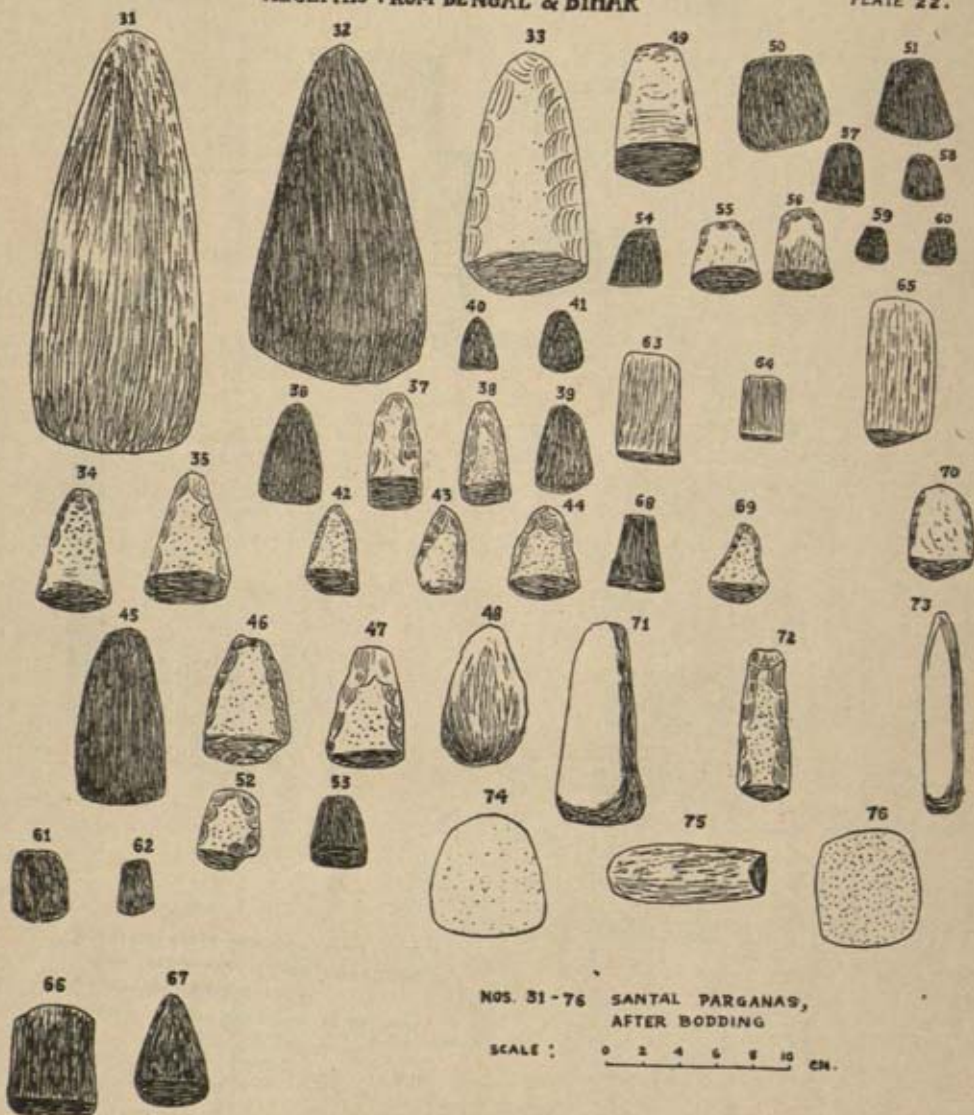


NOS. 24-25 SINGBHM AFTER ANDERSON
 NOS. 26-28 SANTAL PARGANAS, PITT
 RIVER MUSEUM COLLECTIONS.
 NOS. 29-30 SINGBHM AFTER V. BALL

SCALE: 0 1 2 3 4 5 CM.

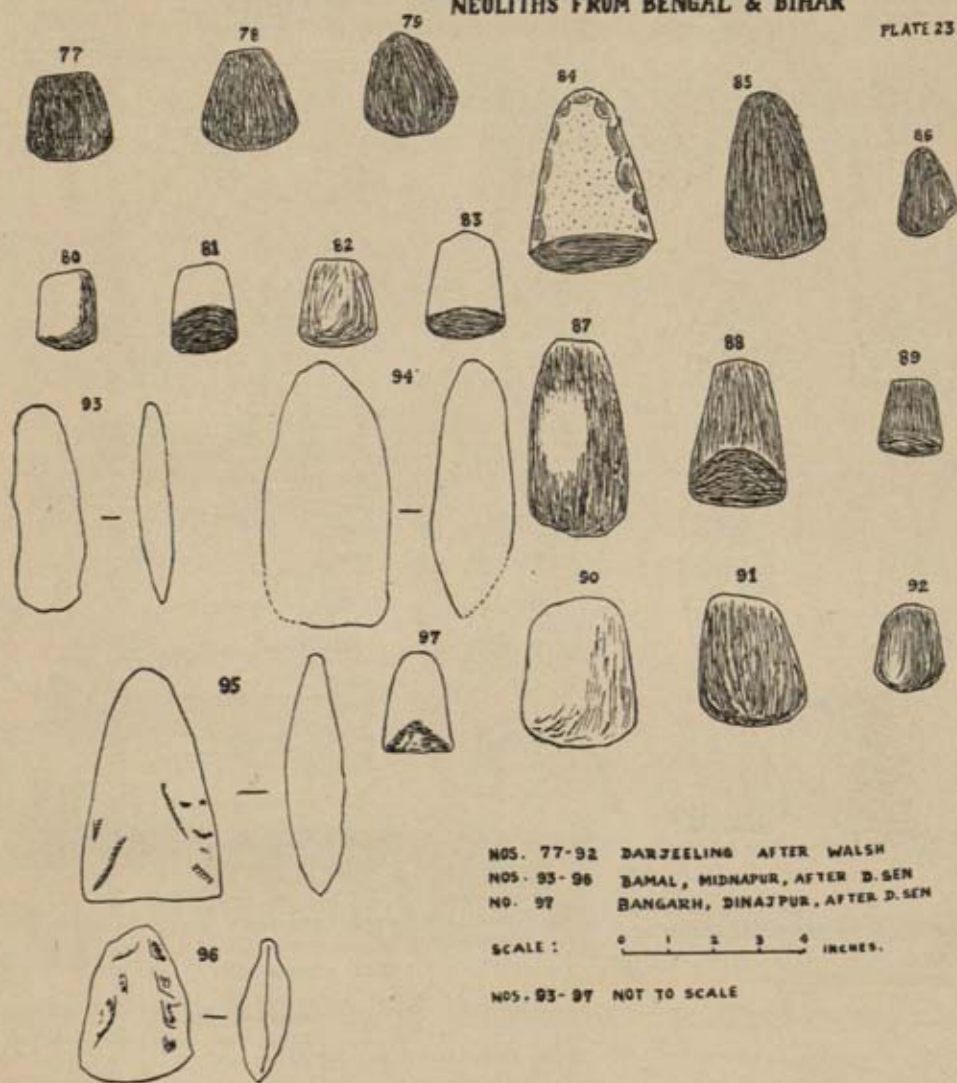
NEOLITHS FROM BENGAL & BIHAR

PLATE 22.



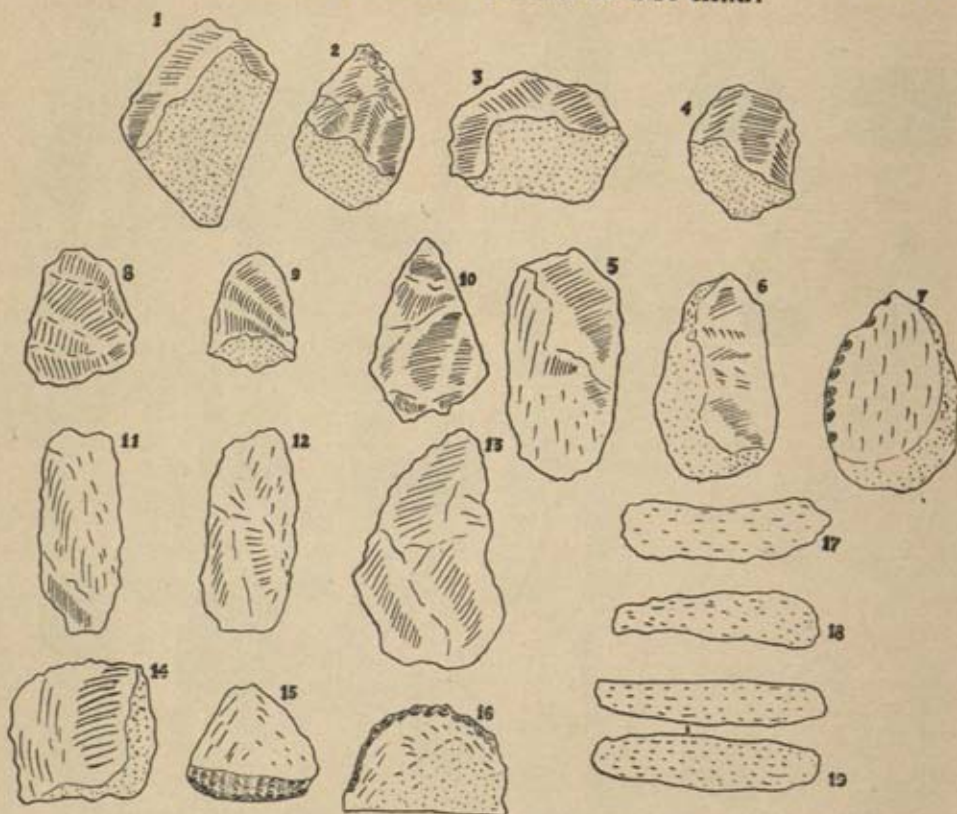
NEOLITHS FROM BENGAL & BIHAR

PLATE 23.



TYPOLOGY IN HOABINHLIAN CULTURE OF INDO-CHINA

PLATE 24.



NOS. 1-4 STAGE 'C' : GROUP I
NOS. 5-19 STAGE 'C' : GROUP II

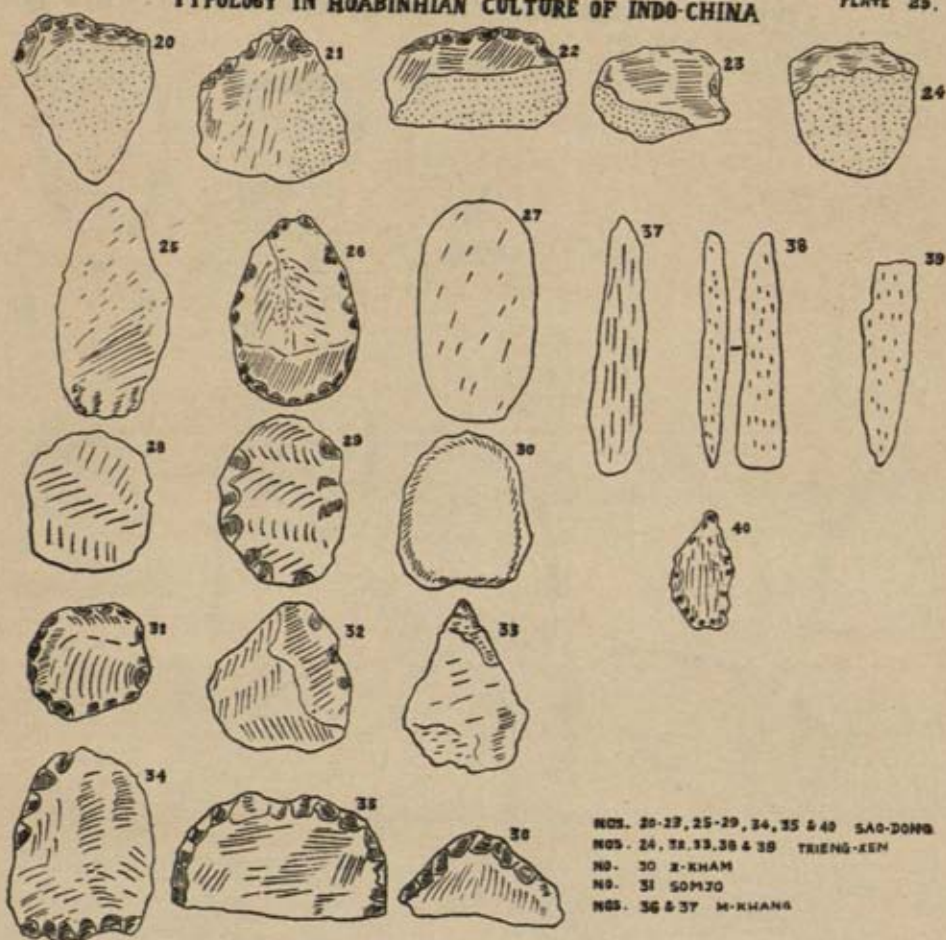
NOS. 1-7 & 14-16 SAO-DONG
NOS. 8 & 11-13 X-KHAM
NOS. 9-10 & 17-19 TRIENG-XEN

SCALE : 0 2 4 6 8 10 CM.

NOS. 11, 17 & 18 NOT TO SCALE

TYPOLGY IN HOABINHIAN CULTURE OF INDO-CHINA

PLATE 25.



NOS. 20-24 STAGE 'B' : GROUP I

NOS. 25-40 STAGE 'B' : GROUP II

SCALE : 0 2 4 6 8 10 CM.

NOS. 25, 27 & 38 NOT TO SCALE

NOS. 20-23, 25-29, 34, 35 & 40 SAO-DONG

NOS. 24, 32, 33, 36 & 39 TRIENG-KEM

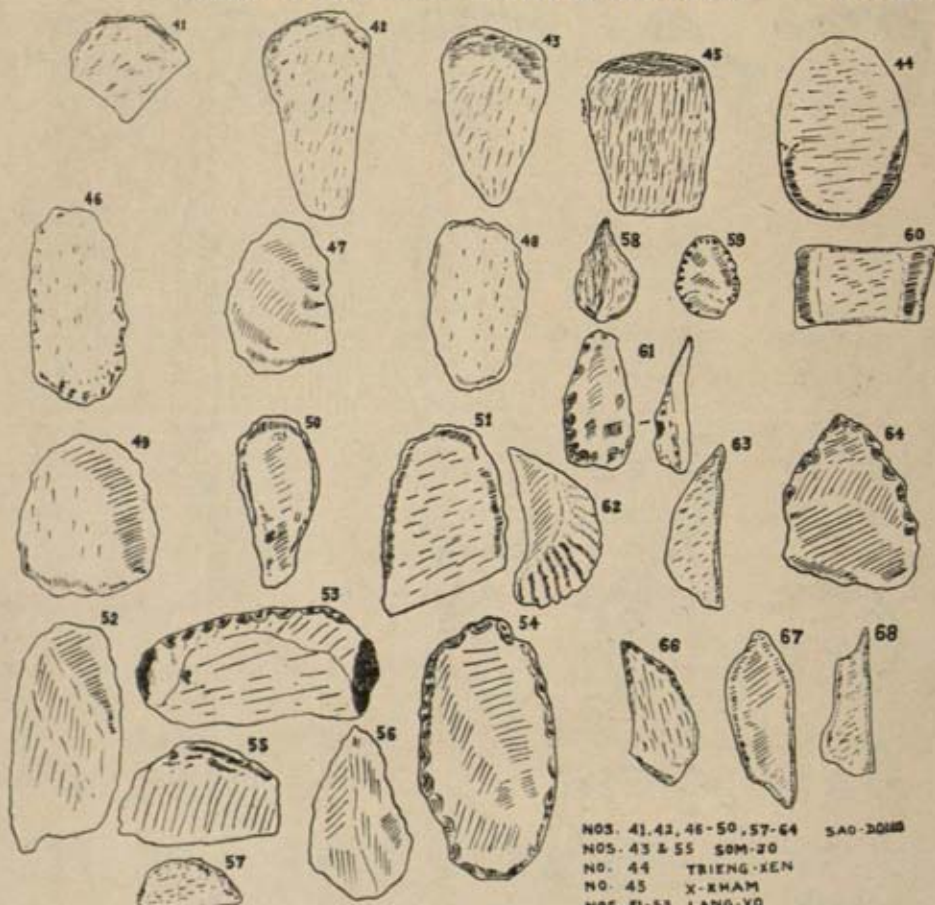
NO. 30 X-KHAM

NO. 31 SOMTO

NOS. 36 & 37 M-KHANG

TYPOLGY IN HOABINHIAN CULTURE OF INDO-CHINA

PLATE 26.



NOS. 41-45 STAGE B' : GROUP III
 NOS. 46-57 STAGE A' : GROUP I
 NOS. 58-68 STAGE A' : GROUP II

NOS. 41, 42, 46-50, 57-64 SAO-DONG
 NOS. 43 & 55 SOM-TO
 NO. 44 TRIENG-XEN
 NO. 45 X-KHAM
 NOS. 51-53 LANG-VO
 NO. 54 LANG-BAY
 NOS. 56, 65-68 LANG-NEO

SCALE : 0 2 4 6 8 10 CM.

NOS. 46 & 54 NOT TO SCALE

TYPOLGY IN HOABINHIAN CULTURE OF INDO-CHINA

PLATE 27.



NOS. 70-76 STAGE 'A' : GROUP II

NOS. 69, 77-88 STAGE 'A' : GROUP III

SCALE : 0 1 2 3 4 5 CM

NO. 73 NOT TO SCALE

NOS. 69, 80-82 LANG-NEO

NOS. 70, 71 & 83 X-KHAM

NOS. 72 & 73 M-KHANG

NOS. 74, 86, 87 LANG-VO

NOS. 75 & 85 LANG-BAY

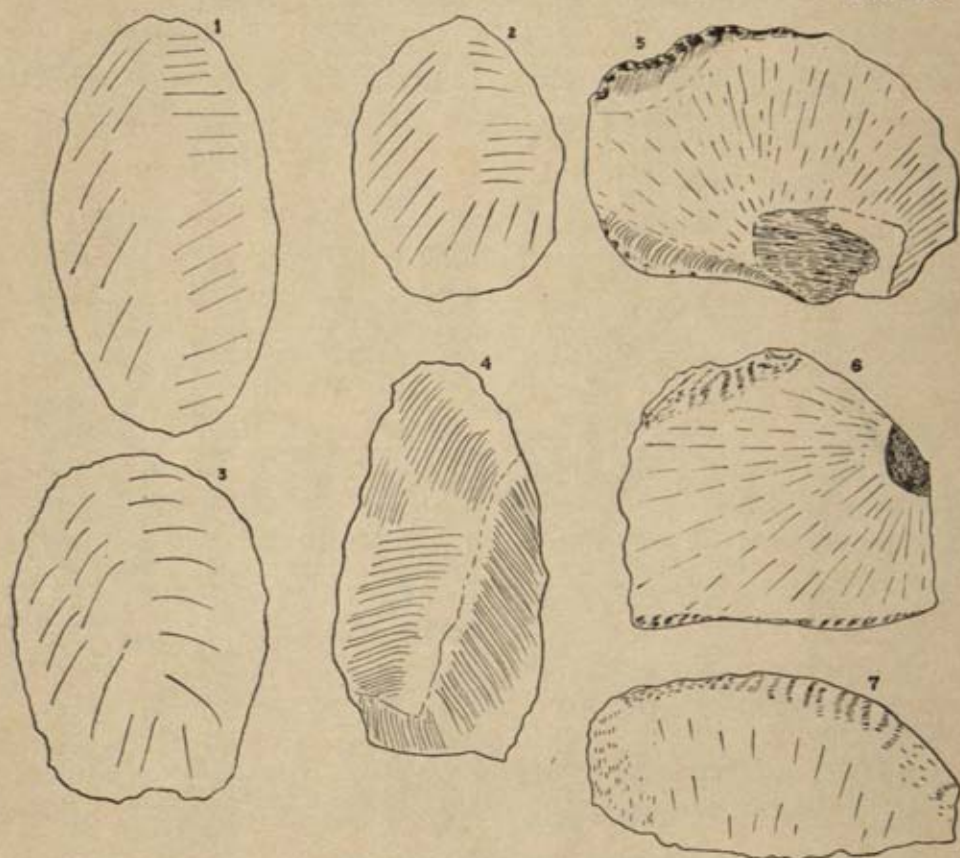
NOS. 76-79 SAO-DONG

NO. 84 SOM-JO

NO. 88 HA-BI

BACSONIAN CULTURE OF INDO-CHINA

PLATE 28.



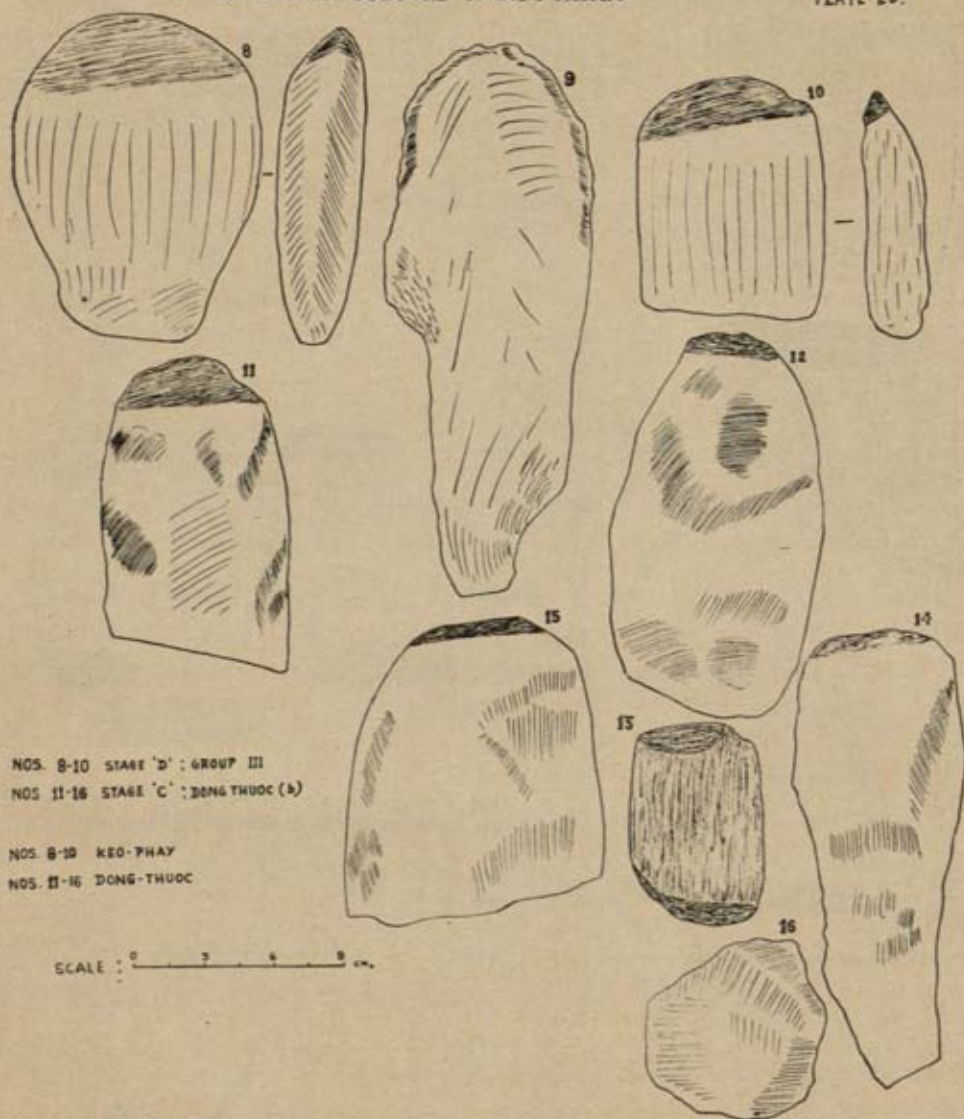
NOS. 1-4 STAGE 'D' : GROUP I
NOS. 5-7 STAGE 'D' : GROUP II

NOS. 1-7 KEO-PHAY

SCALE : 0 2 4 6 8 cm

BACSONIAN CULTURE OF INDO-CHINA

PLATE 29.



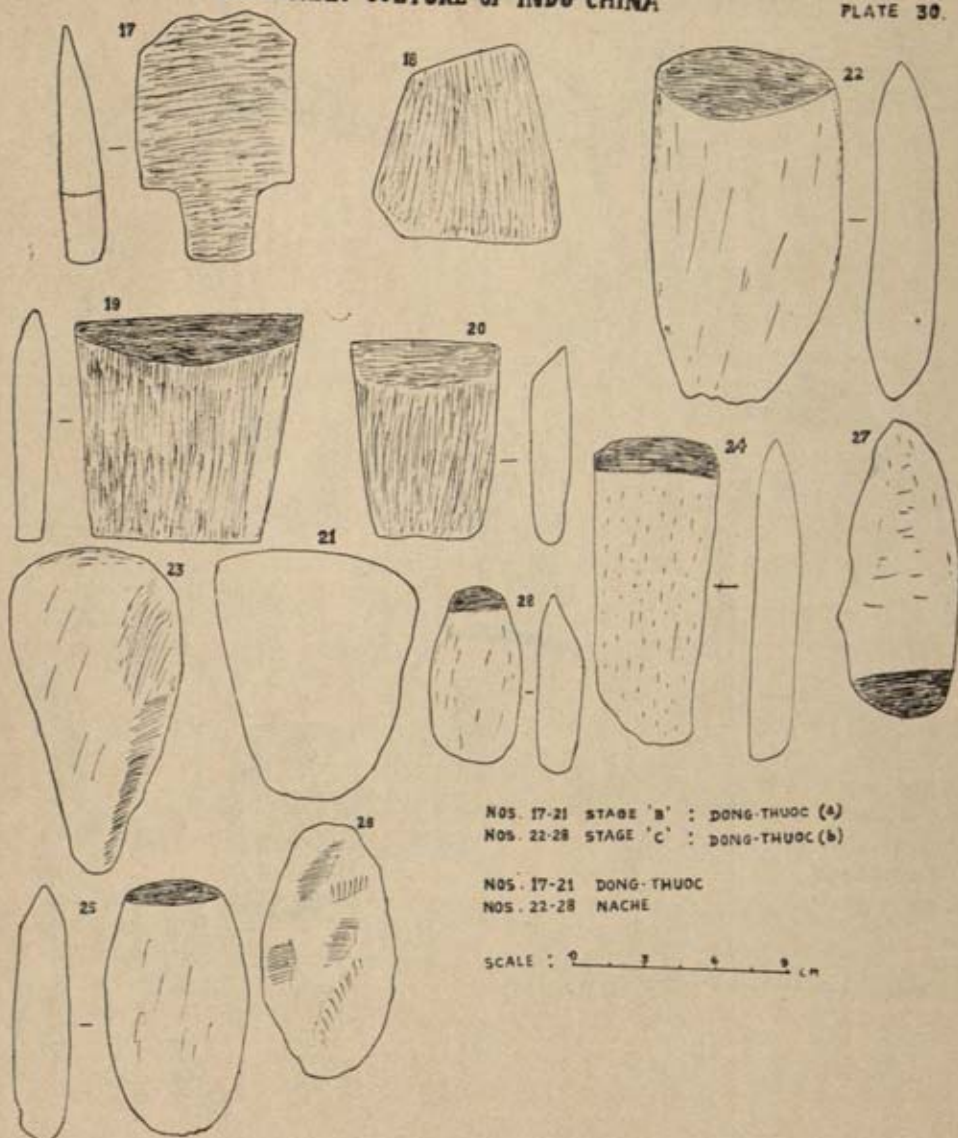
NOS. 8-10 STAGE 'D' : GROUP III
NOS. 11-16 STAGE 'C' : DONG THUC (b)

NOS. 8-10 KEO-PHAY
NOS. 11-16 DONG-THUC

SCALE : 0 1 2 3 4 5 CM.

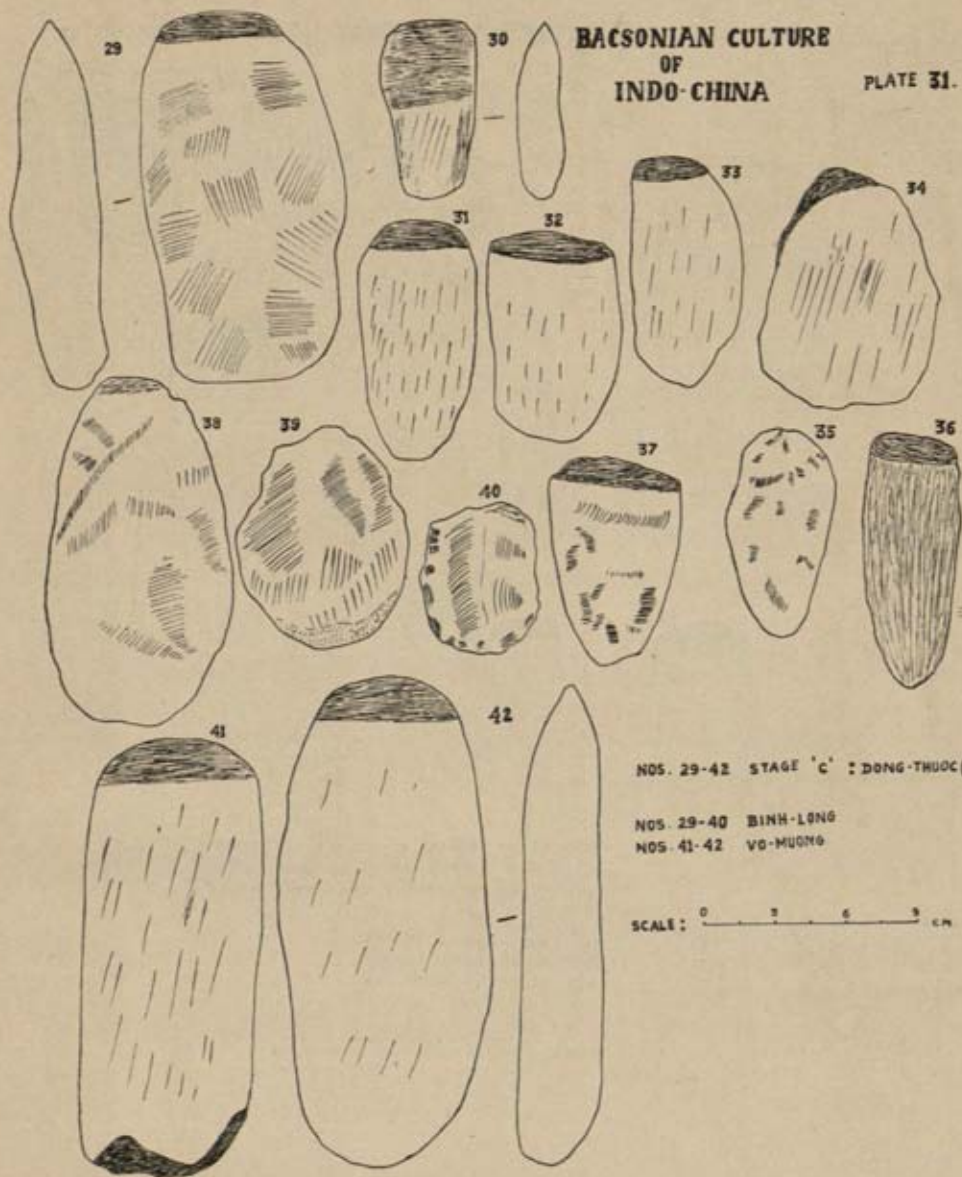
BACSONIAN CULTURE OF INDO-CHINA

PLATE 30.



**BACSONIAN CULTURE
OF
INDO-CHINA**

PLATE 31.



NOS. 29-42 STAGE 'C' : DONG-THUOC (b)

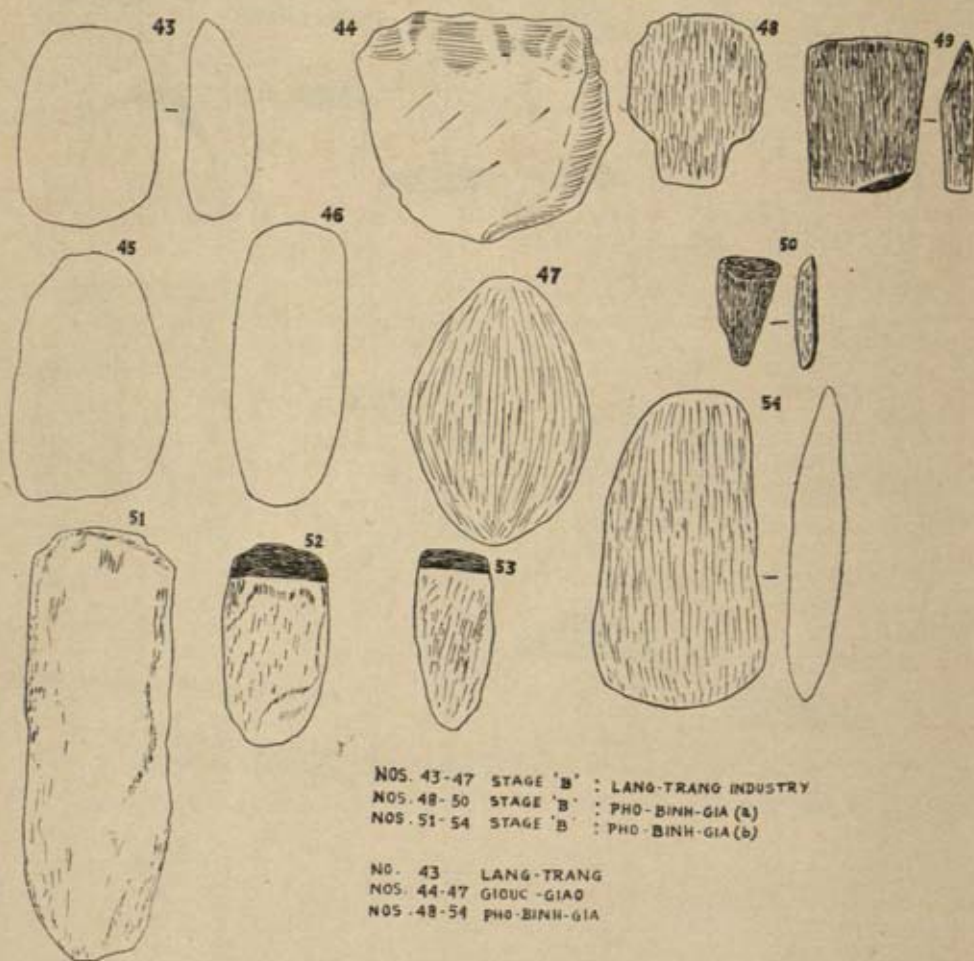
NOS. 29-40 BINH-LONG

NOS. 41-42 VO-MUONG

SCALE : 0 2 4 6 8 cm

BACSONIAN CULTURE OF INDO-CHINA

PLATE 32.



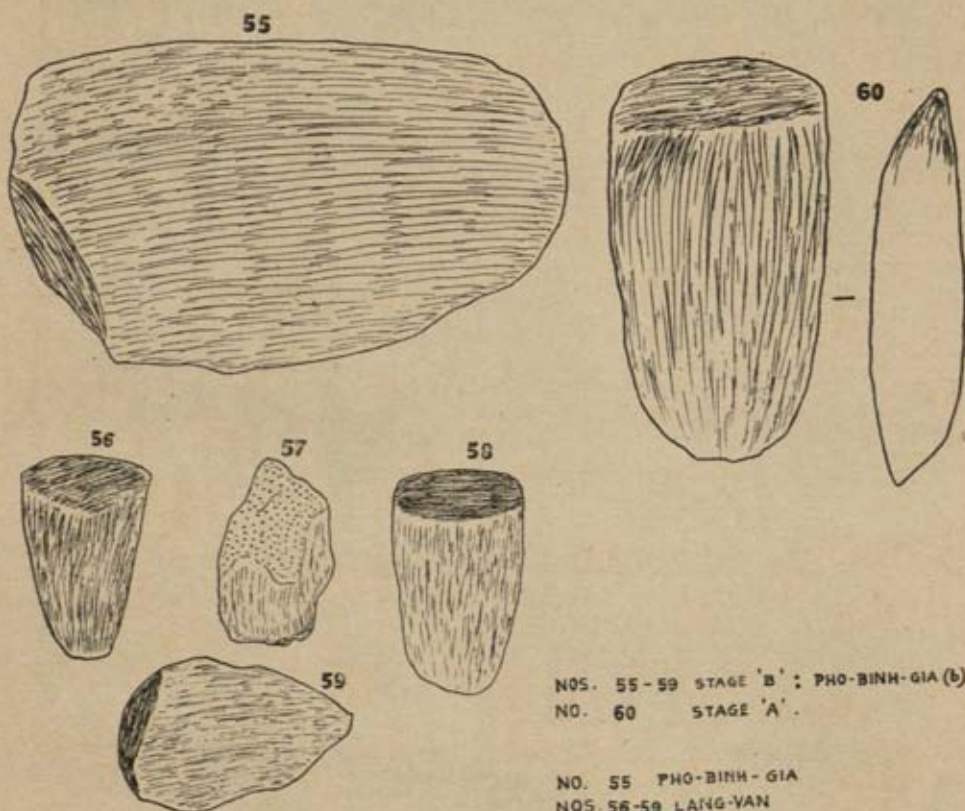
NOS. 43-47 STAGE 'B' : LANG-TRANG INDUSTRY
 NOS. 48-50 STAGE 'B' : PHO-BINH-GIA (a)
 NOS. 51-54 STAGE 'B' : PHO-BINH-GIA (b)

NO. 43 LANG-TRANG
 NOS. 44-47 GIOUC-GIAO
 NOS. 48-54 PHO-BINH-GIA

SCALE : 0 2 4 6 CM.

BACSONIAN CULTURE OF INDO-CHINA

PLATE 33.



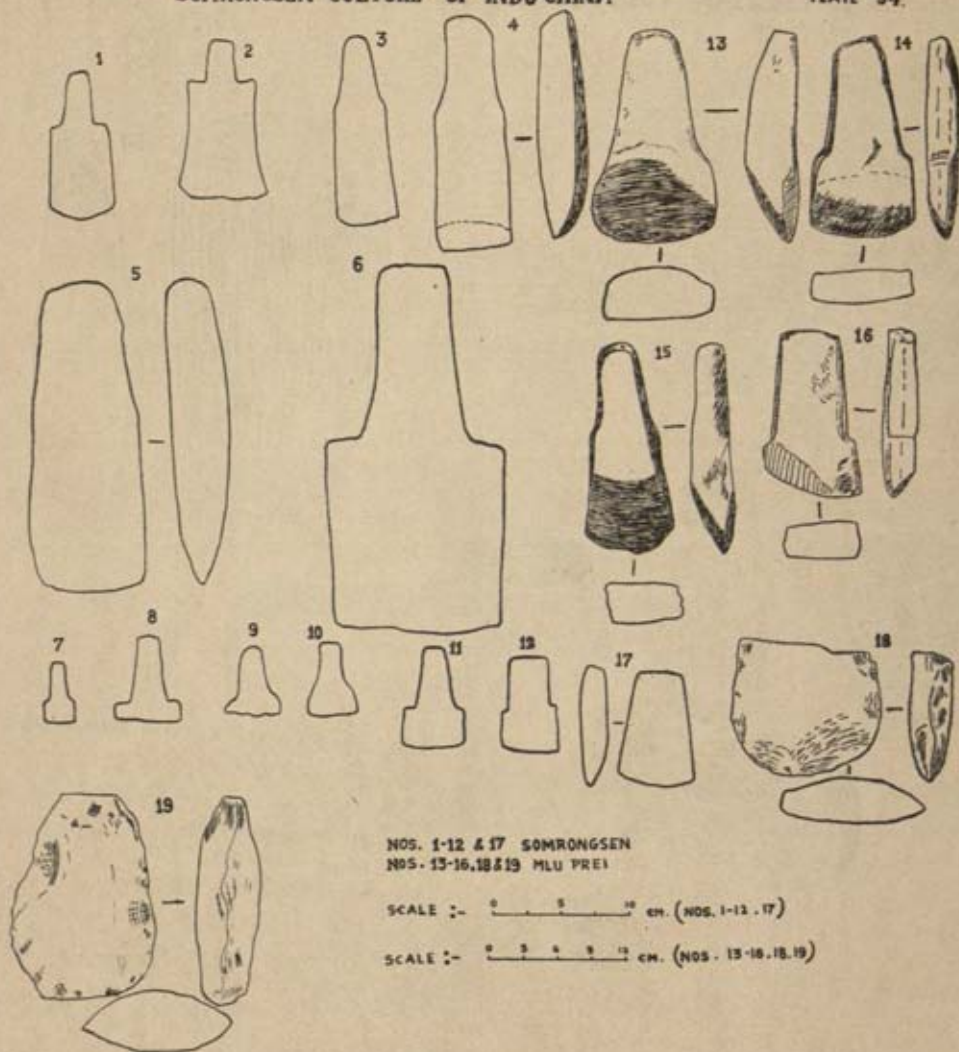
NOS. 55-59 STAGE 'B'; PHO-BINH-GIA (b)
NO. 60 STAGE 'A'.

NO. 55 PHO-BINH-GIA
NOS. 56-59 LANG-VAN
NO. 60 SUAM-SON

SCALE: 0 3 6 9 CM.

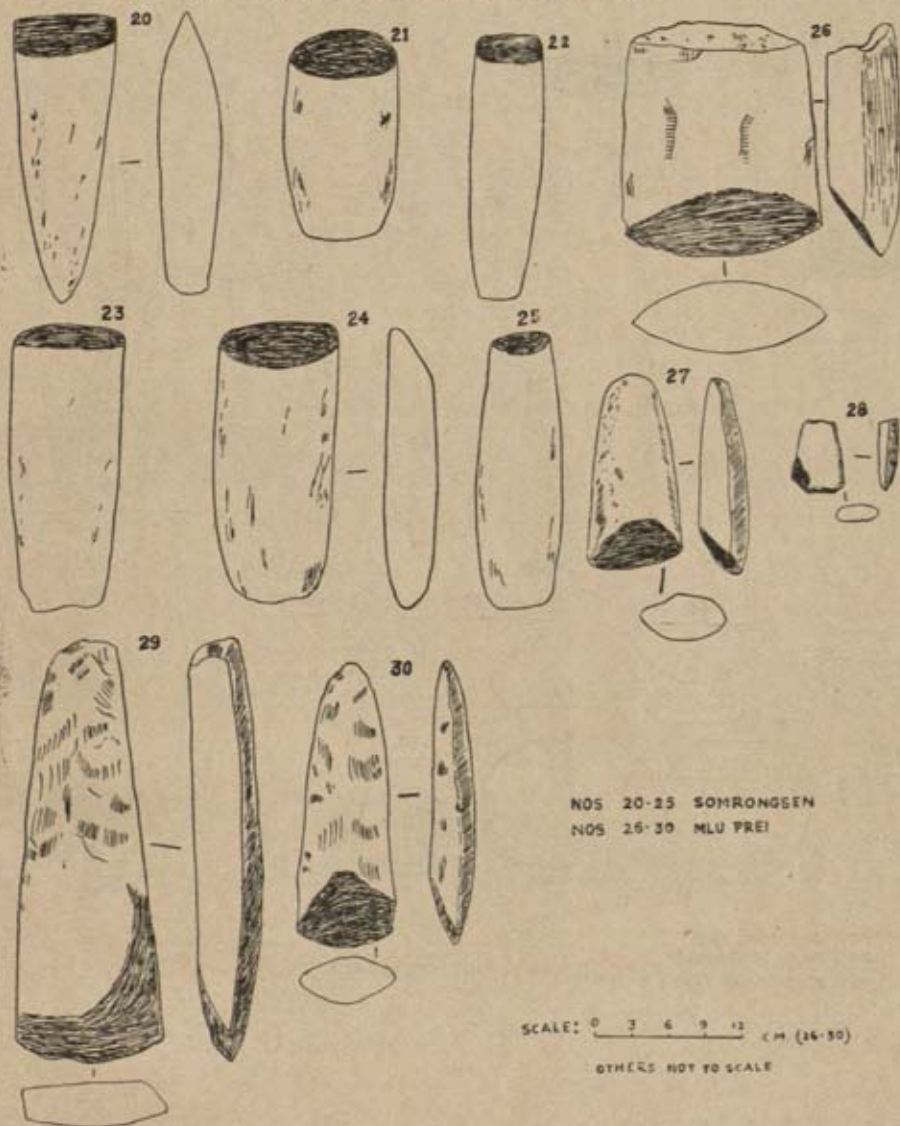
SOMRONGSEN CULTURE OF INDO-CHINA

PLATE 34.



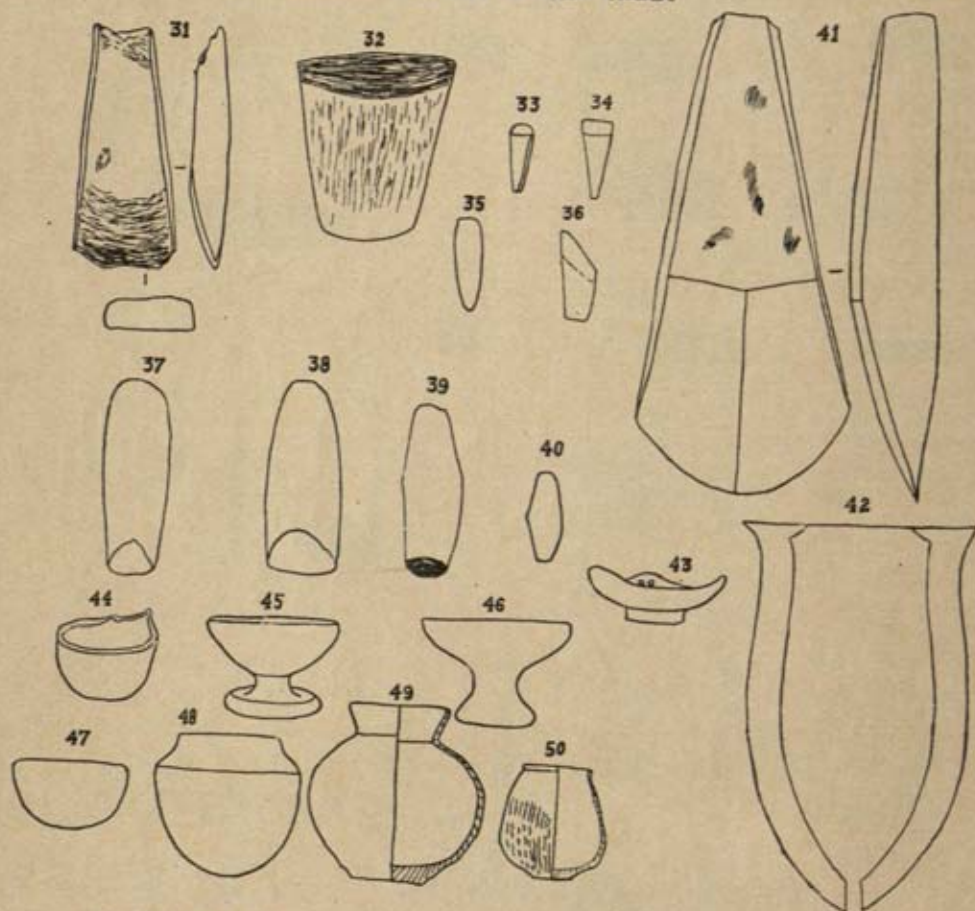
SOMRONGSEN CULTURE OF INDO-CHINA

PLATE 35.



SOMRONGSEN CULTURE OF INDO-CHINA

PLATE 36.

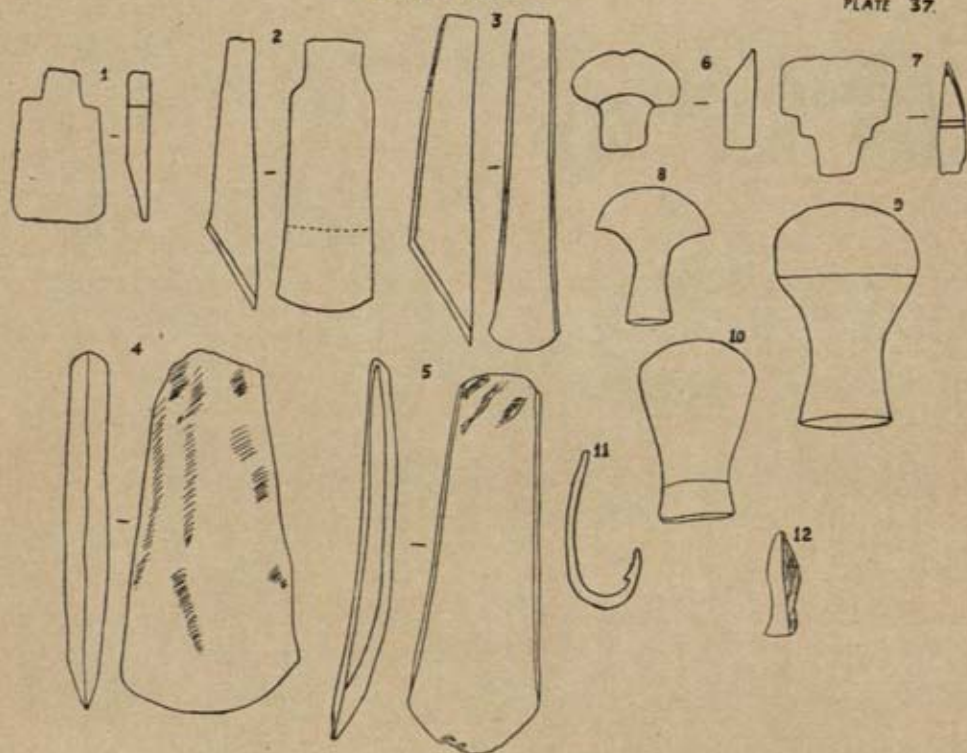


NO. 31 MLU PREI
 NOS. 32-40 SOMRONGSEN
 NOS. 43-50 PAUL LÉVY'S MATERIAL

NOT TO SCALE.

INDO-CHINA

PLATE 37



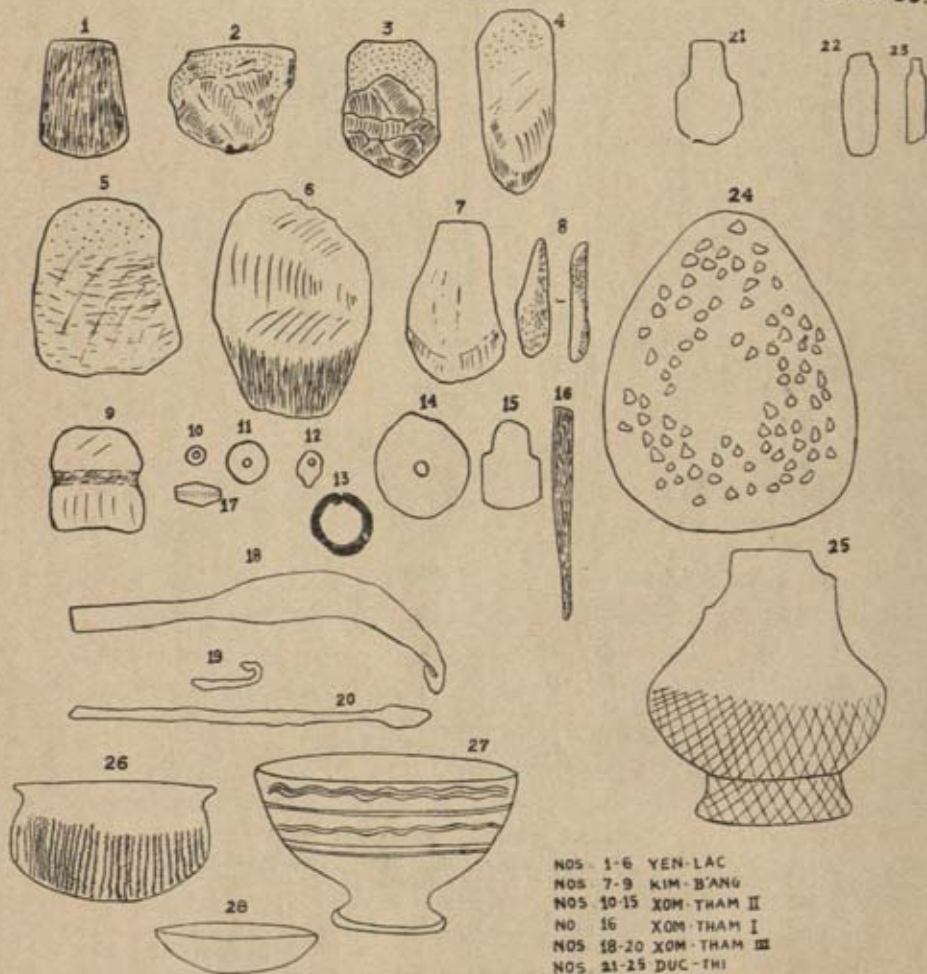
NOS. 1-7 NEOLITHS FROM LUANG PRABANG

NOS. 8-12 BRONZE TOOLS FROM LUANG PRABANG

SCALE : 0 3 6 9 CM.

INDO-CHINA

PLATE 38.



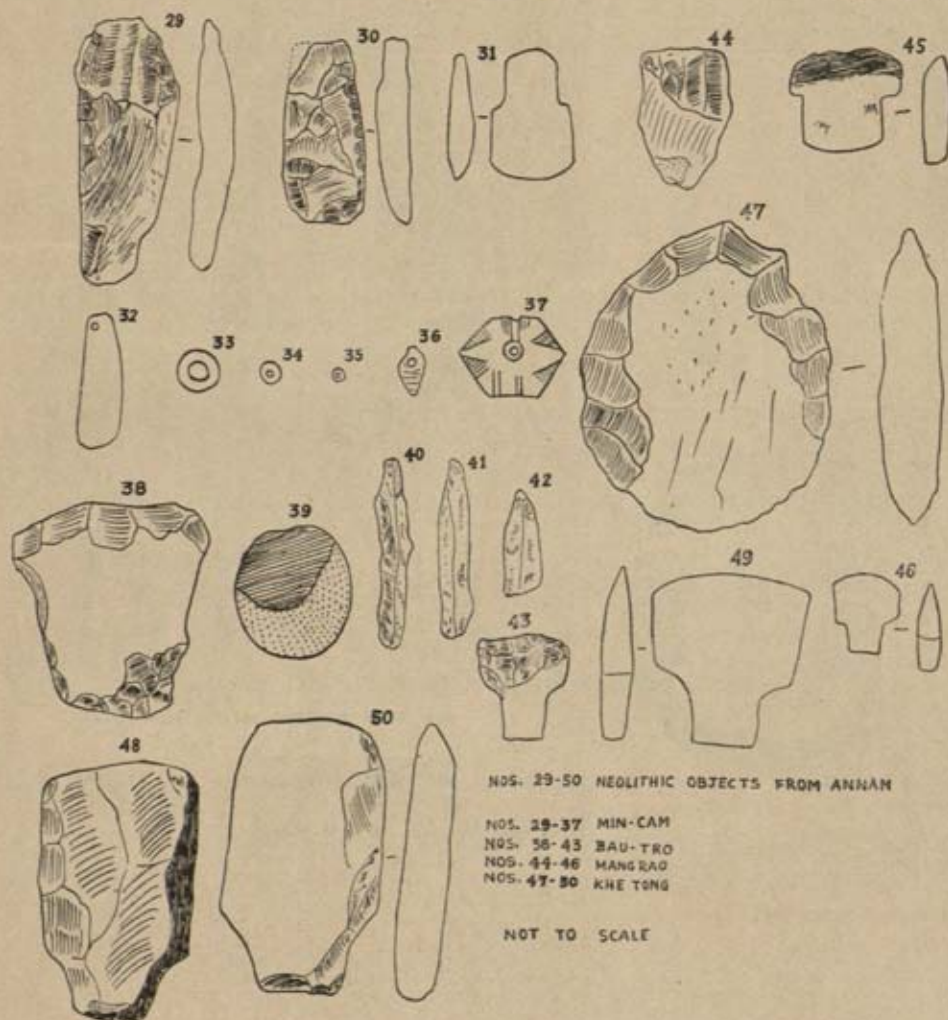
NOS. 1-28 NEOLITHIC OBJECTS FROM ANNAM

NOT TO SCALE

- NOS. 1-6 YEN-LAC
- NOS. 7-9 KIM-B'ANG
- NOS. 10-15 XOM-THAM II
- NO. 16 XOM-THAM I
- NOS. 18-20 XOM-THAM III
- NOS. 21-25 DUC-THI
- NOS. 26-28 BAU-TRO
- NO. 17 XOM-THAM I

INDO-CHINA

PLATE 39.



NOS. 29-50 NEOLITHIC OBJECTS FROM ANNAM

NOS. 29-37 MIN-CAM

NOS. 38-43 BAU-TRO

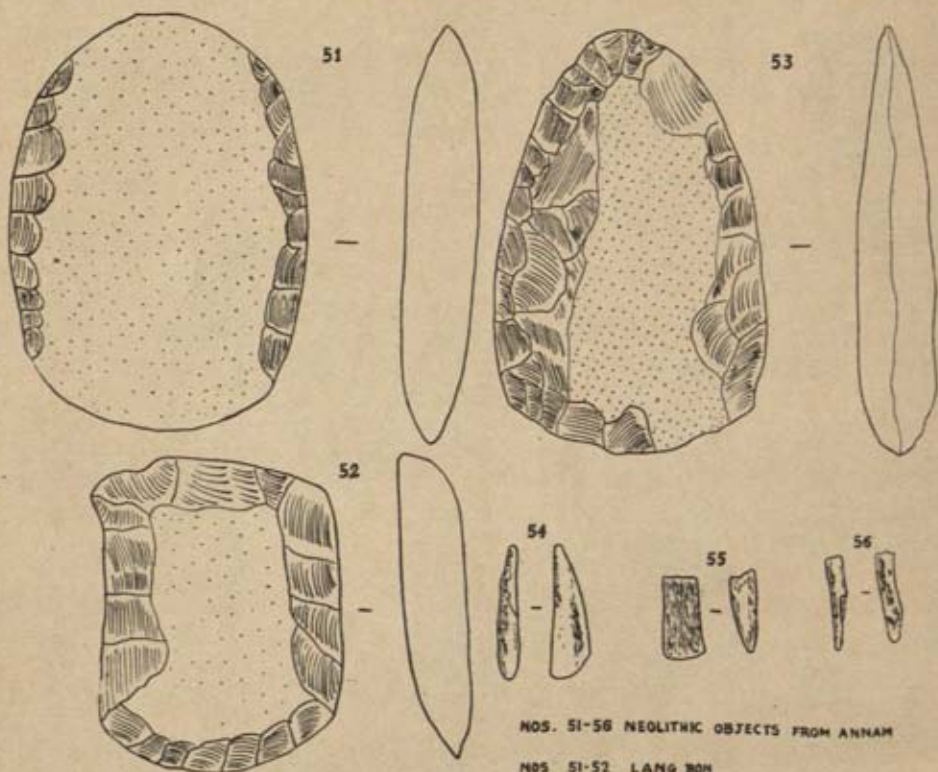
NOS. 44-46 MANG-RAO

NOS. 47-50 KHE-TONG

NOT TO SCALE

INDO-CHINA

PLATE 40.

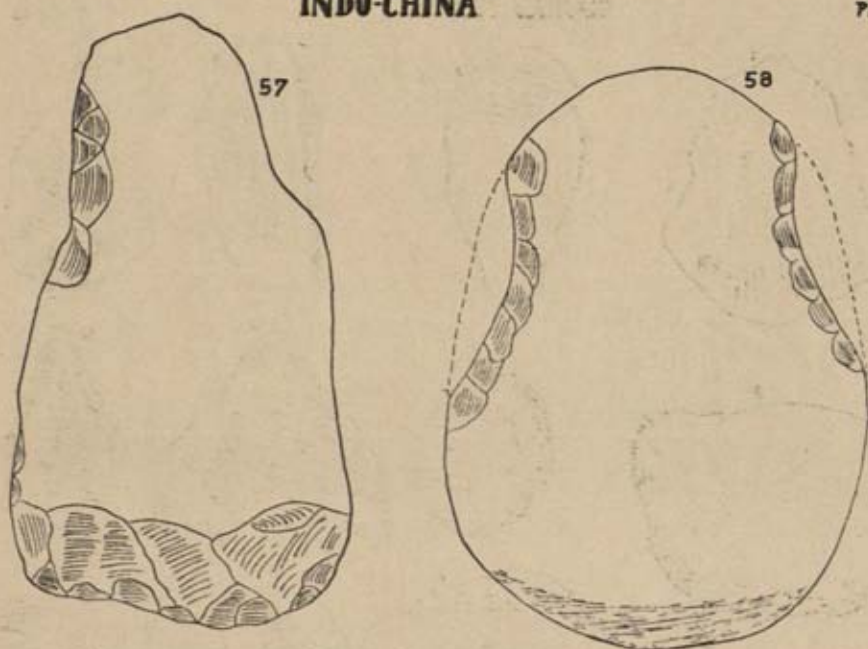


NOS. 51-56 NEOLITHIC OBJECTS FROM ANNAM

NOS. 51-52 LANG BON

NOS. 54-56 AFTER COLANI

NOT TO SCALE



NOS. 57-58 NEOLITHIC OBJECTS FROM ANNAM

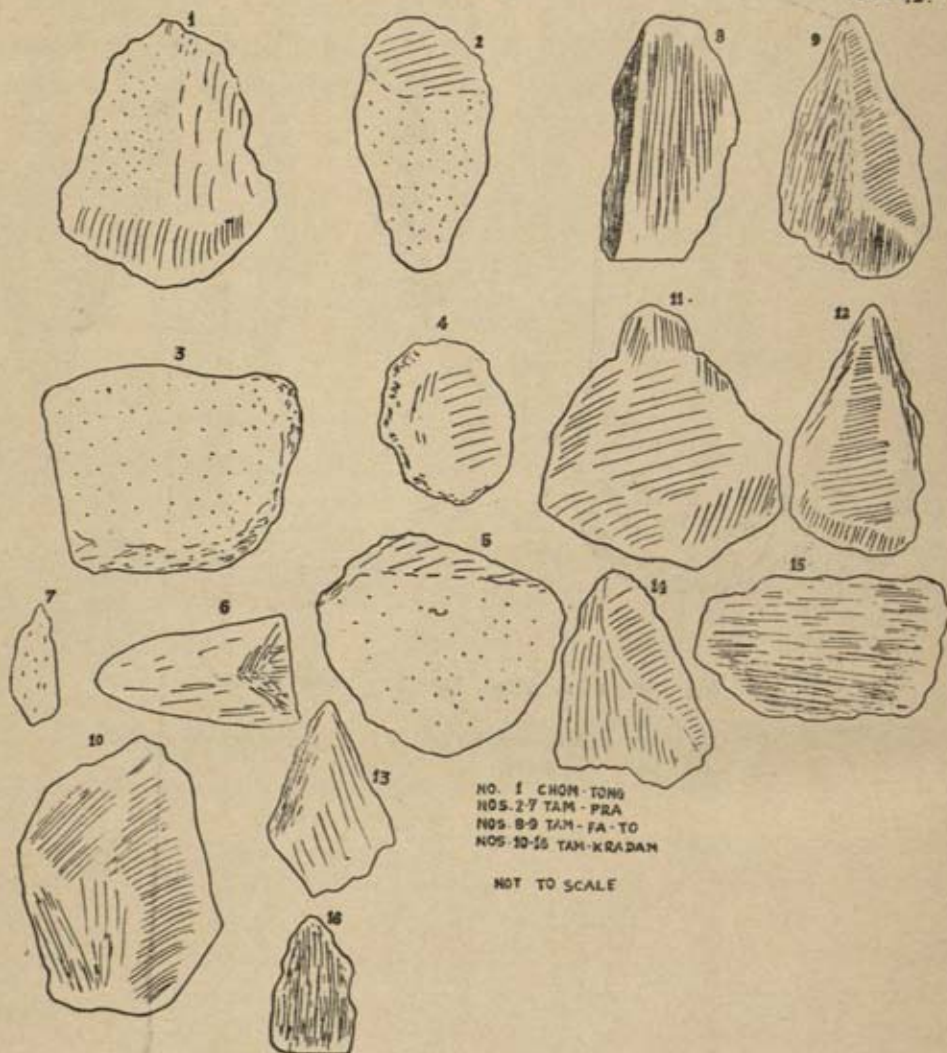
NO. 57 LANG-VANH

NO. 58 DA-PHUC

SCALE : 0 1 2 3 CM.

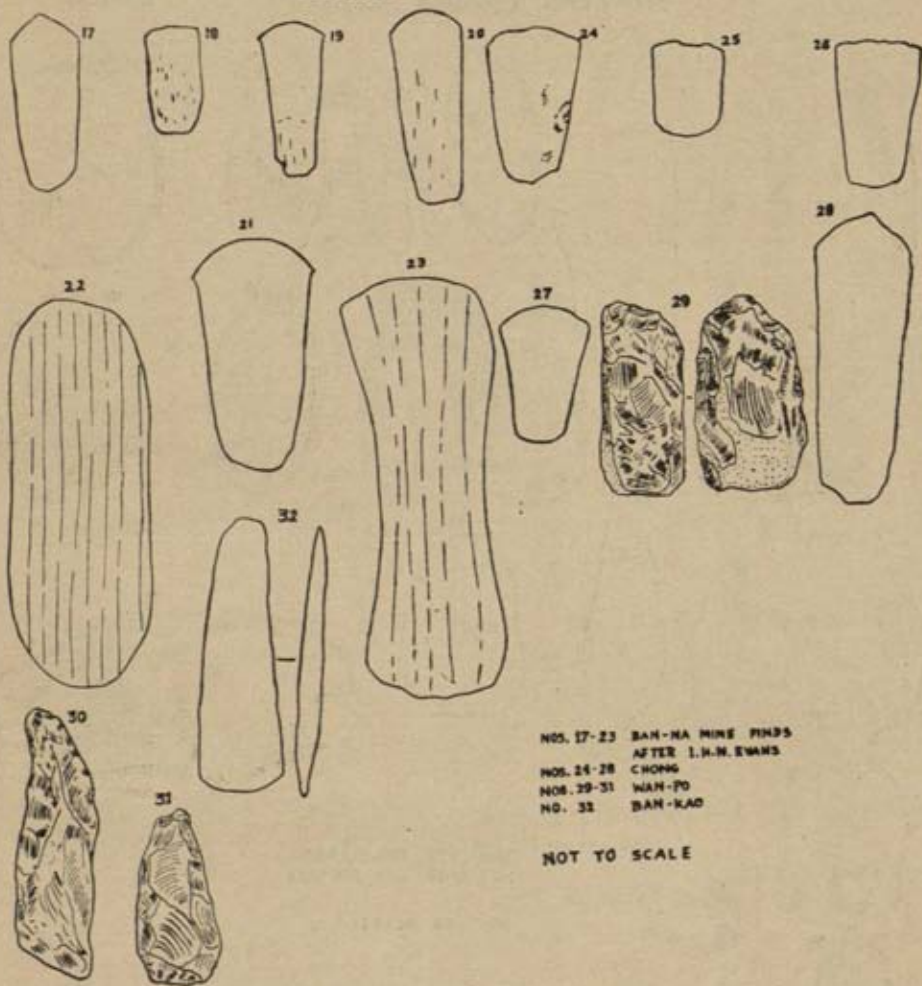
SIAMIAN CULTURE

PLATE 42.



SIAMIAN CULTURE

PLATE 43

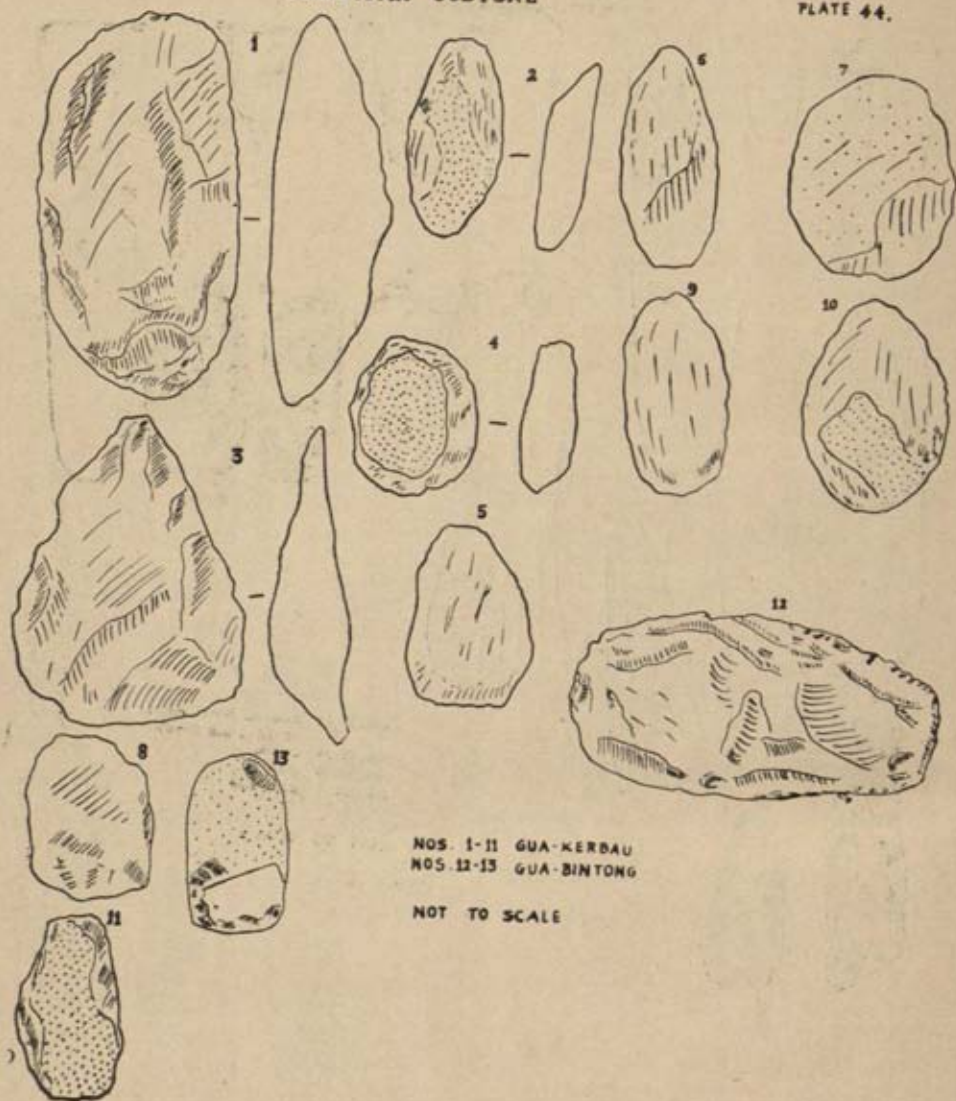


NOS. 17-23 BAN-NA MINE PINS
AFTER I.H.H. EWANS
NOS. 24-28 CHONG
NOS. 29-31 WAN-PH
NO. 32 BAN-KAO

NOT TO SCALE

MALAYAN CULTURE

PLATE 44.

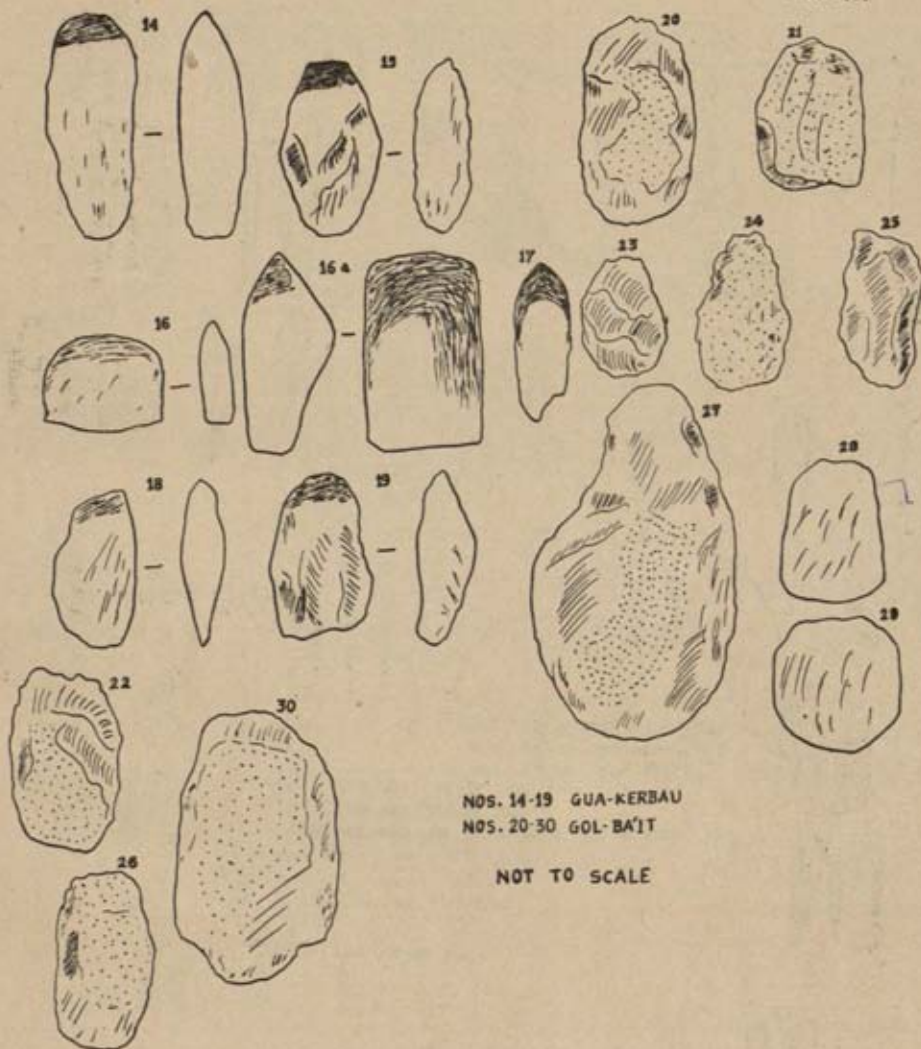


NOS. 1-11 GUA-KERBAU
NOS. 12-13 GUA-BINTONG

NOT TO SCALE

MALAYAN CULTURE

PLATE 45.

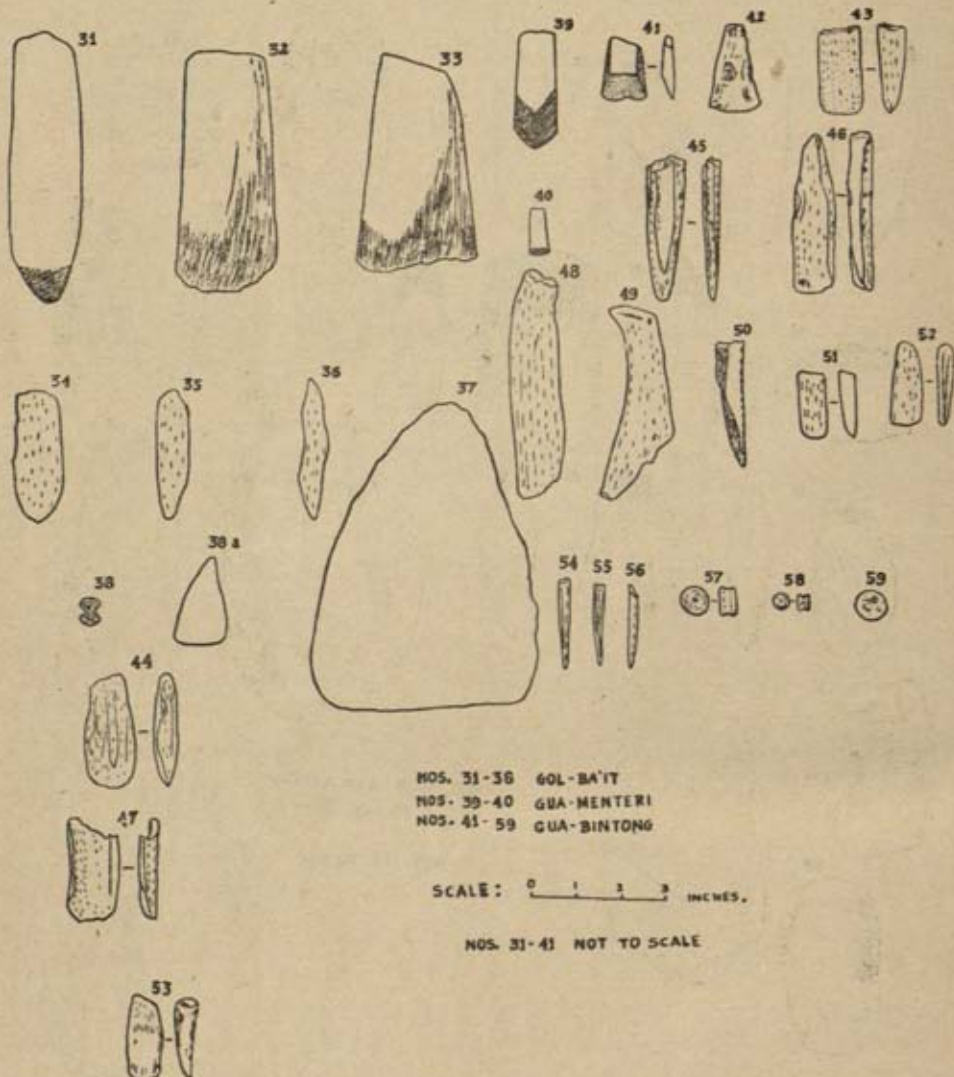


NOS. 14-19 GUA-KERBAU
NOS. 20-30 GOL-BA'IT

NOT TO SCALE

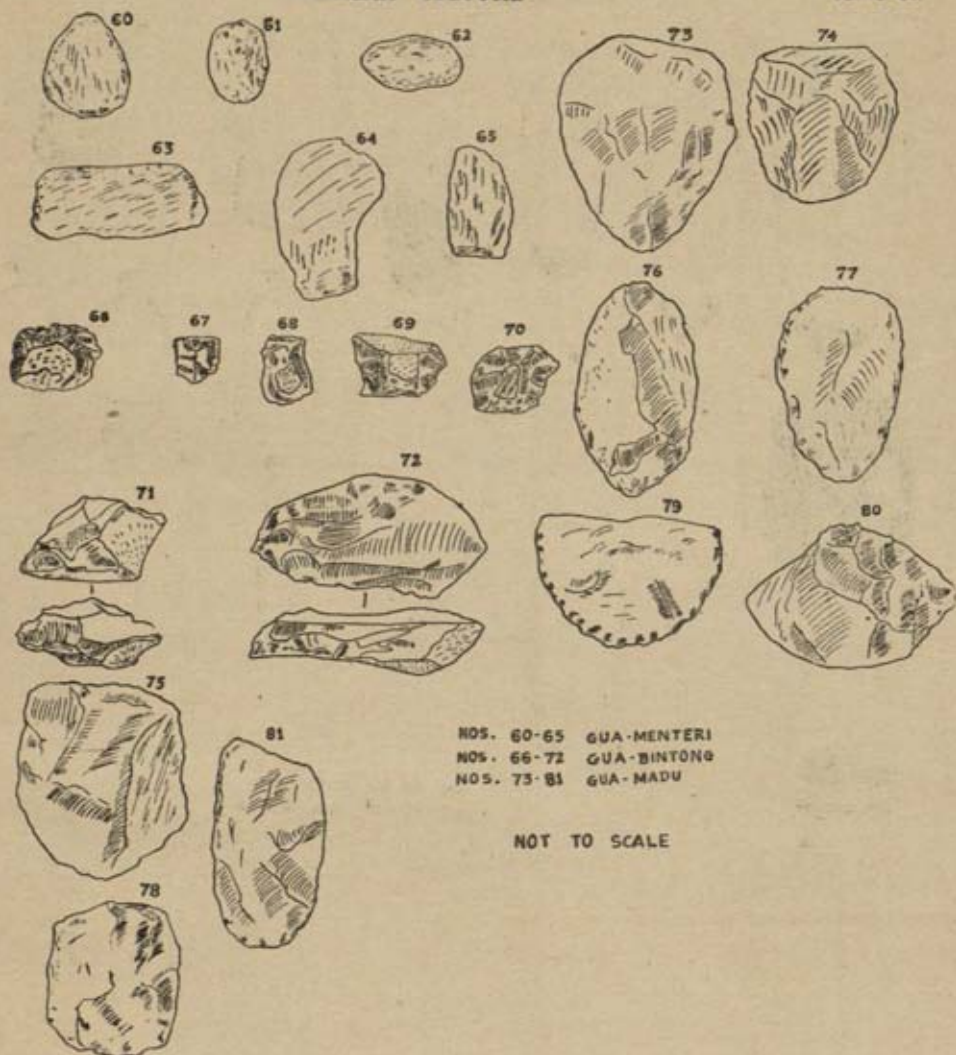
MALAYAN CULTURE

PLATE 46.



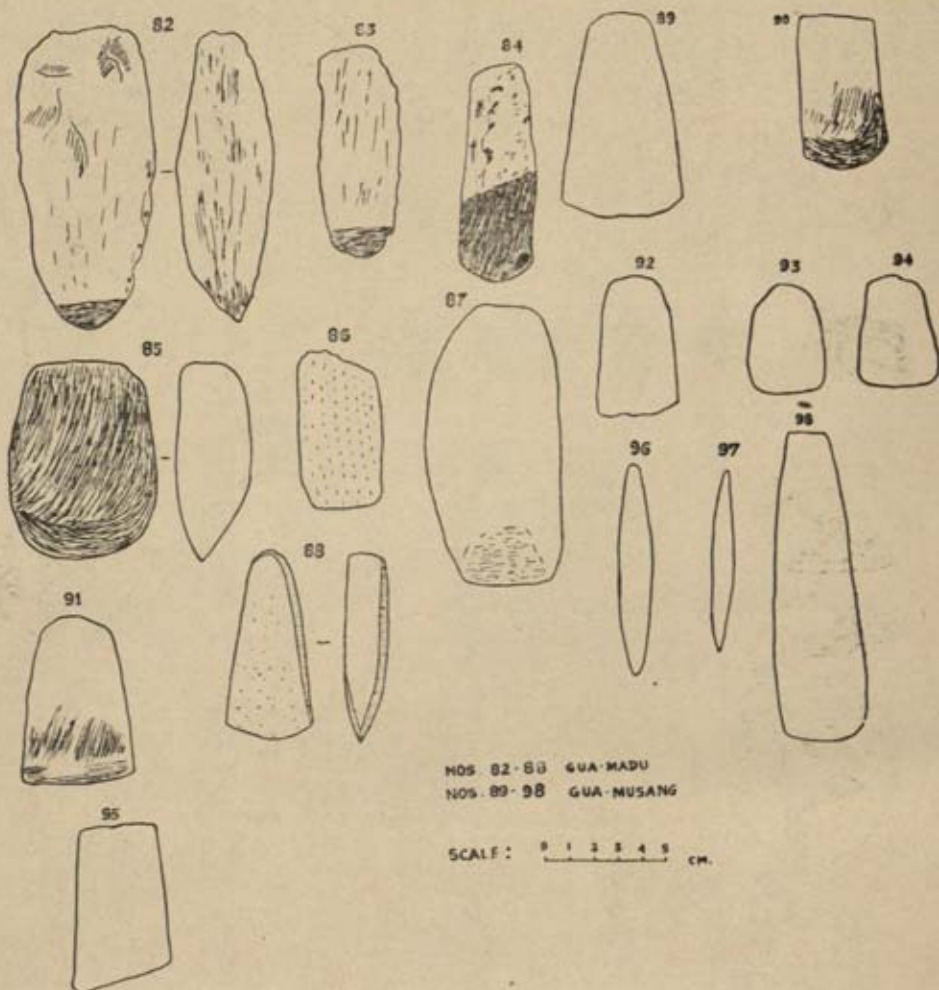
MALAYAN CULTURE

PLATE 47.



MALAYAN CULTURE

PLATE 48.

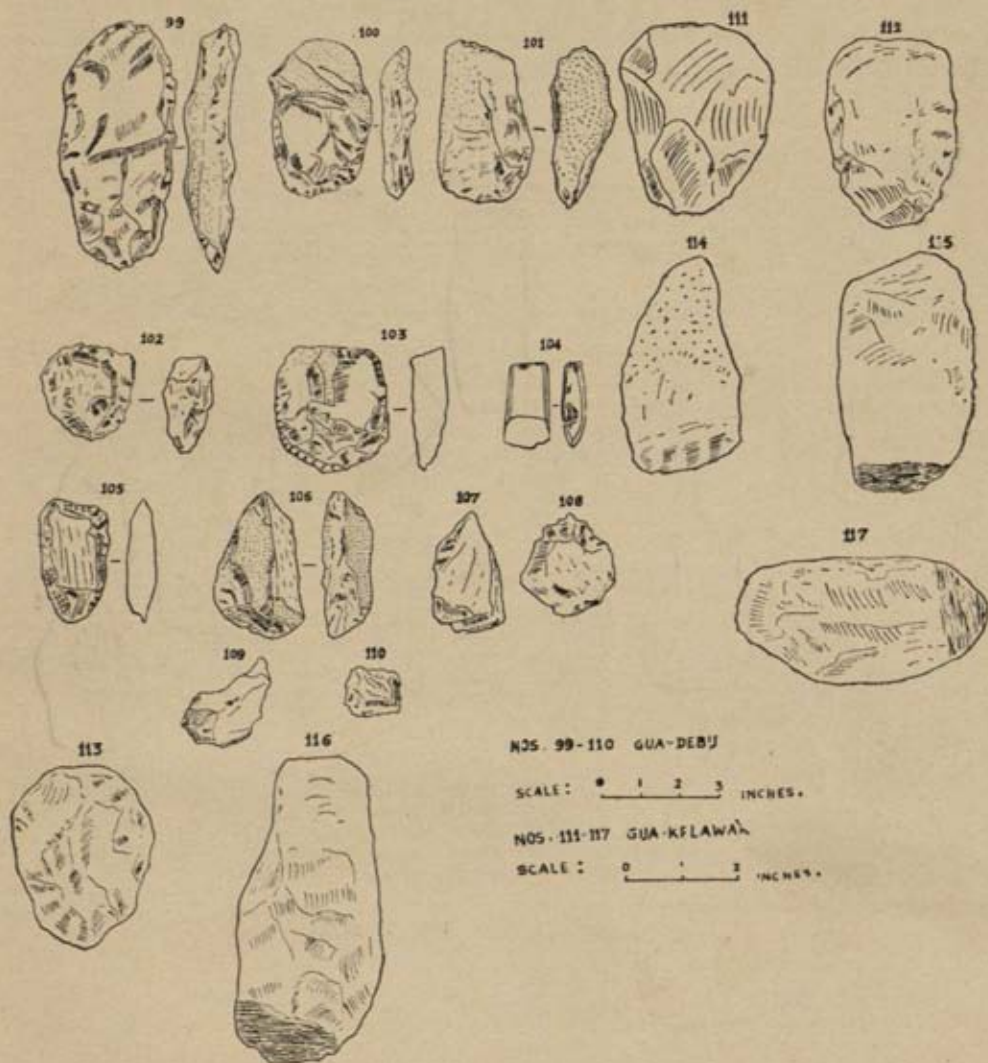


NOS. 82-88 GUA-MADU
NOS. 89-98 GUA-MUSANG

SCALE : 0 1 2 3 4 5 CM.

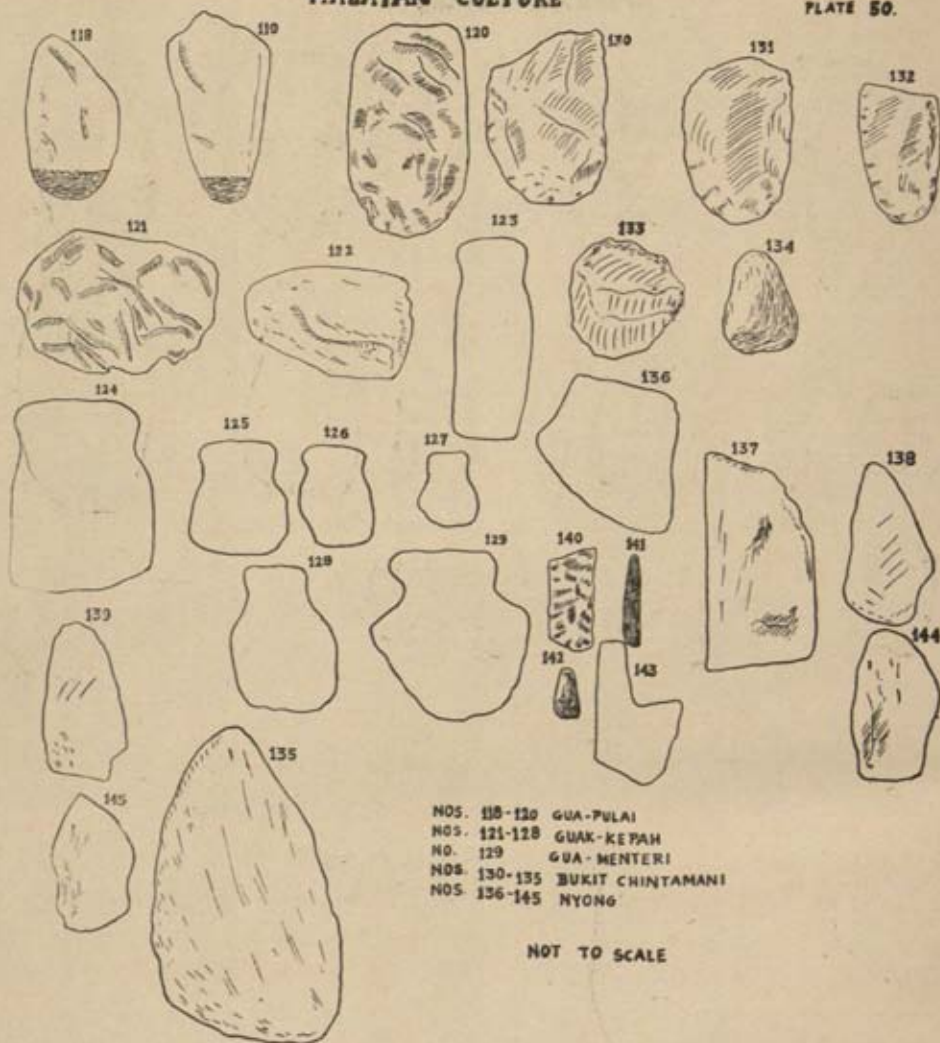
MALAYAN CULTURE

PLATE 49.



MALAYAN CULTURE

PLATE 50.

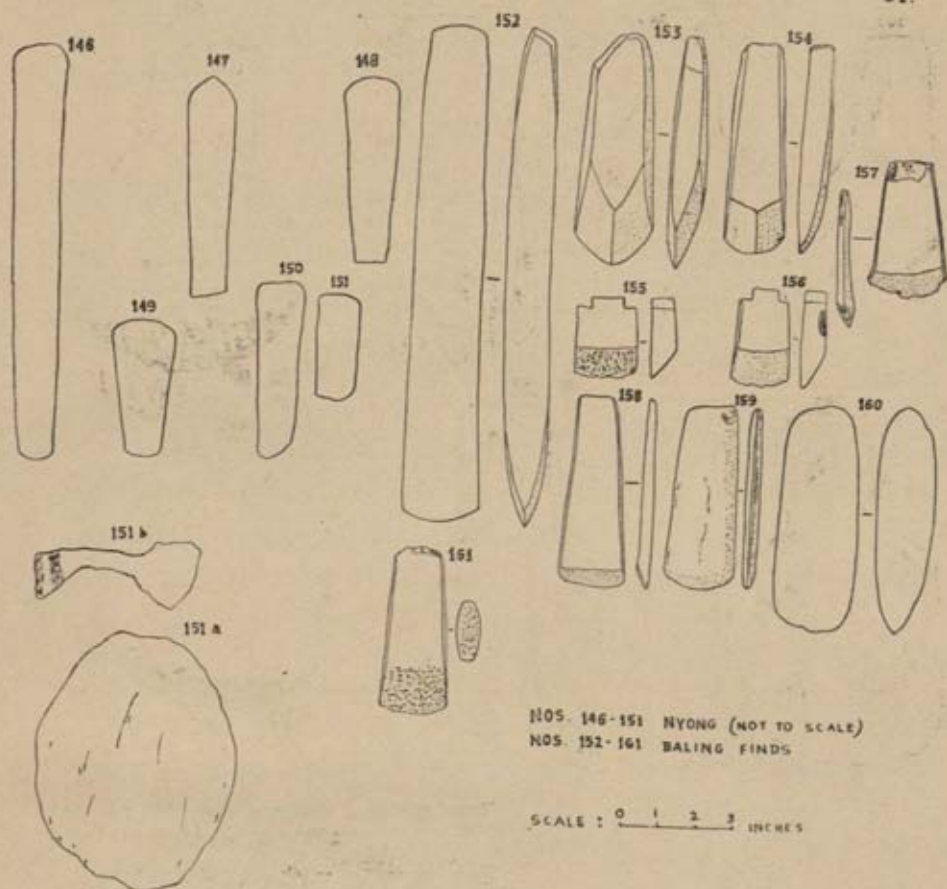


- NOS. 118-120 GUA-PULAI
 NOS. 121-128 GUAK-KEPAH
 NO. 129 GUA-MENTERI
 NOS. 130-135 BUKIT CHINTAMANI
 NOS. 136-145 NYONG

NOT TO SCALE

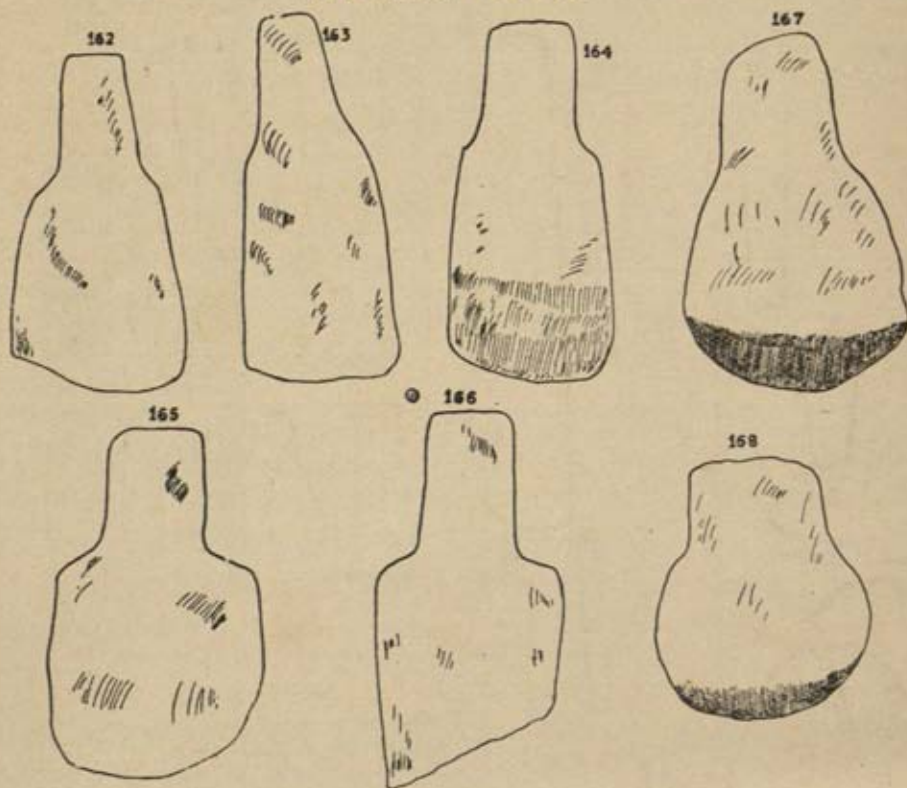
MALAYAN CULTURE

PLATE 51.



MALAYAN CULTURE

PLATE 52.



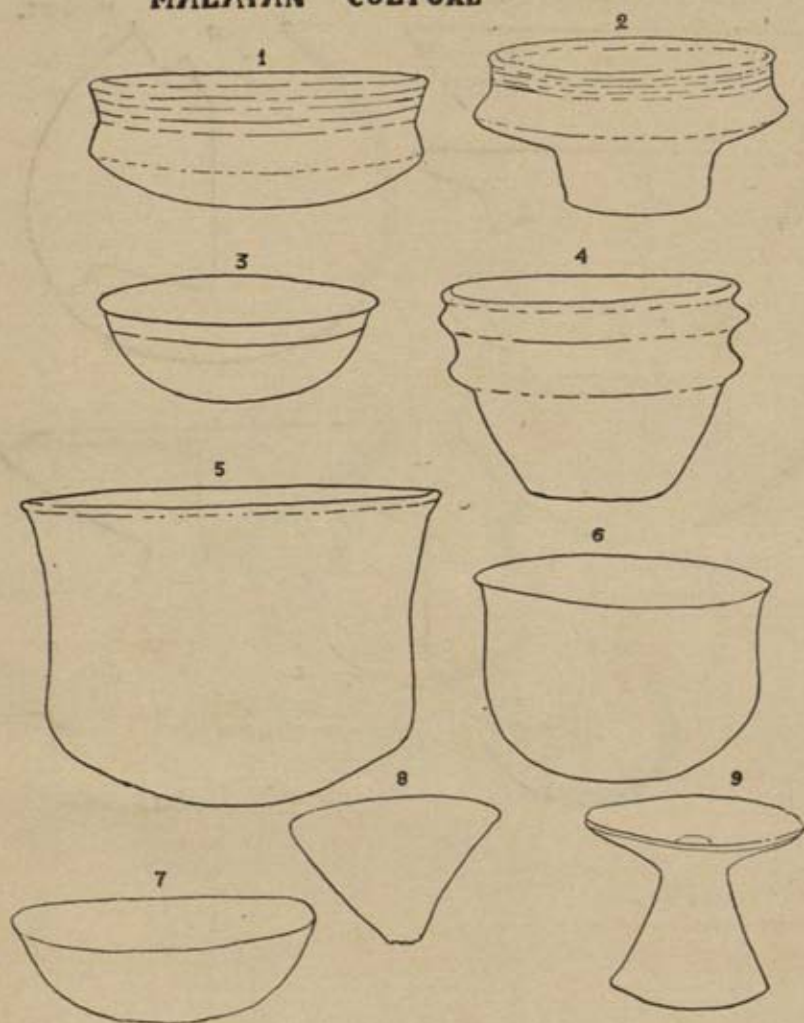
NOS. 162-166 SURFACE FINDS ON THE EAST
COAST OF PAHANG & KELANTAN

NOS. 167-168 ULU-LIPIS (PAHANG)

SCALE : 0 1 2 3 4 5 CMS.

MALAYAN CULTURE

PLATE 53.

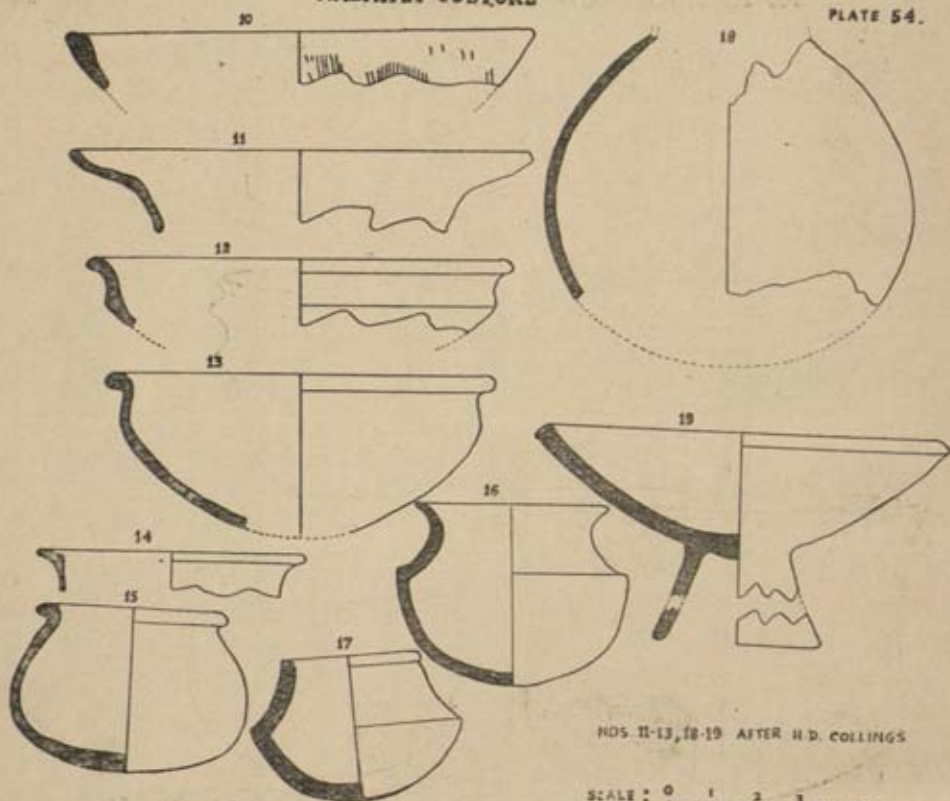


NOS. 1-3 GUA-MENTERI
NOS. 4-9 GUA-MUSANG

NOT TO SCALE

MALAYAN CULTURE

PLATE 54.

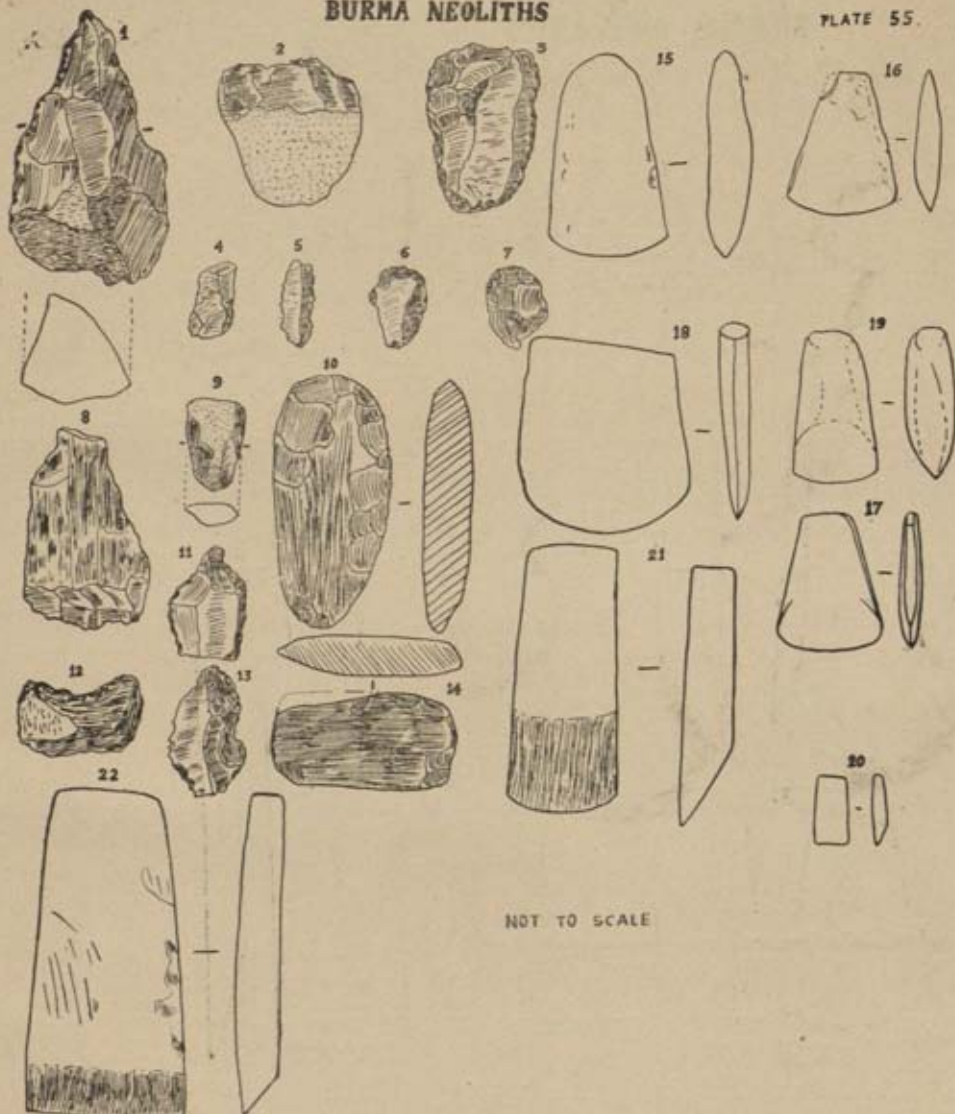


NOS. 11-13, 18-19 AFTER H.D. COLLINGS

SCALE : 0 1 2 3 INCHES

BURMA NEOLITHS

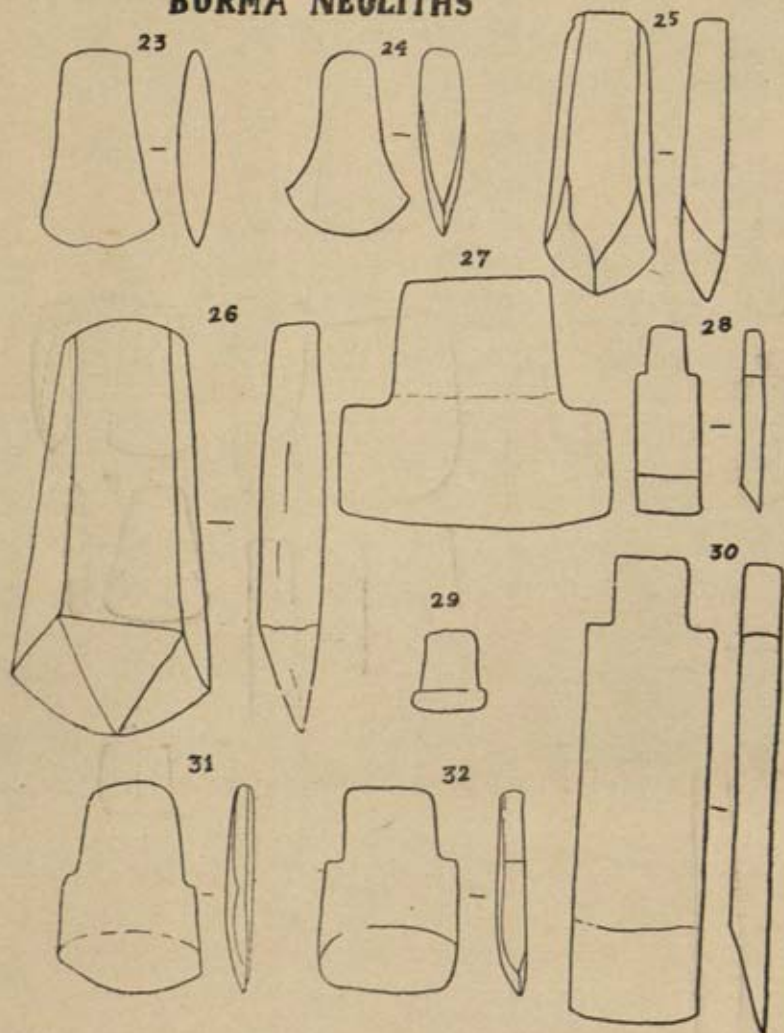
PLATE 55



NOT TO SCALE

BURMA NEOLITHS

PLATE 56.



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