

GOVERNMENT OF INDIA
DEPARTMENT OF ARCHAEOLOGY
CENTRAL ARCHÆOLOGICAL
LIBRARY

913.054/Sri

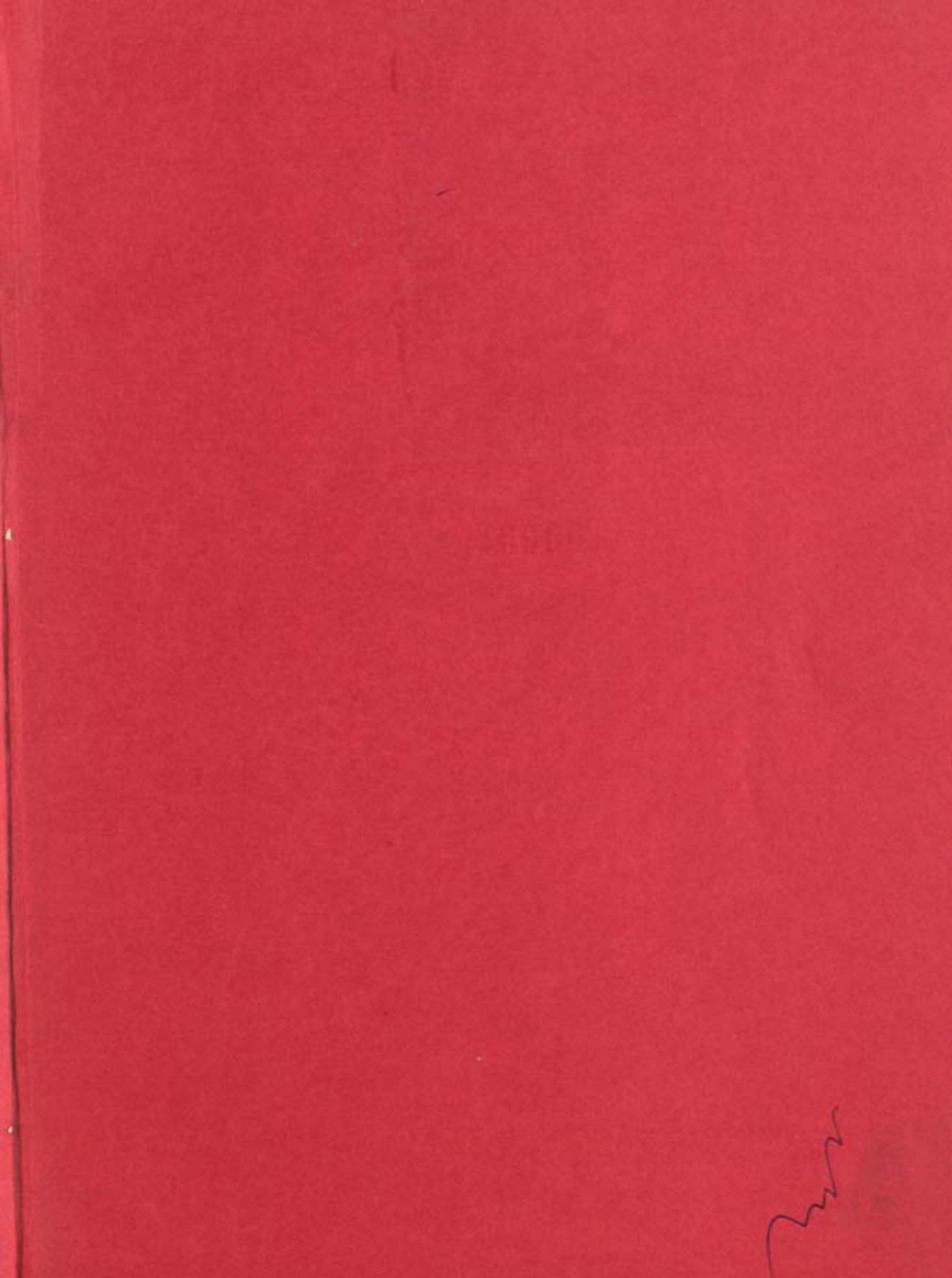
CALL No.

ACC. No.

69601

D.G.A. 79.

GIPN—54—2D. G. Arch. N. D./57.—25-9-58—1,00,000.



**New Era of
Indian Archaeology**

New Era of Indian Archaeology

69601

K. M. Srivastava

Director'
Archaeological Survey of India

Vol. I

913.054
Sri



Cosmo Publications

69601

अवधि... दिनांक... 21.1.83

निर्देश... 913.054/S81.....

डिप्टी

क.द. ... वस्तुशाला

Cover . Bakraur — Excavation in progress

First Published 1982
© K. M. Srivastava

PUBLISHED BY :
Mrs. RANI KAPOOR
Cosmo Publications
24-B, Ansari Rd.
New Delhi-2

PRINTED BY
S. K. Mehra
at Mehra Offset Press
Delhi

CONTENTS

Preface		i
I.	INTRODUCING THE SUBJECT	1
II.	SPROUTING OF INDIAN ARCHAEOLOGY	7
III.	THE NEW ERA	13
IV.	EXCAVATION, PREPARATION AND TECHNIQUE	24
1.	Preparation for Excavation Campaign	24
2.	Excavation and its Techniques	32
3.	Lay-out of Trenches	36
i	Vertical and Horizontal Excavations	36
ii	Megalithic Burials	40
(a)	Cist Circles	40
(b)	Pit Circles	40
(c)	Other burials	40
iii	Stupa	41
4.	The Digging Operation	42
5.	Principles of Stratification	43
6.	Identification of Layers or Strata	46
7.	Digging of a Structure	50
8.	Digging of Mud and Mud-brick Structure	53
V.	RECORDING	56
1.	Pottery and Antiquities	56
2.	Archaeological Drawing	61
i	Section Drawing	61
ii	Plan of the Structures	64
iii	Pottery Drawing	66
iv	Antiquities Drawing	68
3.	Archaeological Surveying	68
i	Chain Surveying	69
ii	Plane-table Survey	70
iii	Level Surveying	70
4.	Archaeological Photography	71
i	Photography of the Excavated Remains	74
ii	Photography of the Antiquities	77

Recd. from Books & Books, Pri/12/10, 0252 dt. 24/12/82 for Rs 150/- S. No. 11

VII.	1.	Relative Dating	90
	i	Level Dating	90
	ii	Stratigraphic Dating	91
	iii	Seriation Dating	91
	iv	Sequence Dating	91
	v	Cross Dating	91
	(a)	Geomorphology	91
	(b)	Palaeontology	92
	(c)	Palynology	92
	vi	Cultural Remains	92
	vii	Flourine-Uranium-Nitrogen	92
	2.	Absolute or Scientific Dating	93
	i	Radio Carbon Dating	93
	ii	Potassium-Argon Dating	93
	iii	Dendrochronology	94
	iv	Thermoluminescence Dating	94
	v	Archaeomagnetic Dating	94
VIII.		PUBLICATION AND EDUCATION	95
	A.	Publication	96
	1.	Half-tone Blocks	96
	2.	Line-Drawing Blocks	101
	3.	Lithographs	102
	B.	Education	102
IX.		SEQUENCE OF CULTURES	102
	1.	Prehistoric Sohan Culture	105
	2.	Prehistoric Guler	105
	3.	Prehistoric Liddar Valley	107
	4.	Stone Age in the Vindhyas and Ganga Valley	110
	5.	Stone Age Cultures of Orissa	112
	6.	Prehistoric Hoshangabad	115
	7.	Prehistoric Bhimbetka	119
	8.	Prehistoric Sabarmati in Gujarat	123
	9.	Prehistoric Chirki-on-Pravara	125
	10.	Prehistoric Pallavaram	128
	11.	Prehistoric Madras	129
	12.	Prehistoric Khandivli	132
	13.	Teri Sites of Tinnevely District ✓	133
	14.	Bagor	134
	15.	Langhnaj	137
	16.	Kuchai	141
	17.	Burzahom	142
	18.	Koldihwa	143
	19.	Chirand	144
			148

20.	Brahmagiri	149
21.	Tekkalkota	151
22.	Hallur	152
23.	Kalibangan	153
24.	Lothal	157
25.	Rangpur	160
26.	Surkotada	163
27.	Ahar	165
28.	Kayatha	169
29.	Navdatoli	172
30.	Eran	174
31.	Bahal & Tekwada	176
32.	Prakash	178
33.	Rupar	181
34.	Hastinapur	182
35.	Atranjikhhera	185
X.	Glossary	187

LIST OF ILLUSTRATIONS

Plates

Plate	I.	Sir John Marshall	9
Plate	II.	Sir Mortimer Wheeler	13
Plate	III.	Pottery Yard	36
Plate	IV.	Vertical Excavation	36
Plate	V.	Horizontal Excavation	36
Plate	VI.	Pit Circle	40
Plate	VII.	Vertical Excavation	38
Plate	VIII.	Horizontal Excavation	39
Plate	IX.	Excavated Sites	105

Figures

Fig. 1.	Cist Circle	40
Fig. 2.	Pit Circle	40
Fig. 3.	Structure and Stratification	52
Fig. 4.	Structure with strata	53
Fig. 5.	Recording in deep trenches	58
Fig. 6.	Undifferentiated section	62
Fig. 7.	Unintelligently Differentiated section	62
Fig. 8.	Intelligently Differentiated section	62
Fig. 9.	Symbols for section	63
Fig. 10.	Section with all details	63
Fig. 11.	Pottery drawing	66
Fig. 12.	Pottery drawing	67
and 13.		
Fig. 14.	Levelling	70
Fig. 15.	Terraces in Sohan	106
Fig. 16.	Sequence at Kuchai	143
Fig. 17.	Sequence at Rupar	181

PREFACE

While presenting the first volume of the book 'New Era of Indian Archaeology' the happy memories of the camps at Sisupalgarh (Orissa) and Hastinapur (U.P.), where I learnt the fundamentals of excavation, are brought back to my mind. The job of excavation, the most important branch of archaeological pursuit, is no doubt a very strenuous one, yet it appeared to me to be most absorbing and interesting. The thrill at every moment to unearth any valuable antiquity, that may reveal the story of man's past, is a feeling which can only be experienced and not imagined or expressed in words. It is an instinct, not inborn in any student of archaeology, but has to be developed by undergoing the continuous stress and strains in the field in a most devoted manner. The serious student in the field is expected to merge himself completely with the buried soil and the remains representing the story of man's past, so as to unfold the mystery of bygone days.

The title of the book 'New Era' has been labelled after Sir Mortimer Wheeler, who introduced the technique of Scientific Excavation based on the Principles of Stratification in the country, besides bringing a military discipline in the field. Though I was not fortunate enough to receive the first hand training under Wheeler, I still feel proud of having been introduced to the subject by one of his best pupils, B.B. Lal, who is still regarded as the topmost field archaeologist in the country. There had been a number of occasions when I got impatient to speed up the work, while working under him, at the same time I frankly admit that I was always amazed by the keen observation of my teacher. In this context I very well remember to have been once told by my teacher that according to Wheeler the primary requirements of a field archaeologist are a long walk and a keen eye.

The absorbing interest in the field created by my teacher had such a deep impact on me that I developed an attachment with the subject and tried to specialize in it. I consider it to be the proper forum to record the truth that during the long span of about thirty years of my service career the attachment to field archaeology had always had an upper hand on any other branch of archaeology, whatsoever, leading ultimately to the epoch-making discovery of the lost town of Kapilavastu. With the same consideration in view I was sent to Egypt as a member of the Indian Expedition to Nubia to assist B.B. Lal in excavations. My continuous involvement in Exploration and Excavation gave birth to an urge to produce a book on the subject based on my life-long experience. The absence of any book on it, particularly in Indian context, was always felt, both by the post-graduate teachers and students of Archaeology. In the circumstances Wheeler's book 'Archaeology from the Earth' was the only volume to which

they could refer, though it did not cover all the aspects of the subject. Like the buried remains of man's past, the urge to produce the book remained buried in my mind till the year 1980 when the first volume of Wheeler's Memorial Lectures delivered by Graham Clark was released by the Archaeological Survey of India. The volume acted like a switch to put on the light considered necessary to produce a book.

Though the stay of Sir Mortimer Wheeler in India as the Director General of Archaeology was limited to four years, he left behind a deep imprint on the scholars by his strategic planning, new techniques and above all a military discipline in the field. The lessons imbibed by the Indian scholars continued to have their hold on the field for a considerably long time. I, however, very much regret to put on record that the spirit, enthusiasm and the military discipline introduced by Wheeler are gradually dying away from the country. According to my own assessment there are only a restricted number of reasons to account for it. First of all, the number of students who absorbed the strategies and principles of Wheeler in the true sense was very limited. Secondly, those who assimilated the lessons of Wheeler did not make an earnest effort to generate those lessons in the same spirit to the younger scholars, not only to keep them alive but to develop upon them. Of course, the last but the most important reason for the dying spirit is the complete change in the bent of mind of scholars. They are trying hard, and to a great extent they are successful as well, to achieve their goal not by toiling in the field, but simply earning the credit of excavation in one way or the other to add to their qualifications. With this book I fervently appeal to all those who claim to be field archaeologists to see that the dying spirits are revived again in order to maintain the recognised high standards of the country in the world, so far as excavations are concerned.

There need not be any misconception amongst the scholars that the above statement means that excavation and exploration are the only branches in Archaeology in which they ought to specialize, but the scholars who claim to be field archaeologists must be very serious about it. The term should not be used as loosely as the current trend is developing. Further, as I have already emphasised in the second sentence of my preface, any scholar, who claims to be an archaeologist, must have basic grounding in the field of exploration and excavation. Archaeology is a science to study and reconstruct the various stages of the development of man in the past with the help of those tools, weapons and other traits left behind by him, which have survived the onslaughts of time, nature and climate. If the above definition of Archaeology has any meaning, the basic knowledge of exploration and excavation, which help in bringing to light various equipments of man in the past, is a primary necessity.

In this book I have tried to place before the scholars my own experiences in the technique of Excavation and Exploration, besides incorporating all those for which we are indebted to Sir Mortimer Wheeler. The second volume of the book will cover an altogether new field relating to various advancements achieved in archaeological pursuits after the lessons of Wheeler. When the manuscript of the book was in final stages I received a valuable suggestion from a senior professor to add one more chapter on 'Sequence of Cultures' in it. Though the chapter has converted the handy book into a voluminous one, I feel grateful for the suggestion, because without it the book

would have been rather incomplete. The sequence of Stone Age Cultures of Sohan finds a place in the book on account of the fact that in almost all studies of Stone Age problems a reference is made to the tools and climate observed in Sohan valley, though of course the sites are not in India. The case of Indus Valley Civilization in India may be considered by the scholars to be on the same footing, though the sites representing the civilization in India have their own individual characteristics. The subject will, however, be dealt with in the subsequent volume. I hope the book will be of some use to all those working in the field.

A fairly good number of hands are responsible in making this publication see the light of the day within a short time. Of all, the first credit goes to Shri S.N. Mukherjee, Stenographer, who had always been goading me to produce a book on excavation based on my own experience. In addition to goading he appeared to be prepared at every moment to render any service which may expedite the preparation of the book. He always kept me alert and up on my feet, particularly for this job. Sarvashri S.P. Nandi, Draftsman and S. Roy, Photographer of the Museums Branch of the Archaeological Survey of India, were of immense help to me in readily coming forward to prepare the illustrations within a limited time. The manuscript was finally typed by Sarvashri S.N. Mukherjee and J. Pal. In the last stages Shri Jassu Ram, Draftsman of the headquarters office prepared the map of India showing the principal explored and excavated sites at a very short notice. I stand beholden to them all. M/S. Cosmo publications also deserve all appreciation for bringing out the publication within a limited time.

I must express my deep sense of gratitude to my wife Smt. Shanta Srivastava, but for whose constant inspiration a book of this kind would not have been possible. I used to remain away from home on the exploration or excavation field continuously for months together, but my absence was always taken in the right spirit. This was a source of great encouragement to me. Had I not been on the field, away from hearth and home, for such a long time, I would not have been able to acquire an adequate knowledge of the subject, which is essential to produce a book.

K.M. SRIVASTAVA

CHAPTER I

INTRODUCING THE SUBJECT

Although the general impression may be otherwise, the job of an archaeologist in bringing the ancient world to life and making it speak, is absorbing and interesting. The word archaeology is laid on Greek foundations, *archaios* meaning ancient, *arche* meaning beginning and *logos* meaning discourse.

Archaeology is a science to study and reconstruct the various stages of the development of man in the past with the help of those tools, weapons and other equipments left behind by him, which have survived the onslaughts of time, nature and climate. Archaeological research can be suitably compared with a window through which we can have a peep and glimpse of the picture of our own evolution through times. Though the study of Archaeology as a systematic scientific discipline had its birth only in 1859 with the publication of '*Origin of Species*' by Charles Darwin, it had developed its roots in a distant past, the specific time of which cannot be determined. By nature human beings always possessed the instinct of curiosity about things of the past and it was the fascination for antiques which gave birth to the study of Archaeology. The event on which we can lay our hands specifically to mark the beginnings of archaeological research goes back to sixth century B.C., when Nabonidus, the last king of Babylon, excavated below the temple of Shamash at Sippar and organised a museum to house the collection yielded by the operation. During the course of the excavation he also came across a foundation stone laid by Naram-Sin, the son of Sargon of Akkad about two thousand years earlier.

The interest of the Europeans in collecting and displaying the ancient remains is closely connected with the Renaissance Movement in fifteenth century, when the city of Rome gained magnetic attraction of the artists and popes viz. Sixtus IV (1471-1484) and Alexander VI (1492-1503) not only encouraged, but also financed, the excavation and collection of Italy's antiquities. Though the people responsible for such a type of excavation and collection could not be designated as archaeologists, their collections formed the nucleus of world's most reputed museums. The Ashmolean Museum at Oxford University is one of the examples, which housed the collection of Mediterranean antiquities made by Thomas Havard. James Stuart and Nicholas Rivett followed the footsteps of Havard and collected things of the past from Greece between 1751 and 1753. William Camden (1551-1623) travelled extensively in his own country, England, for the same purpose.

Egypt and the valleys of Tigris and Euphrates attracted the attention of the art collectors sometime in 1800 A.D. Claudius Rich, the British Consul in Baghdad, made

rich collections from many Mesopotamian cities between 1808 and 1820. The collections made by him formed a part of the British Museum after his sad and untimely demise by cholera. French people did not lag far behind the British in making collections for their own country. There was a regular competition between Giovanni Belzoni and Drouetti, the latter a French, in the activity, which reached the climax of even stealing from one another, sometimes at gunpoint. The best example of it is the discovery of Philae Obelisk, which was though the result of an adventure of Belzoni, went ultimately in the hands of Drouetti, who intercepted before it was transported to Luxor by the former.¹ In order to establish their claims, the objects were either carried away, wherever possible, or they inscribed their names and date on massive items, which could not be transported easily.

Like Claudius Rich, the French Consul at Mosul carried out his activities of the search of antiquities at many Mesopotamian sites. He initiated excavations at Nineveh in 1842 and Khorsabad in 1843. The discovery of the palace of Sargon II (8th century B.C.) by him will stand as a landmark in the history of archaeology. Encouraged by the discovery, Sir Austen Henry Layard undertook excavations at Nimrud, where the massive winged bulls, the Black Obelisk of Shalmaneser III alongwith many other well-known sculptures were brought to light. They are all housed in the British Museum. The financial assistance to Layard by the British was limited as compared to French to Botta and as such the former had to remain contented with the portable antiquities and objects worthy of being displayed in a Museum. Rouet, who succeeded Botta at Mosul, deputed his own agents to explore the mounds around Nimrud in order to lay hands on the treasures lying buried in them. Layard could not tolerate the attempts and in turn, therefore, repeated the same type of sneaky activities with the result that Mesopotamian archaeology degenerated into archaeological robbery.²

Against the background of archaeological piracy mentioned above, the work of Mariette at Memphis in Egypt on behalf of Louvre in 1850 stand out as of great integrity and honesty. He was so much absorbed in the work that he did not care to return back to his own country. He stayed on and organised the first National Museum in the Near East by establishing the first National Department of Antiquities. The antiquities were not carried away from the country of their origin.³

In spite of the great honesty and integrity of Mariette, some of the techniques adopted by him in the excavations stood only for condemnation as commented by the reputed archaeologist W.M. Petrie. Mariette went to the extent of using dynamite to clear away the ruins of a temple while he was excavating near the site of sphinx at Giza. There was no systematic report also on the operation and antiquities and in certain cases preparation of any report was totally ignored. However, the services rendered

¹ G. Belzoni, *Narrative of the Operations and Recent of Discoveries Within the Pyramids, Temples, Tombs and Excavations in Egypt and Nubia*, London. J. Murray, 1820.

² N.B. Kubie, *Road to Nineveh. The Adventures and Excavations of Sir Austin Henry Layard*, Garden City, N.Y. Doubleday, 1964.

³ G. Daniel, *One Hundred Years of Archaeology*. London: Duckworth 1950.

by Mariette must be commended in view of a set of regulations observed by him in digging. Further, he will always be remembered for the success achieved by him in ridding Egypt of the regular tomb-robbers and art collectors, who were very active with the label of archaeologists. Thus the fate of Egypt in the line of archaeological research was not doomed and sealed as it happened in the case of Mesopotamia.

During the days preceding nineteenth century, archaeology in America was in a much more primitive stage. The archaeologists were no more than armchair scholars interpreting the material remains of the past. Thomas Jefferson was one amongst a limited few, whose devoted, enthusiastic and systematic work earned him the name of a top-ranking archaeologist. The excavations undertaken by him at an Indian mound in Virginia in 1784 were based on scientific principles. It was simply a misfortune that the importance of the principles adopted by him was not realized by the archaeologists for decades together¹. The nine volume treatise of Lord Kingsborough on the 'lost tribes of Israel' was nothing beyond an useful illustrated document in contrast to the meritorious work of Jefferson².

Caleb Atwater made a careful study of the mounds in North America in early 1800 and recorded systematically the earthworks in the Ohio Valley. The invaluable descriptions of archaeologists like Bernal Diaz and Cie-za de Leon culminated ultimately into the observations and drawings of John Lloyd Stephens and Frederick Catherwood (1841-1844) in the area of Maya civilization. On the same lines Squier and Davis explored and excavated a number of ancient sites in the Mississippi and Ohio Valleys of North America, the report of which appeared in 1848. The publication of *Archaeology of United States* by Samuel F. Haven in 1856 is a great landmark in the direction of scientific archaeology³.

Decipherment of various forgotten scripts and languages played a vital role in unravelling the knowledge of civilizations, which were completely covered under the shroud of oblivion. Rosetta stone, a black basalt slab, now displayed in the British Museum, is the earliest example of this nature. The famous inscribed stone was observed by one of the field officers of Napoleon named Bouchard during the course of an excavation to uncover a fort near Alexandria in Egypt. The stone is inscribed in three characters viz. Greek, Egyptian hieroglyphs and demotics (a more simplified way of Egyptian cursive writing). Though efforts to decipher the inscription were made by scholars like De Sacy, Akerblad and Thomas Young, Jean Francois Champollion (1790-1832), in conformity with his name, deserves the title of a champion by his major contribution in the work and ultimately providing the key to the text. It was translated and published in 1822.

¹ K. Lehmann-Hartleben, "Thomas Jefferson, Archaeologist", *American Journal of Archaeology* 47 (1943): pp. 161-63.

² G.R. Willey, "One Hundred Years of American Archaeology". In *One Hundred Years of Anthropology*, edited by J.O. Brew, Cambridge, Man: Harvard University Press, 1968, p. 31.

³ G.R. Willey, *op. cit.*, p. 34.

Henry Creswicke Rawlinson (1810-1895) successfully deciphered the cuneiform writings after his adventurous work of copying the inscription by hanging perilously with the help of a rope on the scarp of a rock surface at Behistun in Iran, which stood about 125 metres off the ground at a height of more than 500 metres. The text was got inscribed by King Darius I of Persia (521-484 B.C.) with messages in Old Persian, Elamite and Babylonian. The translation of the Old Persian part of the inscription was finalized by Rawlinson in 1846 and without much time lapse the Babylonian text was also translated with the assistance of Edward Huicks¹.

Heinrich Schliemann is a classic name in the field of archaeology. He had drawn a picture of the heroic exploits vividly described in Homer's writings at a very young age. After taking leave from business, which had enabled him to amass substantial wealth at the age of fortysix, he devoted his mind to the study of Archaeology with the ultimate aim of discovering the city of Troy described by Homer. He visited many sites in Greece and Turkey in 1868 for the same purpose and during this expedition he was convinced of having struck the remains of Troy, when he arrived at the ancient site of Hissarlik in Asia Minor. The excavations undertaken by Schliemann on a large scale at the site not only established the identification of Troy, but also brought to light important Bronze Age Civilizations of the eastern Mediterranean. Schliemann did not remain contented with the discovery of Troy, but probed the Homeric texts further, which led him to the site of Mycenae on the mainland of Greece. Of course, it has been proved beyond doubt that Mycenaean Civilization belonged to a period earlier than Homer, the historical authenticity of Homer was established once for all. A new chapter in the prehistoric-Mediterranean was opened up by Schliemann with his discoveries of two pre-Hellenic civilizations of the eastern Mediterranean viz. the Mycenaean civilization of Greece and the pre-Mycenaean Anatolian civilization of Troy II.

Almost at the same time, when Schliemann was busy in adding new chapters by his discoveries in western Anatolia, Richard Burton and W. Wright, an Irish missionary in Damascus, Syria were preoccupied in deciphering one of the most important inscriptions at Boghazkoy in Asia Minor. Although unable to unlock the inscription, they suggested rightly that the same referred to Hittites, a people mentioned in the Bible. Boghazkoy was proved to be the capital of the Hittites, the ancient city of Hattosas after the joint excavation work by the Germans and Turkish between 1906 and 1908. With the help of the key of the translation of the inscription published by a Czech scholar, Friedrich Bronzy, a team of scholars was successful in revealing the text completely. The decipherment of the text and the discovery of the capital of the Hittites were another addition to the civilizations of the old world.

Schliemann had his own plans to undertake excavations in Crete to trace out the origins of the Mycenaean civilization. Before he could strike the spade he died and ultimately Arthur Evans (1921-1935) initiated probing the ancient site of Knossos. The diggings at Knossos by Arthur Evans brought to light another lost civilization known as Minoan culture. Three types of script were observed to be used by the Minoan people, of which one was pictographic and the other two linear labelled as Linear A and

¹ G. Daniel, *op. cit.* p. 75.

Linear B. Michael Ventris, an architect and John Chadwick, an archaeologist and art historian were crowned with success in deciphering and translating Linear B script in 1953 and 1961. Linear A script is yet to be deciphered satisfactorily.

In the far east the remains of the well known third centre of civilization in the world after Egypt and Mesopotamia were struck for the first time when the great mounds at Harappa on river Ravi in Punjab were noticed in eighteen-twenties by Sir Alexander Burnes and Charles Masson while they were travelling to Afghanistan. The first clue of the lost civilization came from an inscribed seal picked up by Alexander Cunningham, the first Director General of Archaeology in India, from Harappa in 1873. The realisation of the great value of the seal, however, did not dawn till Daya Ram Sahni resumed excavations at Harappa in 1921. Almost at the same time R.D. Banerji initiated excavations at Mohenjodaro in Larkana District of Sind about 700 kilometres south of Harappa in Montgomery District of Punjab. The seals were found buried under the remains of early historical period at Mohenjodaro. In the beginning it was believed that the civilization was confined to the limits of Indus Valley alone, but the hard and devoted work of extensive exploration by Indian archaeologists has revealed that the civilization spread its wings far more further east and south. Important sites like Lothal in Ahmadabad District of Gujarat and Kalibangan in Ganganagar District of Rajasthan representing one and the same civilization have been brought to light and subjected to excavation. The archaeologists all around the world are making vigorous efforts to decipher the script on the seals and sealings, which may unlock many mysteries of the civilization.

A joint expedition by the Chinese Academy and the Smithsonian Museum in Honan province of China led to the discovery of an advanced Bronze Age urban culture in China. The project led by Li-Chi and Liang Ssu-yung also established that the old city of Anyang was the capital of the Shang Dynasty¹.

The study of Archaeology on a scientific footing received great impetus from the progress and development in the science of geology. The idea of superposition of strata of rocks in this direction was first conceived by Nicolans Steno in 1669. Long before that date stone tools, believed to be of human origin, were being collected from various places. Michael Mercati, an Italian naturalist, collected tools in late 1500s and suggested that they were made use of by the people who were ignorant about iron or any other metal. William Digdale corroborated his views in 1650². Regarding a collection of tools made by him, John Frere wrote to the Society of Antiquaries at the end of eighteenth century in the following words. "If not particularly objects of curiosity in themselves.....(they) must, I think be considered in that light, from the situation in which they were found"². The tools were found twelve feet below the surface, which contained extinct animal bones. Frere's statement was no doubt ignored at that time, but it must be recorded that the tools collected by him were of Acheulian

¹ Li Chi. *The Beginnings of Chinese Civilization*, Seattle University of Washington Press, 1957 and Anyang, Seattle, University of Washington Press, 1976.

² G. Daniel, *The idea of Personality*, Baltimore, Penguin 1962, p. 39.

facies and he was the first man to assess the significance of their findspot in undisturbed layers and in association with extinct animal bones.

In the fourth decade of nineteenth century Jacques Boucher de Perthes, a customs official, collected flint implements from the gravels of the Somme River near Abbeville in France. He published a report on the finds with the firm conviction that they were man made, particularly when found in association with animal remains. They could not be ignored as remnants of the Biblical floods. John Evans, Joseph Prestwich, and Charles Lyell, three distinguished scholars confirmed the views of Boucher de Perthes in 1859. The same year the publication '*Origin of Species*' by Charles Darwin saw the light of the day.

CHAPTER II

SPROUTING OF INDIAN ARCHAEOLOGY

Tossed on the tidal waves of circumstances, the study of Indian Archaeology encountered many ups and downs in the past. Though it was Archaeology which ultimately unfolded the mystery of the past glories of the country, its study was initiated with an humble beginning as late as 1784 when Sir William Jones founded the Asiatic Society on 15th January. Being unfamiliar with the archaeological science, the scholars working with Jones were much more attracted towards the literary remains rather than unravelling the material vetiges of the past. Jones, a brilliant scholar, however, deserves the honour of being credited with the achievement of providing a firm chronological datum line in the annals of ancient Indian history by establishing the contemporaneity of the Mauryan emperor Chandragupta with Alexander the Great. He was also successful in identifying the remains of classical site Palibothra (Patna) on the confluence of the Ganga and the Son in Bihar.

The fire which was kindled by Jones did not remain confined to the Northern parts of the country, but spread to the South as well. Colonel Colin Mackenzie realised the importance of the antiquities lying buried and tried to assess their potentialities by penetrating through them. He also attracted the attention of the scholars for the first time towards the Megalithic monuments of South India.

The next pioneer in the study of Indian Archaeology was James Prinsep who laid the foundation of a scientific approach to the subject. It was his scientific outlook which led to a number of remarkable discoveries, one of them being the famous rock edict of Asoka at Dhauli in Orissa by his colleague Markham Kittoe. Alexander Cunningham, another distinguished colleague, deriving inspiration from him, excavated the Dhameka Stupa at Sarnath. This operation was just the beginning of the subsequent excavations at the ruins of Sarnath. The posterity not only of India but all around the world will, however, continue to remember the name of James Prinsep for his greatest contribution in deciphering the Brahmi and Kharoshthi scripts between 1834 and 1837. This helped him in identifying the names of three Hellenistic kings in 1838 viz. Antiochus II, Ptolemy Philadelphus, and Magas of Cyrene in the Asokan inscription on the rock at Girnar in Gujarat. It was a great landmark in Indian history, because it proved the contemporaneity of those kings with Asoka, thereby establishing another datum line. The credit for identifying the ancient site of Sankisa also goes to James Prinsep.

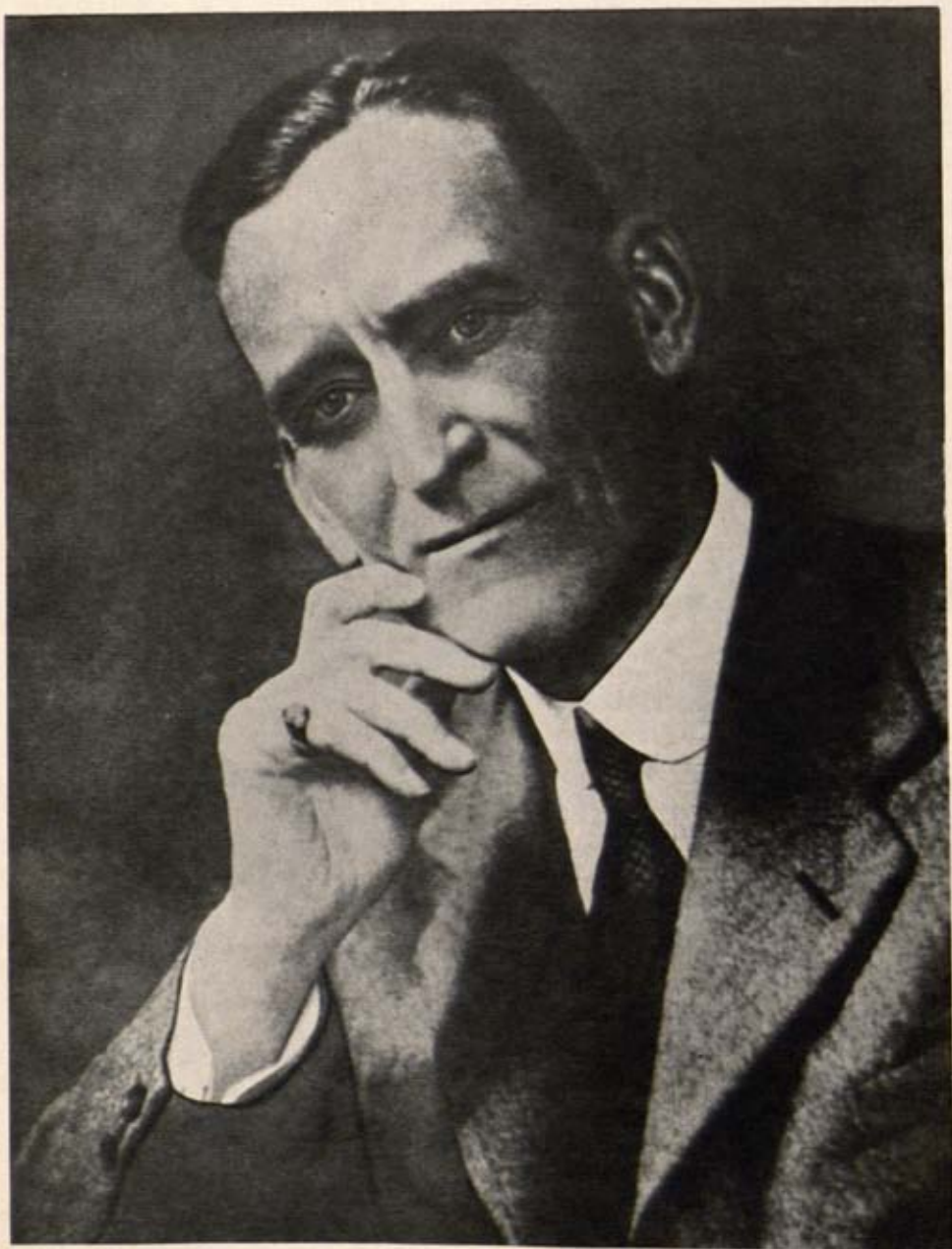
But for the great service rendered by Meadows Taylor in studying and opening

a large number of Megalithic tombs in South India, the period following the death of James Prinsep was again shrouded in darkness.

As darkness is always followed by a bright sun, the awakening in Indian Archaeology dawned with a greater force in 1861 when Alexander Cunningham, one of the associates of James Prinsep, was appointed the first Archaeological Surveyor. Following the footsteps of the great scholar Prinsep, Alexander Cunningham preoccupied himself in locating the ancient sites visited by the Chinese pilgrims Fa-hien and Hiuen Tsang in the first instance. Though Cunningham himself or so to say any scholar who preceded him were not the least concerned with the Stone Age Archaeology, a beginning was made in 1860 by H.P. Le Mesurier, not an archaeologist by profession, in discovering a large number of Neolithic tools in the valley of Tosney river. Within a short time Robert Bruce Foote of the Geological Survey of India brought to light a genuine Palaeolithic tool from Pallawaram and again similar tools from Attirampakkam near Madras. Alexander Cunningham no doubt rendered great service to Indian Archaeology, it is Robert Bruce Foote who laid the foundations of the study of Pre-history in India. The days of sunshine in the study of Indian Archaeology were not allowed to last long and the spell of darkness again set in in 1866.

The lull continued till 1871, when a regular Department of the Archaeological Survey of India with Alexander Cunningham as its Director General was established. Though this happened to be the time when Schliemann was preparing for his epoch making excavations at Hissarlik, Indian Archaeology in the hands of Cunningham continued to be limited to the study of architecture, sculpture, coins and inscriptions. The true objective of Archaeology in revealing the complete picture of man's culture and achievements with the help of the material remains left behind by him had hardly any place in the ideals of Cunningham. It may not be far off the mark if it is said that lack of such aptitude was responsible for not taking the seals and other important objects found by him at Harappa as far back as 1872-73 seriously. He could never imagine that the same objects will one day bring to India the distinction of being one of the centres of ancient civilization like Egypt and Sumer and push back the history of the country to 2500 B.C. However, it would be a great injustice if the pioneering services rendered by Cunningham to Archaeology are not duly acknowledged. He can very well be considered as one of the greatest leaders of Indian Archaeology on the basis of the ground he prepared for the archaeologists to work in future. The reports published by him contain first hand information of a large number of ancient sites, which he visited after undertaking arduous journeys. He was undoubtedly a real field worker and not confined to the study of literary remains on the table. With the retirement of Cunningham on 1st October 1885 another important chapter in Indian Archaeology was brought to an end.

During the tenure of the next Director General, James Burgess, hardly any work of great importance, but for the excavation at Kankali Tila mound at Mathura, was undertaken. James Burgess was, however, conscious enough to insist on close supervision of excavation by trained personnel. A dreary and bleak period followed the retirement of James Burgess particularly in the field of excavation.



John Marshall (Born 1876)

The arrival of Lord Curzon as the Governor General of India in 1899 came as a great boon to Indian Archaeology. The keen interest which he took in the subject led to the revival of the post of Director General. As a sequel, John Marshall of the British Museum, who had the experience of working in Greece and South Turkey, was selected to hold the post in 1902. In his book 'The Story of Indian Archaeology', S. Roy has applauded the interest of Lord Curzon in Archaeology in most appropriate words. He said, "All the same he had fought and won one of the most difficult battles ever waged for Indian archaeology. No other ruler of India before or after him has evinced so single-minded a devotion to the cause of archaeology, and, when all is said, it has to be admitted that he succeeded in rekindling an archaeological conscience in the country and placing the Archaeological Survey of India for the first time on a sound and secure foundation."¹

Though the primary concern of the Archaeological Survey of India was supposed to be conservation of monuments, exploration and excavation also received adequate attention at the hands of Marshall (Pl. I). The new Director General was absolutely against reckless and haphazard diggings. The first site where Marshall undertook excavation was Charsada (the ancient Pushkalavati) in North-western part of India. Material remains of the Indo-Hellenistic civilization were revealed during the course of excavation at the site. Besides exposing the remains of a very important period in Indian history, the excavation at Charsada laid down a systematic technique, which was followed for a considerably long time. Amongst other important sites which were subjected to excavation by Marshall were Sarnath, Kasia, Rajgriha, Basarh, Vaisali and Lauriya Nandangarh. The attention of Marshall was not confined to the limits of the country alone. During his regime expeditions to Central Asia under Sir Aurel Stein were also organised, yielding very rich and varied antiquities.

The seed sown by Lord Curzon not only sprouted during his tenure of office, but developed such deep roots that the tree burst into blooming flowers even after his departure from India. The outlook on the study of Indian Archaeology was transformed altogether and attention was now directed towards the real aims of the subject. Archaeology ceased to be only a quest for artistic or religious objects. The aim of Archaeology to study the cultural pattern and way of life of man in the past as a whole on the basis of the artefacts, ornaments, furniture, tools, arms, weapons, jewels, seals, coins etc., left behind by him came to be the rule of the day. With the same end in view John Marshall undertook excavations at a large number of ancient sites, of which the most important were the three cities of Taxila, the important Buddhist site Sanchi and the two leading proto-historic sites of Harappa and Mohenjodaro. Marshall was very particular in recording all the details of excavation including the technique with the help of sketches and accompanying descriptions. John Marshall has left an ineffable impression in the field of Indian Archaeology by the new footing he provided to it by his organised and well disciplined approach to exploration and excavation. Alexander Cunningham undoubtedly was a great pioneer in the field of exploration, the name of John Marshall in Indian Archaeology is immortal on account of his scientific and analytic approach to excavation.

1. S. Roy, *The Story of Indian Archaeology, 1784-1947*, New Delhi 1961. p. 84

The first world war brought a great set back to the study of Indian Archaeology. The days of gloom were, however, followed by revival of the activity with a much greater vigour and enthusiasm in 1926-27 when several new posts for undertaking explorations and excavations were created. A new Exploration Branch was organised for the purpose for the first time.

The greatest service which Marshall rendered to Indian Archaeology was the wide interest which he created amongst the general public towards the subject by the variety of antiquities, particularly the sculptures collected by him from the excavation at important Buddhist sites. The lead already taken in the direction by earlier scholars and the documents left behind by the Chinese pilgrims who visited India were immensely useful to him for the purpose. Marshall paid an equal attention to the excavation of city-sites like Bhita, Kumrahar, Bulandibagh, Taxila etc. Further expeditions to Central Asia were also led by Aurel Stein during his regime.

Of all the works undertaken by Marshall, the most outstanding contribution was his study of the materials from the Indus Valley sites of Harappa and Mohenjodaro and the decision regarding their date. "At a single bound", said Marshall, "we have taken back our knowledge of Indian civilization some 3000 years earlier and have established the fact that in the third millenium before Christ or even before that, the peoples of the Punjab and Sind were living in well-built cities and were in possession of a relatively mature culture with a high standard of art and craftsmanship and a developed system of pictographic writing"¹. Enchanted by the discovery, Marshall organised planned excavations at the two sites. The works undertaken at the two sites and the results thereof were published in three monumental volumes under the title 'Mohenjodaro and the Indus Civilization', which will always continue to be the ground work for any research work on Indus Valley Civilization to be undertaken in future. The other masterly contribution of Marshall is the three volumes on Taxila.

John Marshall has been frequently criticized for focussing his attention to a particular class of sites and those also restricted to the northern part of the country. He never cared to prepare a chronological index of various ancient cultures in India. Further, the technique adopted by Marshall was not based on the Principles of Stratification and hence unscientific. The above mentioned charges were flashed much more after Sir Mortimer Wheeler arrived in India in 1944 to occupy the chair of Director General. There may be some element of truth in the charges levelled against him, particularly when weighed in the light of the new technique of Principles of Stratification and the new objective of preparing a time-table of various cultures in India, but the accusation can in no way overshadow the meritorious achievements of Marshall. That way no man can be considered as perfect. Even a giant like Sir Flinders Petrie in the field of Archaeology could not escape the criticism at the hands of successive generations. Remarking on the Principles of Stratification, it may be pointed out that no archaeologist has so far been able to dispute the date assigned by Marshall to a particular antiquity or structure. Criticism only for the sake of underestimating the achievements of a particular scholar can never be justified. Marshall has himself

¹. S. Roy, *op. cit.*, p. 108.

admitted the shortcomings to some extent, but he was a captive in the hands of circumstances. He had to keep the public interest alive by the rich collection of sculptures, which acted as a great saviour for the Department of Archaeology from the doomsday in 1923, when a number of institutions were made a victim of Inchcape Committee and closed. Marshall, on the other hand, was successful in obtaining liberal grants for exploration and excavation.

The Archaeological Survey of India could not maintain its stability for long after the retirement of John Marshall in 1928. Days of adversity set in in 1931, when the Exploration Branch of the Survey alongwith a number of senior posts were abolished. The officers of the Archaeological Survey of India, however, maintained their enthusiasm and a number of monumental works were undertaken. During the course of his extensive exploration undertaken in Sind, N.G. Majumdar discovered numerous Harappan and pre-Harappan sites between 1929 and 1931. He was unfortunately made a victim and killed at the hands of dacoits in one of his expeditions. Madho Swarup Vats continued his excavation work at Harappa and brought to light the remains of the granary at the Cemetery H complex. He published the results of his work in two volumes under the title of 'Excavations at Harappa'.

The study of Pre-historic archaeology also received attention during this period, when M.C. Burkitt analysed the collection of stone tools from the Krishna basin in South India by L.A. Cammiade and compared them with those found in Africa. In 1933 a scientific expedition was led by Helmut De Terra and T.T. Paterson to Kashmir and Punjab to unfold the problem of Stone-age cultures in India. The team observed with a keen eye the formation of different terraces and the type of stone tools connected with them. For the first time in the history of Pre-historic archaeology, tools were named after a particular site Sohan characterized mainly by pebble choppers. Though tools from Kashmir were not completely devoid of hand axes, as is generally believed, two traditions of stone tool viz. chopper complex in the north and hand axe complex in the south were distinguished. The expedition of De Terra and Paterson will always stand as a great landmark in the study of Pre-historic archaeology in India.

In the year 1937 the reins of the Department of Archaeology passed on into the hands of Rao Bahadur K.N. Dikshit. He took a dynamic step in releasing the archaeological activity from a complete control of the government and opening the doors to the Universities. Calcutta University happened to be the first to obtain a license to excavate the ancient site of Bangarh in Dinajpur District. Dikshit also organised an expedition to Gujarat aimed at Pre-historic studies in the valley of Sabarmati on the lines of De Terra and Paterson.

K.N. Dikshit ardently desired in 1938 that the Indian archaeologists should be trained in the latest technique of excavation. In effect, however, the objective of Dikshit acquired an altogether new shape and Sir Leonard Woolley was requested by the Government to review the archaeological activities in the country. With ambiguous terms of reference, Woolley made a flying visit to the country for a rapid survey. The activities of the Archaeological Survey of India were vehemently criticized by him. In the first instance he did not appreciate the works at several sites with limited funds.

He advocated detailed attention to a limited number of sites depending upon the availability of funds. In place of superficial observation, the excavations should be conducted to the natural soil to establish the typological sequence of antiquities. With the same end in view he pleaded for spreading the activity of excavation to different categories of site covering the entire country so as to bridge the gulf between various cultures. While expressing his views he completely ignored the system of levelling, which was made use of in establishing successive occupations at a site. Woolley, in spite of the fact of being a renowned scholar, cannot be absolved from the blunder he committed in recommending the discontinuance of further works at Mohenjodaro on an unfounded pretext that the site was poor in painted pottery.

The brighter side of the recommendations of Woolley included appointment of an Advisor on Archaeology alongwith two specialists on stone-age antiquities. He was also of the view that non-official agencies, both foreign and Indian, should be encouraged to take part in excavation. Woolley prepared a select list of historical sites, where he wanted the Department to undertake large scale excavations. Ahichchhatra in District Bareilly of Uttar Pradesh found its place at the top amongst those ancient sites. Following his recommendations excavations on a large scale were conducted at Ahichchhatra between 1940 and 1944, which brought to light for the first time the characteristic ceramic industry later on known popularly as Painted Grey Ware. Specimens of Northern Black Polished Ware were also collected in an appreciable quantity.

With the retirement of K.N. Dikshit in 1944 the period of Old Era in Indian Archaeology came to a close. Developments in any field of research work are gradual leading to new and better techniques and methods. The new techniques and methods do not flash to the mind of a scholar like a bolt from the blue, but have their grounding, to whatever extent they may be, in the earlier methods and techniques.



Sir Mortimer Wheeler

CHAPTER III

THE NEW ERA

The new era in the study of Indian Archaeology began with the arrival of Sir Mortimer Wheeler (Pl. II) in India after his appointment as the Director General of Archaeology in India. Sir Mortimer Wheeler was a well-known British archaeologist possessing an adequate knowledge and experience in the line of field archaeology. He was a General in the British Army before taking over the stewardship of the Archaeological Survey of India in 1944. The service rendered by him in the army had a deep impact in his attitude towards the work. Though Wheeler stayed in India only for four years, the Indian archaeologists, particularly excavators, stand indebted to him for the spirit of discipline, control, alertness and constant attention injected by him amongst the archaeologists working in the field. He was of the firm opinion that excavation is like a war of which the strategies must be carefully thought out and directed by a single trained mind. Wheeler was very strict in the observance of the military discipline in excavation. Graham Clark, while estimating the contribution of Wheeler to Archaeology said correctly, "Mortimer Wheeler always insisted on a military standard of neatness and precision on his excavations"¹. Excavation under Wheeler ceased to be simple digging with a leisurely approach. The excavator was required to be up on his feet all the time with his eyes wide open for keen observation when the digging was in progress. He could not leave the digging under the control of labourers or laymen supervisors. As a matter of fact the excavator was expected to play with the dust, not as a child, but as a serious student to analyse the excavated remains in their true colours and context. With the same end in view particular type of dress in the field was a necessity, so that the supervisor was able to move freely and at the same time unmindful of the dirt with which his dress will be covered. The assessment by Wheeler of the lethargy in excavation prevalent at that time and the disciplined approach through constant hard work will be clear from the following statement. "But now we must turn sharply onwards from 327 and 326 B.C. to the 1940s A.D. in the light of the exhortations of successive Viceroys, already cited, to stir the activities of the Indian Archaeological Survey from its unworthy condition of lethargy and archaism to a new and modernised phase of archaeological research and methodology. And here, at Taxila, amidst a useful assemblage of hutments and storehouses, including a well-conditioned local museum accumulated over the years by the well-conditioned but too often desultory efforts of the under-trained Survey, opportunity and occasion stood adequate usage on the metropolitan site, where, as we have already

1. Graham Clark, *Sir Mortimer and Indian Archaeology*, New Delhi 1979, p. 17.

described, more than twenty-three centuries ago the rulers of west and east had forgathered in friendly and intelligent interchange. All that was now required by us in 1944 was the final urge for renewed co-operation in a modern context. That came in fact in the spring of the year when, at an annual meeting (in Patna) of the nineteen vice-chancellors who then constituted the total hierarchy of the amalgamated universities of India, an urgent appeal was made for the recruitment of young university graduates for organised research into the neglected arts of India's archaeological technology.

"The response was to me astonishing alike in quantity and quality and was almost instant. Within a few weeks more than sixty young graduates had assembled from all directions amidst the inviting facilities of Taxila and quickly settled down in an assortment of tents and huts prepared for their reception in accordance with traditional needs and usages. It might indeed be fair to claim that this was the last occasion in modern India when representatives of such a multiplicity of castes and other social variations voluntarily came together so earnestly on one spot with so unified an aim and fraught with so patent a sense of mutual goodwill. Such was 'The Taxila School of Archaeology, 1944', a tiny academic episode which those of us who shared in it like to remember with a certain pride and pleasure that may in passing be found worthy perhaps of the present casual but affectionate memorial. It was at last the first organised phase of a new Indo-Pakistan archaeology and the environment was a happy one"¹.

While laying a great emphasis on proper control of excavation Wheeler commented by reproducing two quotations. "The first is from the annual report of the Archaeological department of one of the leading Indian States, and describes the recent excavation of some important megalithic tombs. It is as follows 'where necessary, the dolmens were blasted, the circles of stone were removed and the cistvaens constructed with large flat slabs were made available for study'. As evidence of impartiality, the second quotation is taken from an annual report of the Archaeological Survey of India'. The maximum number of labourers employed at any time (in an excavation controlled by one supervisor) was something over thirteen hundred'. These quotations are eloquent of all that an archaeological excavation should not be"².

The remarks of Graham Clark, though not correct in its entirety, are apt enough to assess the qualities and nature of Wheeler. He said, "Mortimer Wheeler, though a prolific author, was not much interested in abstract theory. He was concerned above all with action"³. But so far as his assessment regarding control of excavation is concerned, no archaeologist can contest it. Graham Clark further commented, "When Sir Mortimer Wheeler applied the term Scientific to archaeology he was in deadly earnest. Aimless digging or digging for finds as such were equally anathema to him. So also was uncontrolled, indisciplined excavation carried on from whatever motive the

1. Mortimer Wheeler, *My Archaeological Mission to India and Pakistan*, London 1976, p. 32.

2. *Ancient India*, Bulletin of the Archaeological Survey of India, No. 4, p. 311.

3. Graham Clark, *op. cit.* p. 6.

same may be. Even worse in his estimation was unrecorded, unpublished excavation"¹. "Excavators of repute", in the opinion of Wheeler, "were digging up archaeology like so many potatoes"². He was always of the contention that any excavation should be undertaken with a specific end in view.

Devotion and constant attention are no doubt the primary requisites in any field of work, Wheeler will always be considered as the pioneer of scientific excavation in India by introducing the application of the Principles of Stratification. The technique being completely new on the Indian soil, Wheeler organised training camp on the field, the first being at Taxila, to impart necessary guidance to the young students from University. Wheeler learnt the new scientific technique from the renowned field archaeologist Pitt Rivers. Commenting on the training camp organised at Taxila, Wheeler said, "The article on Taxila will deal with exploratory work carried out by the Archaeological Survey on that famous site in 1944-45.....Its main purpose, however, was to form a basis for the technical training of Indian students at a centre of known and varied interest, where suitable equipment in the form of an organised museum and workshop was available Their course of training lasted for a minimum period of two months, but many stayed longer.

"The day's work at the school began at 8.45 a.m. The students were divided into three classes, each student passing after a stipulated period from one class to another. The largest class consisted of trainees in the actual technique of excavation or the supervision of excavation, and in the preparation of the necessary field-records. The other classes dealt with surveying, photography and administration. At 6. p.m. field-work ceased, but at 9 p.m. the students reassembled for a lecture on subjects such as publication, epigraphy, photography or special historical, archaeological and anthropological topic. These lectures were given by the staff, by visitors, or sometimes by the students themselves. The day ended at about 10.30 p.m."³.

In spite of the fact that Wheeler organised the training camp keeping in view all aspects of archaeology in a very creditable manner, he himself was not satisfied with the period devoted to such training. He candidly expressed the hard facts and said, "Strenuous though the day's work was, the course was necessarily too short to give the students more than a general knowledge of the standards arrived at by modern archaeological technique. It could not profer to turn out fully qualified field-archaeologists, for whom long-term experience is indispensable. It could not produce skilled recorders or photographers capable of embarking on single-handed work. But it could and did attempt to demonstrate the special requirements of archaeological field-recording and photography, and thus provided the basis essential for further advance"⁴. The paramount importance of proper training and experience in excavation before anyone is allowed to undertake independent excavation can be further gauged from the following words of Wheeler. "Trained leaders are the first essential men

1. Graham Clark, *op. cit.*, p. 8.

2. *Ibid*, p. 10.

3. Ancient India, Bulletin of the Archaeological Survey of India, No. 1, New Delhi, 1946, Editorial Notes, p. 1.

4. *Ibid*, p. 2.

paid by their universities for passing on their training in subsequent years. Experience has shown that, properly led, the young Indian student is as apt a pupil of field-archaeology as is the student of any other nation. To teach him is a pleasure and an inspiration. He learns quickly and keenly. But he must naturally have his leader, and it is the responsibility of the university to provide the leader. The Archaeological Survey will gladly cooperate in that leader's training, provided that the period of tuition is not unduly restricted. In field-archaeology tuition is useless without experience, and the acquisition of experience takes time. A year's hard work with the Survey is the minimum required by a leader who is to command the confidence of his pupils"¹

When Wheeler set his foot on the Indian soil as the Director General, the state of archaeology in the country was rather in poor shape, which had forced Sir Leonard Woolley to cast aspersions on the working of the Archaeological Survey. A peep into the state of affairs at that time can be had from the personal account of Wheeler himself. He said, "Marshall subsequently worked closely and sympathetically with his Viceroy, but his lack of technical knowledge or interest led ultimately to the notorious breakdown of the Survey and to the resultant Woolley Report of February 1939, so that by 1943 even war could not longer defer some sort of action and at the end of June the Secretary of State for India received a code telegram from the Viceroy (Lord Wavell) which included the following sentences: 'Post of Director General of Archaeology falls vacant next year and the Member for Education (India), after discussion with me, is extremely anxious to get a man from home for succession. I fear that condition of department is quite lamentable. It contains no one of any quality and level of its work is low I do not know if Mortimer Wheeler who I understand is at present serving in the Army would be possible'"². The follow up action in the words of Wheeler himself was as follows, "Irrelevantly though it may seem, the account begins with a brigadier in a small military encampment on a hilltop above Algiers and the date is the beginning of August 1943. In the sunset the end of the days planning operations of the forthcoming British and American invasion of Italy had drawn to its just close when the corps commander General Sir Brian Horrocks, dashed across towards my doorway with a signal in his hand and the remark. I say, have you seen this—they want you as—(reading) "Director General of Archaeology in India"—Why, you must be rather a king-pin at this sort of thing! you know, I thought you were a regular soldier! "If the General ever paid an extravagant compliment, he did so then, although there was, I thought a hint of pain and disillusionment in his voice. For my part the proposition was a complete bombshell. Without any sort of pre-warning, the India office was asking for my release to take up a key post in a teeming country I had never been to in my life. However, I gathered my wits and said that I would consider the offer after the next battle but not before?"³.

Wheeler recapitulated the primary reasons of the quick deterioration of Archaeology in India after Marshall in a very remarkable manner. He commented, "What then

1. *Ancient India*, No. 3, Editorial Notes, p. 1.

2. Mortimer Wheeler, *My Archaeological Mission to India and Pakistan*, London 1976, p. 11.

3. Mortimer Wheeler, *My Archaeological Mission to India and Pakistan*, London 1976, p. 9.

went wrong after Marshall's retirement in 1929? Why in the thirties did his old department sink so rapidly into disrepute, as indeed it did? I need not here resuscitate a whole family of clanking ghosts, but in justice to Marshall on the one hand and Woolley and myself on the other, two or three of them may be exhibited.

"First the retiring Director General had, it must be remembered, taken office at a very early age and at a period when modern archaeological technique (outside Cranborne Chase) was in a rudimentary stage. In Greece, it was certainly no less rudimentary than elsewhere, and such little practical experience as the young Marshall had was in Greece. His immense task in India inevitably barred close or continuous contact with international development, and in excavation his technical standards remained to the end substantially those of Greece and the Near East in 1900. The defect was aggravated by other factors. Several of his senior colleagues, mostly European, retired about the same time as himself, and in less than ten years after his retirement the department had no fewer than four successive Director Generals (two European and two Indian), all of them men at the extreme end of their service and not likely therefore either to innovate or even to maintain with any special fervour. And there was yet another factor of a personal kind. I once heard a friend and admirer of Marshall describe him as 'a beech tree under which nothing grew'. That was well put. Marshall was of a temperament which hinders the confident delegation of responsibility, and hinders therefore the adequate training of subordinates to assume responsibility"¹

Sir Mortimer Wheeler was the most suitable archaeologist at the time to set the state of affairs right and bring a new awakening amongst the young scholars in India by imparting new and the latest technique of excavation unknown in India till then. He deprecated the old technique and condemned the same openly. He said, "Without any depreciation of the high value of the archaeological field work carried out in India by past generations of scholars, Indian and European, the time has come to recognise bluntly, but in a proper constructive spirit, certain shortcomings for which remedy is overdue. Of these the most important is the omission to appreciate adequately the significance of stratification, which is as fundamental to the science of archaeology as it is to the parent-science of geology. The scientific study and record of stratification were established in principle over half a century ago by General Pitt-Rivers, and his standards, extended and elaborated, are now international. Their full application to Indian archaeology is essential to the reputation of Indian scholarship, and the rising generation of Indian archaeologists is in fact rapidly becoming familiar with them"². Wheeler laid down the shortcomings of the technique followed earlier in a clear cut manner. He said, "To appreciate the absurdity of the bench-level method, it is only necessary to recall that, except perhaps at the earliest period of a site (hardly ever adequately explored), an ancient city of this kind is never level. Very rarely is a city completely destroyed and completely rebuilt at one moment and at one level horizon. Normally, a house is reconstructed or replaced as it decays, or at the whim of its owner. The town as a whole is constantly in a state of differential destruction and construction. Individual

1. Mortimer Wheeler, *Still Digging*, London 1955, p. 181.

2. *Ancient India*, No. 3, P. 143.

building sites rise above their neighbours, the town-site itself rises and assumes the colour of a hill, buildings on its slopes are contemporary with buildings on its summit. A doorway or a potsherd may be found at one spot 20 feet below or doorway or a potsherd of precisely the same date at another spot. Such differences, of vital importance to the scientific interpretation of the site, are ironed out and obliterated by the bench-level. If it be necessary to illustrate further the dangerous fallacy of this method, the attached diagram (fig. 1) may serve"¹.

In order to achieve the ideal of producing well-trained and experienced field-archaeologists, the need of the hour, certain immediate measures were initiated by Wheeler in the face of acute financial stringency. To quote his own words, "In spite of war-conditions, certain steps have accordingly been taken recently by Government to equip the Department a little more adequately for its function. Thus, the Excavation Branch, abolished in the general retrenchment of 1932, has been re-established as a specialized nucleus for Indian field-archaeology. The systematic survey of prehistoric sites, such as megaliths, urn fields, and implement-bearing strata of the Stone Age, will now for the first time be organised by a prehistorian appointed for the purpose. And two research-scholarships have been reconstituted in connection with the Department on an annual basis. In these and in other ways a better balance has been achieved between the Department's personnel and its various activities. The reforms are admittedly inadequate in detail and will require amplification in the light of further experience, but they at least imply a new recognition of the scope of the Archaeological Survey and, coupled with a suitably high standard of training, may be expected to render the Survey better capable of grappling with its colossal task"².

The above mentioned steps were only an humble beginning in the direction of the ideal desired to be achieved by Wheeler. He cherished the desire of establishing an Institute of Archaeology for teaching not only archaeology, but all the humanities and sciences related with it. In a dramatic way, so characteristic of Wheeler, he said during the course of delivering the presidential address before the Indian Science Congress in January 1946 at Bangalore, "The other day I had occasion to remark to a committee of the Central Legislature that, as an archaeologist, I was concerned with the future rather than with the past. I was gently corrected, but my words were correct. In India, archaeology and anthropology have admittedly all too little behind them. There have been archaeologists and anthropologists in this country, but no coherent science of archaeology and anthropology has ever been established here, such as has been partially established in Western Asia, in Europe and in America or such as was growing up in China before the barbarous devastation of that country in the name of progress. Indian humanistic science has been relegated largely to the future. But the future of India is now close upon us. It is time not only to plan but to act"³. With the above objective Wheeler wanted to study archaeology from a scientific footing for which he had a well thought out plan in his mind. He said, "Although the ideal solution of the problem would be the establishment of a properly equipped Indian Institute of Archaeology on the general lines of some of the American Institutes,

1. *Ancient India*, No. 3, p. 143.

2. *Ancient India*, No. 1, Editorial Notes, P. 2.

3. *Ancient India*, No. 3, P. 125.

much could be done by the co-ordination and development of existing facilities. Until one or other of these advances has been achieved, it will not be possible for archaeological research in India to attain the high international position which the astonishing wealth of India's cultural heritage both justified and demands"¹.

When Wheeler arrived in India to take over charge of the greatest archaeological department in the world, he observed that different assortment of cultures were being excavated in various regions of India, but in inter-relationship or chronological sequence they were all engulfed within the well known question of a school boy 'Fill in the blanks'. On the one hand a great deal was known about the earliest Indus Valley Civilization and on the other a large number of Buddhist sites were exposed with the intervening period completely covered up in darkness. Further, in South India the megalithic tombs were being systematically destroyed without knowing their chronological position. A connected history or cultural sequence of South India was completely in the dark. Lamenting the situation Wheeler expressed in a romantic manner, "The trains have been running vigorously but we do not know clearly when they are running, or where they start, or their stopping places, or their destination. We need time-tables. We need carefully dug and recorded vertical sections, sufficiently deep to reach the starting point, sufficiently wide to ensure an accurate recognition of the route. Later, with the new information thus gained at our disposal, we shall be able to stop at intermediate stations and explore"². The condition of South India was much more worse as correctly estimated by Wheeler in the words, "In Southern India, we have at present even fewer data for reconstructing the progress of human society in its various phases and environments. Material is abundant, its inter-relationship unknown. It is a jumble of words with no consecutive meaning. Here again, planned work can gradually bring order and significance into chaos"³.

As it has already been pointed out above, Wheeler was deadly against digging without planning. He advocated the primary principle of excavation in having a specific plan and said, "Put simply, I would say to the young archaeologist, *Have a plan*. And, having a plan, see that the plan is worth while, is likely to add significantly to our knowledge of the human mind and human achievement. Let our work be creative"⁴.

Besides having a specific plan in his mind, the other basic principles which he desired to be observed in excavation were as follows:-

Firstly, the sections i.e. cutting-edges of the trenches should be maintained in a very neat and tidy fashion by keeping them absolutely vertical. This will be of a great value in observing the principle of stratification and also the cultural sequence. Secondly, while observing the principle of stratification, the excavator should be meticulous in recording most accurately each and every find during the course of excavation. In this context the remarks of General Riverse Pitt whose methods were adopted by Wheeler are very pertinent. Riverse Pitt said, "Excavators, as a rule, record only

1. Ancient India, No. 3, p. 125.

2. *Ibid*, p. 144.

3. *Ibid*, No. 2, Editorial Notes, p. 2.

4. Mortimer Wheeler, *Still Digging*, London 1955, p. 231.

those things which appear to them important at the time, but fresh problems in Archaeology and Anthropology are constantly arising, and it can hardly fail to have escaped the notice of anthropologists that, on turning back to old accounts in search of evidence, the points which would have been most valuable have been passed over from being thought uninteresting at the time. Every detail should, therefore, be recorded in the manner most conducive to facility of reference, and it ought at all times to be the chief object of an excavator to reduce his own personal equation to a minimum"¹.

Thirdly, Wheeler taught the young Indian students how to be perfect in recording by means of drawing and photography. Each and every important structure should be carefully drawn in relation to the section and stratification. Since drawing could be prepared in any manner liked by the excavator, Wheeler was of the firm opinion that the drawings should be well supported by photographs of the highest quality. Wheeler was very much fastidious so far as the standard of drawing and photography was concerned. Fourthly, Wheeler for the first time in India, emphasised the importance of the study of ceramics seriously. The reasons for this careful study of the earthen wares were apparent enough. Earthen wares have been in use of man regularly whether he belonged to the higher or lower class. Their shapes and designs do not continue for a long time and hence can act as a very good index for innovations in successive cultures. Further, by studying the ratio of poorer quality of earthen wares with the sophisticated wares, the standard and proportion of rich and poor class of people could be delineated. Last of all, but the most important was the belief of Wheeler in quick and disciplined publication of the excavation reports. He was of the opinion that it was far more preferable to leave a site unexcavated rather than excavate it and leave the report unpublished for a long time. With this end in view Wheeler introduced a new yearly publication by the Archaeological Survey of India viz. *Ancient India* primarily to incorporate the reports of the excavation conducted by the Survey. The standard of the publication of the journal is considered even now to vie with any international publication.

Since Wheeler was ignorant regarding the past history or civilization of India, he decided to excavate for the first time at a site of which the date and the remains were known to a great extent. His choice fell on Taxila because of two reasons. Firstly, the ancient site of Taxila was excavated for a long time by his predecessor Sir John Marshall. Secondly, the ancient site had some connection with Alexander the Great. Right from the beginning the primary aim of Wheeler was to set datum line for the study of cultures in various parts of India. After a season's work at Taxila in North-western part of India, he turned his attention to the south, where till then there was no datum line at all. Wheeler was well conversant with the Roman antiquities by his works in the past and as such he struck his spade at the ancient site of Arikamedu in Pondicherry. The decision was taken by him after he observed Arretine Ware made in Italy during the first half of the first century A.D. and Rouletted Ware of Mediterranean type at the site. Results of the excavation at Arikamedu were, however, not very encouraging, since Wheeler could not find a Roman coin during the course of excavation. He, therefore, turned his attention towards fixing the chronology of the megalithic

1. Graham Clark, *Sir Mortimer and Indian Archaeology*, New Delhi 1979, P. 16.

remains in South India. The ancient site of Brahmagiri in Chitradurg District of Karnataka was selected for the purpose. During the course of excavation the remains of the megalithic people were found to be sandwiched between the superimposing Rouletted Ware and the deposits of the people represented by polished stone axes below.

After completing the excavation at Brahmagiri, Wheeler again turned his attention towards North-western India, where the well-known Indus Valley Civilization was discovered by the great archaeologists like Cunningham, John Marshall, R.D. Banerjee, Daya Ram Sahni etc. In one of his visits to the ancient site of Harappa Wheeler observed the remains of powerful defences. In order to verify the existence of fortification Wheeler started fresh excavation at Harappa. The excavations confirmed his observations, though the results were twisted by Wheeler to propound unfounded theories on the destruction or end of Harappa Culture. In his earlier excavation conducted at Brahmagiri also Wheeler was not justified in assigning unreasonable dates to the Polished Stone Axe and Megalithic Cultures. He was somehow or the other too subjective in associating the remains of various cultures with one or the other important event in historical tradition in a most dramatic manner.

The extreme subjectivity of the thoughts of Sir Mortimer Wheeler will be exposed by the following two statements. The first one is in reference to Megalithic Culture in South India and the subsequent one is on the end and destruction of Harappa Culture.

No. 1. "Here we may pause for a moment to consider the historical context. The conjectured duration of the Megalith Culture would postulate its arrival in northern Mysore sometime in the third-second century B.C. Our knowledge of the characters of that culture and of its Stone Age predecessors enables us to affirm that the event must have been one of some considerable magnitude for, whilst we have recognised an *overlap* between the Stone Axes and the Megaliths, there is no cultural *transition* from the former culture to the latter. On the one hand the picture is that of a crude equipment consisting of polished stone axes, miserable little blades and points chipped from scraps of felspar and the like, hand-made pottery mostly of the roughest and coarsest kind, and practically no metal (certainly no iron); on the other hand we have a culture richly provided with iron weapons and tools (amongst them, iron bars or spears upwards of 6 feet in length) a well-made ceramic turned on the (slow) wheel, beads of gold and faience, glass bangles. It would be a pardonable exaggeration to say that between the two cultures there was little more affinity than there is to-day, for example, between a Nilgiri hill-station and a neighbouring Toda village. The sudden and overwhelming character of the Megalith intrusion upon the Stone Axe natives of Brahmagiri is abundantly manifest. And all that we know of megalith-distribution points to an approach from the south or south-west. Port-holed cists are not at present recorded north of the latitude of Hyderabad city (Deccan), whereas they swarm over South India, save in its most southerly tip. If our chronology, then, is anywhere near correct we must suppose that in the third century B.C., there was a sudden extension northwards into the Deccan of a formidable iron-using megalith-building folk from peninsular India.

"Of one thing we may be certain this invasion did not occur during the firm rule of Asoka (C. 274-236 B.C.) within whose border-provinces as no fewer than three local Rock-edicts indicate, Brahmagiri lay. It must have occurred therefore either before 274 B.C. or after 236 B.C. But it is also unlikely to have occurred during the reign of Asoka's father, Bindusara (C. 297-274 B.C.) for as Dr. Chakravarty has inferred it is reasonably certain that Bindusara himself took the offensive in these parts and was responsible for the extension of the Maurya empire into the Deccan. It might be argued that this offensive was stimulated by a precious move from the South into the same region, and that the Megalith-folk were already in fact spreading northwards about 300 B.C. If so, our two hypothetical centuries are stretched backwards in a somewhat hazardous fashion. As the evidence stands at present, I find it easier to suppose that the northward move of the Megaliths occurred later, in the chaos which followed the death of Asoka, c. 236 B.C., when the Mauryan empire melted away and a Dark Age settled upon the Deccan for some three centuries. That Dark Age, following characteristically upon the break-up of a 'universal state' is an appropriate context for a folk-wandering which may reasonably and logically have led to a partial settlement of the Deccan in force by the Megalithic Southerners"¹.

No. 2. "The suggestion has indeed been made, very hesitatingly that the Cemetery H intruders may belong to the Aryan invaders, the conventional date for whose first incursion into India is the fifteenth century B.C. And here the risk which Indian archaeology is always ready to run in the search for a literary context lies once more across our path.

"Nor am I altogether disinclined to face that risk. The Aryan invasion of the Land of the Seven Rivers, the Punjab and its environs, constantly assumes the form of an onslaught upon the walled cities of the aborigines. For these cities the term used in the Rigveda is *pur*, meaning a 'rampart', 'fort' or 'stronghold'. One is called 'broad' (*prithvi*) and 'wide' (*urvi*). Sometimes strongholds are referred to metaphorically as 'of metal' (*ayasi*) 'Autumnal' (*Saradi*) forts are also named this may refer to the forts in that season being occupied against Aryan attacks or against inundations caused by overwhelming rivers. Forts with a hundred walls (*Satabhujī*) are mentioned. The citadel may be made of stone (*asmamayī*) alternatively, the use of mud-bricks is perhaps alluded to by the epithet *ama* (raw, unbaked), Indra, the Aryan war-god, is *purandara*, 'fort-destroyer'. He shatters 'ninety forts' for his Aryan protege, Divodasa. The same forts are doubtless referred to where in other hymns he demolishes variously ninety-nine and a hundred 'ancient castles' of the aboriginal leader Sambara. In brief, he 'rends forts as age consumes a garment.'

"Where are-or were-these citadels? It has in the past been supposed that they were mythical, or were 'merely places of refuge against attack, ramparts of hardened earth with palisades and a ditch'. The recent excavation of Harappa may be thought to have changed the picture. Here we have a highly evolved civilization of essentially non-Aryan type, now known to have employed massive fortifications, and known also to have dominated the river-system of north-western India at a time not distant from the likely period of the earlier Aryan invasions of that region. What destroyed this firmly-

1. Ancient India, No. 4, P. 201.

settled civilization? Climatic, economic, political deterioration may have weakened it, but its ultimate extinction is more likely to have been completed by deliberate and large-scale destruction. It may be no mere chance that at a late period of Mohenjodaro men, women and children appear to have been massacred there. On circumstantial evidence, Indra stands accused"¹.

The conclusions arrived at by Wheeler as mentioned above, though baseless, should not be considered as a wholesale condemnation of the great personality. He must be appreciated for the great quality of not being satisfied only with the skeleton of a culture. He always attempted to present the complete picture by reconstructing the flesh, blood, arteries and veins in the skeleton. Further, the knowledge of the country's past culture, history and civilization was very much restricted and from a foreigner like Wheeler who had not much background of Indian history nothing more could be expected. Wheeler himself admitted his shortcomings when he was entrusted with the job of the Director General of the Archaeological Survey of India in the frank statement, "Thereafter an eventful voyage took us to Bombay, and I stepped ashore with a mind full of ill-digested Indian history but with a pretty plan of campaign"². On the other hand Wheeler will always be remembered in this country for the new technique of excavation he evolved and the warlike alertness and military discipline introduced by him in the field. It must be acknowledged that the driving spirit and force in excavation, in whatever fraction they are still extant in the country stand indebted to the giant personality of Wheeler. The author had an opportunity to see the great man in 1962 on the eve of the celebration of the centenary of the Archaeological Survey of India. It was simply a surprise to observe the lively and youthful spirits in him at that old age.

This chapter may be considered by some readers as replete with nothing else but long quotations from Wheeler's statement. The accusation may be true to some extent, but at the same time it must be reiterated that they are the best way to present the real character and personality of the great man. While bringing the chapter to a close a few words incorporated in the prefatory note to the series of Wheeler's Memorial's Lecture No. 1 from B.K. Thapar, Director General of the Archaeological Survey of India are quoted to highlight the aims and ideals of Wheeler. "However, of his work in India during the four eventful years of his Director Generalship of the Survey (1944-48), when he bestrode the Indian scene like a colossus, three things stand out prominently indeed and must, therefore, be remembered with gratitude (i) bringing Indian archaeology to a modernized phase of research and methodology; (ii) building up a new generation of trained Indian archaeologists and (iii) employing strategic planning and tactics of field archaeology in the solution of archaeological problems. In fact, through his planning Indian archaeology woke to action as a stimulant to research, linking chronologically the ancient cultures of north and south India"³.

1. Ancient India No. 3, P. 81.

2. Mortimer Wheeler, *My Archaeological Mission to India and Pakistan*, London 1976, P. 10.

3. Graham Clark, *Sir Mortimer and Indian Archaeology*, New Delhi 1970.

CHAPTER IV

EXCAVATION - PREPARATION AND TECHNIQUE

Without writing anything on Exploration, which always precedes excavation, the chapter on Excavation may not be appreciated by the scholars in the field. The author would like to appeal to the readers not to have any misgivings on this topsy-turvy attempt. He is well aware that Exploration always precedes Excavation, but the privilege of writing on Excavation in the first instance deserves forgiveness in the light of the fact that the primary aim of Wheeler, within his short span of the stewardship of the Archaeological Survey of India, was to introduce new techniques of Excavation and thereby present a chronological framework or time-table of various cultures in India. There was hardly any attempt on the part of Wheeler, responsible for the New Era, to organise a well-conducted expedition of Exploration with a specific end in view, in order to emphasise the importance of the work. This might have happened owing to the fact that Archaeology and proper understanding of various cultures in India was in a stage of infancy. In such circumstances and the limited number of years for which he stayed in the country, he should not be deprecated for ignoring the priority and importance of Exploration. Before Wheeler excavations were undertaken in a haphazard manner, without deciding the aim and purpose of the same. Hence, when Wheeler arrived on the scene, he was engulfed in complete darkness by the absence of any idea where to start and for which destination. In a picture of such a complete gloom Wheeler, in all likelihood, was ignorant entirely regarding the primary search of ancient cultures, which is the main aim of Exploration. He did not know what to search and where to look for it.

1. Preparation For Excavation Campaign

To a layman any excavation camp may appear to be a picnic excursion for a change from the daily routine life of home. This is far from truth. Excavation campaign, is not very much different from a military campaign, though it may not be true for the time preceding the days of Wheeler. Before launching the campaign of Excavation, the leader of the team has to make all preparations. In the first instance, the leader of the team must be fully conversant with the aim with which he is going to undertake the campaign. Unless and until he is aware of the aims and purpose of his excavation, he would not be in a position to decide upon the type of team and equipments which will be needed at the site. The ancient sites are mostly located in an out of the way place making it impossible for the leader of the team to make anything readily available from the nearby market, whenever any equipment is needed. It was one of the reasons, though not the most important one, for which Wheeler emphatically repeated that the leader of the excavation team should always be well-experienced.

Certain minimum constituents of a team for undertaking excavation are laid down. The leader of the team must be confident that each and every member of the team, which accompanies him, will work in a team spirit, always prepared to act on the direction of the captain. The leader of the team should, in the first instance, have an assistant of his own line, who is well acquainted with the technique and administration of an excavation. The necessity of such an assistant is considered indispensable in view of the fact that the leader of the team may not find it possible to be always present at the site. In the absence of the leader, the well-trained assistant should always be in readiness to command and direct the strategies of the excavation. When Wheeler laid emphasis on the requirement of a well-trained leader, he never meant that he should be well-versed only in the technique of excavation. The leader of the team must possess at least the basic knowledge of the setting up of the tents, drawing, photography and surveying. It was only with this objective that Wheeler arranged training in all the branches at his famous school at Taxila. In the absence of the fundamental knowledge of all the branches of field archaeology, the members of the team will act according to their own likings and dislikings, which may not be in tune with the standards of archaeological excavation set down by Wheeler. With the leader of the team it is also desirable that his immediate assistant also possesses to some extent the basic knowledge of all the branches of field archaeology.

Next to the principal assistant, the immediate man who is needed on the field is a store-keeper or foreman entrusted with the duties of arranging the camp by setting up of the tents and making available to all the members of the team the basic necessities of life in the camp. It would also be preferable if the store-keeper is made responsible for organising the kitchen of the camp to serve nourishing meals and breakfast to the team. The store-keeper is always in a better position to attend to this duty, because he is not required to go to the field. The leader of the team has to be very particular in seeing that good and nourishing food is served to the team. It is essential because of the hard life, which the excavation team has to stand on the field. In order to maintain the healthy team spirit in the camp, arrangement for meals for all the members of a team should be made at one and the same place. There need not be any distinction between the commander and the soldiers.

The leader of the team must be fully conversant with the climate and environment of the area, where the excavation is to be undertaken. The number of the members of the team should also be determined in advance, so as to assess the necessity of accommodation and materials in the field. Before actually striking the pick-axe for excavation, the leader of the team should visit the site in the company of the store-keeper to decide the venue of the camp. While selecting the venue for the camp certain important factors have to be borne in mind. The venue of the camp should not be in the midst of a village or anywhere very near it. The source of potable water should not be far away from the camp. Regular road, if at all available in the area, should also be close by, so that unnecessary expenditure on the preparation of an approach road is avoided. Though the author has observed many leaders of the team deciding upon residing in the houses of the village instead of staying in tents, he is not in favour of it, because on several occasions such a step has led to unpleasant and very often

dangerous situations. The camp should always be set up at a place, which is nearest to the site without overlooking the other necessities mentioned above.

When the venue of the camp is decided in the company of the store-keeper, he should be sent at least fifteen days in advance with all the camp equipments in order to enable him to keep everything needed for excavation ready before the team arrives. The number of tents and other camp equipments will depend on the members of the team. In addition to the camp equipments the store-keeper should also carry with him all tools required for conducting the excavation. The requirements mentioned above need not lead any scholar to feel that there is no limitation on the expenditure, which the leader of the team can spend on excavation. The planning on the part of the leader of the team will always be circumvented by the funds placed at his disposal. The area of excavation, its duration and the number of staff members to assist him in the work, depend entirely on the funds available for the purpose of excavation. The Director of the excavation in association with the team, however, should be conscious at every step that within the amount available the achievement of the aim is maximum.

Besides the services of a store-keeper, who has a very important role to play in the smooth running of the camp, the team of the excavation should constitute of a trained surveyor, photographer and draftsman. Since the surveying, photography and draftsmanship in an excavation are works of an altogether different nature, trained personnel in the field may not be readily available to any Director of excavation. In such circumstances the Director will have to render necessary training to the surveyor, draftsman and photographer in the field. Since they possess the necessary basic qualification in their field, they will not lose much time in understanding the nature of work they are expected to do in the excavation of an ancient site. If the trade secret of any excavation is considered as a whole, the draftsman, photographer and the surveyor will observe that their work is not complicated, but far more simpler than usual works. They will simply have to be intelligent enough to catch the relevant necessities which they have to incorporate in their work. Extensive training and experience of any Director beforehand was, therefore, emphasised every now and then by Wheeler. He remarked in a commendable manner on the requisites of a Director and said, "But, just as a general must be exactly familiar with the performance the range, fire power, mobility, and so forth—of every arm available to him or his enemy, so must the Director of an archaeological excavation be acquainted with the exact potentiality of various techniques appropriate to his craft and the nature of the problems which are likely to oppose him. He may himself, for example, be an indifferent photographer, but he must know accurately the capacity of his cameras, lenses, and filters, and must thoroughly understand the preparation of a photographic subject, at all points he must be able to direct or check his expert. I have been blessed with a series of exceptionally competent photographers, but scarcely ever have I had an archaeological photography taken without carefully checking the subject through the lens before exposure, for lighting, position of scale, angle and background. Experience of this procedure (and of the converse) has convinced me of its necessity. The director, and he alone, is responsible for the record of his work, he knows, or should know, better than anyone else exactly what his record should express, and he can achieve the

best possible record only through a full knowledge of the capacity of the mechanism he is using"¹. The Director of the excavation can apply his mind freely to such types of checks, training and supervision only if he is not burdened with the work of administration. Wheeler said aptly, "First and foremost, the director must be a free agent, free from administrative detail. His primary and constant duty is to circulate from site to site and from workshop to workshop. Every section, in its latest manifestation, must be clearly in his mind's eyes, and he must be familiar with every development in the hour-to-hour work of his team"². The author's own feelings are that any man, howsoever capable he might be academically, should not be allowed to excavate as a Director of the team unless and until he has worked at least for full three seasons in excavation camp as a deputy director or principal assistant of the Director.

In the institutions, which awarded them the necessary degree or diploma, the surveyors, draftsmen and photographers were taught or given training to produce new works on the basis of the latest inventions, in order to extend the comforts and facilities needed by the modern man. The nature of work in the excavation is just the reverse. The traits learnt by them are to be employed in a different fashion. They are required to present vividly in a life-like manner the way of life already lead by our ancestors from the cultural remains left behind them in the occupational debris of the mound.

If the Director of the excavation expects burials at the ancient site, the assistance of an anthropologist is also a must. In the excavation of Megalithic remains his presence is needed at every stage. The services of a chemist for treatment of minor antiquities in the field, if readily available, will also be useful. Amongst minor antiquities, coin is the most important, which needs immediate treatment to throw light on the date of the strata which yielded the same.

In this context the author is reminded of one of the comments made by him in a lecture delivered before the Rotarians of Calcutta. Amongst the audience physicians and surgeons of Calcutta constituted to be a majority. In order to make the lecture more lively, particularly because History and Archaeology are considered at all hands to be subjects dealing with the dead people, the author just at the outset of his address told the audience that there was very little difference between a doctor and an archaeologist. A doctor in pursuit of his profession and also in service of humanity makes all efforts to save the life of a dying man by application of a number of drugs in combination with machines for oxygen or respiration, whereas the duty of an archaeologist is to bring back the already dead people to life and make them speak. Bringing the dead people to life and making them speak are made possible by a field-archaeologist not only by himself, but in close co-operation with the works of the surveyor, draftsman, photographer and other assistants. The better and clearer the archaeologist can make the dead ancestors speak, the more proficient, capable and intelligent the archaeologist will considered to be.

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 131.

2. *Ibid*, p.135.

So far as the basic requirements, qualifications and aptitude of photographer, surveyor and draftsman are concerned, the observations made by Wheeler still hold the ground and are correct not only in each word but each letter of the word. For a photographer, he said, "The essential qualifications of the field photographer are (a) that he shall be technically dependable in all lights and colour-schemes, and (b) that he shall be quick and ingenious in the improvisation of scaffolding for his camera and in particular, of a readily accessible dark-room, he must always be in a position to produce the developed plate or film for inspection by the director within 20 minutes of exposure. To these qualities he must add a thorough understanding of the preparation of a subject, whether in the open air or in the studio, although this is ultimately the personal responsibility of the director.

"An intelligent and experienced photographer is a *sine qua non*. From the beginning of the excavation, it is his spare-time job to make a study of the site at different times of the day, and so to be prepared to advise in regard to lighting and position. Here again the director is primarily responsible, but a good and observant photographer can help him a great deal. Like a doctor, the photographer must be available and prepared at a moment's notice and at all times"¹.

The observations of Wheeler in regard to a surveyor in the same fashion are as follows. "On the other hand, the preparation of a contoured survey or the plan of a building, though, like everything else, demanding constant supervision, must on a large excavation be delegated primarily to a professional surveyor. I do not propose to include here a detailed excursus on the craft of surveying on which many hand books are available. But there are one or two observations which may usefully be made in regard to the application of professional survey-methods to archaeology.

"First let us consider the nature of the tasks which are likely to await the archaeological surveyor. These are (a) the preparation of a site plan, generally contoured and often of considerable extent, and (b) the planning of a structure or group of structures on a small scale or in detail. For (a) either a plane-table or a theodolite may be used; (b) is normally carried out by triangulation from a base line. In both categories, it is important to remember the degree of accuracy required"².

In the case of a draftsman Wheeler stated, "The work of the draftsman is various, involving a range of qualities rarely possessed by one and the same individual. In practice, I have generally found it necessary to employ three draftsmen, although I have known one or two exceptional men who have covered the whole ground.

"Whether one or three, it is essential that the draftsman shall thoroughly understand the technique of line-block production, and shall so be able to attune his style to the machine: to employ lines of the right thickness and firmness, having regard to the extent of reduction required in publication, and to avoid too close a proximity of one line to another, such as may lead to a fusion of the thin metal strips and will

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p.142.

2. *Ibid.*, p. 143.

ultimately represent those lines on the blocks. Clean lines and clean hatching, without an unnecessary coarseness of detail, entail a sureness of hand and eye that, combined with experience, are a primary qualification in all types of scientific draftsmanship.

"On the common basis, the work falls roughly into three categories: the tracing and lettering of maps and plans, the drawing of objects and the semi-schematic drawing of pottery. In all these things, the critical eye of the director is a present need. As always, the director must be able to impose his judgement with an acceptable authority upon his draftsman. At the same time the draftsman's initiative must be encouraged; his advice, comments, criticism are, or should be, always worth listening to, and I have often profited from them. Not only in matters of scientific interpretation, but in the attractive presentation of his material, the draftsman can help the archaeologist to 'get over' to his public—his scientific no less than his non-specialist public"¹.

Before moving down to the excavation camp, the store-keeper should not forget to carry with him some patent medicines for general indisposition like ordinary fever, pain in the body, dysentery, bruises, cuts, etc., in consultation with a doctor. The members of the team, however, need be conscious enough to use these medicines only in cases of simple illness. In cases where a little carelessness is likely to lead to complications, a reference to qualified physician need not be deferred. It would always be advisable if the store-keeper or any member of the team has undergone a training in first-aid.

Since the ancient sites, where excavations are undertaken, are in almost all cases located at an out of the place, where day to day necessities are not readily available, a conveyance preferably jeep with a trailer is an essential requirement.

Amongst the staff members whose services are needed in the excavation, the surveyor like the store-keeper has also to move in advance, so that by the time the Director and other members of the team arrive on the scene he is in a position to present before them a preliminary contour plan of the site. The detailed and fair contour plan can be prepared later on for publication. The preliminary contour plan of the site will be of a great value to the Director of the team to take quick decision regarding the area where the trenches for excavation are to be laid. In certain cases it is difficult to spot out fortification at ancient sites at a first glance, particularly when the same is not prominent and high enough, but the Director will not miss to strike the same immediately on seeing the contour plan of the site, if prepared in advance. During the advance excursion the surveyor, while preparing the rough contour plan, should also try to present the site plan incorporating the contours.

The surveyor should carry with him the following instruments and equipments.

1. Theodolite.
2. Dumpy level.
3. Two levelling staff.
4. Plane table.

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 145.

5. Prismatic compass.
6. Drawing Board.
7. Plumb-bob.
8. Spirit (bubble) level.
9. Survey poles at least six.
10. Good drawing paper.
11. Architectural scales.
12. Chain for surveying.
13. Good pencils and soft erasers
14. Good inflexible string.
15. Abney-level.
16. Binocular.
17. Circular celluloid protractors.
18. Large celluloid set-squares.
19. T- squares.
20. Drawing pins.
21. Paper clips.
22. Steel Tape—30 metres - 1 No.
23. Metallic tape
 - (a) 30 metres - 3 Nos.
 - (b) 15 metres - 2 Nos.
 - (c) 5 metres - 2 Nos.
24. Two small note-books for noting the recordings during surveying at various points.
25. Tripod stand.
26. Parallel ruler.
27. Folding scale.
28. Pocket steel tape - 2 metres.
29. Ordinary wooden pegs.
30. Water proof ink both black and white.
31. Necessary pens for inking the drawings.
32. Plastic holders to keep the drawing paper fixed to the plane-table.
33. Survey umbrella.
34. Parallel ruler.

The equipments required by a draftsman in the field are as follows:-

1. Plane-table.
2. Tripod stand.
3. Metallic tape refill
 - (a) 30 metres - 3 Nos.
 - (b) 15 metres - 2 Nos.
 - (c) 5 metres - 2 Nos.
4. Pocket steel tape - 2 metres.
5. Architectural scale.
6. Metallic tape
 - (a) 30 metres - 2 Nos.
 - (b) 15 metres - 2 Nos.
 - (c) 5 metres - 2 Nos.
7. Parallel ruler.
8. Celluloid circular protractor.
9. Celluloid large set-squares.

10. Good pencil and soft erasers.
11. Plumb-bob.
12. Good inflexible string.
13. T-square.
14. A few nails measuring 15 cms and 7½ cms.
15. Paper clips.
16. Drawing pins.
17. Plastic holders to keep the drawing paper fixed to the plane table.
18. Good drawing paper.
19. Good section paper (graph sheet) preferably a roll.
20. A few small section papers.
21. Folding scale.
22. Water proof ink both black and white.
23. Necessary pens for inking the drawings.
24. Umbrella to protect from the scorching sun and the resultant glare.

The following are the equipments to be carried by a photographer:-

1. Field camera, preferably full size, but in modern days a camera of 2B or quarter size like Linhof is much more handy and the results are equally good.
2. Sufficient number of cut films.
3. One good camera of 120 size like Rolleiflex.
4. One 35 mm. camera.
5. Four lenses (normal, wide angle, close up and telephoto).
6. Stand for field camera.
7. Three filters (green, yellow and red).
8. Bubble - level.
9. Pair of scissors.
10. Exposure metre.
11. Lump of plasticine.
12. Sheet of velvet (black) for taking photograph of small finds.
13. Black background cloth for looking through the camera.
14. Note-book for keeping a record of the photographs taken.
15. Scale -

(a) 50 cms. 1	suitably divided into metre and centimetres.
(b) 1 metre - 1	—do—
(c) 2 metres - 1	—do—
16. Sufficient number of rolls both 120 size and 35 mm. The photographer should carry coloured rolls of 35 mm. so that slides on various stages of excavation could be prepared.
17. A small box containing metal scales of all sizes ranging from 15 cms. to 2 cms. for small finds.

Now let us turn our attention to the general equipments for which arrangement will have to be made by the store-keeper. These equipments will be required in the digging operation.

They are as follows:—

1. Large pick axe.
2. Small pick axe (at least double the number of large pick axe).

3. Trenching tool (small pick with shovel-end).
4. Hand shovel.
5. Sharp-edged spade.
6. Bale (turf-cutter or trimmer) for trimming down sections.
7. Baskets closely knit.
8. Supervisor's knife.
9. Folding scale.
10. Survey pole (2 metres).
11. Triangle for three-dimensional measurement with bubble-levels fixed on the two arms. The two arms should also be divided into centimetres. Each arm should be one metre long.
12. Metallic tapes (30 metres), at least two for every trench.
13. Steel pocket tape (2 metres), one for every trench.
14. Nails -

(a) 15 cms.	in adequate quantity as
(b) 7½ cms.	required by the number
(c) 2½ cms.	of trenches.
15. Pottery labels.
16. Antiquity envelopes.
17. Smaller but cloth-mounted envelopes for coins.
18. Note books with left hand side having graph sheet and the right hand side plain.
At the end there should be pages for recording the daily antiquities.
19. Sprit (bubble) level.
20. Brushes of various shapes, kinds and sizes viz. coir brushes, paint-brushes of various sizes, wire brushes, etc.
21. Pottery bags in adequate quantity.
22. Scissors.
23. Pen-knife.
24. Surgical knife.
25. Wooden pegs - 50 cms. long, square at the top with the bottom 15 cms. sharpened.
The number of the pegs will depend on the number and type of trenches. The square on the top of the peg should be 6½ cms.
26. Blower.
27. Plaster of Paris.
28. Araldite.
29. Quick fix.
30. Water proof ink both black and white for marking the pottery.
31. Black and white paint.
32. Tin foil and plastic covers for collecting samples for C14 dating.

The store-keeper must bear in his mind that the above equipments which he has to carry will be needed by the supervisor of individual trench and as such their number should depend on the number of trenches which are likely to be laid at the site. This can be ascertained from the Director of the excavation in advance.

2. Excavation and Its Technique

With all the preparations and the equipments, of which the details have been given above, the stage is set for undertaking the excavation on the field. In a tropical country

like India, the best time for excavation is the winter season when the sun is mild and it is not difficult to stand or walk in the sun. The time, however, will vary in case of Kashmir or Himachal Pradesh. On arrival at the site, the team after a day's rest, if necessary, should launch the actual campaign of excavation. Before the trenches are laid out and the excavations started, the Director must be fully conscious, without any ambiguity, of the specific aim with which the site has been selected for digging and the artefacts which the excavation is likely to yield. The members of the team need not be kept ignorant of the specific aim, particularly because they are the soldiers to fight out the battle under the command of the Director. Having been made conversant with the specific aim of the excavation, the team particularly the Director and his immediate assistant should go round the site several times, not only on one day but days together, if required, to decide the place where the trench should be laid in the first instance. This decision will have to be taken after carefully studying the rough contour plan prepared by the surveyor in advance supported by personal observations of the mound. Amateur field-archaeologists do not take pains to go round the ancient site several times before deciding upon the place to lay out the trench. This is, however, a primary necessity and cannot be ignored. Any decision taken without detailed study and observations of the ancient site cannot be expected to lead to the desired or expected results.

While going round the site the Director should keep his eyes wide open to see if the fringe of the mound all around is higher than other parts of the mound. The rough contour map can also corroborate it. If it is so, there need not be any doubt in assuming that the ancient site was fortified. Hence, it is essential to lay a trench across the fortification at a suitable spot, preferably at the highest point to reveal the nature of the fortification as also the time when it was raised in its initial stages and till what time it continued to be in existence. In case of the existence of a moat the trench across the fortification must connect it.

The area where the occupational debris of the mound is maximum will be the next choice of the place to lay out a trench. The trench in the highest part of the mound will enable the excavator to determine the earliest time when the site came under occupation, the duration of the occupation and the last days when the site was ultimately abandoned. Such a trench will be very valuable in preparing an index or frame a time-table of the site with representative antiquities in each successive cultures.

Another area which should not, in any circumstance, be left out from laying out a trench is the central portion of the mound. It is well known to one and all that the most important structures occupied by the elite class of people in the society, particularly in ancient days, are generally located in the central part of the occupation.

For arriving at the decision of selecting the area, where the digging operation should be undertaken, the portion of the mound which has yielded the most important antiquity or the maximum number of good antiquities during the course of surface collection also deserves particular attention.

If there are two obviously separate mounds, both of them must be tapped in order to reveal the nature and characteristics of different strata of people, which must have been responsible for the occupation on two separate mounds. The same step is to be taken in case of a series of mounds. Each and every mound must be tapped.

The areas in which the digging operations are to be conducted in order of priority as given above need not always be considered to be a fetter of hard and fast rules. According to the experience of the author himself, the above-mentioned priority leads to maximum results within a minimum time. It must, however, be always borne in mind that the area of the excavation and the number of trenches to be laid out are always circumscribed by the funds available for the purpose in addition to the number of supervisors, which the Director has at his disposal. In this context, the author considers it very important to recall one of his experiences in excavation which may be of great avail to field archaeologists. While he was under training at one of the ancient sites the Director of the team laid a trench at one of the extreme fringes of the mound, where there was a deep rain-gully. The step on the part of the Director was of great ingenuity to achieve the desired and maximum result with the minimum expenditure and labour. The expectations were turned into great disappointment when the earliest remains of the occupation at the site, of which pottery and antiquities were collected from the surface, were not struck in the trench. They were completely washed away by the river flowing not far off, which had changed its course. The idea of minimum expenditure and labour, as conceived in the beginning, had to be abandoned and the excavations conducted in the centre of the mound, which ultimately revealed the causes of the absence of the earliest occupational remains on the fringe of the mound. Care should be taken to avoid such situations.

As it has already been made clear in the beginning, perfect control in the excavation cannot be overlooked in any circumstance. The services of young post-graduate students, particularly in history and archaeology may be requisitioned by the Director to act as supervisor of each and every individual trench. No trench should be left without a supervisor. The supervisors can be paid some stipend, in whatever manner practicable, but the same must be adequate enough to meet their expenditure on meals and other petty requirements in the camp. Before posting them actually on the trench to act as a supervisor, they should be imparted necessary basic training in the form of watch-words. They must be told very frankly that in case of any problem, the excavation must be stopped till necessary further guidance is given by a trained personnel. In the beginning, however, two or three supervisors can be kept under the charge of one trained personnel. The trench of the trained personnel should be adjacent to those, where the supervisors are working, so that he has no problem to keep a constant watch over them. The supervisors can be left to control the labour and the excavation independently only when the Director is confident enough that the supervisor has developed that capacity. In such cases also it is essential on the part of the Director or a trained personnel to go round the trenches of the supervisors regularly to maintain the necessary check. The practical work of the supervisors on the field will act as a very good supplement and corroborative to the lessons they learnt in the class from their professors.

severe crisis. On the recommendation of Wheeler in addition to some other Director Generals before him, the subject of Archaeology has been decentralized and most of the Indian Universities have taken over the responsibility of teaching archaeology in post-graduate classes. Post-graduate degrees in Archaeology under one name or the other are awarded by them. But, it must be pointed out that most of the Universities are doing so without imparting any training to the students in field archaeology. The state of affairs is indeed very deplorable. The students cannot be expected to learn the technique of excavation and the principles of stratification in the class by means of lectures or tuitions. They may pass the examination and secure the degree in Archaeology but, it is the experience of the author that they remain completely blank in the most important branch of the subject. No time should be lost now to stress the need of practical training in the field before any student is awarded with the degree of Archaeology by any University. The best course would be, according to the feelings of the author, to allow the subject to be taught in those Universities only, which have the required arrangements to take the students to the field for practical training. If the university is not in a position to make arrangements for practical training in the field, the teaching of the subject should be stopped forthwith. The Universities have awarded enough degrees in the subject and many students with the degree are without jobs. Hence, the interest of Archaeology will not be in jeopardy in any manner whatsoever.

In the event of University post-graduate students not readily available, the Director need not wait for them. He can easily engage local graduate students, who are intelligent enough to catch the preliminary principles and techniques of excavation by a few tips. Having a good background these young students can very well pursue their studies with Archaeology as the subject in post-graduate classes.

Before the digging operation is actually started or even the trenches laid out, one of the basic necessities which has not been mentioned earlier is the preparation of a pottery yard to keep the pottery yielded by various layers in proper places (squares). The planning of the pottery yard has been clearly spelt out by Wheeler and therefore the same is reproduced here. "A reasonable area adjoining the pottery-shed is carefully levelled and smoothed, and a rectangular framework x yards (say, 20 yards) square is marked out by neat line of stones. Within the frame, subsidiary compartments are formed by similar lines of stones laid down in both directions at 1 - yard intervals. These subsidiary squares are then demarcated by flat wooden labels driven in along the margins of the framework and bearing in one direction the denominations of the various excavated sites (square-number or trench number) and in the other direction the successive numbers of the layers (1,2,3, 8c). Thus every subsidiary square is identified with a horizontal and vertical datum on the excavated site. In the illustration (Pl. XVIII), taken from the Arikamedu excavations of 1945, the line of labels across the foreground represents the site (A1, A2, A3, C) and the line receding from the camera represents the layer or stratum.

"The operation of the grid is as follows. As the basket-carriers bring in the labelled baskets of pottery at intervals during the day, the pottery assistant empties the contents, with their two labels, carefully on to the appropriate square. In the illustra-

These days the studies in the branch of field archaeology are passing through a tition, he is actually emptying a basket on to the square representing stratum 8 on site A4. *This task is never delegated.* It must be remembered that at this stage the individual sherds are not marked, and any careless spilling will irreparably transfer a sherd to its wrong stratigraphical position. After being emptied, the basket, no longer labelled, is sent back to the excavation for re-use.

"The next stage is to inspect the sherds thus dumped and to transmit all that do not require special treatment to the washers, who in the illustration are seen squatting under the banyan-tree at the back. The contents of *one square only* are washed by each washer or group of washers at any one time, otherwise admixture is inevitable. When dry, the washed sherds are transferred group by group to the table, where they are further examined by the pottery-assistant (and as often as possible by the director) and are marked carefully, sherd by sherd, by the marker under the pottery-assistants direction, in accordance with the two labels which still, of course, accompany them. Finally the marked sherds are bagged, *group by group*, with one label in the bag and the other tied on outside, in accordance with the procedure already described"¹.

The only remark which is needed on the above requirements of a pottery yard is that in place of yard metre should be used in view of the introduction of metric system. Further, stones should be used for demarcating the squares only at those sites where they are readily available. At many sites brickbats are available in place of stones. In such cases brickbats can serve the purpose equally well (Pl. III).

3. The Lay-out of Trenches

(i) Vertical and Horizontal Excavation:

The excavation is of two kinds viz. (1) Vertical (Trench System) and (2) Horizontal (Area Excavation). The aim of a vertical excavation is to prepare an index of the site, like the page of the contents of a book, by digging in a limited area. Archaeologists resort to this kind of excavation, particularly in the beginning to throw light on the sequence of cultural occupation at the site, the earliest time when the site came under occupation and the latest date till the same continued. Though not in detail, the characteristic features of various cultural periods expected at the site will also be reflected in such a type of excavation. In the words of Wheeler, "It is a railway timetable without a train"². The knowledge regarding the successive cultures revealed during the course of excavation would, however, be sketchy (Pl. IV).

The other method is horizontal. The aim of this type of excavation is to reveal and understand the detailed planning of the township with its streets, lanes, by-lanes, various types of structures like shrines, palaces, general houses, shops etc. The horizontal excavation leads to complete reconstruction of the cultural pattern of a particular period. The area of excavation in vertical excavation is restricted and extremely limited, whereas in horizontal excavation the same can be extended to any limits desired (Pl. V).

1. Sir Mortimer Wheeler, *Archaeology from the Earth*. London 1954, p. 167.

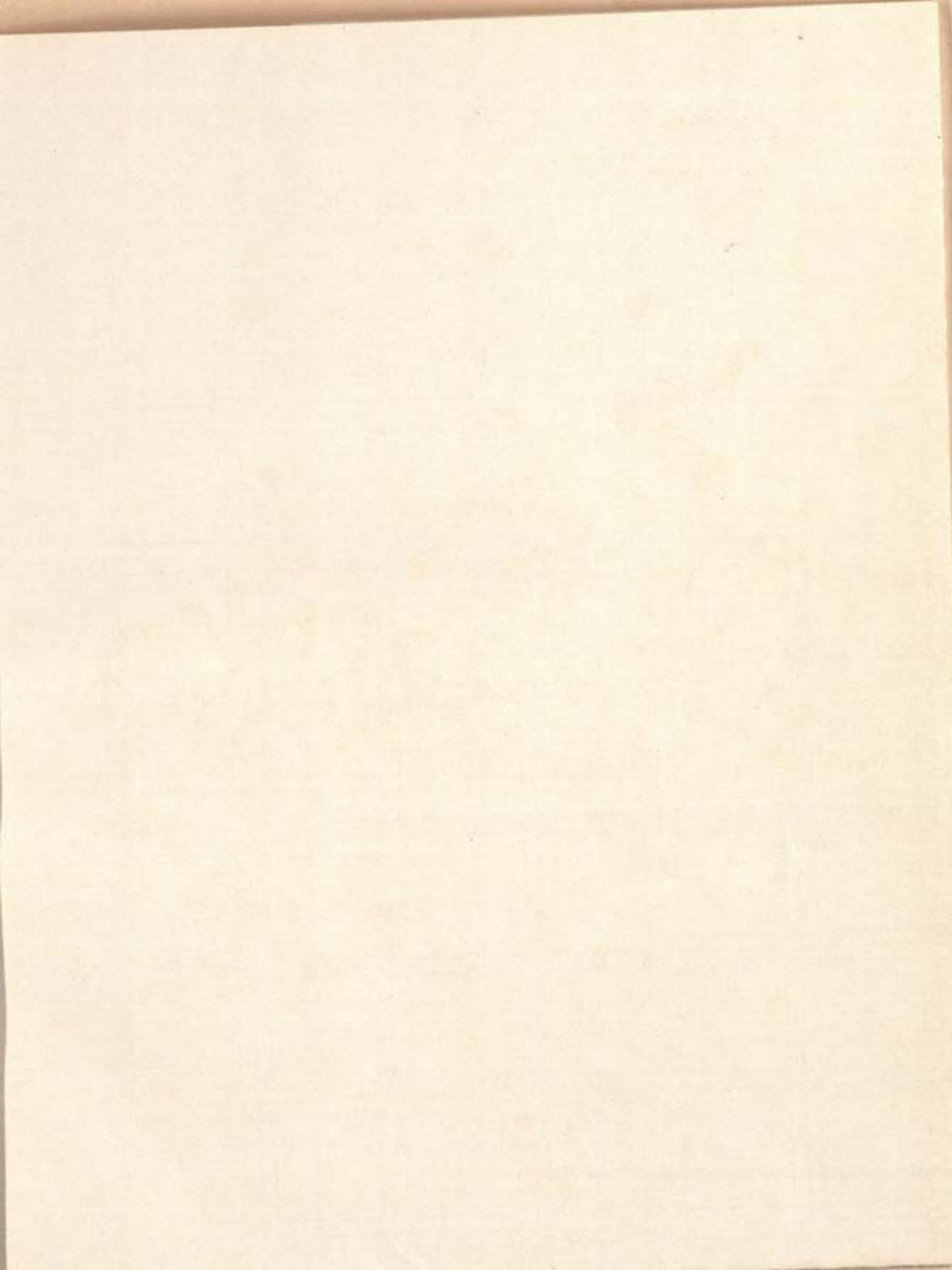
2. *Ancient India* No. 3, p. 143.



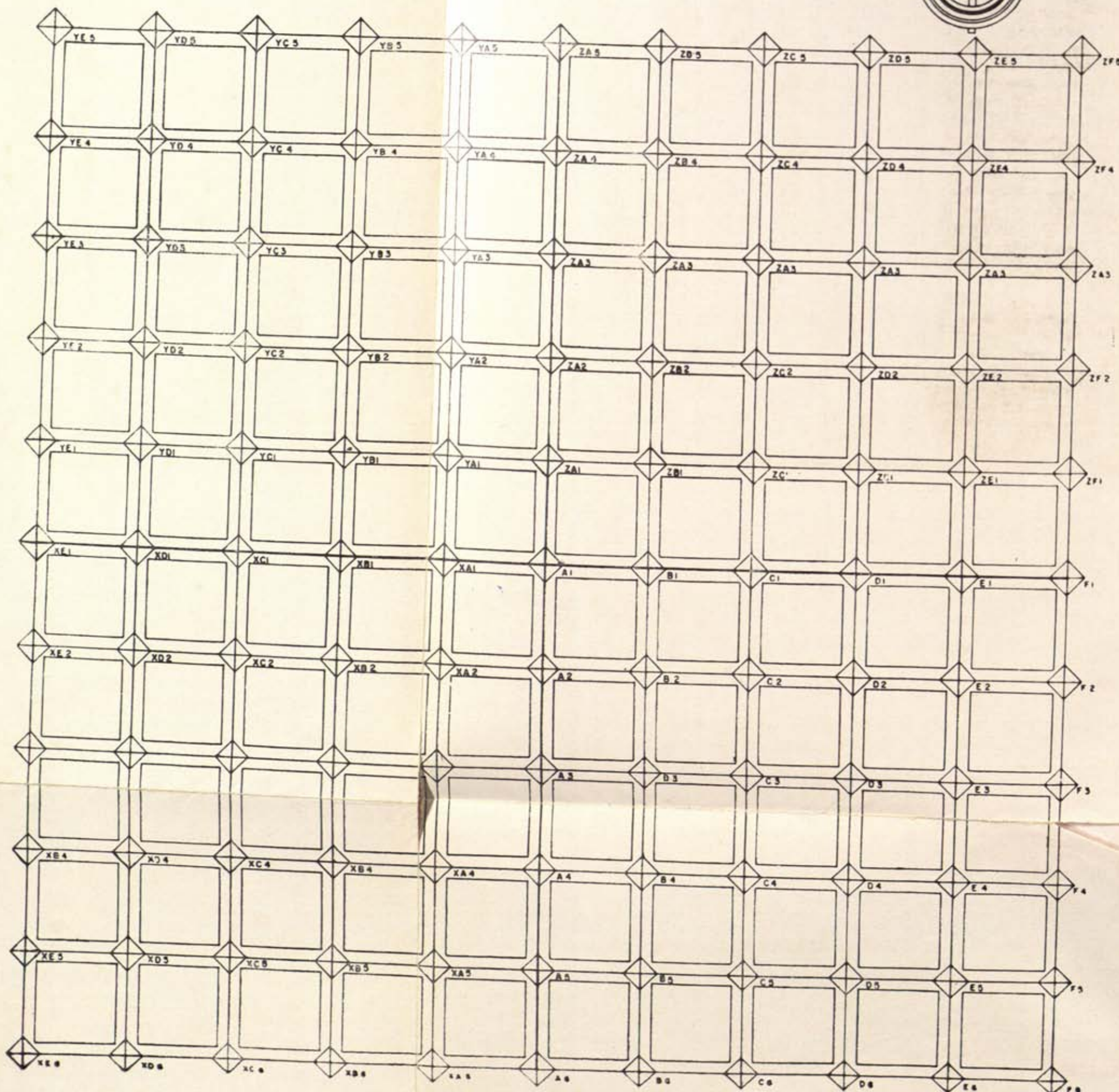
Pottery Yard



Vertical Excavation



LAY-OUT OF TRENCH IN HORIZONTAL EXCAVATION



Comparing the merits and demerits of both the types of excavation Wheeler said, "Vertical excavation alone whilst supplying a key to the length of an occupation, to its continuity or intermittency, and to some part of its cultural equipment, cannot be expected to reveal, save in the most scrappy fashion, the significant environment - economic, religious, administrative - of a human society. In other words, it leaves us in the dark as to those very factors which fit a past culture or civilization into its place in the story of human endeavour and so make its recovery worth our while. It is a railway time-table without a train. The Parthian civilization of Taxila would have had comparatively little meaning for us had we not an extensive knowledge of the general lay-out and shape of its streets and shrines, its palaces, its houses and its shops. Similarly, Mohenjodaro could never have taken its high place in the history of urban development, with its rectilinear street-plan, elaborate drainage and sophisticated brick work, had it not been for the somewhat summary but far-reaching horizontal excavation to which it was submitted. Painstaking vertical sections carried down to the natural surface of the subsoil would doubtless have given us valuable information for which we are still waiting and without which we cannot at present relate with sufficient precision the Indus civilization to other cultures in India or Iran. But as a *civilization*, the Mohenjodaro complex would not have existed for us, and it is as a civilization, not as a mere local 'culture' that Mohenjodaro looms over the prehistory of Asia"¹

Though both types of excavation are complementary to each other, it is considered essential to make it clear that any horizontal excavation, large or small, must be preceded by a vertical excavation. The excavator will have to decide in the first instance as to which chapter of the book he would like to study in detail. This can be possible only after he goes through the page of the contents in the book. As already stated the vertical excavation is like the page of the contents in the book. Once the excavator is in a position to decide the chapter of his liking, the first page of the chapter can easily be opened and thereafter read in detail. In the absence of the page of the contents in the book, the reader will have to go through each and every page of the book to ascertain the portion of his liking. It would simply be a waste of time and energy. Similarly, the excavator has to decide in the beginning the cultural period of which the details are to be brought to light. This can be possible only after undertaking a vertical excavation without which the excavator will be completely ignorant regarding the thickness of the deposit superimposing the cultural period, of which he wants to reconstruct the picture in all details. The rule of vertical excavation always preceding the horizontal excavation will not be strictly applicable in case of a site which has a cultural occupation restricted to one period only. In addition, the rule is waived even in those areas of a site where there is no superimposition of any other cultural deposit above that of which the excavator desires to reconstruct the complete picture in detail. It must not, however, be forgotten that even in one period of a site, the various cultural phases will have to be determined, for which the only method is vertical excavation.

There are certain rules and regulations to be followed in both the systems. In vertical excavation the area to be excavated is restricted, whereas in horizontal excavation it is unlimited. Once a trench is laid out on the system of vertical excavation, the

1- Ancient India No. 3, p. 143.

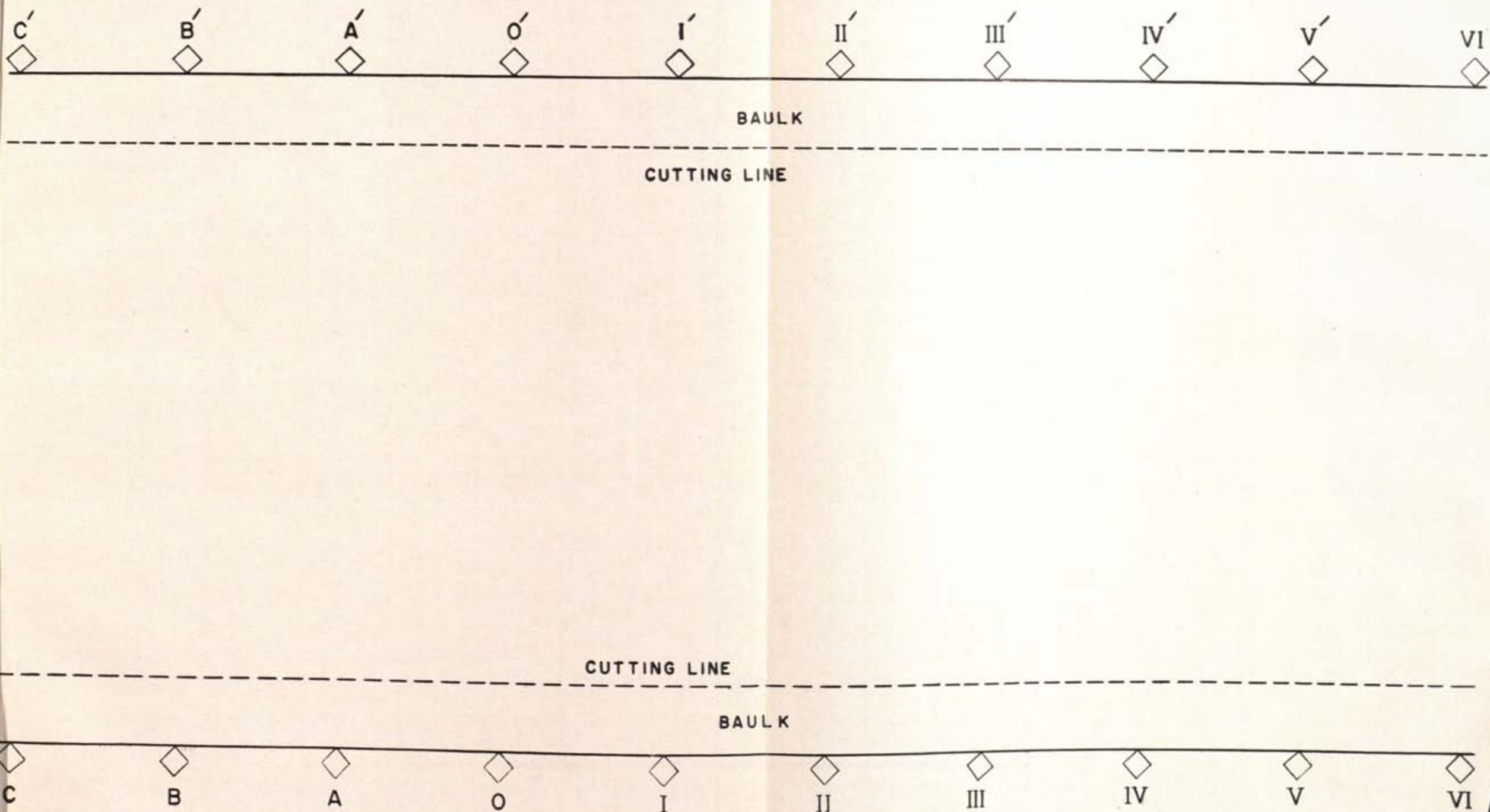
excavator cannot extend the trench sideways. The trench can be extended, if at all required, only in the front or backwards. In a trench of a vertical excavation the square pegs are fixed at regular intervals of one metre. The width of the trench can be decided on the basis of the occupational debris at the mound. With the area available for digging the excavator should be able to reach the natural soil without any difficulty. The marking of the pegs in such a type of trench will be as given in the following lines. The excavator has to face the side in which the trench is running. Beginning with O, the pegs on the right hand side will be marked as I, II, III, IV, V etc., whereas those on the left hand side will be marked as I', II', III', IV', V' etc. In case the excavator feels the necessity of extending the trench on the other side of O i.e. backwards, he can easily do so by placing the pegs at the same regular intervals and marking them with English alphabets viz. A, B, C, D, E etc. In such an exigency the side of non-dash and dash marking on the pegs will not change e.g. A' will always be on the side of II'. Plate VII will serve as a very good illustration for guidance to the excavator. The measurement of one metre from one peg to the other should always be reckoned from the corners facing the trench. The same corners will face the cutting line of the trench as shown in the accompanying illustration. The peg-line will act as the datum line for all measurements in recording the antiquities. An adequate distance between the peg and the cutting line of the trench is to be left unexcavated. This distance should generally be 50 cms., on both sides of the trench, but it can vary according to the thickness of the occupational debris. If the cultural deposit is very little, it can be reduced to 25 cms. The fundamental requirement, however, is that the sides from the cutting line to the peg do not collapse during the course of excavation, since the peg-line only can be considered to be the firm line for any measurement. Keeping of baulks (unexcavated strip) at regular intervals say for example after every five pegs is also a primary necessity. The maintenance of such baulks at frequent intervals helps proper control over the area of digging, besides making the movement of the supervisors and the labourers easy.

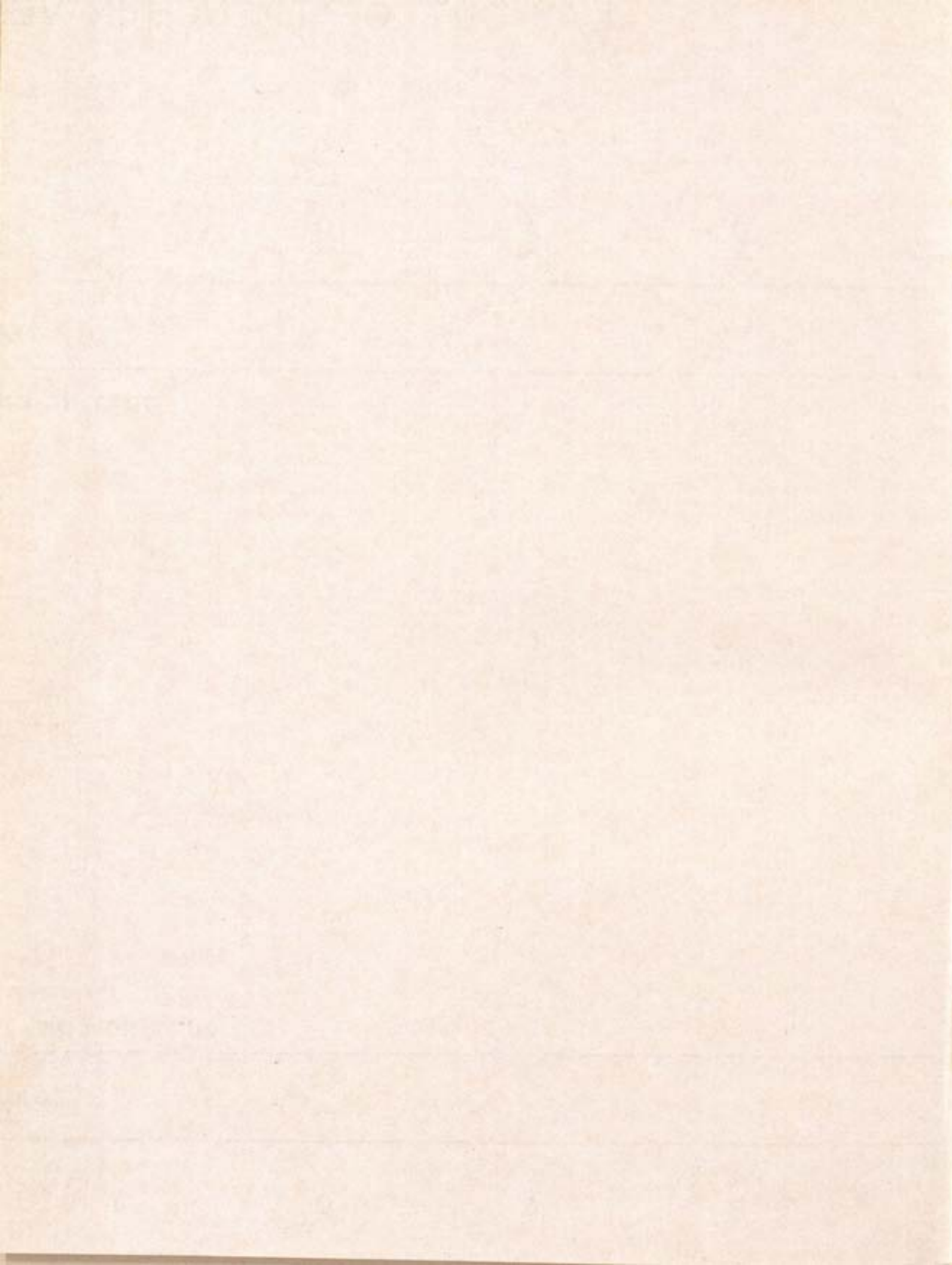
Since the reconstruction of the entire picture of any culture is the desired aim of the horizontal excavation, the excavator is free to extend his trench and dig anywhere he likes. The system of laying out of the trenches in horizontal excavation is completely different from that of the vertical one. In this method two lines in cardinal directions, intersecting each other at right angles, approximately at the centre of the mound are drawn. Thus, the two lines divide the entire mound in four quadrants or areas. The central point i.e. where the two lines intersect each other will be marked as A1. Now on one side of the line in one of the areas the alphabets will run, whereas on the other the numbers e.g. on one side the pegs at regular intervals will carry the marking of B1, C1, D1, E1, F1 etc., whereas on the other arm the marking will be A2, A3, A4, A5; B2, B3, B4, B5; C2, C3, C4, C5 etc.

The other three quadrants will be called Areas X, Y and Z. On the line just opposite the pegs marked as A1, B1, C1, D1, E1 etc., the area will be reckoned as X area and as such marked as XA1, XB1, XC1, XD1, XE1 etc. The pegs XA1, XB1, XC1, XD1, XE1 etc., will be in the same line as A1, B1, C1, D1, E1, etc. Accordingly pegs XA2, XB2, XC2, XD2, XE2 etc. will be exactly opposite to A2, B2, C2, D2, E2 etc. Similarly the area just opposite X and diagonally opposite A will be marked as Area Y and the

LAY-OUT OF TRENCH IN VERTICAL EXCAVATION

Plate VII







Horizontal Excavation.

pegs shall have the markings in the same order. Immediately opposite XA1, the peg shall carry the marking YA1 and in the same order peg YB1 will be opposite XB1, peg YC1 opposite XC1, peg YD1 opposite XD1, peg YE1 opposite XE1 and so on and so forth. The serial number of the pegs, however, in this area will be exactly in the other direction than X area i.e. between trench XA2 and YA2 there will be two intervening trenches viz. XA1 and YA1. Similarly between YB3 and XB3 there will be four intervening trenches viz. XB2, XB1, YB1 and YB2. The only area now left over will be known as Area Z. Peg ZA1 will be exactly opposite A1 in the other cardinal direction unlike the cardinal direction of the trench XA1. In this area also the pattern of marking the pegs will be one and the same. ZA1 will be opposite A1, ZB1 opposite B1, ZC1 opposite C1, ZD1 opposite D1, ZE1 opposite E1 and so on. On the other arm in the area, the pegs will carry the serial numbers viz. ZA2, ZB2, ZC2, ZD2, ZE2 etc. and ZA3, ZB3, ZC3, ZD3, ZE3 etc., and so on. An accompanying illustration (Pl. VIII) of the marking of the pegs and the division of the areas will be of great help in understanding the system of laying out trenches in horizontal excavation also known as grid pattern. The illustration need not leave any doubt to the fact that in this system the excavator is free to dig anywhere he likes.

The four pegs on the four corners of the trench in the horizontal system of excavation will be different from each other in marking. There need not, however, be any problem for any excavator to determine the number of the trench on the basis of this marking. It can be determined very easily by a glance on the marking of the peg which faces the trench. A few trainees of the School of Archaeology of the Archaeological Survey of India asked this very pertinent question as to how to determine the number of the trench, since they were not able to follow exactly the marking system. The author solved their problem by explaining in a very simple manner. The students were exhorted to stand in the trench facing north and asked further to see the marking on the peg on the front left hand side. The number of the trench was the same as the marking on the peg in that position. The students caught the point very quickly and the confusion looming large in their mind withered away.

In the case of horizontal excavation baulks are maintained on all the four sides of the trench. The baulks on all the four sides are necessary on account of various reasons. In case of extensive excavation the supervisor or so to say any man will not have to take a complete round of the area under excavation to reach any trench in the middle. The baulks provide free and easy access to any square. In addition, the labourers engaged in the clearing of the earth can take the shortest route to the dumping ground. Baulks are also helpful in photography. Above all, excavation should be conducted in a controlled area in which the recording of each and every antiquity will be easy. The width of the unexcavated area will again normally be 50 cms. relaxable in the same circumstances as in vertical excavation. The baulks should be removed only at the time of the close of the excavation or when they stand as an obstruction in understanding the nature and details of a structure.

The fixed and permanent point in recording the finds during the course of horizontal excavation will not be the peg-line. Every square peg will be inserted with a nail in the centre of its top. All measurements will be taken from this fixed point. The

distance between each peg at regular intervals will also be reckoned from the nail on the top and not the side of the peg.

(ii) Megalithic Burials

The method of laying out a trench in the case of various types of Megalithic burials is entirely different. The Megalithic burials can be broadly classified into two groups viz. (1) Cist circles and (2) Pit circles. The method of laying out the trench differs in both the cases and the same is as follows:-

(a) **Cist circles:** In the first instance the surface humus on the top is to be cleared. If there is some accumulation of earth over the cist circle, the same should also be removed, so as to expose the complete plan. It must, however, be borne in mind that during the course of exposing the plan not a single stone is to be disturbed, not even the capstone. Once the complete plan is exposed, a cutting line passing through the centre of the longer axis of the cist is to be drawn. The line should not end at the edge of the stone-circle, but run even further, so as to ascertain all the details of the circle and also establish the associated stratigraphy. At both the ends of this line pegs can be fixed. For the sake of recording the measurements of each and every find, points at regular intervals of one metre may be marked. There need not be any peg to mark these points because the same will disturb the position of the stones of the circle. In order to facilitate the measurement further, another line passing through the centre of the smaller axis and cutting the earlier line at right angles may also be drawn in the same fashion. Digging against the cutting line on the longer axis i.e. half of the area of the cist, should be undertaken following the principles of stratification and continued till the bottom. After the section is drawn by the draftsman, photograph taken by the photographer, and all details concerning sequence are recorded, the remaining half of the cist area can be cleared. The method can be easily followed by seeing fig. no. 1.

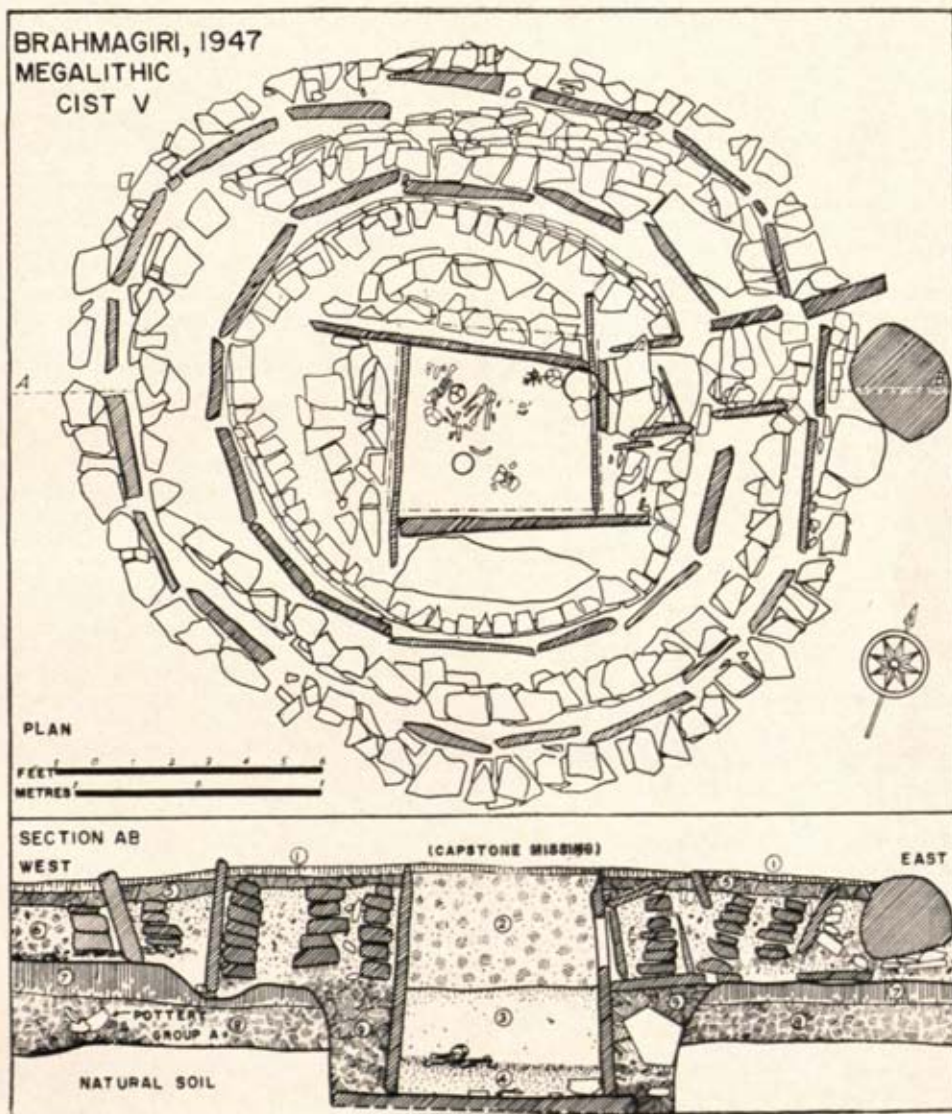
(b) **Pit circles:-** In the case of pit circles again, the plan is to be exposed in the first instance by clearing the surface humus. After exposing the plan, two lines in the cardinal directions passing through the centre of the circle and cutting each other at right angles are to be drawn. Thereafter the pit itself is to be divided into four quadrants. It must be remembered that division into four quadrants does not mean four squares. In the case of quadrants the system is entirely different. With twenty-five centimetres baulk in each cardinal direction the pit circle is to be divided into four in such a fashion that one line from both the lines in the cardinal direction form the cutting line, but the division into four will be such that the outer corner of each quadrant in the centre will be touching opposite each other diagonally. Plate VI and figure no. 2 will serve as a good illustration to understand the method. The stones of the circle should never be disturbed.

(c) **Other burials:-** In the case of simple burials in pit cut into the natural or other soil, the simple procedure is to expose the plan of the pit following the system of horizontal excavation. After the plan of the pit is exposed, the same should be divided into four parts by drawing two lines in cardinal directions passing through the centre of the pit and cutting each other at right angles. After that, half of the area can be gradually cleared stratigraphically in the same fashion as the cist circle. The other half



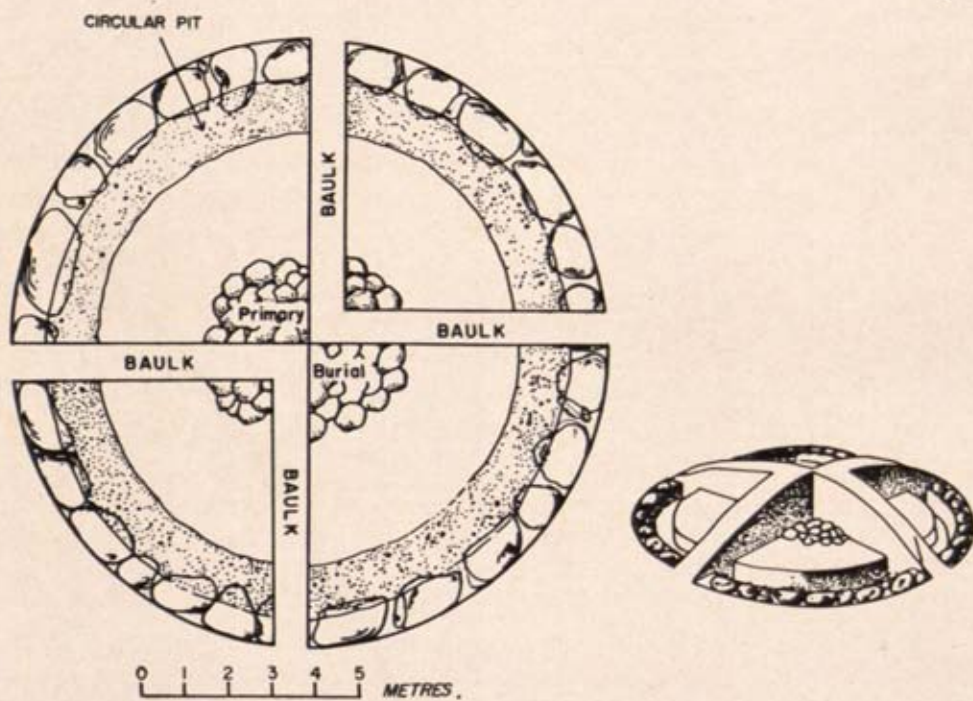
Brahmagiri-Pit Circle

Fig. 1



Cist Circle

Fig. 2



Pit Circle

of the area can be cleared after the sections are properly recorded and good photographs taken.

The excavation of a burial with skeleton is very difficult and complicated and as such consumes a lot of time. In the first instance the entire skeleton is to be exposed along with the accompanied grave goods. The orientation of the skeleton is also to be determined with the position of various parts of the body like pelvis, long bones, knees, shoulders, elbows, duly sketched. The next step would be to remove the dirt covering the skeleton without undercutting it. The places of small finds should never be disturbed, though they might have been disturbed by the weight of overburden followed by the organic decay and the resultant collapse of various parts of the body. They should be removed only after detailed recording, both by means of drawing and photography.

(iii) Stupa.

The *stupa* is also a kind of funerary structure and as such the method of laying out of the trench is almost the same. After exposing the plan of the *stupa*, the centre is to be divided into four quadrants on the lines of a megalithic pit circle. Excavation can be undertaken in one of the quadrants. Since each quadrant touches the centre, the relics are most likely to be struck. At a later stage the cutting line can be extended to prepare a section against the *stupa*. The *stupa* should not be cut across. The section against the *stupa* will reveal all the stages of its reconstruction. No occupational layer should be searched inside the *stupa*. The foregoing sentence was essential to write, because of a very interesting incident. One of the archaeologists, quite well-known, expressed doubts regarding the priority of certain very important finds on account of the fact that the deposit of the 3 to 6 cms. mud intervening between two structures did not happen to be an occupational deposit. Instances have come to light, particularly in later ages, in which the relics were enshrined in the *ayakas* e.g. at Amaravati in Guntur District of Andhra Pradesh. It is, therefore, essential that the section against the *stupa* is cut, so that the relic caskets, both at the centre as well as in the *ayakas* are not lost sight of.

In most of the cases the plan of the *stupa* is not exposed. The best method of laying out of the trench for this purpose will, therefore, be the same as horizontal excavation on grid pattern.

It is the primary responsibility of the surveyor to lay out the trenches with the help of the instruments and equipments carried by him. The laying-out must be perfect, so far as the accuracy of the distance between the pegs is concerned. All the pegs, their sides and corners must appear perfectly in line, if observed through a ground glass. In certain exigencies the services of a surveyor is not readily available. The Director, however, need not wait for his arrival and thereby lose time. The trenches can be laid out by the application of elementary mathematical principles learnt during the school days. The principles are based on the pathagorus theorem, which means that the square on the hypotenuse of a right-angled triangle will be equal to the squares on the other two sides. The accuracy of the distance between the pegs as also the trench can be easily checked by calculating the diagonals by means of

square root and verifying the same. This is the most accurate, safest and dependable method of laying-out a trench in the absence of a surveyor. The surveyor also depends more or less on the same triangulation method.

The trenches should always be laid with the help of steel tape, because the metallic tape is liable to stretch and contract easily in a wet and moist weather. During the process of laying-out of trench, finest string, which do not stretch and contract easily, should be used.

4. The Digging Operation

After the trenches are laid, it is not obligatory that the whole area falling within a trench is subjected to digging. Each trench will be divided into small areas which can be easily controlled by one supervisor. As already emphasised, each and every area (sub-trench) must be placed under the charge of one supervisor with a trained man working in some adjoining or nearby trench. The first step in the excavation would be to remove smoothly and gently the vegetation and other dirty accumulations on the top of the trench. This is called surface humus and nothing from this layer should be collected unless and until it brings to light something extraordinarily important and valuable. Once the surface humus is removed it is not proper to undertake digging operation in the whole sub-trench which may be unwieldy. In order to achieve the aim of digging under perfect observation a control pit in one of the corners of the trench is to be laid. There is no hard and fast rule on the area of the control pit. The dimension is to be decided on the spot. It should, however, be not too small as to render the observations difficult, rather impossible. A fairly good picture is expected to be revealed by the control pit, particularly in regard to stratification. Once various layers based on the principles of stratification are marked in the control pit, further excavation based on clearing one layer at a time becomes very easy and thereby saves both time and energy. Certain precautions, however, by the supervisors, while digging in the control pit are essential. Excavation in the control pit has to be stopped immediately if any structure is encountered. Detailed observations on any structure are not possible within the area of the control pit. For detailed observations the control pit will have to be extended. The same rule is applicable in case of coming across a pit which disturbed the regular occupational layers. As it has been emphasised at a number of places, the Director must be fully conversant with the problem and the specific aim for which he has undertaken the excavation. He is also expected to be experienced enough to lay his hands on the area where the problem can be solved within the minimum means and time. The foregoing remarks became imperative on account of author's own experience. A mud brick structure was encountered at a depth of about 7 metres below surface during the course of an excavation at an ancient site. The Director of the excavation believed that the structure was a rampart. In order to establish the same the author was called upon to assist. He observed that regular parallel trenches were being laid after clearing the occupational debris of 7 metres above the structure. The author considered them to be nothing but waste of time, money and energy. With permission of the Director to solve the problem within a week, a trench was laid on the slope just opposite the original structure and in the same alignment avoiding all the maximum possible occupational debris over the structure. The Director was simply surprised to see that his problem was solved within three days.

5. Principles of Stratification

The principles of stratification applied to archaeological excavation have been borrowed from the science of geology in which the priority of dates of various rocks is based on their superimposition. The simplest example, which the author could imagine to make any student understand the principles of stratification is as follows. Almost every educated householder purchases a daily newspaper. Let him be very particular in storing the paper after reading it at a particular place one above the other carefully. What will be the result after a month has passed? Any layman can observe that the paper of 31st day of the month is on the top, whereas of the 1st day at the bottom. The priority of any day's newspaper will depend on the position it occupies. The earlier the date the lower its position will be. Similarly during the course of excavation layers are distinguished on the basis of the change of any sort in their composition. A simple line is marked to distinguish the layer or strata. During digging operation the basket in which the pottery is collected should be changed immediately after the distinction has been observed. It would rather be better if basket is changed at every subsequent dig. If the layer or stratum is found to continue, the materials of the basket can be easily mixed with the earlier one. If this is not done, and the materials are collected in one and the same basket, it will be impossible to divide them again in the stringency of the change in the layer. In case of doubts in the change or mixing up of the layers, it is always safe to keep the materials in the basket containing the objects of the earlier dig separately. The principles of stratification are based on the fundamental truth that any object found in layer no. (2) will be later than that found in layer no. (3). Similarly any material found in layer no. (5) will be earlier than that found in layer no. (4). In the process of marking or distinguishing the layers the excavator will have to be always alert to observe that the regular occupational layer has not been disturbed by a pit dug for any purpose whatsoever by the local inhabitants in bygone days. If a pit is observed, its deposit should be cleared in the first instance and the digging in the regular occupational layer stopped forthwith. It would always be safer to include in the pit material a little of the regular occupational layer rather than try to be too intelligent to demarcate both neatly, which may lead to mixing up of the objects from the pit into the layer. If the objects from the pit in the above manner are mixed up in the finds of the regular layer, they may sometimes create great confusion. The materials from the pit are to be marked as pit 1 or 2 or 3 sealed by layer (5) or as the case may be in both cases. Any object found in any pit cannot be later than the sealing layer. However, the Director has to be careful enough not to depend on the objects from the pit for the purpose of dating unless and until the same is supported by other evidences.

The author considers it necessary to throw more light on the principles of stratification in order to elucidate the same. At any ancient site or in a general way the accumulation of various types of deposit is a sequel to several natural and human factors viz. deposition by wind, water or by the disposal of garbage. It must not be forgotten that even in natural course the level of the earth is rising, though at a very low speed. The layer or the context in which the antiquity has been found is much more important than the object itself. Any object involving great technological skill may not be of any surprise if the time to which it belongs was considerably advanced and the technique had developed. The same object will, however, be of great astonishment if found in

layers of the time when that sort of advanced technique was unknown. Any discovery of such a type will be a great contribution to the knowledge of the achievements of our ancestors. In the absence of a thorough understanding of the principles of stratification, any reliable or clear interpretation of the cultures and their sequence is impossible.

As already stated the principles of stratification in the field of archaeology have been adopted from three concepts involved in the science of geology. They are superposition, uniformitarianism and sequence. The primary and basic idea behind the concept of superposition is that in any series of undisturbed occupation the deposits are always from bottom to top. Thus, as explained in the example of the daily newspapers the earliest occupational layer will be at the bottom and the latest on the top. The concept of superposition is, therefore, the fundamental basis and key to understand the principles of stratification. The first scholar who established the concept of superposition in the science of geology was William "Strata" Smith. He revealed the mystery of successive strata after his keen observations during the course of surveying canal routes in Southern England as an engineer and land surveyor. Being a very keen observer, he could assess the importance of the succession of layers. His interest in the succession of layers was further deepened when he collected distinctly different fossils from each layer in succession. The discovery of the principle was published by Smith in 1816 in his article '*Strata Identified by Organised Fossils*', which will always stand as a great landmark in the history of geological studies. The article incorporated thirty-two different strata with fossils related to each and every stratum.

The idea of uniformitarianism was first conceived by James Hutton, who published the basic principle in various articles like '*Theory of the Earth*' or '*An Investigation of the Laws Observable in the Composition, Dissolution, and Resolution of Land upon the Globe*'. Besides dealing with the question of deposition of strata, James Hutton came out with a firm statement on the nature of such depositions. According to him the geologic processes, which are observed at the present time, can very well form a basis to understand and explain the geological events of the past, since the processes had been uniform throughout the ages. Uniformitarianism, however, as a general principle of study in geology, received due place of significance at the hands of Charles Lyell in 1830 after he published his monumental three volume work on '*Principles of Geology*'. The doctrine of Uniformitarianism was discussed and explained by him in his work in a most brilliant manner.

The idea of sequence is closely related to the concept of superposition, so far as the principles of stratification is concerned. If any of the two ideas is abandoned, the technique of the principles of stratification will not be clear and free from confusion. Sequence basically means the order in which the strata are formed in a particular deposit, whereas the concept of superposition means that the deposition of strata is always from the bottom to the top. It is only on the basis of the doctrine of superposition used in the principles of stratification that the geologists and the archaeologists declare that the objects in the bottom layers are older than those in the top layers.

In the science of geology the principles of stratification are applied to the study of rocks and their ages, whereas in archaeology they are applied in determining the cultural succession of the remains left behind by man. With the passage of time the old buildings collapse and old floors are damaged. They are replaced by new ones over them. Instances are also not unwanted in which the floods or sandstorms deposit foreign material. Similarly, the materials and equipments of the occupation undergo decay and ultimate destruction. While undertaking the construction of a new building, the owner may like to have a big mansion for which he is required to lay a deep foundation trench, thereby cutting through the earlier occupational layers. Like Hastinapur in Uttar Pradesh the occupations, sometimes entirely, are liable to be washed away by erosion and floods. There are a large number of cases in which the human agencies are responsible for the complete destruction of an ancient site. All the above mentioned factors either individually, collectively or a few of them combined together go to form an ancient mound or site. The agencies, however, leave behind their traces, which form the basis for the principles of stratification. In a similar manner the artefacts or cultural equipments of an ancient site can be compared and correlated with those found at another site.

The Principles of Stratification is considered as a great landmark in the history of Archaeology and Excavation. It will not be an exaggeration if it is said that the principles of stratification brought a revolution in the field of archaeology. Though in India the principles were introduced as late as 1944 after the arrival of Wheeler, it had a much earlier beginning in other countries. Thomas Jefferson was the first scholar who applied the principles in his carefully recorded Indian mound in Virginia in 1784. Unfortunately, the careful excavation conducted by Jefferson did not catch the attention of the archaeologists. The realization of the importance of the principles had to wait for decades. A pattern of stratigraphic revolution was observed by Guiseppe Florelli in his excavations at Pompeii in Italy in 1860s. He exposed the complete plan of the structures by digging stratum by stratum in order to understand the lay-out of the city. In the Old World, however, the stratigraphic revolution could gain firm hold only in 1870s and 80s after the excavations conducted by Schliemann at Troy and those by Germans at Olympia (Southern Greece). The credit ultimately was earned by the British scholars, who gave the principles of stratification a firm-footing. A large number of sites were excavated by Augustus and Pitt Rivers in England on the same principles between 1880 and 1900. The same principles were followed by Flinders Petrie in Egypt. In the New World the revolution was brought about by N.C. Nelson and A.V. Kidder at Galisteo Basin and Pecos in New Mexico during second decade of the twentieth century. By their work the field technique of the Americans was greatly improved. It will, however, be a great injustice if it is not recorded here that the megalithic tombs of South India were excavated by Meadows Taylor on stratigraphic principles as early as 1851.

The question of the formation of mound confronted the author with a very delicate and embarrassing question at an ancient site, where the excavations were in progress and students from the School of Archaeology of the Archaeological Survey of India, officers deputed by the State Governments and teachers from various universities were being imparted training in field-archaeology. After a complete three months strenuous training in the field, one of the students who happened to be a teacher in one of the

universities suddenly asked the author, "Mr. Srivastava, you have explained everything to us in great detail and we are very much thankful to you for the same, but one question still puzzles my mind. It is the length of time which is taken in the formation of a mound". The author simply burst into laughter, but ultimately made it clear to him that the formation of any mound is not fastened to any time limit or time span. A low lying mound, having only one cultural period with various sub-phases without appreciable change may be older than another much higher mound having within its womb several cultural periods with frequent changes. It is not the height of the mound which determines the age of the ancient site, but the cultural equipments found at various levels in different strata.

6. Identification of Layers or Strata

Keeping the cutting lines of the trench perfectly vertical and clean, with the help of small pick-axe, bale and knife, is the pre-requisite for distinguishing or identifying the layers or strata. The vertical sides also help in presenting a good picture by the photographer and draftsman. Vertical cutting lines no doubt will be of a great help in distinguishing the layer, even then identification of strata correctly is not an easy job as assumed generally. It is based on the consideration of several factors. They are as follows:

In the first instance the strata are distinguished on the basis of colour difference. The colour of the strata, however, does not undergo a change so quickly, particularly in a single cultural period, as to enable the excavator to observe successive layers readily. Soil composition is the most important element in the identification of layers. Some of the layers may be sandy, whereas others silty and still others clayey. The contents of some of the layers may have more ash or pebbles or gravel etc. A combination of some of the above mentioned components may also go to form a layer. Next factor to be taken into consideration for the distinction of layers is their texture. The composition of some of the layers is loose, whereas of others it is compact or hard. In the same fashion some of the layers are greasy, whereas others damp and moist, which continue to be damp even after the sun has dried them up completely by its scorching heat.

Of all, the most important factor to distinguish the layers is based on the type of pottery and other cultural equipments yielded by them. In a fairly large number of cases it has been observed that the primary requirements to distinguish the layers are completely absent. In such circumstances the excavator has no way out but to depend on the variation in cultural equipments. Structures, collapsed in the past, and the damaged floors more often than not constitute one layer. Ash, charcoal or patches of any other material need not confuse the excavator, if they do not run all along the trench. They can simply be a part of a layer and not complete layer in themselves.

The hot and bright sun is always a great hurdle in the identification of layers, because it dries up the cutting sides very quickly, thereby rendering them uniform in colour, texture, etc. In order to avoid such eventuality the layers will have to be observed in different shades of light at different hours of the day. A sprayer can also be used to wet the layers, so as to rise over the hurdle of uniformity caused by the hot and bright sun. During the course of spraying it may be observed if a part of the cutting

edges dries more quickly than others. This will be of great help in identifying the layers. The best instrument, however, to help the excavator in distinguishing the layers is his excavation knife. Though the job is considerably tiring, injuring the joints of the finger, the excavator should continue to scrape the section with the help of his knife till he is in a position to demarcate the line between two different layers. The excavation should in no case be allowed to proceed further if there is any confusion in the identification of layers.

The colour, composition and texture of the soil in different layers can throw a flood of light on the environmental condition and climate in the old days.

In the process of presenting a complete picture of the human activity in the past by the reconstruction of the cultural remains yielded by various layers, the archaeologist's or excavator's eyes must pay special attention to the layers which are meaningful and significant, for all of them are not equally important. The trenches should always be dug upto the natural soil for this purpose. Layers which are sterile and intervene between two cultural periods may not be of much value to an ordinary historian, but the same is of great importance to an archaeologist. The study of the sterile layer will enable the archaeologist to ascertain the time lapse between the superimposing and underlying cultural periods. If the sterile layer runs in an undulating manner the archaeologist can very safely presume that the underlying occupation was completely abandoned and only after a lapse of time, whatever it may be, the superimposing cultural occupation came into existence. The distinction of the layers is of fundamental importance in distinguishing successive cultural periods at an ancient site. In certain cases like the ancient city of Jerusalem, it may not be easy to determine the sequence of culture, because the subsequent occupants Romans demolished the older buildings almost completely for new constructions by them. However, in such cases also it is not impossible to establish the sequence of cultures if large scale excavations are undertaken. Cutting across the mound completely should be avoided in all cases.

The fundamental aims of an excavator or archaeologist in the study of stratigraphy are clearly laid down. He should be able to read the stratigraphy before him for reconstructing the sequence of cultures with as much detail as possible. Secondly, he must be able to fit the sequence of cultures in a chronological order and thereby frame a time-table. The above mentioned aims can be achieved only if the strata have been identified and distinguished accurately. It is not an easy job for an archaeologist to interpret the cultural remains in a sound manner through the principles of stratification, because the formation of strata is the result of the actions of a number of natural and human agencies. Some of the cultural layers might have been formed at the expense of the the earlier ones. In this context the remark of Graham Clark may be noted. He said, "The more advanced their technology, the more likely and the more capable people are to raze, excavate and in all manner of ways interfere with the stratigraphy of their predecessors"¹.

1. Graham Clark, *Archaeology and Society*, New York, Barnes and Noble, 1957, p. 152.

The human agencies sometime play a vital role in creating a confusion in the principles of stratification by reversing the stratigraphy completely. In the bygone days and even to-day certain instincts are common and inherent amongst the inhabitants of a site. They clear out the old buildings and other remnants of the earlier occupants and dump them in the form of another small mound. In such situations the small mound will reflect a reverse stratigraphy. The earliest material will be found on the top and the latest at the bottom. The excavator must always be very careful in his observations while recording such strata. Reversed stratigraphy cannot be easily detected in a very small and restricted area. The excavator has to be conscious enough to see that he is not misled in a state of such confusion and verify his stratigraphy by digging in a fairly large area. The successive strata in the case of a dump of this type will present almost a semi-circular picture, which is quite unusual in regular cultural occupation.

A single cultural period may also be represented by a series of layers, but the strata exhibiting two cultural periods must always differ from each other in all respects. The sequence of cultural periods at a site need not always be continuous so far as chronology is concerned. They can be intervened by time gaps. The excavator is expected to possess a very keen eye in observing these gaps. There are various indications to detect them. They are the deposits of wind-blown sand, weathered surfaces, immature soils, the occurrence of a large number of pits at one and the same level and undulating surface. Sterile layers, intervening between one period of occupation and the other, are also formed when the entire habitation is engulfed into fire or washed away by turbulent floods. In the former case the sterile layer will be of burnt material, whereas in the latter case the composition will be of silt and sand. In the same fashion the sterile deposits of wind-blown sand, weathered surfaces and immature soils are formed. Indication of break in occupation by a large number of pits occurring at one and the same level is on account of the reason that the occupation or habitation is never abandoned at one and the same time. The abandonment is a gradual process, though of course, not in catastrophes like fire and flood. When the habitation is abandoned, the remaining occupants or the inhabitants of the nearby areas dig the ancient occupation for materials like earth, bricks etc., which leads to the occurrence of a large number of pits at one and the same level. Similarly undulating surface points towards break in occupation, because all houses are not abandoned at one and the same time. One house falls into decay and is abandoned, whereas others continue to be in occupation either by way of repairs, reconstruction or durability. This will not be the case in continuous periods of occupation. Of all, the most important clue to establish the time-gap is the study and comparison of the material remains. If the artefacts do not display any appreciable change, thereby indicating functional continuity, the cultural period can be said to continue. In case a complete change in the assortment of cultural equipments is noticed without any overlap, whatsoever, the excavator can very easily declare that the cultural complex has undergone a change. It is with this objective in their mind that the excavators sometimes decide to get the materials washed and cleaned at the trench itself. The excavators or archaeologists are, however, warned against building up the stratigraphic and cultural sequence of a geographical region after excavating a single site.

Since the identification of layers is a tough job, requiring keen observation and great labour, many excavators are not very particular about it. They avoid the main job by simplifying it in a manner which can not be justified at any cost. The layers are marked at almost equal intervals by the excavator with the help of lines, which are parallel to each other thereby presenting a monotonous picture. The real truth instead of being revealed remains concealed. This practice can be allowed only at those ancient sites, where the stratification is not at all clear and the excavator finds himself helpless. In circumstances like this, the excavator should resort to arbitrary unit levels i.e. demarcating the layers at frequent and regular intervals. In stratification as also in arbitrary unit level method, it is always safe to divide one layer into two or more rather than merging two entirely different layers into one. In arbitrary unit level method, the best course would be to fix up a particular thickness like 10, 20 or 30 cms., as the case may be, and demarcate the layers immediately after the digging of that thickness is completed. In the absence of clear stratigraphy, however, it is not impossible to reconstruct the sequence of cultural periods. It can easily be done by recording the depth of each and every find, without exception, accurately and then studying and comparing the artefacts. In a tropical country like India there is hardly any such site, where the strata cannot be distinguished. There may be certain sites of this category in Europe or some other countries where identification of layers may be a problem.

The period of time during which any cultural period flourished cannot be calculated on the basis of the thickness of deposit representing the period. The rates of accumulation of cultural debris are not always one and the same. The same principle is applicable to the formation of a mound as mentioned on page 46 earlier. Archaeologists have in a large number of cases, on the reckoning of deposits, taken decision on the duration of time. Wheeler condemned this principle of calculation by declaring it only of academic or abstract interest. The rate of accumulation is a sequel to the nature and development of the man in the past. Human beings with an aptitude of quick alterations in their structures and objects of their use will lead to quick accumulations of deposit, whereas conservative people with an entirely different bent of mind and no liking for quick changes will lead to slow accumulation. Wheeler said, "When we leave geological stratification and turn to stratification derived mainly from human occupation, inference is less certain. It is impossible to lay down any law for the equation of man-made strata with an absolute time-scale. For example, at a site (Chandravalli) which I excavated in India, coins that were not, apparently earlier than 50 B.C. or much later than A.D. 200 ranged through a vertical accumulation of 5 feet, the period thus represented was probably in fact not more than two centuries. In what is now Pakistan, at the famous site of Taxila (Sirkap), excavations in 1944-45 indicated that 6-9 feet of floors and debris were deposited during some two centuries of very intensive occupation. In an earlier phase of the same city, Taxila (Bhir Mound), an untidy site, 14-15 feet were ascribed to three centuries or a little more, but the masonry and building-methods were here of so unstable a character that the accumulation may well have been exceptionally rapid. In every instance a multitude of unknown and variable factors is involved, and objective calculation on the basis of depth is virtually impossible"¹. Heizer and Graham have also condemned the estimation of time on the basis

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 29.

of the thickness of deposit. They said, "Any age estimation derived from this method is only an approximation and is quite likely to be of so much error that the calculation was a waste of good time"¹. In spite of the hazards in the calculation of time by the thickness of deposits, it may be remarked that there are a number of cases in which the estimate came out to be absolutely correct when checked by the dates arrived at by the C 14 analysis ².

7. Digging of a Structure

Man, right from the day of his existence, has been making efforts to improve the conditions of his living by adding to his comforts and conveniences. In the beginning he was only a parasite on nature and lived in natural rock-cut caves, but when the consciousness of a settled economy developed in his mind, he started first of all living in pits cut into the natural soil by him. He used to keep the top of the pits narrow and cover the same with the help of wood, stone etc. The pits in certain cases have been observed to be so deep that the man had to provide a step by inserting a stone in the side walls for getting up and down. The existence of such pit-dwellings have been noticed for the first time in the Neolithic context. In India very good examples of pit-dwelling have been reported from Burzahom in Kashmir.

Pit-dwellings were, of course, ideal for living from the angle of security, but at the same time they were bereft of any free air and light from ventilation. Hence, man was not fully satisfied with the dwellings and tried to improve upon them. He made efforts to erect structures over the ground-level with the locally available material in which he could provide the facilities of his own liking. The result was the erection of houses with walls made of the hard and compact mud available locally. The basic problem in erecting mud structures was the covering i.e. the roof. With his own innovation, however, the man planned to cover the roof with the help of wooden beams supported on poles inserted deep into the ground. The wooden beams must again have been covered by thatch or thick mud, the latter possible only after a closely woven cage-like wooden frame was provided over the top.

Again, the man observed the shortcomings in the mud structure. The shortcomings were particularly on account of non-durability and regular erosion. Further innovations in the building structure were, therefore, considered essential by man. The result was the construction of houses with walls made of mud-bricks. Buildings of mud-brick were found to be quite comfortable by man and that is why structures of mud-brick continued to be erected even by the Indus Valley people who were so advanced. In areas where stone was readily available, man resorted to its use in the construction of houses, generally in an undressed form.

Man, however, was and even now is never contented with the comforts and conveniences available. It is a natural instinct, though a great hurdle in the path of spirituality. With the same natural instinct the man improved upon the mud-brick

1. R.F. Heizer and J.A. Graham, *A Guide to Field Method in Archaeology*, Palo Alto, Ca: The National Press, 1967, p. 73.

2. *Ibid*, 173-174.

structures and initiated the erection of houses made of burnt-bricks. The binding material used to be either mud or lime.

This is not the proper place to go into further details of invention by man, because here the technique of excavation of a structure is to be discussed. The excavation of any structure is not very tricky, but it must be emphasised that it needs patience, which on certain occasions the archaeologists don't have. Like the artefacts, it is the duty of each and every excavator to determine the age and time of the structure. This is possible only if the structure is properly excavated. When the top of any structure is exposed in the trench, the excavator becomes over anxious, as a natural instinct, to expose it completely without any attention to the stratification, particularly when the wall or structure happens to run in the centre of the trench. The author has observed several excavators, some of whom are considered to be well-known to-day, during the course of his experience, exposing the walls completely without caring the least for the principles of stratification. Excavators are warned not to resort to such an action in any circumstance. This warning by the author has been necessitated by a strange and unhappy incident in front of his own eyes. One of the excavators came across a beautiful and important structure in the centre of his trench. He immediately called the author to show the structure. The author, though working under him, recommended that a cross-section may be retained against the structure, since the same covered a considerable area of the trench. The excavator, however, ignored the suggestion and exposed the entire structure without any section. A few days later the visit of a higher officer was planned. Before the higher officer reached the trench, where the structure was found, the excavator, realising his mistake, committed another blunder of filling up both sides of the structure with the excavated earth. The higher officer could catch the bluff immediately and remarked in a great anger, 'Am I a fool not to distinguish it?'

The age and time of any artefact is determined by the layer which yielded it. Similarly the age and time of the structure can be decided only when the same is related to the layer. The excavator must, therefore, see that each and every structure exposed in his trench is always connected with the cutting line of the trench. Efforts should also be made to see that the structures are connected with the cutting line at right angles (the 90° angle should be at the structure and not at the cutting line). If the structure is absolutely small and the same is connected with the cutting line, the requirement of right angle can be waived. But, the technique of connecting with the cutting line at right angles cannot be overlooked in case of any structure which is more than two metres approximately in length. There are many examples in which huge structures run obliquely in a trench and touch the cutting edge of the baulks or those which do not happen to be the main cutting edge or section. In such cases a cross section in the form of a baulk is to be laid against the structure passing through the centre of the structure at right angles. This principle has been laid down and emphasised, because the stratification of any structure can be studied in the best manner only if the angles are not obtuse or acute. The age and time of any structure are established by the observation of the layer in which the foundation trench of the structure has been laid. Deciding the priority, contemporaneity or a later date of various structures in the same trench on the basis of depth or level is very hazardous, because

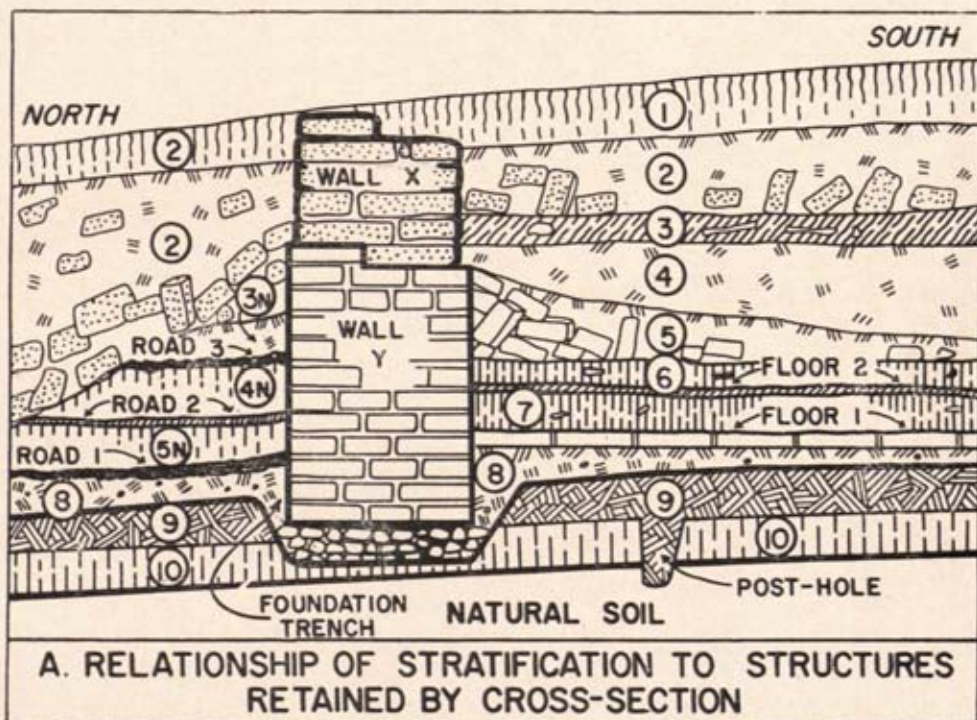
the foundation trench of a simple and single-storey structure will be shallow, whereas building of several storeys will have a very deep foundation trench. In this connection the words of Wheeler to impress upon the excavator the importance of the foundation trench are quoted. "To understand the full meaning of a building in decay, it is necessary to understand how it was originally constructed. I have accordingly urged elsewhere (p. 133), for this and other reasons, that a knowledge of building-construction be included amongst the qualifications of an excavator. In its simplest form, a masonry wall is built normally as follows. A trench, known as the 'foundation-trench', is cut along the line of the proposed wall in order that the foundations of the latter may rest upon the solid sub-soil rather than upon the relatively unstable soil that is commonly found on the surface whether natural *humus* or disturbed 'occupation earth'. Rarely, when the surface-soil is itself solid, or when the building is a slight one, or when the building is jerry-built (an abnormal crime in ancient times), the foundation-trench may actually be cut even into the live rock, in order to give a level seating to the wall. The preliminary assumption in all instances must be that a foundation-trench is present"¹.

The excavator or the Director of the excavation, as reiterated at several places in the book, is expected not to collect the antiquities like potatoes but, to reconstruct the complete picture of human settlement from all angles. With this objective in mind it becomes obligatory on the part of the excavator to study the structures in all details. He has to ascertain the time when the structure was built, the span of time during which it continued to be in use, the plan of the structure, the number of storeys, the number of times the structure was repaired, the number of floors raised one above the other after damage, the artefacts used by the people who owned the structure, the main purpose of the structure, etc. The collection of all the above mentioned information is possible only after a very careful analysis of the structure and the artefacts in relation to the stratification. The words of Wheeler regarding the chronology of the structure are sufficient to bring home to the mind of the excavator the fundamental importance of stratigraphy in the study of the details of the structure. He said, "The dating or cultural setting of a building is based ideally on three categories of objects: (i) those supplied by strata which accumulated before the building was constructed; (ii) those supplied by strata contemporary with the construction; and (iii) those supplied by strata subsequent to the construction. Categories (i) and (ii) bracket the structure chronologically or culturally, whilst category (iii) defines the point within the brackets"².

An illustration reproduced from Wheeler's book *Archaeology from the Earth* (fig. 3) and his statement explaining the stratigraphy of the structure will be sufficient to understand the details of any structure. While explaining his illustration he said, "Let us take an example. Fig 16A illustrates the accumulation of strata under, around, and over the wall of an ancient structure. On the right hand side of the wall-section, over the natural soil, two layers (9 and 10) represent village occupation of Culture A, with post-holes indicating wooden huts and associated with potsherds, spindle-whorls,

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 72.
2. *Ibid.*

Fig. 3



Structure and Stratification

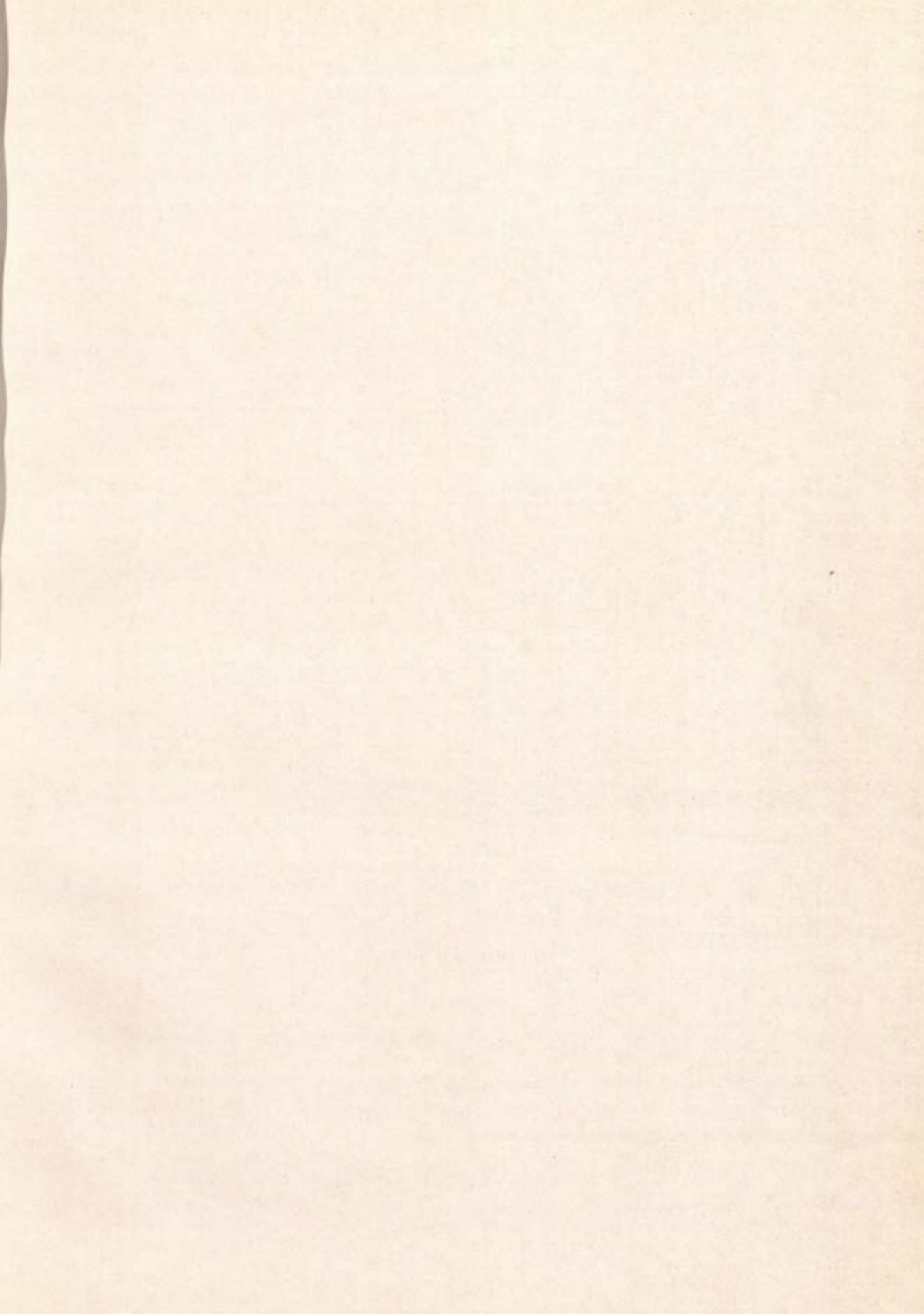
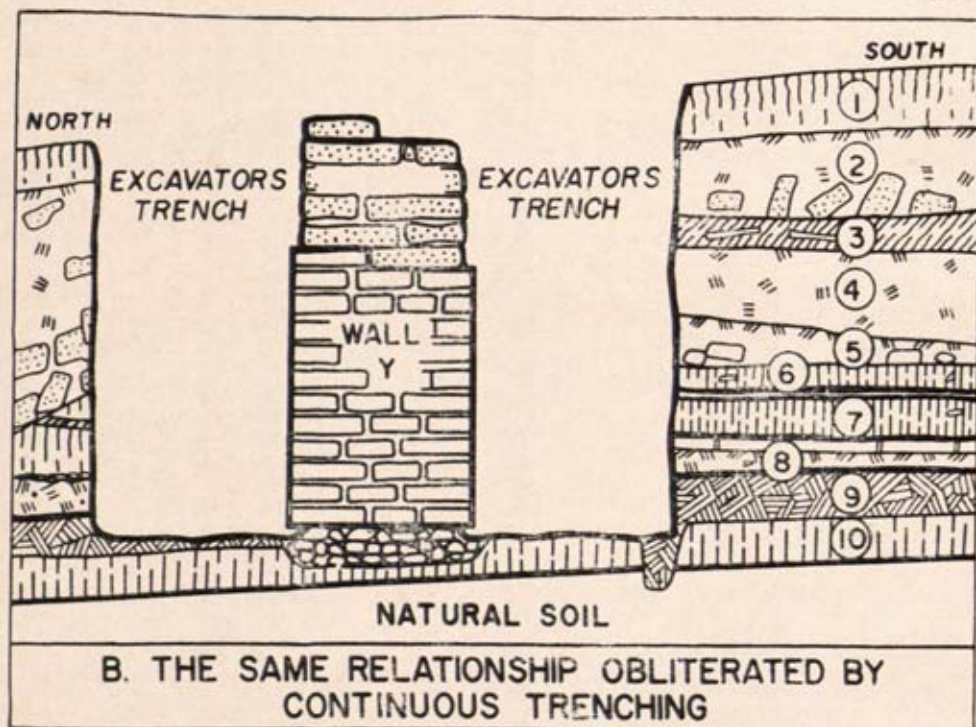


Fig. 4



Structure with Strata

&c. Into these layers is cut a shallow foundation-trench to take the footing of wall Y, and the flanks of this trench are filled with layer 8, which is also spread (on the right) as a basis of Floor 1. Layer 8 contains only relics of Culture A, but one or two relics of Culture B are imbedded in Floor 1; and the superimposed layer 7, resulting from the occupation of the buildings, represents Culture B exclusively. Over this occupation-layer, a new rammed floor (Floor 2) is laid, and on it is a further occupation-layer (6) of lesser extent, still containing objects of Culture B but in a somewhat evolved form. On this occupation-layer, a cascade of bricks mixed with burnt timber and clay (layer 5) indicates the destruction of the building by fire. Thereafter the stump of the wall is used as the foundation for a mud-brick wall (X) of lighter construction associated with an earthen floor (layer 3) containing relics mostly of Culture C. This new structure represents an intrusive culture of inferior quality, immediately preceded by the violent destruction of Culture B, and may (if the evidence is found to be typical) be interpreted perhaps as a semi-barbarian supersession of Culture B in an evolved phase of the latter.

"On the left hand side of the wall-section, the same two pre-wall strata (9 and 10) are continued, but are superseded at the wall-level by a well-metalled street (Road 1). This metalling is renewed at intervals (Roads 2 and 3), the upper metalling being inferior to the lower and suggesting a decline in municipal standards. Finally, in association with the mud-brick wall (X) of Culture C, metalling ceases, and traffic gradually wears the street into a hollow, removing earlier strata in the process. This process of road-deepening may be seen in many Eastern villages of the present day, and serves to remind us that the passing of time may be represented stratigraphically by denudation no less than by aggradation"¹.

In another figure reproduced from the same book the destructive type of excavation of a structure is shown (fig. 4). Condemning such a type of excavation Wheeler said, "Fig. 16B shows the unhappy consequence of the wholesale clearance of the wall along its two faces. The relationship of the wall with the adjacent strata has been lost beyond recall, and the sequence indicated above is irrecoverable. Excavation has devolved into irreparable destruction"².

The statements of Wheeler in connection with the technique of digging a structure are only to prepare the skeleton of the body i.e. Culture. They are devoid of the flesh, the arteries and veins and other muscular parts without which the physical body cannot function. The picture of any Culture can be fully reconstructed only after all the artifacts related to the people who used the structure are studied in detail.

8. Digging of Mud and Mud-Brick Structures

The maximum precaution needed by an excavator is in the digging of mud or mud-brick structures. Excavators generally fail to distinguish such structures and as such destroy them, thereby closing the eyes-completely to one of the most important cultural component. The excavator will have, therefore, to be constantly alert, so

¹. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 73-75.

². *Ibid*, p. 75.

that the remains of such structures are not lost sight of. The alertness can be observed in the following way. After every dig and clearance of the earth, the excavator should scrape with the help of his knife, the entire floor surface to be dug again. During the course of scraping he should try to feel and observe that the entire surface is uniform and no portion is hard or compact. If any part is hard or compact than other parts of the surface, the excavator should try to trace out the alignment of the compact portion. In case of mud or mud-brick wall the compact portion must make a meaning. Though the mud and mud-brick walls are generally straight, existence of circular structures is not unwanted. One of the mud structures at the ancient town-site of Kapilavastu happened to be circular. There are a number of cases in which the colour of the compact soil itself is distinguishing to enable the excavator to catch the existence of a structure. The excavator can also spray water on the surface to observe the distinction. The water from the top of a structure will take more time to dry up than the rest of the area. The same is the case with the mud-brick and the mortar used. The water from the mortar portion dries much more quickly than the mud-bricks themselves. Once the excavator is in a position to establish firmly the edge of the compact or hard soil, the task becomes very easy. The edges of the compact soil should be cut neatly in order to distinguish the existence of any structure on the section. It is always much more easy to distinguish the existence of a mud or mud-brick structure on the section than on the plan. When the structure will be detected on the section, exposing the plan of the same may not pose any problem to the excavator. Let it be repeated once again that a very high skill is needed to expose the remains of mud and mud-brick structures.

Instances have come to the notice of the author in which even burnt-brick structure has been destroyed. It happens only because of utter negligence of the excavator. In order to exercise economy over bricks, complete bricks are sometimes used only in the facing of the structure. The core of the structure is filled up with brick-bats. If the complete bricks are somehow dislodged with the passage of time, the core of the structure is taken to represent only the debris of an adjoining structure without much meaning. Wheeler has given a very good account of the method to be adopted and the alertness required in exposing mud-brick structures. He said, "The problem once more is that of intelligent supervision, though the trained workman is here an asset of almost equal worth. The texture of the earth, the feel of it, the sound of it as the pick or shovel strikes it, are all factors which, almost equally with direct visual evidence, tell the experienced digger when he is or is not on a mud-brick wall. The instructed peasant learns to think through the point of his pick or the blade of his knife. Decayed mud-brick work may fill the interior of a room and present on plan an undifferentiated surface where it and a mud-brick wall-top abut upon each other. But tapping carefully and obliquely with a small pick will often produce a distinguishable hard note when the point, penetrating the filling, strikes the face of the actual wall. Scraping the surface carefully with a knife, sometimes aided by damping may reveal a slight but significant line where filling and wall meet, or between individual bricks. The composition of the mud wall will sometimes indicate whether it represents brick or filling: flocks of charcoal and scraps of pottery rarely occur in bricks but are not infrequent in filling, and I have sometimes found them in the coarser mud which may be used as the equivalent of mortar. Their presence, therefore, is a useful guide, though their absence proves nothing. Petrie adds that 'in the last resource the stuff should be

searched with a magnifier to see the hollows left by decomposed straw: in kneaded brick these hollows lie in every direction, in blown dust and wash they lie nearly all horizontal'.

"The initial tracing of a mud-brick wall may thus be a fairly lengthy process, involving careful inspection and digging in different lights and different degrees of dampness or dryness of soil. When the wall-face has been definitely located, further care must be taken to ascertain whether it was anciently 'rendered' with a mud or plaster facing. If not, it can be gently brushed horizontally or scraped with a knife"¹

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 84.

CHAPTER V

RECORDING

1. Pottery and Antiquities

Excavation of any site means destruction of the site after which it is impossible to replace any object at the original place, where the same was found. The primary requisite of any excavation, therefore, is to record each and every object with all details before it is removed from its place, so as to enable the excavator to reconstruct the complete picture authentically. Before the excavation is started, the contour and site maps incorporating the environment must be prepared. They should be further supported by the maximum number of general views of the site from all angles. This is the primary responsibility of the photographer. In the absence of the photographer, the Director must attend to this job.

After the excavations are started, the next job of the excavator is to mark the pottery and artefacts with proper labels carrying all the necessary details. So far as the preparation of labels for the pottery is concerned, it is very simple, because in it only the depth and the stratum from which the same has been found are to be mentioned. In vertical excavations the labels will be marked as follows:-

5. 12. 55

RPR - 1

O - V

Depth 2.65 m. B.S.

Signature of the Supervisor.

The first line indicates the date of digging. RPR means the name of the site i.e. Rupar. In a convention of archaeologists in India it was decided that the code of any site must have three letters, neither less nor more, in order to have uniformity. RPR - 1 means the first trench laid at Rupar by the particular excavator. O - V is the area or locus between pegs O to V, the excavation of which has yielded the pottery. There is nothing to explain in depth. The depth will always be recorded from the topmost surface which is indicated by B.S. i.e. below surface. Stratum (10) means that the pottery has been found from layer (10). At the bottom of each label the supervisor has to put his signature for necessary enquiry or verification in future.

In case of grid or horizontal system of excavation the writing of the labels differs slightly. All other details will be the same, but for the area of excavation. In place of O - V the excavator will have to mention the square number which yielded the pottery i.e. B 1, C 1 or XA 2, whatever the case may be.

In the case of burials the area of excavation is replaced by the serial number i.e. Megalith 1, 2, 3 etc., or Cist 2, 3, 5 etc., or Burial 3, 5, 7 etc. Other details will be one and the same.

The recording of antiquities is not as simple as the pottery. Any find, other than pottery, needs pinpointing by three-dimensional measurement. The system of three-dimensional measurement in vertical and horizontal excavation varies from each other. In vertical excavation the right angle with bubble-level will be placed in alignment with the peg line, the other arm being completely in straight line to the spot, where the find has been observed. In conclusion the depth from the surface will be recorded along with the material and object. The details of the writing on the cover on the above line will be as follows:-

7. 1. 56

RPR - 1

O - V.

III-IV - 0.85 X 2.35 m.

Depth 2.60 m. B.S.

Stratum (10)

Iron Nail

Signature of the Supervisor

The first three lines are one and the same as recorded in the case of pottery and also carry the same meaning. The measurements given in line number four mean that the place of the find is 0.85 m away from peg number III when measured towards peg number IV in line with the corner of the pegs, which is the firm line. From that point the place of the find is 2.35 m at right angles inside the trench. There need not be any problem in following the other details. When trenches are very deep and it is cumbersome everytime to go to the top to take measurements, two points with the help of nails may be fixed, exactly in line with two pegs, near the level or on the level where digging is in progress. These two points will be fixed after recording the measurements in the same manner as given above. All the finds collected during the day of digging operation can be recorded from these points and plotted in the site note-book serially numbered as 1, 2, 3, 4, etc. The cover of the find should also be marked accordingly in a serial order. The plotting can be done on the graph sheet available on the left side of the site note-book. In the evening or even at the site itself the actual measurements can be calculated with the help of compass and scale and final measurements arrived at thereby can be recorded on the label or cover of the find.

In case of horizontal excavation the recording of measurements is not from the peg line, but from the nails inserted in the centre of each peg. The recording of measurements in square trenches is called triangulation method, whereas in vertical excavation

it is called three-dimensional. When any find is struck, the excavator will fix the loop of two tapes in two nearest nails of the peg, so as to form a triangle. The measurements from both the points will be recorded by crossing the two tapes exactly above the place of the find which will be rendered possible with the help of a plumb-bob held over the place. The measurements thereafter will be recorded in the following manner:-

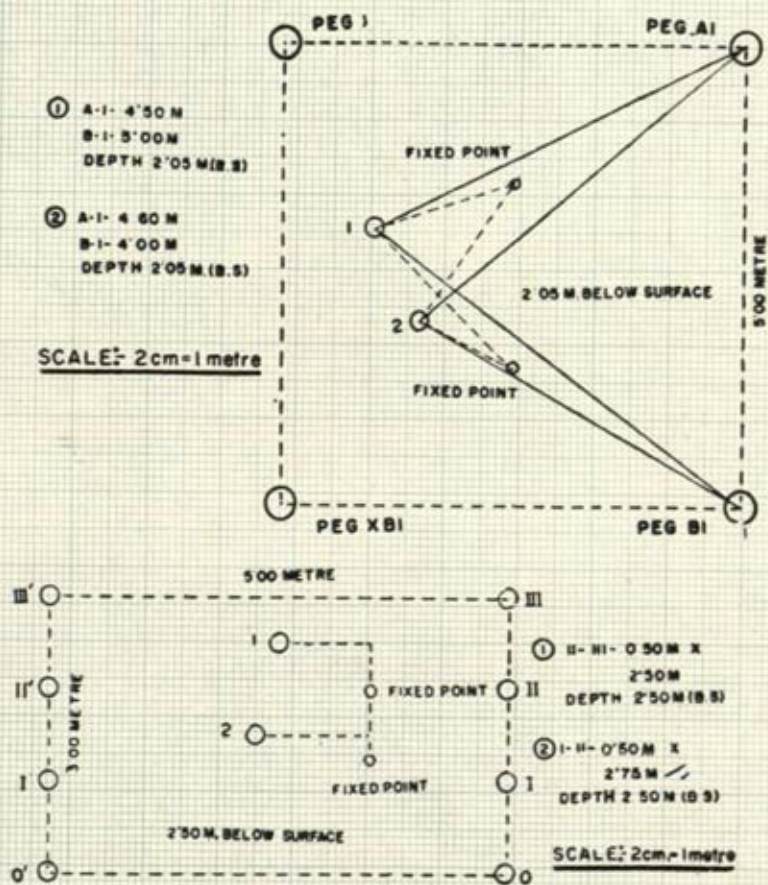
7. 12. 54
RGP - 2
B1
A1 - 3.25m.
B1 - 4.35m.
Depth 3.75m. B.S.
Stratum (6)
Copper Chisel
Signature of the Supervisor

All the details given above mean as follows. Line number one means that the copper chisel was discovered on 7th December, 1954. RGP - 2 means the name of the ancient site i.e. Rangpur, 2 being the second area in which excavation has been undertaken in order of priority. Line number three means that the copper chisel was found at a distance of 3.25 m from peg A1. Similarly line number five means that the copper chisel was 4.35 m away from peg B1. Further lines need no explanation. In case of finds at great depths Wheeler and other archaeologists suggested the use of fish hooks. As the author has already explained, the method is very tedious and cumbersome, particularly when the digging is in progress at a great depth. Some of the students of the School of Archaeology, Archaeological Survey of India experienced the above-mentioned difficulty after which the alternate method suggested by the author under recording in vertical excavation was explained to them (see page 57). The task became very easy. Two points are to be fixed on the level or very near it, where the excavation is in progress in the trench with the help of the triangulation method. The measurements of all finds are to be taken from these two points and plotted in the site note-book on the graph sheet serially marked as 1,2,3,4, etc. The cover of the find should also be marked in the same order. In the evening or even during the course of the day the distance of each find from the pegs can be measured with the help of compass and recorded finally on the cover. This method will have to be adopted when the yield of antiquities is too much (fig. 5).

Each and every antiquity should be kept in individual covers. No short-cut methods should be resorted to, like giving the same measurements if two finds are not too far away from each other or keeping several antiquities in one cover, if they have been found from one and the same level. If any pottery of great value e.g. carrying inscriptions or beautiful designs is found, the same should also be recorded like other finds.

The site note-book at the disposal of each supervisor individually is the best document of recording. The supervisor has to note down all details of the digging on each day. The details will include the layers which have been excavated, the composition of each layer, particulars of any structure if encountered, the antiquities

Fig. 5



Recording in deep trenches

and pottery found during the day in relationship with the layer etc. The supervisor is also required to have a good hand to prepare sketches and measured drawings in the site note-book. The plan of each pit encountered during the course of excavation is to be drawn on the graph sheet available in the site note-book. It would be better if a sketch of the layers is also prepared. At the end of the site note-book a good number of pages are left for recording the antiquities daily and also preparing sketches of important and characteristic pottery found during the course of excavation. The capability of any supervisor can be judged from the site note-book maintained by him. The greater the details, the greater is the capability. Short-cut methods are being adopted these days everywhere, and there are a very limited number of excavations, where the site note-book is maintained by each and every supervisor. This leads very often to problems, particularly in cases where some find or object turns out to be very valuable at a later stage. All details must, therefore, be recorded. The Director will not be in a position to ascertain the details of a structure or antiquity in the absence of the well recorded site note-book. In this context the author would like to repeat the statement of Rivers Pitt who said, "Excavators, as a rule, record only those things which appear to them important at the time, but fresh problems in Archaeology and Anthropology are constantly arising, and it can hardly fail to have escaped the notice of anthropologists that, on turning back to old accounts in search of evidence, the points which would have been most valuable have been passed over from being thought uninteresting at the time. Every detail should, therefore, be recorded in the manner most conducive to facility of reference, and it ought at all times to be the chief object of an excavator to reduce his own personal equation to a minimum"¹.

The Director is not always free from problems. Capable and trained supervisors are not readily available. Further, if they are available, they are not in a position to write out all the details clearly, because of the lack of expression generally experienced in the present system of education. The students are not taught to develop command on any one language, may be English or the regional language. The Director should, therefore, allow free hand to the supervisor to write the note-book in any language in which he can express himself in the best possible manner. Mixture of two languages as is the general practice these days can also be permitted. The Director should, however, go through the method of writing by the supervisor as frequently as possible and advise necessary improvements, which will be very valuable to him at the time of compiling the final report.

Besides the site note-books maintained by each and every supervisor of the trench, the Director of the excavation has additional or further responsibility of coordinating the results of the excavated remains in each and every trench. When the excavation comes to a close, the Director of the excavation should take each and every supervisor with him and dictate notes in details at the site or the trench itself in consultation with all the assistants and supervisors. The services of a stenographer at such a stage will be very valuable. The comprehensive note drawn by the Director at the close of the excavation will be of great help in preparing the report.

1. See page 19.

These days, archaeology, more so, excavation is quickly developing into a hobby. The Directors of the excavation visit the site simply like a picnic, without caring the least to know and understand the details of the results. They are simply satisfied by being called as the Director of the excavation and hence remain contented with the reports furnished by his assistants. The development of such a routine practice has its own reasons at the root. Any official holding a good position either in the Archaeological Survey of India, State Department of Archaeology or University is granted license to undertake excavation without going into the details of the training and experience of the gentleman. The officials generally attend one excavation for a restricted period only to obtain a certificate of training in excavation. There are cases in all institutions, including the Archaeological Survey of India, where one official obtained certificates from two or three excavation sites within one season of excavation only. As it has already been reiterated a number of times, the Director of any excavation is expected to possess adequate knowledge of all the branches of field archaeology, so that he is in a position to impart the required instructions to the supervisors, draftsmen and photographers in the field. A good foundation in all the branches of field archaeology is much more essential, because it is difficult, rather impossible, to find trained supervisors, draftsmen, photographers etc., and employ them on a remuneration suitable to them. Those possessing good knowledge of the subject are already in good position and not prepared to leave their jobs for alternate ones. Granting licenses invariably to undertake excavation without assessing the capabilities of the Director is gradually leading to the same situation as sarcastically pointed out by Wheeler that the archaeologists are digging like potatoes. Excavation of a site without detailed recording itself is destruction, but granting licenses to inexperienced persons to undertake excavation is nothing but destroying the evidence in a wholesale manner for ever. Before granting the license the qualifications and experience of the Director should be fully studied. It is obligatory on the part of the Director of excavation to remain present at the site for a maximum period. This will be possible only in those cases in which the Director, after considerable experience, has developed keen interest in excavation and is over-brimming with the urge of remaining present at the site of excavation for a maximum possible time. Now, training in excavation, undertaking one or two excavations and compiling their reports are nothing more than a business to acquire higher positions and chairs. The seriousness and urge for undertaking excavation with all sincerity of purpose are gradually dying out from the country. There are a good number of scholars who are proud to call themselves as an archaeologist without understanding even the fundamentals of excavation. In recent days a general practice of compiling a large number of articles and printing them into a book after adding a little introduction as an editor or editors is sprouting very rapidly. The so-called editor or editors have very little background of the subject and the book containing a number of articles written by others has hardly any contribution of their own. Any way the editors claim to be great scholars in the field. The work of excavation and standing in the sun for the whole day, far away from hearth and home, is indeed very toiling and tedious. Hence, a very limited number of scholars are prepared to undergo the hardship. Moreover, they don't consider it necessary when they can easily be called scholars by working on cosy chairs and tables in their rooms with all the amenities and comforts. The author, however, would prefer to call them only by the name of drawing-room archaeologists instead of real archaeologists.

2. Archaeological Drawing

The job of a draftsman in preparing the record of archaeological remains is slightly different from the routine job learnt by him during the course of his educational career. In the institution of his learning he is given instructions to prepare new designs and models helpful in the progress of man. In the field of excavation, however, he is expected to prepare drawing of dead objects with the aim of injecting life into the same. The drawings themselves must spell out the cultural context of the excavated remains.

The job of a draftsman in the field as well as at the time of preparation of the excavation-report falls into four categories viz. (1) Preparing the drawing of the sections exposed by the cutting edges of the trench, (2) Preparing the plan of the structures exposed during the course of excavation, (3) Preparing drawing of the pottery and (4) Preparing drawing of other important antiquities found in excavation.

(i) Section Drawing

Of all the jobs of a draftsman, the preparation of a section drawing is the most difficult and requires a sharp intelligence and keen observation. The section drawing is considered to be so important, because it can reveal a brief history of the occupational remains at the site at a glance. The Director of any excavation must be present at the site when the section drawings are prepared, particularly when the draftsman is not well-conversant with the work. A good draftsman means that he must understand the principles of stratification, because he has to record the strata in his section with the maximum possible details. The section must include and speak at the first glance the number of successive occupational periods at the site, the number of structural phases, the working levels of all the structures with the help of their foundation trench, all the floor levels, important compositions of the layers and any other important evidence revealed during excavation.

Before undertaking the task of preparing the section, the draftsman will have to fix a datum line either with the help of a spirit level or dumpy level. The string used for fixing the datum line should be inflexible as far as possible. By the side of the datum string a refill tape may also be fixed for facilitating measurements at various points in the excavated area. The section drawing should always be prepared on squared sheets or roll. All measurements must be taken from the datum string. The section drawing is not simply a collection of lines delineating the distinction of the successive strata. The job of the draftsman is to present the picture in such a manner that the characteristics of various occupational strata are easily intelligible to anyone with an interest in reading the section. With his drawing he must be able to interpret the sequence of cultural deposits. In the words of Wheeler the draftsman or the archaeologist must be able "to understand the sentence as well as to transliterate it"¹.

The draftsman, while drawing the section, will have to catch the main idea behind the following words of Wheeler. He said, "The correct interpretation of a section then is a matter of accurate observation, clear thinking, and experience. Let us pause for

¹. Ancient India No. 3, p. 148

a moment to consider this in practice. We will assume that the draftsman has correctly identified the changes of material, i.e. the strata, and (measuring from a carefully levelled datum-string) has accurately transcribed them to squared paper. His delineation will probably appear as in fig. 2A (fig. 6). But this delineation, although indicating the presence of strata, does little or nothing to indicate their varying character and significance. It is a meaningless collection of lines - a procession of letters not yet divided into words. A more ambitious draftsman may attempt to indicate something of the individuality and diversity of the strata, and fig. 2B (fig. 7) illustrates such an attempt. This fails in two main respects. First, the general evenness of tone throughout the section produces the unmeaning monotony of a sentence spoken without inflection, and so fails largely to convey the intended impression. The draftsman has not realized the varying significance of the facts which he is recording, he has failed to see the wood for the trees. Secondly, he has not realized that his rendering is not merely a transcription of accurately measured or even accurately emphasised lines it is, or should be, also an accurate *picture* of what he sees. Not only should lines of demarcation be transcribed from measurement, but also the size, shape and position of brick-bats, bones, sherds or other materials which, by their character and quantity and by their 'angle of rest' in the soil, combine to indicate the nature of a stratum and the method of its accumulation. An intelligently drawn section is far more than a diagram; it is a *picture*, representing not merely the skeleton but also the vital flesh and blood of its subject. Fig. 2C (fig. 8) is fig. 2B corrected in this sense.

"However rudimentary and obvious these details may seem, I have no hesitation in emphasising their importance. A well drawn, i.e. intelligently recorded, section is relatively a rarity. But it is nevertheless a basic necessity of modern fieldwork"¹.

Wheeler has cautioned the draftsman further in the following words. "First, sections are drawn by means of vertical measurements above or below a horizontal string firmly stretched across the section and levelled either by means of a bubble level or by a supervisor's level laid on the terminal points. Here again details should not be neglected. Only string of the best available quality should be used; inferior string breaks or, worse still, stretches and sags. In any case, the string should be supported on carefully levelled pegs at horizontal intervals of ten feet. Moreover, to avoid errors from stretching or other causes, the level of the string should be checked once or twice during the day.

"Secondly, as to scale. The smallest scale at which the detail of a section can be accurately rendered is $\frac{1}{2}$ inch = 1 foot is necessary, but larger scales practically never.

"Thirdly there is a common tendency on the part of the inexperienced draftsman to exaggerate inequalities in the surface of a stratum and so to obscure its general contour and character. He should be reminded that, on the normal scale of $\frac{1}{2}$ inch = 1 foot, the picture will be one twenty-fourth of the size of the original. An inequality, therefore, rising actually 2 inches above the average level of a stratum will in a normal

¹- Ancient India No. 3, pp. 148-149.

Fig. 6

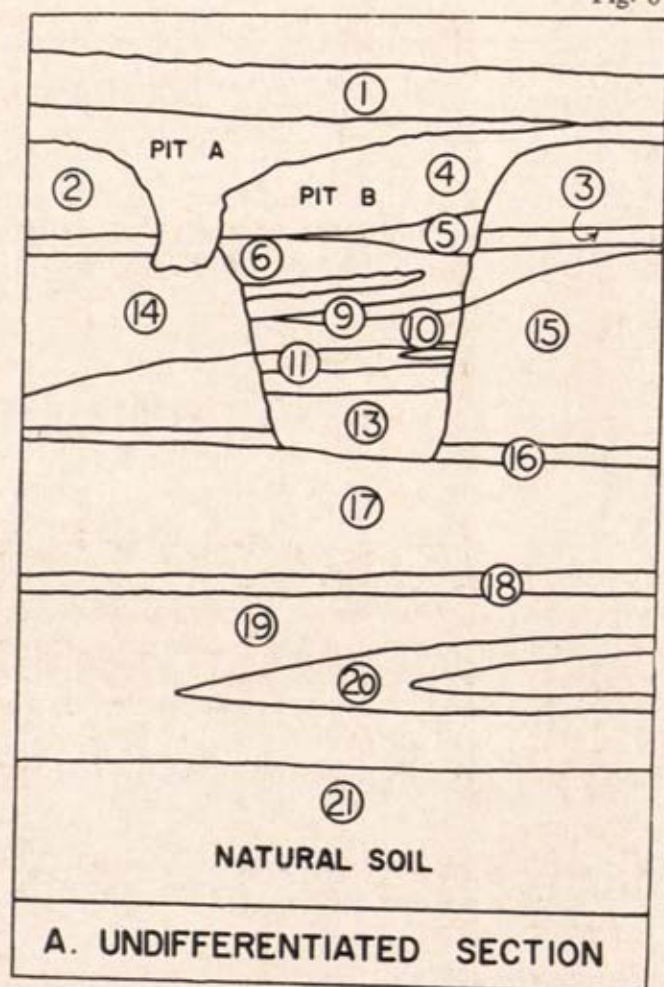


Fig. 7

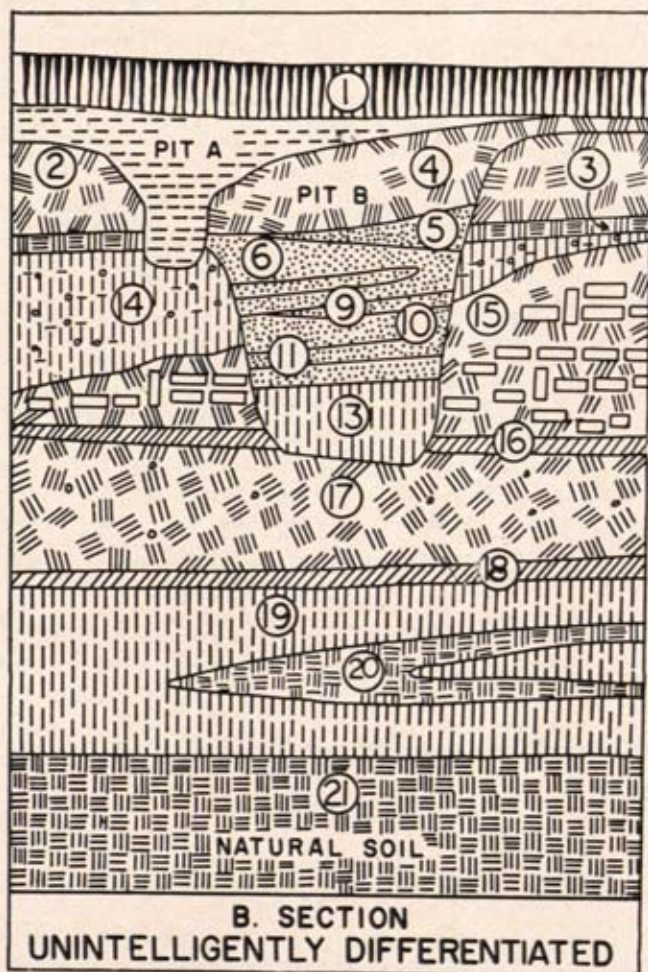
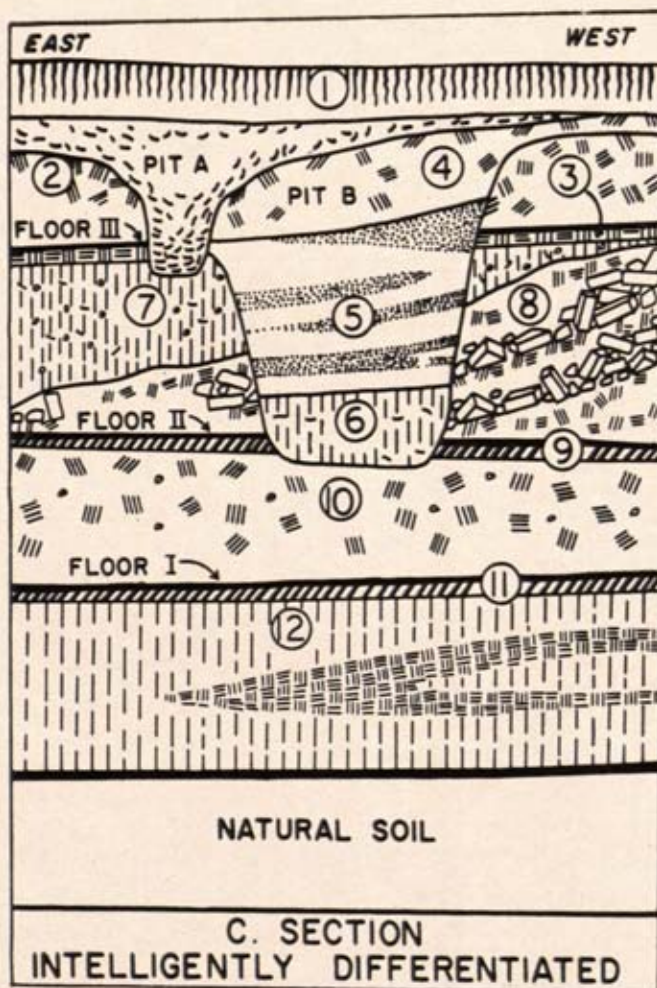
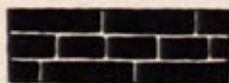


Fig. 8



SYMBOLS FOR SECTIONS

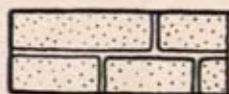
BURNT BRICKS



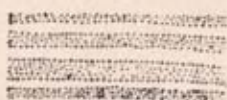
ASH



MUD BRICKS



MUDDY BANDS



LOOSE EARTH WITH GRAVEL ETC.



POT SHERDS



LOOSE EARTH



GRAVEL



COMPACT EARTH



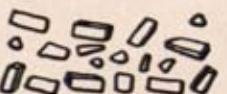
SAND



LOOSE CLAY



BRICK BATS ETC.



COMPACT CLAY



SURFACE HUMUS



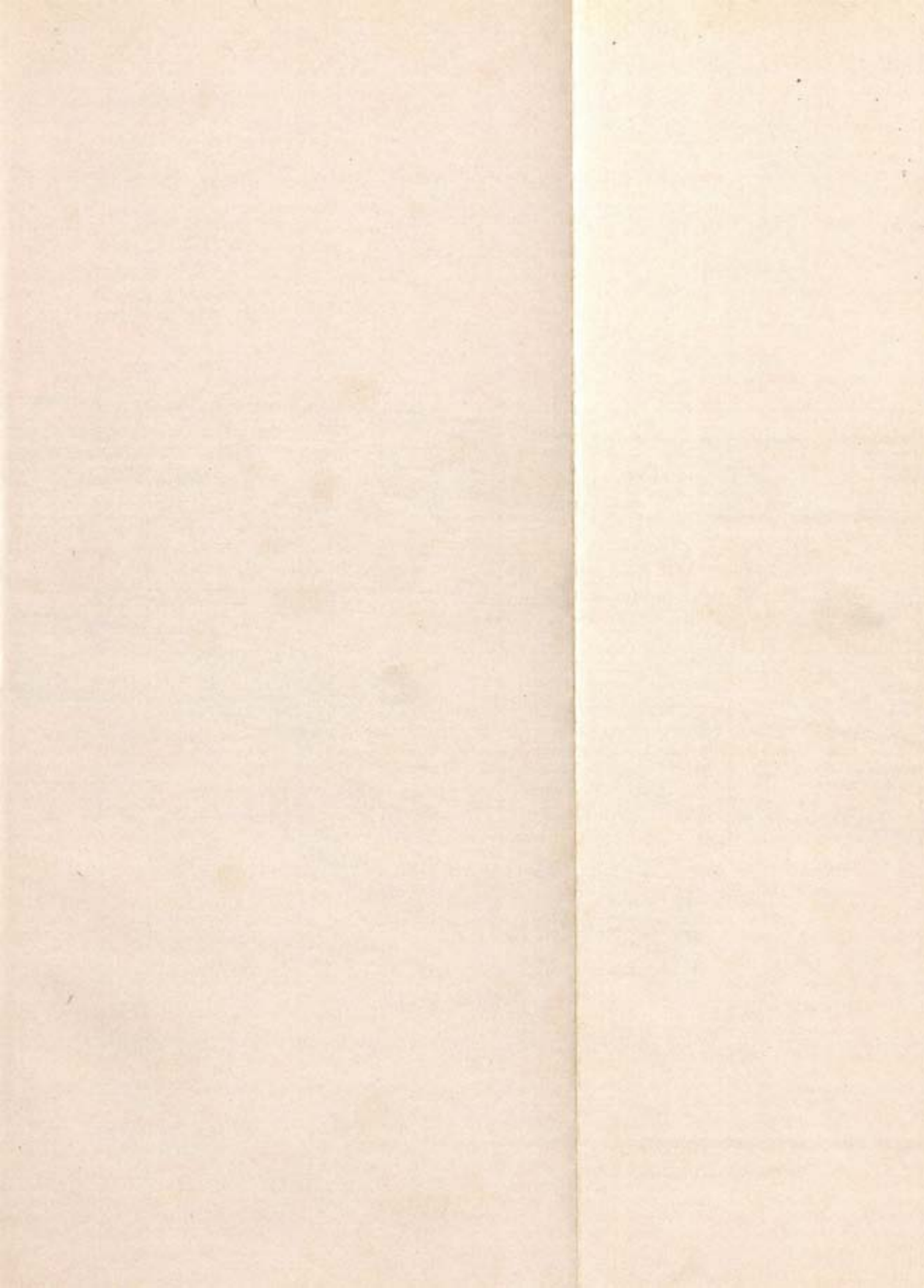
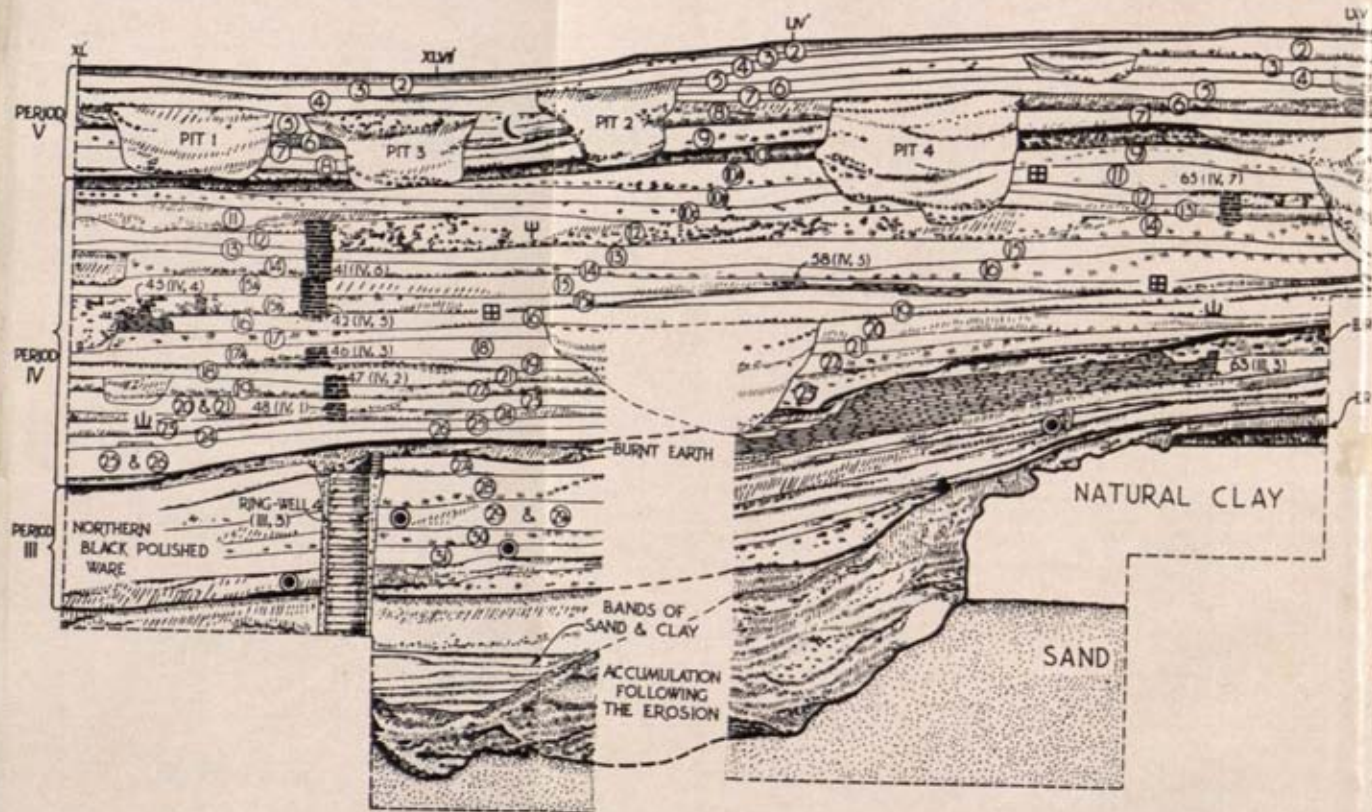


Fig. 10



Section with all details

scale-drawing, vary by only one-twelfth of an inch above the level, and so will form a negligible break in the surface. Almost invariably the draftsman, again seeing the trees rather than the wood, will over-emphasise the obstacle"¹.

Since measurements in India have now been changed to metric system the standard scale which has been adopted is 5 cms = 1 metre. Till Wheeler arrived in India there was no uniform system of symbols to represent various compositions of the soil. In the following illustration (fig. 9) Wheeler laid down a scheme of symbols which are being followed till the present day.

In the illustrations of intelligently and unintelligently prepared sections, Wheeler has not incorporated regular structures, their foundations, phases and various floor levels. An intelligently drawn section with all the details is, therefore, reproduced as fig. no. 10.

The use of inflexible string for fixing the datum line with the help of a spirit-level in the drawing of sections is sometimes very tedious and impracticable, particularly when a section of great length is to be prepared. The string, howsoever inflexible it may be, is not free from the affects of moisture or pressure of wind as a sequel to which it continues to flap. In order to avoid such an eventuality, specially in areas where the momentum of the wind is too great and continuous, an easier method has been adopted in recent days. Iron nails at frequent intervals (not too away from each other) are fixed in the exposed section at a considerable height with the help of the dumpy level. All these nails are in one level and the same line serves as a datum line for taking measurements in the preparation of the section drawing. The nails must be placed at a considerable height but sufficiently below the top surface of the trench, so that the same are not susceptible to easy tempering. They should be cross-checked also in the early hours of the day before the work of the section drawing is started or resumed. The measurements between the nails which are not too far away from each other can be taken with the aid of straight lines at right angles to the vertical string tied with plumb-bob for recording the measurements.

The draftsman has to be very particular on certain fundamental points, which are essential in section drawing. The outline of the pit should be clearly marked alongwith the sealing layer. The working level of each structure alongwith its foundation trench as also various floor levels are to be distinctly brought out. As far as practicable the material used in the preparation of floors needs indication in the section. The line of the natural soil followed by the top layer of a particular period are to be marked distinctly with a bold line. In the case of vertical excavation, only one section of the exposed trench is drawn, whereas in the case of area or horizontal excavation all the four sections have to be drawn. While preparing the section in vertical excavation, the Director and the draftsman have to take care that the maximum possible number of structures and floors are incorporated in the section. This can be made possible by projecting the sections or taking the structures on elevation in a large number of cases. This is essential, because the section drawing is a key to the successive occupational remains and their behaviour for any excavated site. Though in horizontal excavation

1. Ancient India No. 3, p. 150.

all the four sections are drawn, only one or at the maximum two of them are published. It is, therefore, obligatory on the part of the Director as also the draftsman to take decision in advance (not before the excavation of the trench is completed) regarding the section or sections which will be published. There need not be any difficulty in taking the decision. As already stated, the section should incorporate the maximum possible evidences including structures and floors to reveal the story of the ancient occupation at the site. In such cases the sections drawn need not always be in a straight line. Sometimes the alignment has to be changed at right angles in order to cover the maximum number of structures, floors and other evidences. The alignment of the line of the section drawing should, however, be marked on the plan so as to avoid any confusion. Even otherwise, that is to say, in the case of straight lines as well, the alignment through which the section crosses the structure must be marked on the plan. The section of extraordinarily important structures as also the burials should be prepared individually for publication. In case of necessity the laid down scale of 5 cms = 1 metre can be deviated and a larger scale adopted. While incorporating the structures in the section the draftsman has to be careful enough to bring out the nature of the construction viz. course of headers and stretchers in the case of burnt-brick or mud-brick structure clearly. The debris accumulated as a result of the collapse of any structure is also to be carefully plotted keeping in view the working levels against which the collapsed debris struck. Successive reconstruction of any structure or a subsequent structure raised over the earlier one are also to be clearly shown. The Period and the structural phase of each structure must be indicated in the section e.g., II, 3 meaning thereby that the structure belongs to the third structural phase of Period II at the site.

The draftsman has to be conscious at every moment regarding publication, which is the ultimate end in view. In view of the above requirement, the draftsman must possess an idea of preparation of blocks and reduction. With the same idea in his mind he has to see that the lines and hatching are not so close to each other as to merge at the time of reduction in block. The lines and the hatching and above all the letterings should be so distinct as to stand the reduction in block. It is not necessary to give the number of each and every layer or stratum. If at all it becomes unavoidable, the number of the layers should never be given in one vertical line presenting the appearance of a wall. The numbering can be evenly distributed to various parts of the section.

The section of the exposed cutting edge of the trench should invariably be drawn when the light is uniformly spread over it, preferably when the entire area is in shade. In a bright light the details of the composition of strata merge into each other making it impossible for the draftsman to distinguish each and every important evidence in bright conditions of light.

(ii) Plan of the Structures

Drawing of each and every structure on the same scale i.e. 5 cms = 1 metre, unless otherwise required, is to be prepared on plain good drawing paper. The placing of each and every burnt-brick, mud-brick or stone used in any structure and their alignment should be carefully and most accurately shown in the plan. The firm edges of the bricks and stones will reveal the thickness of the mortar used. These details are

essential to bring out the engineering skill with which the people were acquainted in the ancient days. Before undertaking the preparation of the plan of any structure, the draftsman must understand the nature of the construction fully as also its purpose. Structures are of various kinds like residential, shrines, granary, *stupa*, cistern, etc. Each and every type of structure has its own necessary component e.g. main shrine chamber, circumambulatory path, entrance, etc., in a shrine, main room, adjoining rooms, verandah, entrance, etc., in the case of residential structures; various components used to keep away the moisture and insects in the case of granary; relic-chamber and the circumambulatory paths in the case of *stupa* and so on and so forth. Unless and until the draftsman becomes familiar with any structure in respect of the above mentioned purposes, he should not start the preparation of the drawing. Instances are, however, not wanting in which the purpose of certain structure is not decided. In such cases the drawing of the structure is not to be ignored, but prepared most accurately with all details, so as to enable the Director to take the decision on the purpose in consultation with other scholars.

There can be several phases of reconstruction in a particular structure. The draftsman must be able to distinguish the various phases and indicate them clearly with the skill at his command. The Period to which the structure belongs and its structural phase as pointed out in the case of section must be marked. Particular attention is needed in preparing the plan of burnt-brick or mud-brick structures, so as to enable any scholar or layman to measure the size of bricks used at a particular time. The measurement of bricks is always valuable in confirming the date of the structure. A line indicating the alignment of the section drawing is also to be marked on the plan of the structures. The cardinal direction in which the structure was raised is also essential and needs indication with the help of North line artistically shown.

When excavations are undertaken on a small scale, all the structures exposed can be covered in one sheet, but the same is not possible in case of excavations on extensive scale. In the latter case the plan of the structures will have to be prepared individually. In order to know their exact location at the site as also their proximity to other structures, key plan on a smaller scale, alongwith path ways or roads, if any, should be prepared and incorporated with the plan of the structure in a suitable corner at the time of publication. The key plan of the structures will also be very much helpful in understanding the layout of the habitation. There need not be any problem in preparing several copies of the key plan with the help of photo-stat.

In the case of burials the outline of the pit dug for burying the dead body needs distinct indication. Whenever skeletons are encountered in burials, the scale of the plan should in normal course be enlarged. On a larger scale a better picture with all details of the body can be presented. The grave goods accompanying the dead body will also appear in greater details. In case of megalithic burials, the details of the cairn circle, cist blocks and chambers, outline of the pit and the funerary goods placed in the burial should all be presented in the plan distinctly.

A substantial number of cities in ancient India were protected with the help of fortification walls or rampart. While preparing the plan of the fortification wall or

rampart it may not be feasible or practicable to stick to the laid down scale of 5 cms = 1 metre. The scale in such cases should be reduced to such an extent that the plan of the fortification wall is presented on one big sheet of paper without losing the essential details. If considered essential, a part of the fortification wall may be presented with all details on a normal or larger scale. The fortification wall in certain instances are accompanied by a moat. The position of the moat must also be incorporated in the plan. The gateways and watchmen's cabin along with the steps, if any, used for entrance should be marked clearly.* In structures like a dockyard, as at Lothal in Ahmadabad District of Gujarat, the various components like the entrance gates, berthing place, place of loading or unloading, store rooms, etc., need incorporation in the plan.

For recording the measurement of structures and other remains in plan, the simple method of triangulation is to be followed. Two points at a convenient distance from the part of the structure, which is to be drawn, should be fixed as datum points. The two points should be so located that almost the entire area of the structure, of which the drawing is being prepared, falls on the two sides of an isosceles or equilateral triangle. The measurements taken from the two fixed points should every new and then be cross-checked from a third point which may fall on the structure itself. While moving to another area of an extensive structure, another two points should be fixed only by taking measurements from the earlier two fixed points. The two new fixed points should be cross-checked from any part of the structure already drawn. There will always be a possibility of error if the two new fixed points are located independently of the earlier two fixed points. All possible measures will have to be adopted to prepare the most accurate drawing without leaving any margin of error.

(iii) Pottery Drawing

The pottery in all cases, but for those in which the pots are exceptionally big, is to be drawn on scale to scale. A particular method for drawing the pottery has been laid down. The diameter of the rim or any other convenient part of the fragment of the pottery is to be determined by rotating the same on a number of circles already drawn on a sheet of paper for this purpose. The diameter of each and every circle is already given in the same chart. While rotating the rim or any other part of the pottery on the line of the circle, the draftsman should be careful enough to observe that each and every part of the rim touches the line of the circle. Once the diameter is decided a line of the same dimension should be drawn horizontally. Thereafter the line should be bisected perpendicularly, the perpendicular line drawn vertically below the horizontal line. The left half of the area is meant to show the details of the section and the right hand is reserved for the details of elevation. The pot, of which the drawing is being prepared, should be fixed with the help of plasticine in the same position in which the diameter was measured, that is to say, all parts of the rim must touch the surface. After fixing the pot in proper position all essential details and curvatures can be measured with the help of set-squares, compass, callipers and scale against a perpendicular line drawn at the left hand extreme of the horizontal line (see fig.11). The set-square should be placed at right angles to the surface on which the pot has been fixed with the edge

*There will be no occupational layers at the gateways or the watchman's cabin, though of course excavators have often been observed to distinguish them.

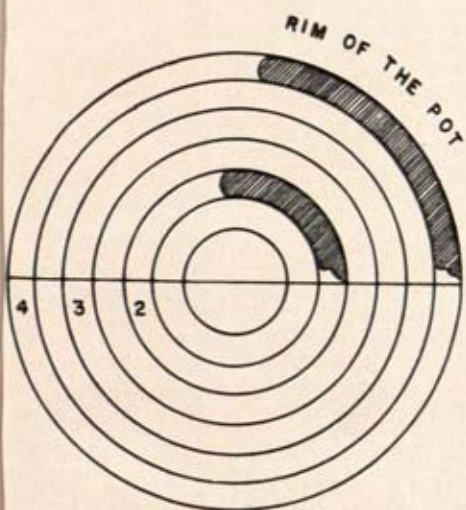


Fig. 1

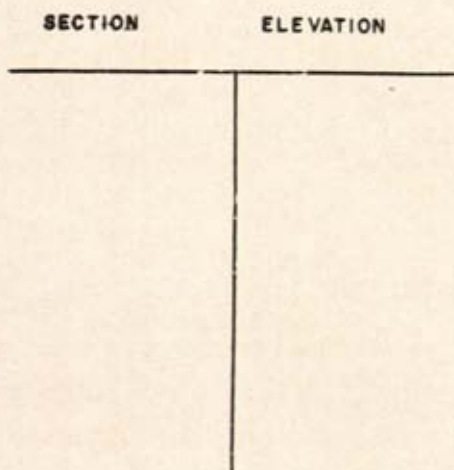


Fig. 2

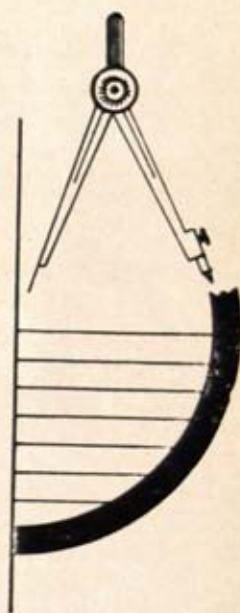


Fig. 3

Fig. 11

Pottery Drawing

touching the rim of the pot. This will make the taking of measurements of each and every curvature or other details very easy. The paintings or other decorations on the interior part of the vessel should be depicted on the left half side and those on the exterior part on the right half side. The striation marks or grooves should be carefully shown with the help of single or double lines (fig. 12 and 13).

The above method is applicable when a large number of pots are to be drawn at one time. In case a limited number of pots are to be drawn at one time, the diameter can be ascertained by putting the rim of the pot on the paper and drawing the outline of the arc. In the arc two chords i.e. straight lines touching two points of the arc are to be drawn. Thereafter the two straight lines are to be bisected perpendicularly. The perpendicular bisectors of both the chords will meet at the centre of the circle, of which the arc is a part. From the centre to the arc the distance is known as radius and double the same will be the diameter.

While preparing the drawing of a particular ceramic well known as the Black-and-Red Ware, the draftsman will have to distinguish the two colour schemes by means of lines. The Black portion should be indicated by drawing close parallel horizontal lines. The lines should be closer to depict the darker portions of the Black area. The Black portion on the exterior upper part of the vessel is to be depicted similarly (fig. 13).

In a large number of cases the pottery pieces are too fragmentary and the rim portion is missing thereby making the measurement of diameter impossible, though they carry beautiful and important decoration and painting. In such cases the fragmentary piece is to be put on the drawing paper and the outline drawn. Thereafter the outline can be filled in by the decoration and painting present on the fragment with the help of measurements. The thickness of the pottery fragment known as section is to be shown on the left hand side by means of a curved line. The curvature should be exactly the same as the curvature of the fragment of the pot.

The adjustment of a large number of pots on one sheet of paper is not at all necessary, because the job of adjustment before the pottery is drawn is very difficult and complicated. Any pot can be drawn on any part of the sheet of paper keeping in mind that minimum space is wasted. At the end when all the pottery pieces are drawn, good plates can be prepared after cutting each and every piece and pasting them on a required size of ordinary paper (as per the dimensions of the plate). The pasting of the drawing of the pot need not be in the same serial order as desired. Any piece can be pasted anywhere on the sheet after which the numbering can be done in the serial order desired. However, it must be borne in mind that the numbering on each and every sheet is complete e.g. if one sheet has been pasted with fragments numbering one to twenty all the numbers from one to twenty should be on the same sheet. Any number falling in between i.e. ten or fifteen should never be carried over to the next plate or sheet, because the same will be a source of great confusion. In addition another caution is to be observed. Various kinds of ceramic are yielded in excavation. Any particular type of pottery or ware or ceramic should have the same running number. For an example, if there are sixty fragments of red ware, all of them should be numbered from one to sixty and in between no other type of pottery should find a place.

The serial number after sixty can continue in the case of other type of pottery like black or buff ware but after that no fragment of red ware should reappear. Another way of numbering individual fabric is also in practice. Each and every fabric is marked individually with its own serial number starting from one. The latter method is much more convenient and preferable for finding out the number of shapes available in any particular ceramic without any loss of time. This is valuable in comparative study as well as in assessing the dominance and importance of various ceramics at the site.

(iv) Antiquities Drawing

The drawing of antiquities like pottery is to be prepared on scale to scale. While preparing the drawing of the antiquities, the draftsman should have a keen eye to find out the most important part of them. Particular attention will have to be paid to bring out that part of the antiquity prominently. The drawing of the antiquity should not be dull, but full of life. In case of tools and implements particular care is required to exhibit the working edge. Greatest artistic skill of a draftsman is needed in preparing the drawing of terracottas. He is required to bring out exactly the same expression as observed in the terracottas. Various expressions are depicted in various terracotta pieces and the skill of the draftsman lies in reproducing the same expression in his drawing. The measurement of any antiquity is not very difficult. The antiquity can be kept on the sheet of paper and outline drawn. Thereafter the outline can be filled in with all the required details by means of hatching and strokes.

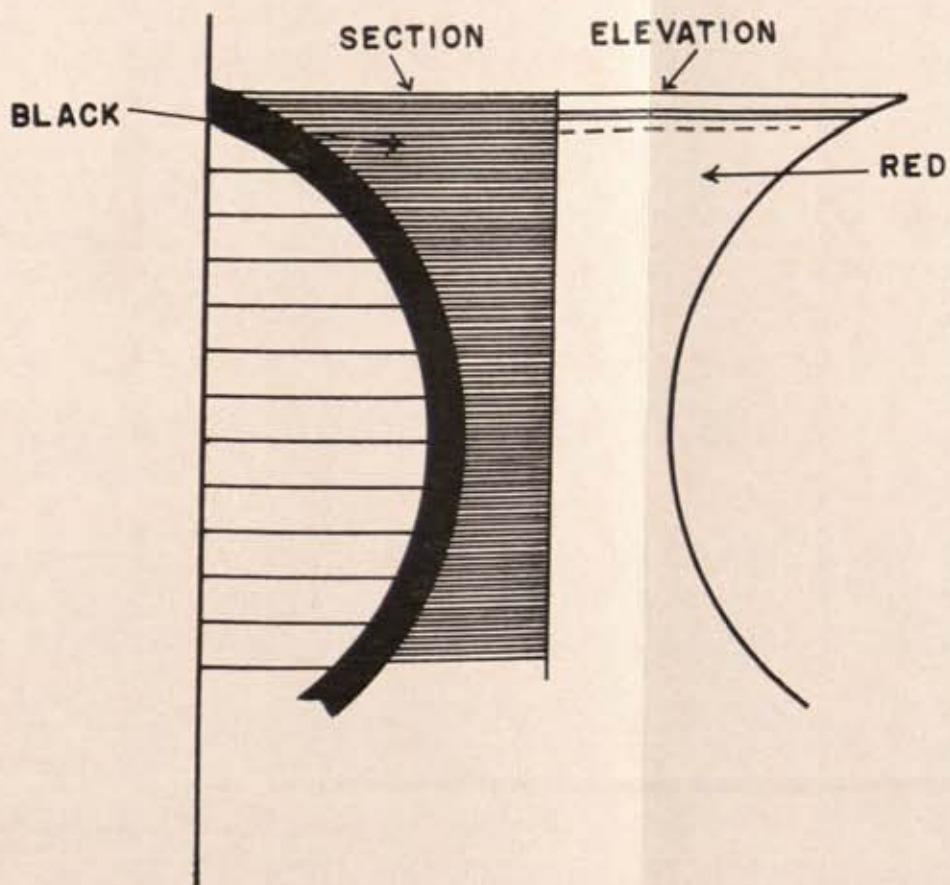
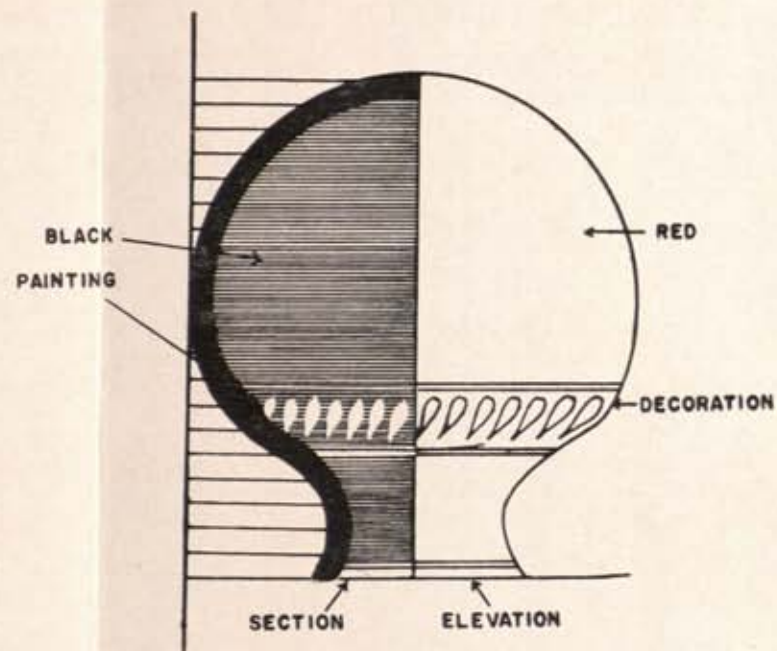
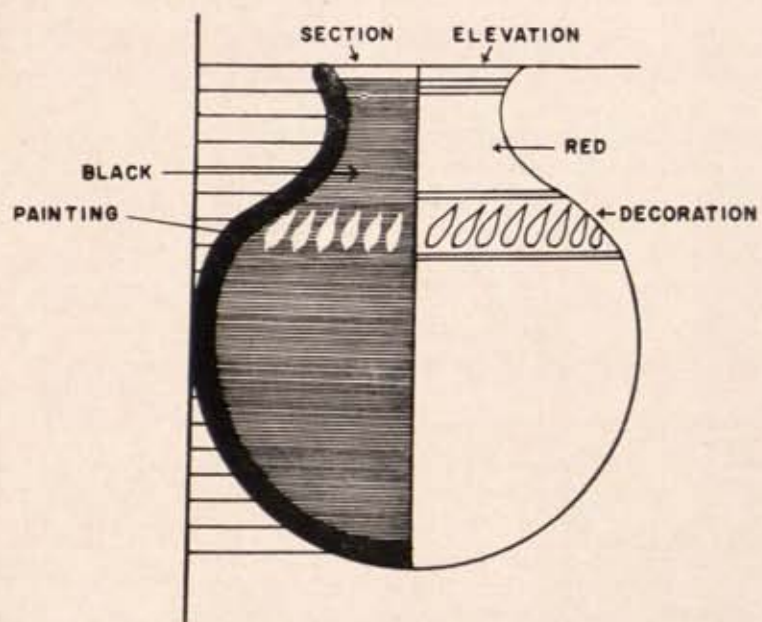
The draftsman is required to play another very important role which is publicity. He has to prepare necessary posters depicting the life of the ancient people in a suitable manner for organising exhibition. The type of houses in which people lived, the environment, food habits, use of various tools and weapons, lay-out of the city or township etc. will have to be included in the poster.

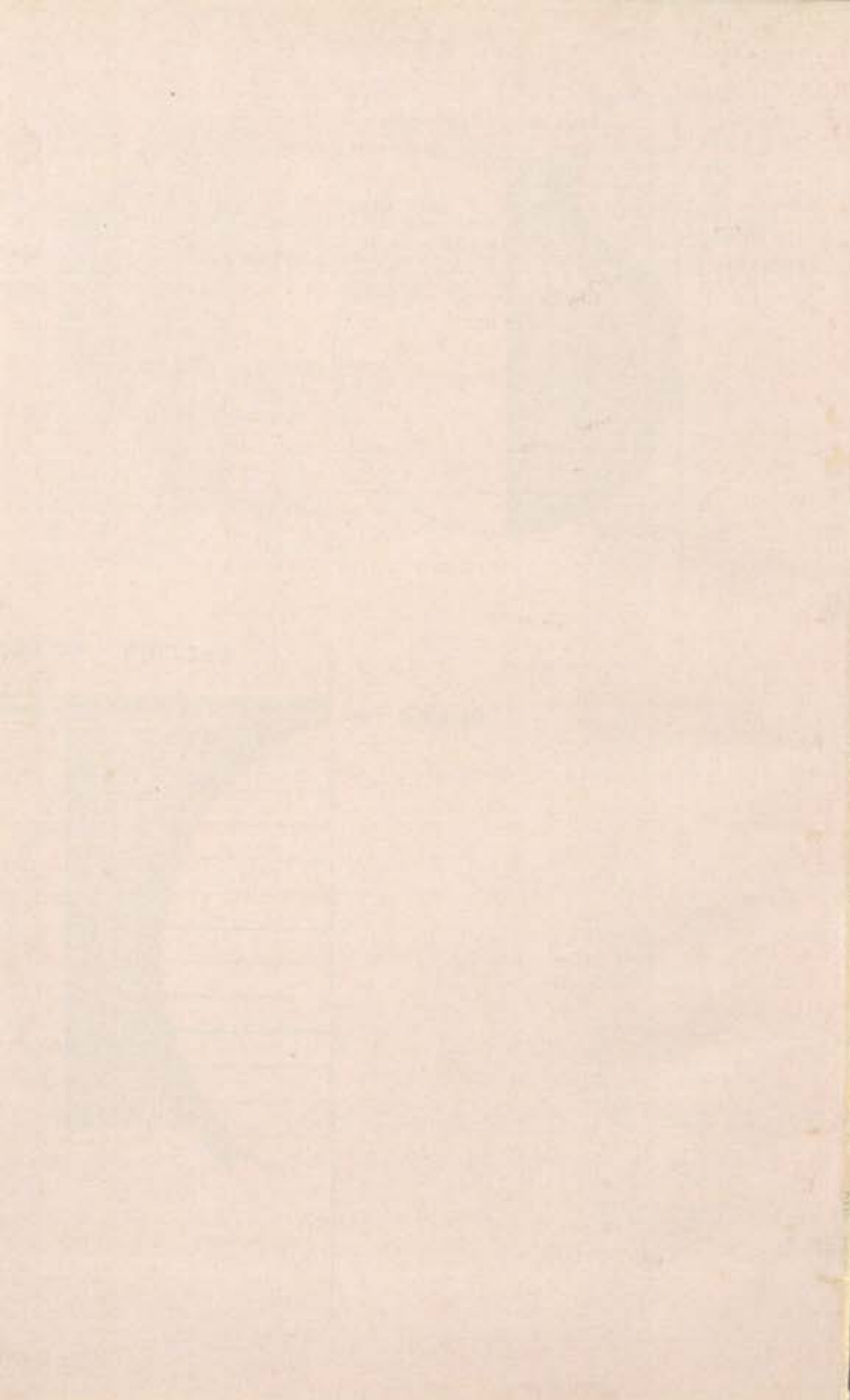
3. Archaeological Surveying

The job of a surveyor in the excavation is one of the most important, because the entire planning of excavation depends on his observation. The surveyor has, in the first instance, to prepare a site plan depicting the geographical environment amidst which the site is located. In addition he has to prepare the contour plan of the site, so as to enable the Director to take necessary decision on the laying-out of the trenches most accurately in the specific areas desired by him. The decision on the method of excavation viz. vertical or horizontal will have to be taken by the Director himself. The surveyor will lay out the trenches accordingly. Keeping this important duty in mind the surveyor must be fully conversant with the method of laying out of trenches and marking of the pegs. He need not ask for the guidance of the Director at every step.

The width of any trench is decided on the thickness of occupational debris at the mound. With the help of the contour plan the thickness can be easily determined and consequently the width of the trench decided. The approximate deposit of the cultural remains can also be ascertained by handy instruments like Abney level.

Fig. 12 & 13





The primary job of the surveyor is to pinpoint the location of the site on the Survey sheet. The Survey sheets are available with the Survey of India. After pinpointing the location of the site the latitude and longitude can be worked out. The details of latitude and longitude are very essential for any scholar in the world to make out the location of the site. With the help of the topographical sheet (Survey sheet) the elevation of the site from the mean sea-level can also be found out. The site plan will be prepared on the basis of the Survey sheet incorporating further details of the environment observed by the surveyor. The direction and distance of the ancient site from important towns or other important landmarks in the vicinity are also to be indicated in the site map. The site map should in addition include details regarding the nearest and easiest approach to the site by recording the roads and pathways.

Archaeological surveying is not a complicated job as is generally believed by the scholars, since it needs the knowledge of mathematics only upto intermediate standard. Of course, the surveyor or the Director of the team must possess the knowledge of a few elementary principles further strengthened by adequate common sense. The archaeological surveyor need not be too fastidious regarding accuracy upto zero point. The general instruments and methods used for recording measurements vary according to the accuracy required in mapping. According to the required accuracy various methods and instruments are used e.g. for approximate and rough work pacing (walking with steps at equal distance) and the prismatic compass held in hand; for simple maps metric tapes and the prismatic compass set on a tripod to keep it steady; and for the perfect and accurate surveys, the steel tape, level and the theodolite. A surveyor in other professions is required to furnish exact measurement of areas and the location of positions for structures of particular size. An archaeological surveyor, on the other hand, deals largely with such formations which have no exact dimensions, giving him the liberty, of course within reasonable limits, to decide the boundary of any land formation. The archaeological surveyor should no doubt try to be most accurate, but any error limited to thirty centimetres can be ignored. The scale at which the maps are generally prepared by the archaeological surveyor the margin of error as pointed out above will be negligible, but on the other hand it will save a lot of time.

For preparing the plan of the site and its environment the three basic methods followed are (i) Chain Surveying (ii) Plane table Surveying and (iii) Level Surveying. In India, however, the last method i.e. Level Surveying is much more popular. A brief description of all the three methods are given below.

(i) Chain Surveying

It is so called because the chief instrument used in it is the measuring steel chain. Though chain surveying is considered to be the simplest, it is the most tedious method of mapping. It would be better to replace the chain by a metric tape of 30 metres if the pressure of wind is not there and the ground itself is not rough. The chain surveying is based on the principle of a series of connected triangles with their sides running as close to the detail to be plotted as possible. The sides of the triangle are measured in turn and so also the offsets to the details to be mapped measured and recorded as the work proceeds. The surveyor should normally include at least two points whose position can be found on a map. If the same is not possible the compass-

bearing of one side must be taken to determine the position exactly. The aid of the compass can also be taken to fix the position of points too far away from a base line (from which the points cannot be fixed satisfactorily by means of offsets) by intersecting bearings. The offsets, according to the laid down rules, should not be longer than one to one and a quarter centimetre at the scale used to prepare the survey plan.

Chain surveying, it has been observed, is not a suitable method in preparing the survey plan for planning of excavations, because in that case the surface is too frequently obstructed by dumps. This method suits best in recording irregular details, especially linear details such as ditches and banks, which are fairly evenly distributed over the area to be mapped.

(ii) Plane-Table Survey

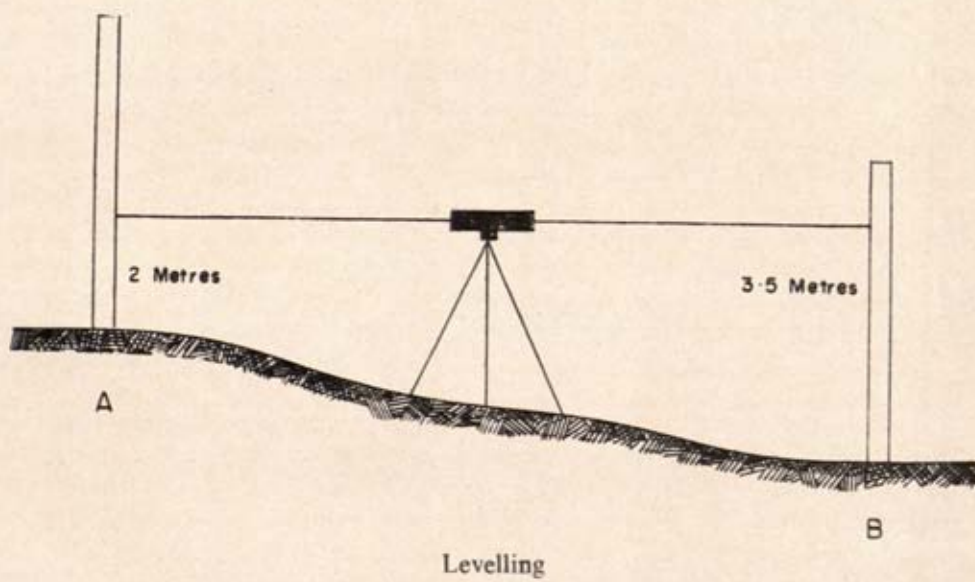
This method is very suitable for an archaeological surveyor. Its greatest advantage is that the work can be done by one person only and the map can be prepared on the field when the excavation work is in progress. This facility enables the surveyor to detect the errors and rectify the same. In addition, it is a quicker method than the compass triangulation as mentioned above. The greatest disadvantage connected with this method is the unwieldy size of the instruments, a problem to transport from one place to the other, particularly when the distances are long. The equipments required for plane-table survey are (1) plane table, (2) tripod stand (3) alidade (4) prismatic compass (5) measuring tape and (6) ranging rods. The basic principle underlying the method of plane-table survey is as follows, though broadly it can be said that the position of a point can be fixed by the intersection of two lines of known direction drawn from the ends of a known base-line.

Two points viz. A and B are fixed. With the help of these points the position of another point C can be fixed by the intersection of two lines of known direction drawn from A and B respectively. The direction of AC and BC is determined by measuring the angles CAB and CBA. With the help of prismatic compass, however, their directions can be determined independently of AB. The prismatic compass indicates the direction of AC and BC in accordance with the fixed direction of Magnetic North, which is constant at all points in the Survey. With the help of the compass it is angles NAC and NBC which are actually measured.

(iii) Level Surveying

For preparing the contour plan of a site, which is most essential for the archaeologist, the measurement of height as well as the distance is needed. In level surveying the instruments required are (1) dumpy level (2) two levelling staff (3) tripod stand (4) plane table (5) prismatic compass and (6) measuring tape. The dumpy level is equipped with a sighting-tube fitted with a horizontal cross-hair which can be set up with the help of the attached spirit-level to provide a horizontal line of sight. The levelling staff is marked with measurements divided into suitable fractions. The surveyor looks through the dumpy level and observes the reading on the staff which is cut by the cross-hair. According to fig. 14 the reading at B is 3.5 metres. The line of sight is, therefore, 3.5 metres above the ground at B. The reading at A is 2 metres, i.e. A is 2 metres below the line of sight. Point A is, therefore, 1.5 metres above point B.

Fig. 14



This is a very simple principle and once it is understood there need not be any difficulty in preparing the contour plan of the site.

To start with, the surveyor will have to search the nearest bench-mark in the vicinity on which the height from mean sea-level is recorded. Once it is found out, the surveyor will have to determine the height at a suitable point on the site with the help of dumpy level and levelling staff on the same principle as given in the preceding paragraph. For preparing the contour plan of the site, the Director of the excavation will have to decide the regular intervals at which the contours are desired. It should in no case be less than 25 cms.

To mark the contour lines at regular intervals the levelling staff is to be moved to and fro to be fixed at the particular contour. The position of the actual contours must be found by interpolation i.e., recording measurements in a diary. Pegs are needed to be fixed at all the points. While plotting the contours radial lines at correct bearings are drawn. The distance of each peg from the centre will be measured along the appropriate line and its height marked. All points of the same height are then joined by a smooth line and the radial lines rubbed off. The vertical intervals of each contour should be marked either by the height from the mean sea-level or by serial numbers starting with a particular height as determined from the bench mark earlier. It must be noted that all contour maps are to be prepared at the site only, which will enable the surveyor to rectify any error.

If the surveyor is well-experienced and his assistant also is intelligent enough, the work of surveying can be expedited with the help of much more sophisticated instruments like theodolite and telescopic alidade, particularly when tachometric methods of determining the distance are employed. The use of such instruments, however, requires special training.

4. Archaeological Photography

Photography of the remains exposed in excavation is the most specialized job in archaeology. The photographer is expected to tell the truth with the help of his camera revealing the complete picture of strata, features, composition, artefacts in context, pits, structures, floors, etc. Photography in the field is much more important than the drawing, because it provides a correct and accurate picture of the context, which cannot be expected in a drawing. Though it can be stated that a photograph covers something more than required, the same may prove to be a blessing, because there are many aspects of the subject of which the significance may not be immediately appreciated by the excavator. Moreover, it is the duty of the photographer in the company of the Director or his immediate assistant to see that the significant and important parts receive greatest emphasis in the photograph. Photography is also of great help in cross-checking the drawings prepared by the draftsman. It is a visual record of a site in its various stages of excavation or so to say destruction, thereby very valuable in reconstructing the history of the ancient remains.

There are three aspects of photography to which the photographer has to pay special attention. They are (1) Picture sharpness (2) Picture distortion and (3) Exposure control. Picture sharpness depends entirely on correct and accurate focussing. For

this purpose a camera having a ground glass which transfers the image directly through the camera lens to the eye should always be used because the ground glass indicates exactly the details of the subject which are covered and the way they appear. Picture distortion is another function of the lens itself. As a general rule, the focal length of a lens is approximately of the size of the diagonal of the negative being prepared. This is called normal lens. Consequently the image size of the subject to be photographed is determined by the focal length of the lens in relation to the film size of the camera. In excavation photography it is always desirable to use a slightly longer than normal lens for obtaining sharpness of the negatives. Exposure control is the most difficult job and requires the greatest skill on the part of the photographer. It includes both the shutter speed as well as the diaphragm opening.

The best results in excavation photography can be obtained with a view camera having an accordion (portable) bellows. Such cameras have ground glass reflecting the image directly through the lens. They are also flexible enough to be set close to the subject with a very good control over distortion. The additional advantage in such cameras is that there is hardly any change in the position of an object owing to change in the angle of vision. The negatives are prepared on large cut-films, which permits contact printing, greater flexibility in film developing for improving the quality of the picture and a great freedom in the choice of the film. Though cameras of this type are generally heavy and bulky, the photographer should never try to avoid the transportation of such unwieldy cameras to the field in the interest of best results. Tripod is a necessary accompaniment of such cameras. These cameras, being slow in operation, are considered to be the best for sharpness of picture, though the films used in them are a little costlier and regular availability is a problem.

The archaeologists, keeping in view all the above mentioned necessities prefer 4 X 5 Graphic/Graflex press cameras as a suitable compromise to a large camera. Though the best results are produced by a full size field camera, the author has his own experience that the results of Linolf 2B size are equally good. It can be fitted with a roll adpoter also. The advantages of a field camera i.e. full-plate (6½ X 8½ inches) cannot be over emphasised and have been brought out clearly by Miss Alison Frantz in the following words. "Lenses are described and identified by their focal length. The focal length, which is fixed for each lens, is approximately the distance between the lens and the image on the film when the lens is focussed on a distant point. Lenses of different focal lengths may be used, within reason, on cameras of different sizes. For general use, however, a lens of focal length equal to or slightly greater than the diagonal of the picture-area is customary. Therefore the larger the camera the greater the focal length of its normal lens. The images projected on the film by lenses of the same focal length at a given distance from the object are the same size regardless of the size of the camera, and the image-size increases with the focal length. Therefore a larger camera will take in a greater field than a smaller camera equipped with the same lens. While using a field camera, however, the photographer has to be careful in fixing apertures. If the subject is appreciably large, the aperture should be kept at the minimum, because the distance between the nearest and the farthest points of sharp focus decreases as the focal length of the lens increases. Similarly the depth of the field increases as the aperture in the diaphragm decreases. In

cases of minimum aperture the lens must be focussed on the foreground viz., 5 metres from the camera on an average and not on the subject falling in the centre''¹.

The single-lens reflex 35 mm camera, though of course used by many archaeologists as the only camera because of the advantage over film packs or 12-exposure rolls and also interchangeable lenses and film packs allowing rapid shifting from colour to black-and-white, it can never be considered to be good for excavation photography on account of various reasons. Firstly, the negative is very small, which means that the finished photos must be adequately enlarged for best results. Secondly, the developing of 35 mm films requires great care. Lastly, but most important, is the great disadvantage of not having proper control over distortion. The use of 35 mm camera should, therefore, be restricted to preparation of slides and colour photography. The general views of the site also should be exposed on 120 size camera, instead of 35 mm.

The photographer must be prepared to maintain a good record of all the stages of excavation. In the first instance he has to take general views of the site and environment before the excavation is started. It should be followed by the picture of the general lay-out of the trench and taking of photographs regularly when the excavations are in progress. *If the entire history of excavation and cultural remains can be reconstructed with the help of photographs, the photographer who has made it possible will be considered as the best photographer.*

Besides the general views of the site before excavation, the job of a photographer includes the picture of structures, sections etc., preparing good negatives of small finds and making slides of all the above mentioned subjects.

It is considered necessary to discuss in the first instance the photography of the sections, structures, floors etc. Let it be emphasised at the very outset that the best results of such subjects can be achieved when they are exposed in uniform light. The entire area should be completely in shade. Some subjects can, of course, be exposed when the sunshine is spread uniformly over the entire area, but this should be restricted to the minimum, because the contrast of sun and shadow destroy the presentation of a good picture. Moreover, the details of any subject merge into each other in a bright sun light. The best time for taking photograph in the excavation field is in the morning before sun rise and in the evening after sun set or immediately before it. In both the lights the details of the subject are very sharp added further by the greater time exposure required to be given by the subdued light. The photographers generally do not mind taking photographs in the evening, but they are rarely prepared to take the photographs in the early hours of the day, particularly on account of two reasons. Firstly, the chilly weather in the early hours and secondly, the habit of late rising. When the Directors of the excavation are not very competent, the photographers find it very easy to avoid the taking of photograph in the early hours of the day. Though the photograph of the subject from a suitable angle can best be taken in the early hours of the day, because the same will be against light in the evening, the photographers taking advantage of the ignorance or inexperience of the Director change the angle

1. Alison Frantz, *Archaeology* (Arch. Inst. of America), Dec., 1950, p. 205.

of vision on their own and explain to the Director that the photograph can be taken in the evening as well with equally good results. The main cause of such an eventuality is the inexperience of the Director. These days the common practice of leaving everything to the photographer is rapidly gaining ground and the photographers are free to take advantage of it. The Directors or his immediate assistant do not care to peep through the ground glass and ascertain the requirements of the photograph. They do not care also to see the negatives after they are ready. They are simply satisfied with the statement of the photographer that the negative is of a good quality. The author has his own experience of observing one or two Directors who rejected the quality of the negatives twice or thrice forcing the photographer to repeat the exposure. This is possible only when the Director himself will have adequate experience of the subject. In earlier days taking of photographs in the early hours of the day was a regular feature. The author very well remembers Shri S.G. Tiwari, retired photographer of the Archaeological Survey of India, who used to rise very early in the morning chanting hymns and disturbing all others in the camp. In the beginning it was taken to be a regular nuisance, but the importance of it was realized later on when the author himself happened to direct certain excavations or act as the immediate assistant of the Director. These days the Directors or their assistants do not accompany the photographer.

(i) Photography of the Excavated Remains

The primary requirement in the photography of the excavated remains is the preparation of the subject. The preparation of the subject is a very painstaking job and needs great patience and skill. Good photographs can be expected only if the subject is nicely trimmed and prepared. In the preparation of a subject, the excavator and the photographer have to keep in mind certain basic requirements. The subject to be photographed should be most prominent and appear like coming out of a box. For this purpose the subject will have to be kept sufficiently in relief so as to catch the eye of the viewer immediately. Different planes of the subject must meet each other at right angles, for which the trowel, knife and edging tool may be used. Sharp cutting edges at right angles are very valuable in revealing the story of the subject in relation to stratigraphy. A neat and clean subject also impresses the spectator regarding the orderliness and accuracy of the work. If the top of a trench is covered in the subject to be photographed, the same also should be rendered spotlessly clean. The grass roots should be completely removed. A stray grass-root may be considered to be meaningless in a photograph but the same goes a long way in spoiling the presentation of the entire picture.

The picture of stratigraphic sections with the subject to be exposed is very important for the sake of accurate record keeping. There are many cases in which the layers are much more clearly visible in a photograph than to the naked eye. With this end in view the use of infra-red films may be resorted to for better results. In black-and-white photos the distinction of layers can be highlighted with the aid of different colour filters. The presentation of layers can also sometimes be emphasised by careful spraying or by additional smoothening or even deliberate roughening, though of course, these methods should be resorted to only when others fail to bring out the desired result. In a tropical country like India where the sun is very bright, the method of damping sometimes becomes necessary to distinguish the colour of the layers.

For the identification of layers in the photograph, the standard and method used are deteriorating at a very fast speed. In order to emphasise the stratification, the excavators are resorting to marking the layers with a very deep line. This should never be done. If at all it is necessary, the lines should be very smooth, otherwise the picture is spoiled by the jugglery of lines. The attention is caught by the lines and not the main subject. The pits also should not be indicated by a sharp and deep line. The surface of the pit, particularly at the outlines, should simply be lowered a little, bringing the regular layers in relief. There is no harm if the marking of layers are avoided in the photograph, particularly when the distinction of colour and composition is clear enough. If it is not so, the layers can be indicated with the help of labels placed vertically in the photograph. The labels distinguishing the successive layers are a must in the photograph, but they need not be obtrusively large. Some of the excavators try to emphasise the number of layers by writing big numbers on the labels. This is not necessary and should always be avoided.

Any archaeological photograph must have a scale. The scale can be in the form of a large round rod, properly graduated, or a small flat scale type piece of wood properly painted and marked. The large round rod is meant for larger subjects and the latter one for smaller subjects. The larger rod can be of two sizes viz. one metre and two metres, the half of the latter should indicate one metre and the rest divided in twentyfive centimetres each. The other rod of one metre should be divided into 50 cms and the rest marked at every 10 cms. The smaller scale should be of 50 cms and divided by two plain markings of ten centimetres each and the rest 5 cms marked with division at every centimetre. A set of other scales of metal is required for taking the photograph of the antiquities. The scale in case of photographs of the excavated trench should always be placed at an insignificant place. It should never be placed in the foreground attracting the immediate attention of the viewer. The scale should normally be parallel to the sides of the negative. If the camera is tilted the scale will also have to be tilted accordingly. The scale will spoil the picture completely, if it is not parallel either to the vertical or horizontal side of the plate. The scale should always be neatly painted without any spot. It should be reserved for photography work. The placing of the scale should always be on the same plane of the excavated remains, of which the photograph is being exposed. The scale should never be more prominent than the subject. In certain cases, particularly large subjects, human scale is also used. While using the human scale, the person concerned should not be conscious of photograph and act just like an accessory. Care has to be taken that the human scale does not occupy a disproportionately large area of the picture. The person concerned should not look to the camera but act like a dead mass of flesh and bones. Even if the subjects are not large enough, there are cases in which the use of the human scale is essential. Certain important features of a subject may not be very clear e.g. a particular type of floor to which the excavator desires to draw particular attention. In such cases the man sitting on one side of the floor can very well draw attention by means of a brush held in hand.

While preparing the subject, the excavator and the photographer have to bear in mind certain other guidelines. In case of burnt-brick structures, the mortar at the joints should be removed adequately, so as to bring the burnt-brick in full relief. Each and every burnt-brick should be distinctly clear, so as to enable anyone to measure the

size of the bricks. The burnt-bricks should be rubbed thoroughly with the help of smooth wire brush before the photograph is taken. The foundation trench of the structure should be made very clear in association with the layers and working level. The preparation of the subject in case of drains is a little more difficult. The relief of the bricks on either side must be fully brought out, so as to expose the bed of the drain. If the drain happens to be very deep, the effect can be produced by suitable light and shade. In case of drains discharging into huge vases, the top of the interior of the vessel should be shown in a little depression allowing the edges i.e. rim to come out prominently besides indicating the flow of the discharged refuse water. Though Wheeler recommended in the case of mud-brick structures to keep the mortar portion in relief and the brick itself in depression but, it is not always practicable. Mud-bricks in a large number of cases are very hard, whereas the mortar is softer. Hence, it is a herculean job to keep the mortar portion in relief, particularly because the same is not very thick and the edges are not uniform. The use of the uniform method of keeping the bricks in relief and mortar in depression is, therefore, much more desirable. The edges below and at the sides of a structure, whether burnt-brick or mud-brick, should be under-cut slightly so as to indicate clearly the thickness and width of the structure both in section and plan.

The archaeologists find it a tedious job to bring out the outline of a post-hole. Generally they avoid the pains of preparing the subject carefully and showing the post-holes on plan. The post-holes are shown by removing the deposits in them thereby presenting the picture of big holes. This is not justified, because by this means post-holes can be shown anywhere according to the desires of the excavator. The excavator should, therefore, prepare the post-hole carefully on plan, before the same is photographed. The ground level should be carefully cleaned and brushed to bring out the distinction of the deposit in the post-hole. If all efforts fail to bring out the distinction of the deposit of the post-hole by means of brushing and cleaning, there is no harm in spraying earth of a different texture around the post-hole. The post-hole should in no case be tampered with. The author recollects one instance very well in which the Director, a well known archaeologist, poured water over the remains of the post-hole to bring out the desired result. The picture was completely spoiled and the cooking could be caught by any layman. The author was ultimately requested to come to his rescue and a good photograph on the lines of the method indicated above was exposed. During the course of the expedition to Nubia (Egypt) as well, a good photograph of the post-hole was a great problem because of the projecting bed-rocks. When the photographer failed to bring out the desired result even after several attempts, the author came to his rescue by removing the bed rocks and spraying the area around the post-holes with the murrum-like earth collected during the course of the removal of the bed rock. In the case of wells the picture will be much better and impressive if a man is shown drawing water from the well. The showing of a man drawing water from the well should, however, be avoided if the same covers up and distorts the main subject. Roads and pathways are generally encountered in the lay-out of the cities and towns. While taking a photograph of such subjects it would always be desirable to incorporate some vehicle on them. The vehicle, should not, however, be a modern one. A bullock-cart which was in use in ancient times and is prevalent even to-day will be much more preferable and suitable.

So far as the use of filters in the field is concerned, it is considered better to quote Wheeler. He said, "With panchromatic plates or films a colour filter is not usually necessary. To emphasise reds and blacks, however, and to eliminate greens and yellows, a green filter may be used with these plates; whilst a yellow filter will produce tone-values more nearly approximating to those observed by the naked eye. The red filter will lighten all reds and yellows, darken all green and blues (e.g. in the sky, thus emphasising clouds), and will separate red from black. Variations of exposures for panchromatic plates are as follows. With a green filter, an exposure six times as long as normal. With a red filter, an exposure four times as long as normal.

"Orthochromatic or yellow-sensitive plates are not used with a red filter. The yellow filter with these plates will lighten yellow up to light orange and will darken all blues. The variant exposures are as follows. With a green filter, an exposure nine times as long as normal. With a yellow filter, an exposure five times as long as normal"¹.

The above mentioned hard and fast rules are meant only for a fresh and amateur photographer and general knowledge of the Director of the excavation. An experienced photographer has his own ingenuities to bring out best results without caring to go through the laid down rules in any book. He develops his own methods and techniques based on his personal experience.

It has already been stated that the general views of the ancient site should be taken from all angles before the excavations are started. The process should be repeated every now and then when the excavation work is in progress. At the close of the excavation the general views should again be taken incorporating as many structures and evidences as possible in one plate. The necessity of a tower is generally felt at that time. A tower can be easily prepared by purchasing good quality bamboos and wooden planks from the nearest market.

(ii) Photography of the Antiquities

There is an appreciable difference between the photography of excavated remains and sites and that of the antiquities. In the former case natural light is used, whereas in the latter artificial light. The artificial light is generally thrown from the top left, but it has to be varied in case of necessities, particularly while exposing photographs of important designs or inscriptions for which some other angle might be suitable. While taking photograph of the antiquities the photographer has to be careful enough to see that the distortion is minimum. The distortion of the picture can be avoided by keeping the antiquities closer to the camera as far as possible. If several antiquities are being exposed on one plate, it is necessary that all of them are brought on one and the same plane with the help of plasticine. Metal scale of appropriate size is to be placed below the antiquities. As a background for placing the antiquities a black velvet cloth is always suitable but for the cases where the colour of the antiquities is also black. For black and dark objects, a sheet of glass placed 10 to 15 cms above a sheet of light-coloured paper may be used. The use of black velvet background can, however, never be avoided in the

¹. Sir Mortimer Wheeler, *Archaeology from the earth*, London 1954, p. 176.

photographs of coins in which both obverse and reverse sides are to be exposed on the same plate by turning over the object.

The use of a tripod is again essential at the time of exposing the antiquities. The camera should always be placed above the antiquities to be photographed. Taking views from the front will never produce the desired result. In order to give proper emphasis to various parts of the antiquities to be photographed, a proportion of reflected light with the help of tin-sheet or tin-foil pasted on a hard board should be used. In a fully equipped dark room, however, artificial lights according to necessity may be used from all angles desired.

So far as the time-exposures are concerned, the ingenuity of the photographer plays a vital role. The exposure metre may be used, but experienced photographers have their own calculation. In the field, however, the author has experienced that the best results are produced by the time-exposure which is a step more than that indicated by the exposure meter. This must be on account of the fact that though the time lapse between the exposure metre reading and exposure is very short, the light in the evening fades out very quickly. In addition it must be noted that if the exposure is a little more, the same can be reduced with the help of chemicals, but if the subject is under-exposed there is no remedy. The same principle is applied in the photograph of deep trenches. The exposure required for the darkest part should be given and the rest of the subject can be reduced after developing with the help of chemicals. The films must be exposed on the same day and results shown to the Director. The subject of which the photograph has been taken can be destroyed only after the Director is satisfied regarding the desired result of the negative. If necessary, the photograph can be repeated.

Taking photographs and producing best results are no doubt very important jobs of the photographer, but the maintenance of proper record of all the negatives is no less important, rather more important. Each and every negative should be numbered with date of exposure and brief details of the subject recorded on the envelop in which the negative is kept. A register incorporating the negative number followed by the brief details should also be maintained. An album containing one print each of all the negatives must also be prepared for allowing any one to select photographs needed by him. The selection of suitable paper for preparing print of the negatives depends upon the ingenuity of the photographer and need not be discussed here.

Preparation of slides should be done on selective basis both of the excavated remains as well as of antiquities for delivering lectures. For lantern-slides colour rolls of 35 mm are used as a general rule. Colour rolls of both types i.e. to be used in bright sun as well as in artificial light may, therefore, be purchased. Since colour rolls are very costly, the use of them should be restricted to the minimum.

CHAPTER VI

EXPLORATION

Excavation is always undertaken with a specific end in view to solve any existing problem or to corroborate the conclusions already drawn on the basis of ancient remains. In order to achieve the goal, the archaeologist is not free to strike the spade at any ancient site with which he comes across. For the purpose he has to formulate a scientific plan of exploration to select the best site, which is likely to fulfil his aims and objects. The primary job of an archaeologist, therefore, is to initiate a research programme on any problem, which can be resolved by the occupational remains and analysis of the data recovered from a particular type of sites. Before undertaking such a project, the archaeologist is required to possess adequate understanding of the ancient cultures, their approximate distribution and time. In the absence of proper understanding, the project can never be expected to lead to the desired success.

Once the problem is fully understood, the immediate next step in the cultural study of the past lies naturally in searching a particular type of site or sites in a particular area. This is called exploration in which the groundwork of undertaking excavation at a particular site is prepared. Hence, Exploration should never be undertaken in a haphazard manner, but should be based on the most scientific lines.

Exploration, like Excavation, it must be emphatically said, can never be learnt simply by reading, though the same is generally presumed by all drawing-room scholars, who have developed archaeology as a hobby. The field work involved in Exploration and Excavation can be learnt only by toiling and doing actual work in the field. The basic and fundamental necessity for both the above mentioned works is a trained and experienced Director. The layman or an amateur archaeologist has already damaged or totally destroyed a large number of sites in the past and such privilege, therefore, has to be stopped completely. Sites can never be replaced once they are destroyed and hence, it is better to allow the precious remains to continue to remain buried, rather than destroying them at the hands of amateur or arm-chair archaeologists.

Field exploration on scientific lines provides the answer to the fundamental question, "Where to dig". The ancient sites are never buried completely as is generally supposed by laymen. It is believed, though wrongly, by almost all who do not know the subject that the archaeologists are a lucky guesser. They can never imagine that the work of an archaeologist, like any other scientist, is based on a vast collection of data and information. The search for specific kinds of data is grounded in problem-oriented

research. Hunches do sometimes play a part, but their role is insignificant and negligible. In fact a large number of sites have come to light only because one archaeologist or the other went out in search of them. According to Laming-Emperaire at least 70 percent of the known sites in the world have been found in site surveys while only 25 percent were accidentally discovered.¹

The primary problem for the archaeologist, therefore, is how to locate the sites before undertaking any decision to dig. The study of the surface collection will resolve this initial problem. The best time for undertaking exploration is the period immediately following the monsoons. During monsoons the splashes of downpour erode and wash away the mud accumulated at the ancient site and bring out the buried antiquities to the surface. A comparative study of these antiquities will be very valuable in taking a decision of digging at a particular site. Explorations are sometimes undertaken simply to decide the distribution of a particular set of antiquities or culture or civilization. Again it must be reiterated that, an adequate knowledge of the ancient cultures and the associated antiquities is a fundamental necessity. The explorer cannot come back from the field everyday to consult a knowledgeable person.

The scheme or project of any exploration is finally undertaken after the groundwork is fully prepared at home. In the preparation of groundwork the aid of various agencies can be taken. In the first instance the results of any prior exploration or excavation need a first hand study in the library. This work should be followed by the study of the information on unpublished reports, maps, field notes, etc., which may be available. The study of the Survey of India maps (Survey sheets) is the next step. A great deal of information is often available in old newspapers, account of personal itineraries by various explorers, missionaries, early surveyors, sailors, crusaders, etc. Detailed and first hand study of the antiquities displayed in various museums will also be very valuable. Certain important sites were discovered by the study of the myths, legends and other miscellaneous literature. One of the greatest discovery, as a sequel to such study, is the great mound of Hissarlik - reputedly Homer's Troy - by Schliemann, who was simply well acquainted with the classical literatures of the area. He was in search of a site, which was similar to that described by Homer and was successful in discovering the site. The explorers in early days were surprised to observe the accuracy of geographical details furnished in ancient texts. In the job of exploration collection of information by personal contacts is generally very valuable. There are amateur archaeologists or historical societies in many areas. They feel proud in extending necessary information at their hands, because of the work being launched in their area. Local farmers, village headman etc., are also sometimes in a position to provide good data. The work of the archaeologists in equipping themselves with adequate data in advance is based primarily on the understanding that the locations of past human occupations are never randomly or haphazardly distributed. A particular set of human beings had their own reasons to select a particular area or type of land for their settlement. Each and every culture need not have the liking for one and

¹. Laming - Emperaire, A. *L'Archéologie préhistorique* Paris : Editions du Seuil 1963, p. 80.

the same type of environment. It varied from culture to culture depending on the basic necessities.

Aerial Survey is also of a great aid in locating particular sites in particular area, but since it is very costly, it is generally not undertaken in a country like India.

After the decision on the project or problem to be solved is finalized the constituents of the team are to be selected carefully. Professional skill in exploration, while selecting the members of the team, is not of such a great importance as their nature and temperament. All the members of the team must have the quality of maintaining a good and congenial atmosphere in the work. Very well-known is the precept that a dirty fish spoils the whole tank. An exploration team should have a Director, his immediate assistant, a surveyor and a photographer.

The kit of the exploration team is very simple. Two pick axes, a pair of excavation knives, a binocular, one 120 size camera (preferably Rolleiflex) and a few pottery bags. Of all, the most important equipment is the survey map which must be carried by the team. It is always better to carry one inch to a mile survey sheets. The sheets on such a scale are very helpful in easy and smooth movement of the team without being led astray. Camp equipments are needed, when any exploration is planned on a large scale. In such circumstances the camp is set up at a central place, wherefrom the team in groups can move in radial directions or in directions suited to the aim of the work.

Of late, village to village exploration scheme has been initiated by various institutions. Village to village exploration of any particular district has not proved to be a very happy and successful planning. Solution of any problem cannot be chained with the boundaries of a district of a particular state. It will be possible in a particular area, which has no connection with the boundaries of a state or district whatsoever.

The primary business of the Director of the exploration team is to prepare the specific lines of his aim. When the problem is crystal clear in his mind, he has to tap the area where the problem is expected to be solved. In order to solve the problem, the Director of the team need not move from village to village of a particular district or state. Water has always been the primary necessity of man and as such all important occupations in the past are generally located on the bank of a river or very near it. The Director of the team should, therefore, concentrate in the first instance on the river valleys, where the distribution of a particular culture, the problem of which he has in his mind, is expected. Priority should be given to the main river valley followed by the tributaries. If not much time is needed to explore the adjoining areas of various tributaries near the confluence, the same should be completed simultaneously. The land around the confluence of rivers acted as a nuclear area for the occupation by man in the past. For the purpose of agriculture the land happened to be most suitable.

During the course of exploration the Director and the accompanying team must be aware that the rivers are always subject to regular or frequent change of their courses. There are certain instances, where the old channel or bed of the river is several kilometres away from the current course. It is, therefore, necessary that at least

five to six kilometres of the area on both the sides of the current course of the river is thoroughly explored lest any important evidence is missed. In ancient texts the ancient site of Hastinapur is said to have been located on the bank of the river Ganges, but at present the course is several kilometres away. Evidence of complete wiping of the occupation by turbulent floods in the Ganges has also been encountered in the excavations. Besides the change in the courses of the river, there are a number of cases in which the bed of the river has dried up completely e.g. Saraswati and Drishadvati, in Rajasthan. A large number of sites representing Sothi Culture, Harappa Culture, Painted Grey Ware Culture and Early Historical Culture have been brought to light on both the banks of the dried up bed during the course of an extensive exploration.

The course of the bed of the river in ancient times is indicated by the deposit of pebbles, gravel, sand and silt. Such deposit in a regular manner need close observation. The close observation of gravel, silt and sand has not only led to the discovery of Proto-historic and Early Historical sites, but to Stone Age sites as well. When any river, particularly near the mountain ranges, is in turbulent floods, the bed is cut deeper in addition to the spreading of the flood water on both sides of the bank. After the flood recedes, the water spread on both sides of the river dries up, but it continues to flow in the deeper course cut during the times of flood. The land on both sides of the river wherefrom the water dried up can be observed in the shape of a step, which is popularly known in archaeology as a terrace. The number of the formation of terraces is not restricted to one or two. The formation, being a result of floods, always depends on the number of floods and their capacity to cut the bed of the river deeper. When exploration of Stone Age sites is undertaken, the deposition of pebbles and boulders is also to be observed in addition to those of gravel, silt and sand. The deposition of the pebbles, boulders, silt and sand, which constitute the formation of a terrace is in a particular sequence. When the floods recede, the river starts depositing the materials carried by it. The heaviest material i.e. pebbles and boulders are deposited at the bottom followed by the deposition of less heavier materials like gravel, then silt and then sand. Instances are also there when this sequence is disturbed by foreign intervening deposit. The deposition of such foreign agencies out of context is on account of redeposition by the river in a subsequent flood at a later time.

During the course of exploration of Stone Age sites, certain other fundamentals are also to be borne in mind. The Man in Stone Age times was completely dependent on Nature and his source of subsistence was only hunting. He used to kill wild animals with the help of stone tools and maintain himself with the flesh of those animals. The process of hunting was always at the risk of his own life. Hence, Man made every effort to keep certain area free from danger and meant for escape. The essentials for the location of Stone Age sites are, therefore, deposition of boulders, gravel, sand and silt, area of forest with an adjoining open land meant for escape or rock-cut shelters.

The daily necessities of Man followed by his observation of the Nature led him gradually to a settled life. The primary necessity for a settled life was permanent source of subsistence which could be possible only by agriculture and secure shelter. For the purpose of agriculture the availability of fertile land was essential. During Neolithic times agriculture was introduced and a pattern of settled economy was initiated.

Hence, all ancient sites belonging to the Neolithic and following Periods also must be explored on the banks of a river, where adequate fertile land for agriculture is available. There need not be traces of regular construction of houses, because the Man in Neolithic times lived in pits cut into the natural soil as well instead of erecting any structure for residential purposes. The best example of this type in India is the Neolithic site of Burzahom in Kashmir. In later times structures of mud, stone, mud-brick and burnt-brick were raised.

When the rivers are sluggish and the floods also are not very turbulent, there need not be any formation of terrace. The flood waters will simply be spread on both sides of the river as a result of which there will be deposition of gravel, silt and sand. Ancient sites, particularly Stone Age, must be searched in such areas as well even if the deposits are several kilometres away from the present bank of the river.

It is a matter of great regret that the Prehistorians working in India have not so far arrived at a general consensus regarding occurrence of various types of tools in different parts of the country and their succession. Of course Stone Age studies have been undertaken systematically in various regions of India, no attempt has so far been made to co-ordinate the results of all exploration and prepare a ground work of Stone Age studies in India as has been done in the case of Protohistoric and the succeeding cultures. In such circumstances, any explorer will have to depend on the work done earlier in a particular region by his predecessors. If he is very keen to establish the relationship and sequence of cultures in two adjoining regions, he will have to undertake a thorough study of the work already done in both the regions. In 1898 R.B. Foote undertook the study of the natural sections along the river Sabarmati in Gujarat and the author is of the opinion that the same still holds the ground. The study of Foote was supplemented by F.E. Zenner when he discussed in 1950 the associated problems related to climate and chronology.

The work of De Terra and T.T. Paterson in Kashmir (Sohan Valley) in 1939 can very well be called as a great landmark in the study of Stone Age sites in India. He prepared a framework of the stratigraphical sequence of Stone Age tools in relation to the terraces formed by the river. The framework drawn by De Terra and Paterson has not so far been challenged by the Prehistorians and any study of Kashmir or the adjoining region is still based on the same conclusions. R.V. Joshi, S.N. Rajaguru, R.S. Pappu and others worked further and studied the Stone Age sites of Liddar Valley in Kashmir in 1975. L.A. Cammiade and M.C. Burkitt did a commendable work in studying the sequence of Stone Age tools in Andhra Pradesh in 1930. The same type of study was undertaken near Bombay by K.R.U. Todd in 1939. The conclusions arrived at by them provided a very good basis for undertaking further studies in the regions. The work of R.V. Joshi in studying the succession of the Acheulian type of Stone Age tools in Central India in 1964 is one of its own kind. The exemplary character of the work is on account of the study of the sequence of Stone Age tools on the basis of excavated material. G.R. Sharma's work in the year 1973 on the banks of the Ganges in the Vindhya has yielded admirable tools and fossils, but their succession and chronological horizon in relation to other cultures needs a scientific and analytical study by the experts in the field of Prehistory. N.K. Bose undertook the study of Stone Age sites

in Orissa, particularly Mayurbhanj, in 1958 which was followed by G.C. Mohapatra in 1962. H.D. Sankalia, V.N. Misra and other scholars of the Deccan College Post Graduate and Research Institute have done pioneering work in Maharashtra, Gujarat and Rajasthan. The Stone Age industries yielded by the excavations at Nevasa in Maharashtra have been systematically and scientifically analysed by the scholars in the Institute. B.B. Lal explored the river valleys of Beas and Banganga in Kangra and brought to light a number of terraces which yielded a variety of Stone tools.

The general belief of the scholars that the hand-axe and cleaver complex of Stone Age tools are confined to South India and the Chopper-chopping complex is represented in the North only, particularly in the areas very close to the Himalayas is not always correct. The conception, so developed, is based on the conclusions drawn by De Terra and Paterson after their work in Kashmir, which cannot be considered to be correct. In his conclusions, no doubt, the above mentioned scholars have taken the liberty of drawing such conclusions, a careful and detailed study of their report on the work will reveal that cleavers and hand-axes were found even in that region, though in a restricted quantity. Now it is high time that the scholars shed old beliefs and start working on new lines deriving the correct conclusions based on the tools found during the course of exploration or excavation. Further, the Prehistorians should now attach more importance on the study of Stone Age in the country as a whole which will reveal the impact of one culture over the other, if there was any. In such studies the correct picture of the relationship between Glacial, Interglacial and Pluvial, Interpluvial in the North and South respectively can also be drawn.

The study of Stone Age needs a basic knowledge at least of Geology, Geography and Environmental Science. The reports of the Prehistorians should no longer be a simple description of tool types and the terraces which yielded them. In an age when Science has advanced so much, the Prehistorians or so to say the Archaeologists should not remain contented with the description of tool types. Greater emphasis has to be laid on the environmental condition in which the Man lived, the determination of the race with the help of fossils, the gradual development of Man, the climatic condition and so on and so forth.

The determination of the age of various types of tools and fossils will always remain the primary concern of the archaeologists. It is a matter of great regret that archaeologists have not yet started making specific distinction between time and space. The same type of tools need not be of the same age in different parts of the country. The requirement and development of a particular type of tool are closely related to the environmental and climatic conditions of the region. The pace of development in a particular region may be far more faster than the other on account of congenial and favourable environmental and climatic conditions. The technique of manufacturing the tools may be one and the same, but if they are described only by the name of the technique, a layman or even amateur scholars will logically be led to believe that the tools belong to the same age. The author, therefore, is of the opinion that the tool types may be named after a particular technique, but they should also be distinguished by complimenting it with the region in which they are found in addition to the age. These details will remove any type of misconception in the mind of layman or amateur

scholars. Comparative study in international contexts should also be based on the above-mentioned determining factors. Subba Rao has in a very brilliant manner divided the physical environment of the country into three categories viz. (1) Areas of Attraction (2) Areas of Relative Isolation and (3) Areas of Isolation¹. This division explains very well the different stages of cultural development, which are observed in different parts of the country at one and the same time. Remains of Man at every stage of development from long established cities back to virtually independent group of hunters, living within a relatively short distance, have been reported from time to time. Certain regions have advanced far more rapidly than others, and the more backward often preserve many features, which elsewhere belong to a distant past.

The framework of the Proto-historic Period in India is much more clear. A time table of the Proto-historic cultures encountered in various parts of the country has been worked out on the basis of the occupational remains. In the north-west the Indus basin has become famous in the world for nourishing one of the largest of its three well known ancient civilizations. In the beginning the civilization was named after the main river as Indus Valley Civilization, but subsequently the archaeologists preferred to label any culture after the site, where it was first discovered. Hence, the Civilization is popularly known as Harappa Culture after the site of Harappa, where it came to light for the first time. For a considerably long time it was believed that the horizon of this advanced culture was confined to the limits of river Indus and its tributaries, which became a territory of Pakistan after partition. Exploration during the last two decades, however, by the Indian archaeologists have brought to light a large number of sites in Indian territory, where the well-known Harappa Culture is represented. With the discovery of new sites, it has now been established that the limits of the culture extended in all directions. In the east it spread upto Uttar Pradesh through Punjab and Haryana; in the south as far as Gujarat, Kathiawad, Kutch and northern parts of Maharashtra; and north-western Rajasthan in the south-east. Some of the important sites discovered within this horizon, are Alamgirpur in District Meerut of Uttar Pradesh, Rupar in District Ambala of Punjab; Lothal in District Ahmadabad and Rojdi in District Rajkot of Gujarat and Kathiawad, Surkotada and Desalpur in Kutch, Kalibangan in District Ganganagar of Rajasthan and Daimabad in District Dhulia of Maharashtra. Of late, the Indian archaeologists have brought to light Harappan elements in Jammu and Kashmir as well.

The general belief carried by the archaeologists earlier that the Harappan Culture is devoid of any genesis or decay has now been completely dispelled after the discovery of the Pre-Harappan remains at Kalibangan. The distinguishing characteristics of the Pre-Harappan Culture were no doubt observed earlier also during the course of exploration in Rajasthan, but all the time they were believed to represent a late Harappa Culture. The belief of abrupt end of the Culture has also now lost the ground after the excavation works at Lothal, Rangpur, Surkotada, Bhagatrav, Daimabad, etc. There was a general transformation of a declining nature leading ultimately to natural death. Recently explorations on a large scale have been undertaken in Haryana and Punjab and a large number of late-Harappan remains have been reported.

1. B. Subbarao, *Personality of India*, Baroda, 1958, p. 12.

The main aim of any exploration should always be to extend the horizon of any culture. Any exploration will be considered to be of greatest importance if the same leads to the extension of the horizon. The horizon of the Harappa Culture has already been outlined above.

A later contemporary of Harappa Culture is the Ahar or Banas Culture which spread mainly in South-eastern Rajasthan, sheltered by the Aravallis and watered by Banas and its tributaries. This Culture was first brought to light by R.C. Agrawala at the site of Ahar near Udaipur railway station in Rajasthan on the left bank of river Ahar in the year 1954-55. The age of the Culture was not, however, correctly assessed at that time. The most characteristic feature of this Culture is a typical pottery known as the painted Black-and-Red or Black-and-Cream Ware. Though the nuclear region of this culture was South-eastern Rajasthan comprising the Districts of Udaipur, Chitorgarh and Bhilwara, it also extended upto Nagda located on river Chambal in District Ujjain of Madhya Pradesh in the north-east and Navdatoli on Narmada in the south. Kayatha on river Kali Sindh in District Ujjain and Eran on river Bina in Sagar District, both in Madhya Pradesh, are the other sites with similar characteristics.

Though the limits of the painted Black-and-Red Ware Culture of South-eastern Rajasthan have been carefully worked out by the author after extensive exploration, the work need not be considered as complete. Further exploration may enable the archaeologists to broaden the horizon and limits of the Culture. Exploration need not always be undertaken with the primary aim of extending the horizon. Intensive exploration will also bring to light the relationship and impact of one particular culture with the other.

Almost contemporary to the cultures described above, we have the recently discovered Neolithic-Chalcolithic Cultures of Eastern India, which flourished in the eastern Gangetic basin. The discovery of a Neolithic Culture at Koldihwa in District Allahabad (U.P.), and Chirand in District Saran of Bihar is outstanding, on account of many new features occurring together. Such a large variety of bone tools, polished stone axes, pottery, beads, terracottas and other antiquities have not so far been reported from any other Neolithic site in India. Another interesting feature at both the sites is the superimposition of the Chalcolithic Culture over the Neolithic. This Chalcolithic Culture was also reported from Pandu-Rajar-Dhibi in Burdwan District of West Bengal.

It is rather very unfortunate that the archaeologists have not paid adequate attention to the archaeological remains in Gangetic basin, though the same has been eulogised in the ancient literature of India. Extensive exploration in the Gangetic basin is now the greatest call for the archaeologists to bring to light many more sites like Koldihwa and Chirand. Sites like Koldihwa and Chirand will be of great importance in throwing light on a particular stage of cultural development of Man. It is not yet clear from the excavations undertaken at both the places, if hunting and agriculture simultaneously continued to be the source of subsistence or in the earlier stages the source of subsistence was restricted only to hunting and agriculture was introduced

only subsequently. This is a very important problem in the archaeology of India and no time should be lost now to study and solve it.

In the Proto-historic period, the western Gangetic and Yamuna basins (Punjab, Haryana and Uttar Pradesh) and the north-western Rajasthan were occupied by a Culture known as the 'Painted Grey Ware Culture'. The Culture owes its name to a well-defined pottery, light grey in colour, painted in black designs. Further exploration can now be undertaken to extend the horizon of the Culture and also to study its relationship with other cultures.

The Neolithic-Chalcolithic Cultures of river Tapti and its affluents and upper reaches of Krishna and Godavari have brought to light another set of sites not very much different from Malwa. The Chalcolithic people found the dry-deciduous areas of Central Deccan with black cotton soil and granatoid hills with basalt and dolerite dykes to be very suitable for practising primitive agriculture and pasturage. Amongst the important sites representing the Chalcolithic Culture of this region, mention may be made of Prakash in District Dhulia, Bahal and Tekwada in District Jalgaon and Daimabad in District Ahmadnagar and Inamgaon in District Pune, all in Maharashtra. This Culture spread widely to the south and occupied Mysore plateau and upper course of river Krishna excluding the coastal region of Eastern Ghats. All the sites representing this Culture have yielded a painted black-on-red and black-and-red wares along with the microlithic blade of the crested guiding ridge facies in association with copper. The Chalcolithic Culture represented in the region is very interesting to study the inter-relationship with and development of Megalithic Culture of South India. Tekwada opposite Bahal is the most important site in this respect, because we come across both the Chalcolithic Culture as well as Megaliths at one and the same place. It must, however, be made clear that iron, a very important cultural constituent of Megalithic Culture in South India, is conspicuous by its absence at Tekwada.

Starting with a Neolithic background, we have in the extreme south of India, the Megalithic Culture with its characteristic burials and iron implements. The Gneissic and Metamorphic areas of Central Deccan watered by the lower Krishna and Godavari rivers were found by the Neolithic communities to be very favourable for their settlements. The most striking feature in the Neolithic occupation of the area is the occurrence of grey ware, black-on-red painted pottery, almost similar to that found at the Chalcolithic sites of Tapti-Purna valleys, painted pieces of the black-and-red ware and a microlithic blade industry. The Neolithic communities were succeeded by the Megalithic people, when the Black-and-Red Ware developed into a predominant ceramic industry along with iron. The Megalithic people have been characterized by a burial complex varying from simple pit and urn to the most elaborate cists and circles with orthostats and clinostats. A new type of Megaliths labelled as 'Passage Graves' has been brought to light by A. Sundara recently. Its distribution is said to be confined to Karnataka State.

Digressing from the serial order, in a way rather reversing it, the attention of the readers are drawn to the ceramic Ochre-coloured ware. For the first time it was reported from the ancient site of Hastinapur in District Meerut of Uttar Pradesh. The ceramic

occurred in a stratigraphical context below the occupations of Painted Grey Ware people with a break in between. It was dated to a period earlier than 1100 B.C. In the decade following the discovery of the ceramic at Hastinapur, it was observed from many more sites in Uttar Pradesh, Haryana and Punjab. Certain shapes occurring in the Ochre-coloured Ware were found to be similar to those in late-Harappan pottery and as such it was believed by some scholars that the Ochre-coloured Ware was nothing but a late-Harappan Ware. A seminar on the Ochre-coloured and late-Harappan Wares was also organised at Kurukshetra, but it was not possible to arrive at a general consensus. There is yet another set of scholars who believe that the Ochre-coloured Ware is the pottery of the people who were the authors of the Copper-Hoard Culture. This view was developed after Ochre-coloured Ware was noticed at certain sites very close to the spots which yielded copper objects supposed to represent a distinct Copper-Hoard Culture. Excavation at the ancient site of Saipeh in Etawah District of Uttar Pradesh was undertaken to establish the association. The excavation, however, did not lead to any positive conclusion. The greatest problem is that Copper-Hoards are stray finds and have not so far been reported from any stratigraphical context representing other traits of the culture. The same was the case at Saipeh. Recently copper objects, believed to represent the Copper-Hoard Culture, have come to light from two sites in West Bengal. If the copper objects found in West Bengal are also taken to represent the Copper-Hoard Culture, the general belief that the Ochre-coloured Ware is one of the traits of that Culture loses ground completely, since the distribution of Ochre-coloured Ware is restricted to the north-western parts of India. The slip from the surface of the Ochre-coloured Ware is generally observed to have been washed away on account of water-logging conditions. Taking the water-logging conditions to be a result of floods scholars are attempting to associate it with Manu's flood described in ancient literature. The study, however, is still in a stage of infancy.

In the beginning the occupations of the Painted Grey Ware Culture were always observed to be superimposed on the Harappa Culture with a clear-cut break in between e.g. at Rupar and Alamgirpur. There being no cultural connection between the two was also corroborated by the large scale exploration in Rajasthan during the course of which the occupations of the Harappa Culture and that of the Painted Grey Ware Culture were always noticed on the opposite banks of the river, instead of being on one and the same bank, one superimposed by the other. The location of the sites representing the cultures of Harappa and the Painted Grey Ware readily leads to the conclusion that the latter never liked to settle down on the sites, which were under the occupation of Harappans in Rajasthan. In the closing years of the last decade archaeologists have been making vigorous efforts to bridge the gulf between the two by undertaking exploration in Haryana and Punjab. During the course of excavation at Bhagwanpura in District Kurukshetra of Haryana the occupations of both the cultures have been found to overlap with each other. Further work on a planned basis, however, is necessary to draw the authentic framework or time-table of the two cultures.

Of late, the scholars have undertaken the work of authenticating the sites and their description given in the ancient literature with the archaeological remains. The attempt in this direction was initiated at Hastinapur, one of the most important site described in Mahabharata, by B.B. Lal. The same scholar has now undertaken a

massive scheme to illustrate the truth of the story furnished in Ramayana. How far he will be successful in his attempts is yet to be seen. It must, however, be emphasised without the least hesitation that a thorough understanding of both the ancient literature and the archaeological remains is a primary necessity. Besides such understanding, extensive exploration followed by intensive excavation will certainly lead to positive results. For the present we need not be too much carried away by the dates of the epics decided by the Indologists.

Now let us turn to the Early Historical Period. It is indeed very sad that a group of archaeologists do not consider the Early Historical Period to be within the scope of the study of archaeology. This cannot be justified. There are many missing links in the Early Historical Period and they can be filled in only by archaeological excavations. There are a large number of sites mentioned in Early Historical texts, which are still unlocated. The archaeologists are not in a position to identify even those sites which received the corporeal relics of Lord Buddha after his cremation at Kusinara. There are a number of other places mentioned in Buddhist texts which continue to be lost in oblivion. Pawa, the capital of the Mallas, where Lord Mahavira died is also unknown to the archaeologists and historians. All these sites can be identified only by undertaking large scale and planned exploration followed by excavation. The distance and direction of particular unknown site from any other known site are furnished in the historical texts. If the direction is mentioned as South-West the best course would be to explore all the villages both on the south as well as west falling within the distance recorded. This is essential, because the direction must not have been indicated with the help of prismatic compass. Identifying the Buddhist sites on the basis of the travel documents of the Chinese pilgrims is one of the most challenging job before the archaeologists.

The problems for undertaking exploration, as mentioned above, cannot be treated to be exhaustive. They have been described in a general manner simply to present a glimpse into the existing problems in Indian Archaeology. A detailed analysis and description of them will itself require another one volume at least.

CHAPTER VII

DATING

Archaeology made its beginning as nothing more than collection of curios and treasure-hunting. Romantic treasure-seeking and antiquity-hunting as the natural instincts behind the aims of Archaeology did not, however, continue for a long time. Towards the end of eighteenth and beginning of nineteenth century the foundations of archaeology were laid on a scientific footing. Difference in the methods and techniques adopted by various archaeologists no doubt continued to hold its ground even after that time, but they were all unanimous in accepting the dating and chronological framework of a particular culture as the first and foremost objective of archaeology. The reconstruction of any culture can never be considered to be complete unless and until the same has a reference to a chronological setting.

The methods of dating can be broadly divided into two categories viz. (1) Relative or comparative and (2) Absolute or scientific or chronometric. Absolute or scientific dating is of a very recent origin, but its pace of development during the last two decades has been very fast. In the early stages the archaeologists had to depend mainly on the relative or comparative dating, which helped them to arrive at a simple conclusion that a particular antiquity is older or younger than the other. In absolute or scientific dating, the archaeologists are much more specific in calculating the period of time by which a particular antiquity is older or younger than the other. The rapid development in scientific or absolute dating must be appreciated, but at the same time it should also be emphasised that there are a very large number of cases in which it is of no use to the archaeologist and he is forced to fall back on the earlier method of relative or comparative dating. In scientific or absolute dating as well, the archaeologists work upon the foundations of relative or comparative data and the final decision on any specific date is taken only if the conclusions derived from both are agreeable to or at least not widely apart from each other.

(1) Relative Dating

As defined above, relative dating aims at preparing a sequence of the antiquities and events in a chronological framework establishing the priority or otherwise of a particular object or event over the other. The aim of deciding the number of years or a particular period of time that elapsed between the occurrence of one object and event is beyond the scope of relative dating. In the same manner relative dating does not help in dating a particular object precisely as a result of which it is not possible to determine the number of years, decades or millenia which stand in between the present and the time when the object was in use. Thus, with the aid of relative dating, the sequence of cultural events can be reconstructed in a particular region. It can also be brought into

use for comparing the sequence of events in one region with the other, but while doing so the archaeologist must be very cautious and compare a number of cultural traits together instead of one or two traits in isolation. Comparative dating based on a single or a couple of cultural traits cannot be treated as dependable and is likely to lead to wrong conclusions.

(i) Level Dating

The oldest method of relative dating is level dating which has now been discarded completely. Various levels above mean sea level were fixed at a site during the course of excavation. The antiquities and artefacts found in a lower level were considered as earlier than those yielded by the higher levels. Similarly the objects found in higher levels were taken to be later than those occurring in lower levels. The main shortcoming in level dating was the ignorance of pits and presupposition that the occupational debris is always accumulated horizontally in a straight line. Though the archaeologists who were experienced enough took adequate care to avoid these shortcomings, the method was abandoned completely after the introduction of the Principles of Stratification.

(ii) Stratigraphic Dating

The most popular and widely used method of relative dating in practice these days is the stratigraphic dating. Stratigraphic dating is based on the principle, 'superposition of strata', first conceived by Nicolaus Steno. During the course of excavation layers are distinguished on the basis of colour, composition, material etc. Various objects are dated according to the relative position of the layers in which they are encountered. Objects found in layer ten will be earlier than those found in nine and as such the greater the number of the layer the older will be the materials yielded by it. Similarly, the objects encountered in a layer smaller in number will be younger to those found in the layers of greater number i.e. earlier layers. (Discussed in detail under Principles of Stratification on page 43)

(iii) Seriation Dating

The method of seriation dating is not very popular, but for corroborating the cultural sequence at various sites it is very helpful. The basic idea behind this method is the assumption of three stages in the life history of an artefact viz. its introduction, popularity and days of disappearance from the scene. In occupational deposits the similarity and dissimilarity in the order of assemblages can be worked out. Artefacts of the same type with similar frequencies will be closer to each other in time, whereas those with different artefact frequencies will be wider apart from each other in date.

(iv) Sequence Dating

This method assumes the principle of changes or modifications in the tool type. Any particular type of artefact undergoes changes with the passage of time, which are called unbroken evolution. The gradual evolution of the tool or pottery type will reveal the gradual lapse of time. The process of development in this method should, however, be checked and verified by stratigraphic data.

(v) Cross Dating

This method of dating aims at establishing the contemporaneity of a particular site of unknown age by comparing the materials with that of a site of known age. A number

of processes are involved in the system of cross-dating. They are Geomorphology (the study of land forms), palynology (pollen analysis) and palaeontology (the study of plant and animal fossils). The following are the various methods involved in cross-dating.

(a) **Geomorphology** - This method of cross-dating is applied to the sites associated with such geological or geomorphic features like change in sea levels, glaciation, wind deposits, erosion and deep-cutting of rivers. In the same geological region sites and materials found in the same type of formation will be contemporary to each other and if the age of one is already determined, the contemporaneity of the other can easily be established. Glacial and interglacial periods of the Pleistocene Period are subjects of great interest to the archaeologists only for the purpose of cross-dating. During glacial periods the formation of wind-deposited silt, known as loess, takes place. This type of formation can be observed in the areas close to the ice sheets and is the result of the fact that glacial outwash quickly filled up the river-valleys to the extent that plants could not grow on the silts. Thus the silts were easily blown and redeposited by the wind. As a result of the rise in temperature, plants could grow in the redeposited silt during inter glacial period. The phenomena of glaciation and interglaciation brought about changes in sea-levels, which in turn lead to the formation of terraces in the river-system.

(b) **Palaeontology** - This method of dating aims at the study of animal and plant remains for the purposes of cross-dating. A comparison of the floral and faunal assemblages can help in reconstructing a rough contemporaneity or relative sequence of various sites. Palaeontologists in general depend on the study of specific fossil types, which serve as an index for cross-dating. These fossil types can be identified without any difficulty and their distribution also is wide enough geographically. Their span of life is also not long.

Elephants and rhinos have served as a very good fossil index for cross-dating in Pleistocene period, because they underwent comparatively rapid and distinctive changes. The remains of *Elephas meridionalis* point to the earliest part of Pleistocene, whereas those of *Elephas primigenius* indicates upper Pleistocene, but the archaeologists must be very cautious in applying the conclusions universally. The archaeologists should be further cautious in adopting this method of cross-dating on account of the capability of the animals in adjusting themselves to changing environmental conditions.

(c) **Palynology** - It is a branch of palaeo-botany and involves the analysis of fossil pollen. The use of this science in cross-dating is still very much restricted. Pollen is the product of seed-producing plant.

(vi) **Cultural Remains**

A comparative study of the cultural remains left behind by man is of great help to the archaeologists in relative dating. A group of or a particular antiquity yielded by one site is compared with that of the other for estimating if one is older or younger than the other. In such estimation the strata of occurrence of the group or of the particular antiquity are also taken into consideration. Objects used in trade have also helped archaeologists in cross-dating. Flinders Petrie was the leader in applying this

method by comparing the pottery specimens from Palestinian sites with those found in Egyptian burials.

(vii) Fluorine-Uranium-Nitrogen

This method in relative dating is applied by studying the absorption of certain chemicals in bones found at different sites. In deposits of the same age and region the absorption of a given chemical in the bone-remains will be uniform. The method, however, is not very much dependable.

2. Absolute or Scientific Dating

During the past two decades several methods of absolute or scientific dating have been developed. All these methods take the calendar year as the basic unit of measurement. The age of any antiquity or find is determined by calculating the number of calendar years that have intervened between the present and the past. Various methods which will be dealt under the present heading are no doubt known as Absolute or Scientific, it must be emphasised that all the dates arrived at are not necessarily accurate. Some of the methods currently in use are described below.

(i) Radio-carbon Dating

Amongst all methods of absolute or scientific dating, radio-carbon dating (C14 dating) is the most popular and widely applied these days. The method of C14 dating was devised by Willard F. Libby in 1949. The principle on which C14 dating is based is that all living matters (organic matter) absorb both C14 and its non-radio-active cousin C12 in equal proportion till the moment of the death as part of the oxygen-exchange cycle. The radio-active Carbon 14 substance starts decaying after the death of the living matter (organic matter). The radio-active Carbon 14 substance is reduced to half in $5,730 \pm 40$ years. In other words Carbon 14 substance measuring a gram would be reduced to half a gram in $5,730 \pm 40$ years. Charcoal found during the course of excavation is considered to be the best sample for C14 dating. The charcoal should not be collected or even touched by hand. It should be collected with the help of spoons and pincers and dried up in sun and packed first in tinfoil and then in polythene bags before sending for C14 analysis. While collecting the charcoal the archaeologist has to be careful enough in observing that the sample is not contaminated by roots or similar other matters.

In the beginning the half-life value of C14 was considered to be 5568 ± 30 but it was revised to 5730 ± 40 in 1965. The dating under this method is limited to 60000 years. Though dating with the help of C14 analysis is considered by the archaeologists to be of great value, it must be emphasised at the same time that the method is a victim of great subjectivity. The scientists undertake the analysis of C14 after the entire data of cultural context and possible date are furnished to them. If the date arrived at by them agrees or is not widely apart from the date furnished in the data, they will declare it, otherwise they will simply come out with the statement that the sample was contaminated. In such circumstances unless and until there are independent ways of working out the dates, the declaration made by the scientists will always be considered as subjective.

(ii) Potassium-Argon Dating

The basis of this method of dating is more or less the same as C14 analysis. In case of Potassium-Argon Dating, potassium 40(K-Ar) decays at a much lower rate than Carbon 14 and as such very helpful in dating objects, which are more than 60,000 years old, the limit of C14. The half-life value of potassium 40 is 1.3 billion years. K40 (potassium 40) is the radio-active isotope of potassium, which decays into two non-radio-active substances, calcium 40 and argon-40. 11.2 percent of the K40 substance decays into argon-40 and the rest into calcium-40. The date is determined by measuring both i.e. the potassium-40 present in the sample and the amount of argon-40. Volcanic ash, basalt, obsidian and other materials which have come out as a result of volcanic explosion constitute very good sample for dating under this method. The archaeologists or the scientists must, however, be careful enough to see that the samples are fresh and not weathered. This method of dating is still in experimental stage.

(iii) Dendrochronology

In prehistoric archaeology, dendrochronology or tree-ring dating is considered to be the most accurate. The method of dendrochronology can also be used to verify the results of C14 dating. The application of dendrochronology is limited both in space and time. Any sample more than 7100 years old is beyond the scope of dating under this method. Growth rings can be clearly demarcated in the trees growing in areas which have regular seasonal climatic changes. The rate of development of these rings is generally one each year by the cambium of the tree. The cambium is the layer of live cells that lies between the bark of the tree, have a distinct beginning and end making it easy to distinguish. When the season progresses the cells produced are smaller and darker with thicker walls. At the close of the season the growth abruptly stops.

The growth of tree rings is dependent on two factors viz. the age of the tree and the climate. The rings of the older trees will be thinner than those of the younger ones. In a dry climate the rings will be narrower, whereas excessive moisture will result in thicker rings. It must, however, be noted that all trees are not equally responsive to change in climate. In dendrochronology any sample with 60 to 200 rings will be ideal for dating purposes. The greatest disadvantage of this method of dating is that the climate of each and every region is not uniform and as such a key for each individual region will have to be prepared before undertaking the work.

(iv) Thermoluminescence Dating

Pottery, which is yielded in abundant quantity by every excavation, is the main basis of thermoluminescence dating. Farrington Daniels of the University of Wisconsin felt that pottery could be accurately dated by means of Thermoluminescence method. Thermoluminescence is a phenomenon observed in numerous crystalline, non-conducting solids, including pottery, glazes and glass. The quantum of thermoluminescence (TL) found in pottery measures the radiation dose to which the pottery was exposed since its initial firing. The thermoluminescence built up in the clay or the tempering materials before the pot is manufactured disappears after the pot is fired in the kiln because of the high temperature (700° or more). After the pot cools down the electron charge-carriers which disappeared as a result of firing at high temperature reassemble

in the form of thermoluminescence. The age of the sample is determined by measuring the quantum of radio-active material contained within the sherd and the sensitivity of various components viz. the clay, the tempering material etc. to alpha and beta radiations (internal radiation) of the sample in the first instance. It is followed by the next step of measuring the quantum of natural TL emitted by the sherd when the same is heated.

The method of thermoluminescence dating is very complicated, because the tempering materials differ in sensitivity from the clay and as such each of them must be isolated and measured separately. As yet there is no established laboratory of fame to undertake this job with satisfaction.

(v) Archaeomagnetic Dating

The earth's magnetic field is measured by the angle of declination, the angle of dip, and the magnetic intensity. The difference between true north (geographic) and magnetic north is the angle of declination. The angle of inclination presented by a magnetized needle with a horizontal plane is the angle of dip. Magnetic intensity near the equator is more than double than that on the poles. All the above mentioned measurements are subject to change through time which constitutes a basis for temporal calculation. When the clay or clay soils, rocks, etc. are allowed to cool down after being fired at a temperature roughly 700°C , they retain some magnetism which is called thermoremanent magnetism. Thermoremanent magnetism is thus a fossil record of the earth's magnetic field when the pottery was fired. Since the magnetic field varies at very short distances, it is to be worked out separately for each and every region before the dating is attempted. Further, the changes in the earth's magnetic field, on the basis of which the sample is to be dated, are also not regular and universal.

In addition to the methods of scientific dating mentioned above, there are certain other methods like Fission Track Dating, Obsidian Hydration Dating and Amino Acid Racemization Dating, but they are all still in a stage of infancy and not yet fully developed.

CHAPTER VIII

PUBLICATION AND EDUCATION

A. Publication (Essential of an Excavation Report)

All is well that ends well, the well-known and popular precept, is applicable to the publication of an excavation report as well. In all other projects, whatsoever, the results achieved are of greatest importance without caring too much for the ways and means by which they were gained. Since archaeology aims at the reconstruction of the life of ancient people with the help of ancient remains, both the ways and means as well as the results achieved are equally important. The methods i.e. ways and means adopted during the course of excavation may be sound and scientific, but they will be of no value if the archaeologist is not in a position to reconstruct the pattern of life of ancient people and present the same before the world through well-documented publication of the results. The above mentioned moral obligation of the field archaeologist has been aptly pointed out by Pitt-Rivers that 'a Discovery dates only from the time of the record of it, and not from the time of its being found in the soil'. While summing up the essential components of Wheeler's bequest Graham Clark correctly said, "Above all, first in Britain and then in India, he made his contemporaries feel that archaeology was really important, so important that it merits the dedication of public support and of the highest standard of professionalism on the part of its executants. I would here repeat that Wheeler was no Marxist. He valued archaeology not as means to an end, but rather as an end in itself, an enlargement of human consciousness"¹.

As it has already been pointed out in preceding chapters, the excavation of any ancient site is nothing but destruction. Hence, if the archaeologist is not able to reconstruct the entire story in the form of well-illustrated and documented report, it is always advisable to leave the site unexcavated at the mercy of those field-archaeologists who are in a position to do justice. If a site is not excavated, the evidences buried in the mound will at least remain preserved for the posterity, but if the same is excavated and suitable report on reconstruction is not produced, it can only be termed as wholesale destruction. The publication of any excavation report should not be unduly delayed. "Wheeler believed in the imperative need to publish the results of field research comprehensively and promptly. The effort he made to get the fully documented report on Arikamedu out within months of the excavation was clearly intended to underline this requirement"².

1. Graham Clark, Sir Mortimer Wheeler and Indian Archaeology, New Delhi 1979, p. 35.

2. Graham Clark, *op. cit.* p. 36.

The pattern of an excavation report should be based on a simple principle that the same is intelligible to maximum number of people, and not only a record of all technical details, which is of no avail to a common man. By entering into all technical details the archaeologists will restrict the approach of the common man to the subject. The public or the common man has every right to understand the subject. The words of Wheeler will be of a great value to an archaeologist who is keen to know the basic requirements of an excavation report. He said, "The Royal Society, in a pamphlet issued recently on 'The Preparation of Scientific Papers', has clear words upon this matter. 'Most (scientific) journals', it remarks with an amiable cynicism, prefer papers written for the moderate specialist, that is to say, an author should write, not for the half-dozen people in the world specially interested in his line of work, but for the hundred or so who may be interested in some aspect of it if the paper is well written'. After all, an excavation-report is a scientific newspaper, with news paragraphs, leading articles, stock-market, hatch-match-and-despatch, and even 'small wants'. Let the writer of it study unashamedly the higher forms of journalism, and neither he nor his clientele will lose thereby. And just as, in a newspaper, one does not want or expect to read solidly from front to back in order to discover the salient news and views of the day, so in a well-balanced excavation-report the student may properly expect to discover something of the wood without a prolonged, tedious, and exasperating hunt amongst the trees. Of course the trees must be there or the wood would not exist. But, alas, how many reports are merely jungle! - *biblia biblia*, fit only to be added to Elia's catalogue of *books which are no books*".¹

After going through the fundamentals of a report incorporated in the above statement, it is considered essential to break the ice and bring out the actual requirements of an excavation report. In the first instance the geographical environment and the location of the site need incorporation in the report, because environment has always played a vital role in the occupation of an ancient site. They should be followed by a reference to the aims of the excavation and the basis on which the aims were conceived. The results achieved by the excavation constitute the main body of the report. While recording the achievements of the aims, a brief reference to the characteristic remains and finds should not be ignored particularly because the results are all based on them. The achievements, while constituting one of the most important parts of the excavation-report, should never be considered to be an end in itself. Once again it may be repeated that the ultimate aim or job of an archaeologist is to reconstruct the life and pattern of those people whose remains were forgotten and buried under the mound. While reconstructing the way of life of the ancient people, the archaeologist has to spell out in a clear and concise manner the grounds on which the structure of reconstruction has been erected. In this attempt the excavator will have to refer to the finds, their context, environment and the date. The way of life led by the people in ancient days should also include the type of dwellings, their dietary habits, manners, customs, art, source of subsistence, economic pattern, etc. For a common man, who is not a specialist in the subject, the above mentioned details will be enough and quite interesting. The style of writing must be simple with well-connected sentences, so

1. Sir Mortimer Wheeler, *Archaeology from the Earth*, London 1954, p. 185.

as to make the results of the excavation intelligible to all. Wheeler has well said, "Sweating with the pen is no less important than sweating with the spade".¹

The turn of the specialist in the field is always after the common man, but he should not be dispensed with totally at the cost of the latter. The detailed analysis of stratification, finds, their frequencies, structural details and the contexts in which they were encountered should follow the general information for the common man as mentioned in the preceding paragraph. It is indeed very sad that these days the field-archaeologists produce the excavation-report in the form of a compendium of the description of all the antiquities and the structures without any conclusion of their own on the life and pattern of ancient people. They are either completely ignorant of the manner in which the life and pattern are to be reconstructed or they are afraid to present their views. In either case the purpose and ultimate aim of an excavation-report are defeated.

The immediate question which strikes the mind of an excavator, while preparing the excavation-report, is the volume of the publication and the sum and substance which it should contain. So far as the first part of the report on general information is concerned, there need not be any controversy, because that is the cream of the entire work. There are, however, two views on the next part of the report. According to Pitt Rivers all the finds including the most minute fragment of pottery need be recorded and drawn. Pitt Rivers may be justified in his views in so far as the complete recording of all finds is concerned. It must, however, at the same time be reiterated that it is well nigh impracticable in cases where the quantity of antiquities and finds is too large. The limitations imposed by the quantity will force the archaeologist to prepare the excavation-report on a selective basis. The job of selection is not an easy one. During the course of selection the archaeologists should always be free from any subjective thinking and thereby adjusting the selection to his own views. Attempts to establish pre-conceived theories and notions are responsible for such a type of selection. Pre-conceived notions, ideas and theories, more than often, sound the death-knell of not only archaeology, but all subjects whatsoever. It is much more so, when the evidences are moulded and twisted to establish one or the other pre-conceived theory. Hypothesis is no doubt the starting point of any research work, but the scholars should be conscious enough not to play with the evidences. They should always be prepared to study all finds in proper perspective with an open mind without hesitating the least in declaring the hard facts, even if they do not suit their theories. In not doing so, they will be killing some of the most important evidences, which may prove to be very valuable to archaeologists of the future in reconstructing the story. The author does not hesitate in asserting that killing of evidences should be treated as a crime, and a responsible archaeologist should never be absolved from it.

While selecting the objects and finds for incorporation in the report the archaeologist has to be careful enough to see that they are the representative collection of the site. The proportion of various objects included in the report should also be the same as

¹. Sir Mortimer Wheeler, *Archaeology from the Earth*, Penguin, London 1956,

presented during the course of excavation. Certain important objects may be rare or negligible at the site, whereas others may be plentiful. It is the moral duty of the archaeologist to present the same authentic picture in the excavation-report.

Summing up the requirements of an excavation-report Wheeler said, "At the risk of raising a personal prejudice to a principle, I would lay down certain constituents as a *sine qua non* of every excavation-report. There need be little hesitation in demanding that the report shall begin with a very short summary, giving the main headings of the matter, the plot of the play, so that the reader is at once in possession of the context that follows. This summary may usefully be isolated in italics; let there be no mistake as to what and where it is. The nature of the second section of the report is more variable, depending upon the scope and character of the material where complex issues are involved, it is useful to have here a reasoned view and interpretation of the new evidence only in sufficient detail to indicate the nature and degree of its authority. How far interpretation should partake of 'theory at this stage and in this factual context is matter for judgement and opportunity. But an element of theory there must be if our facts are to mean anything..... In any case, either succeeding or preceding this section must, of course, come the full statement of structural and stratigraphical evidence which is the hard core of the whole report, followed by description and analysis of the finds. Lastly, it is sometimes useful (before a very full index) to include a short postscript to tie up loose ends and to indicate future needs. Appendixes may deal with specially detailed or controversial problems, but it is not usually advisable to clutter up an already elaborate report with an excessive number of appended essays.

"In brief, the nucleus of a report comprises, summary, synthetic review, full statement of evidence, discussion of general context, appendixes (if any), index; and, however, elaborated, these cardinal features should be clearly defined, immediately obvious and accessible to the reader..... Relic tables, such as those evolved by General Pitt Rivers, have largely been abandoned by his successors in publication (though not in the field), and I am inclined to regret their omission. In suitable circumstances, particularly in dealing with the classification of a new or little-known culture, they serve useful purpose, provided that they are associated with adequate sectional illustration".¹

Wheeler has truly said that, "The first task in the compilation of an excavation report is adequate illustration".² Though reproduction of illustrations in the excavation-report is a very costly affair, the importance of it should not be undermined. Expenditure on other items of work may be reduced, but illustrations should not be allowed to suffer on the simple excuse of heavy expenditure. A well-illustrated excavation-report makes it easier for one and all to understand the subject easily and within a limited time. The reader can be impressed upon many important conclusions with the help of good illustrations only without going into the details furnished in the book.

The illustrations are of two kinds viz. (1) by means of drawing, and (2) by means

¹. Sir Mortimer Wheeler, *Archaeology from the Earth*, P-P-188-189.

² *Ibid*, p. 182.

of photograph. Drawing can be prepared and modified in any manner desired by the excavator, but the same is not possible in the photographs. The author has his own observations in a number of excavation-reports that the drawings and photographs do not tally. In such cases a careful reader can very easily catch the difference and form a correct conclusion that there must have been some unjustified cooking in the drawing by the excavator. The excavator may close his eyes on the direction of the drawing pen, but a dead object like the camera lens cannot close its eyes to the hard facts. The excavator must, therefore, be careful enough to see that the drawings and the photographs reveal one and the same story without the least margin of difference. The best way out is to take all decisions at the site itself and the drawings should always be based on the subject exposed in the photographs.

When the drawings are prepared for final publication in the excavation-report, the archaeologist has to see that they are well-balanced. Any congested area of the drawing can be balanced by placing the heading, lettering or caption of it in the area which is blank. Decision regarding the reduction of a drawing will have to be taken in advance and accordingly the lines in the drawing should be thick enough to stand the reduction. The illustrations of drawing in an excavation-report are simply measured drawings of the excavated structures, sections and other remains, but the archaeologist must be conscious enough to see that the artistic or so to say the aesthetic taste is not completely lost sight of. The lines in the drawing should be distinct, so that they do not present a smutchy picture in the report. Similarly the size of the lettering used for the caption alongwith other particulars furnished on the body of the drawing should be properly balanced. Besides the above requirements, the cardinal direction indicating the north line is a pre-requisite of each and every drawing. The scale adopted for the measured drawing is also a necessity. The caption of the drawing has to be clear enough to spot out the location of a particular structure. Caption, however long the same may be, will not always be sufficient in itself to indicate the location of the structure, particularly when the excavation has been undertaken on a large scale and the number of structures are also numerous. In such cases the simple method is to prepare a key plan of the structures at the site on a very small scale and a copy of the same pasted at a suitable place, preferably at the left hand bottom corner of the drawing. Each and every structure in the key plan will carry an individual number and the same number will be mentioned below the caption of the drawing. While presenting the plan of the structures exposed during excavations, the alignment of the line on which the section has been prepared is to be marked by a dotted line.

Enough has already been said on the subject of photographs under the heading 'Archaeological Photography'. The subject of the photograph presented in the excavation-report must be very clear, so that the reader catches without any loss of time the actual theme of the photograph. Just as a photograph of a human being brings out various expressions of the mood of the man, the basic requirement of an archaeological photograph is to reveal the entire story of the subject without undergoing the pains of turning the pages for details in the report. An archaeologist has always to be conscious that the photograph is not a mass of labels and scales thereby diverting the attention of the reader from the main subject. The labels and scales are generally needed by a man of the same profession, but for a common man they hardly

carry any meaning. Hence, the labels and scales should play an insignificant role in the photograph to the extent the same is possible. They should not be ignored, however, in any circumstance. The bricks of any structure and the extant courses of it must be distinct in the photograph. The photograph should also indicate the working level or levels of the structure in various phases. The types of floor used by the inhabitants of the house are also a necessary accompaniment of the structure. Entrances, wherever available, also need incorporation in the photograph. Due contrast between the background-foreground and the subject proper must be presented, so as to bring the latter well into relief and prominence.

Antiquities of extraordinary importance, which have a direct bearing on the story of the ancient occupation, should always be shown in their original position i.e. the context in which they were found. With the help of such photographs the task of convincing any reader about the story of the occupation becomes very easy. Once the antiquities are removed without being photographed *in situ*, the excavator will have to take great pains for the same purpose.

In addition to the general nature and contents of an excavation-report the excavator is required to possess a fundamental knowledge of the processes by which the illustrations are reproduced. There are, in a normal course, three ways of reproduction viz. (1) by half-tone block (2) by line-drawing block and (3) by lithograph. Colour-processes are indeed very impressive and attractive, besides manifesting the details, but they are very expensive and as such have not so far been adopted as a general rule.

1. Half-tone Blocks

The photograph of the excavated remains and the antiquities are reproduced by means of half-tone blocks. The original photographs are photographed again through a ruled screen placed in between the original photograph and the plate on which the same is to be exposed again. An optical glass with ruled lines is used for the screen. As a result of the ruled lines square apertures with opaque dividing lines are formed. The square apertures and the dividing lines break up the continuity of the subject into dots of varying sizes. The prominent parts of the photograph are reproduced into exceedingly fine dots. In the same fashion those parts of the photograph which are having a middle tone are represented by larger dots and the darker tone by still larger dots. When the negative is ready a contact print of the same is prepared on a copper plate coated with bichromated glue. The space between the dots mentioned above disappear as a result of chemical reaction, thus leaving them in relief. The copper plate is thereafter mounted on a wooden board and printing undertaken just like letter-printing. A little touch of the ink on the dots is sufficient to produce the best results. In order to obtain a print of the highest standard art-paper of the finest quality should be used and the ruling on the screen used for the preparation of the block should be on an average 133 to 150 per square inch or two and a half square centimetres. The greater the number of rulings, the better the results. Since the use of copper has become very expensive these days, blocks are being prepared on zinc plates. If the number of the copies to be printed is not very large, the zinc plates produce equally good results.

Particular care has to be taken in preparing the photo-prints meant for the blocks. They should all be glazed prints and not matt and toned. In black-and-white good glossy prints are the best. While supplying the photo-prints for the preparation of blocks, the excavator has to bear in mind that the scale of reduction should not be too much. Too much of reduction leads to merger of details, thus overcrowding the subject. The scale of reduction or the size of the block required for printing is to be mentioned at the back of each photo-print. If the entire subject of the photo-print is not required to be reproduced the actual area needed for the purpose of printing can be indicated by means of a pencil.

2. Line-Drawing Blocks

The preparation of line-drawing blocks is simpler than the half-tone blocks. A special camera is used to transfer the lines of the drawing directly to a zinc plate. The background of the zinc plate is eaten away by means of an acid bath leaving only the black lines in relief for printing. While giving the acid bath to the zinc plate the block maker has to be very careful in seeing that the lines remain in prominence. The zinc-plate is fastened like the copper plates to a wooden board for printing.

Like the photo-prints the drawings supplied for the preparation of the blocks should also be marked with the scale of reduction required for printing. In a normal course reduction at a scale of one-third brings out good results, but the same can be changed in cases of necessity. The draftsman, however, must be aware of the scale of reduction required beforehand, because the lines used by him have to be bold enough to stand the reduction. Further requirements of a drawing to be published have been mentioned under the title of Archaeological Drawing (See page 61). The size of the drawing to be printed will depend on the size of the publication.

3. Lithographs

Printing by way of lithographs is a special process to bring out best results of line-drawing. The line-drawing is in the first instance photographed on a negative. Thereafter the negative is printed on a thin sheet of zinc. During printing the image attracts the ink by means of chemical process and the blank spaces repel the ink. The zinc plate is clasped tightly to the printing-cylinder of the machine. Rollers with litho-ink and damper-rollers with water are allowed to pass over the zinc plate alternately. A sheet of special rubber is thereafter stretched and fastened to another cylinder on which the inked image is pressed. At the end the printing is done therefrom on the paper. The process is, therefore, known as 'Off-set' or 'litho-Offset', or photo-litho-Offset'. With the help of the rubber sheet undue pressure during the course of printing is avoided and as such the line drawings are reproduced gently on the paper without carrying over the image to the reverse side of the paper.

B. Education

A wide gulf between an archaeologist and a common man continues to yawn in the country inspite of the fact that more than hundred years have elapsed since the introduction of the subject in the country. The general public or the common man still consider archaeology as a subject of luxury or recreation. In a large number of cases they believe that the archaeologists are government agents to dig for the purpose of

collecting treasures. Baseless presumptions like those mentioned above cannot be treated as unfounded, particularly because the archaeologists rarely care to educate the general public on the main aims of archaeology. Huge amounts of public money are spent on the excavation without any care being taken to make him aware of the purpose for which diggings are undertaken. This cannot be justified. When public money is used for diggings, the common man has every right to know and understand the objectives, with which an excavation is undertaken. Cooperation of the general public in an out of the way place can be expected only if the objectives are explained clearly to the common man.

In the era of nineteenth century archaeology could be kept restricted to a few art collectors. During those days archaeology had not developed into a science as well. Besides that, the administration and the government were dominated by a limited number of people belonging to the aristocratic and princely class. Literacy was also not adequate. In such circumstances the wide gulf between the archaeologist and the common man had some justification. But now, when democracy has stepped into the shoes of monarchy in almost every corner of the world, the general public can, rather, should no longer be kept completely ignorant about the subject. Keeping the common man ignorant is nothing else but curbing the rights.

The general conscience and understanding of the common man have advanced considerably in the modern world. He is now eager to know the scientists and their methods. It is, therefore, the bounden duty of the scientist as well to meet the common man and make his aims and methods intelligible to him. There are various ways to bridge the yawning gulf between the common man and the archaeologist.

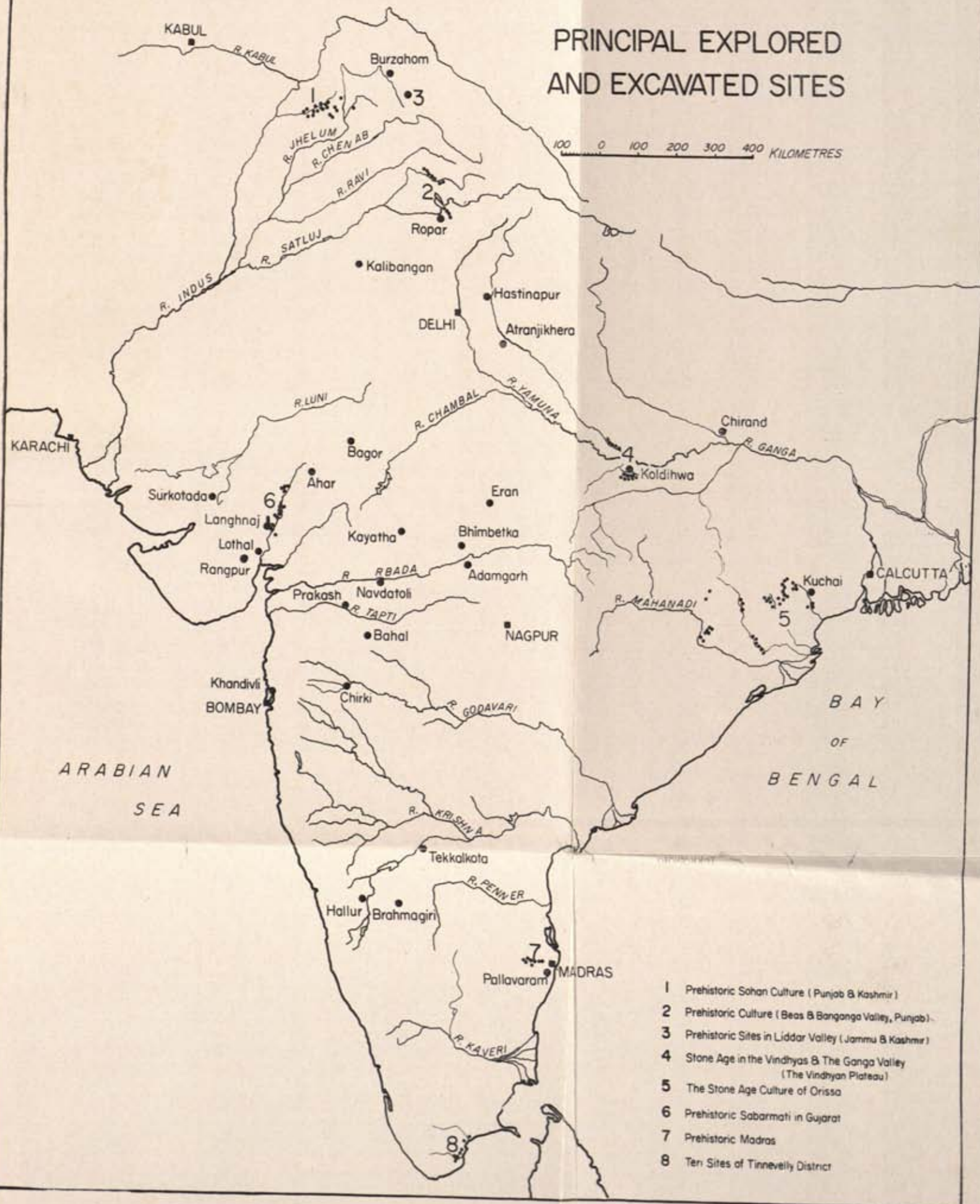
In the first instance the archaeologist has to explain to the general public verbally in a most simple and friendly manner the aims, which are there in his mind to prompt him to undertake excavation at a particular site. The language used by the archaeologist should be intelligible to all. The general discourse is to be framed in such a manner that the common man feels proud of his past history. General discourses may be followed by good pamphlets or cyclostyled notes drawn in a simple and interesting language. Arrangements can also be made to show documentary films, which will go a long way in creating interest in the subject. Regular exhibitions, both on the field as well as in important towns, should also be organised to educate the general public regarding the aims of archaeology. The pattern of life in the ancient past has to be depicted with the help of posters and photographic enlargements. Frequent feature talks on radio in an appealing language is also a good media for education. Small articles in newspapers of local language will be of a great interest to the people.

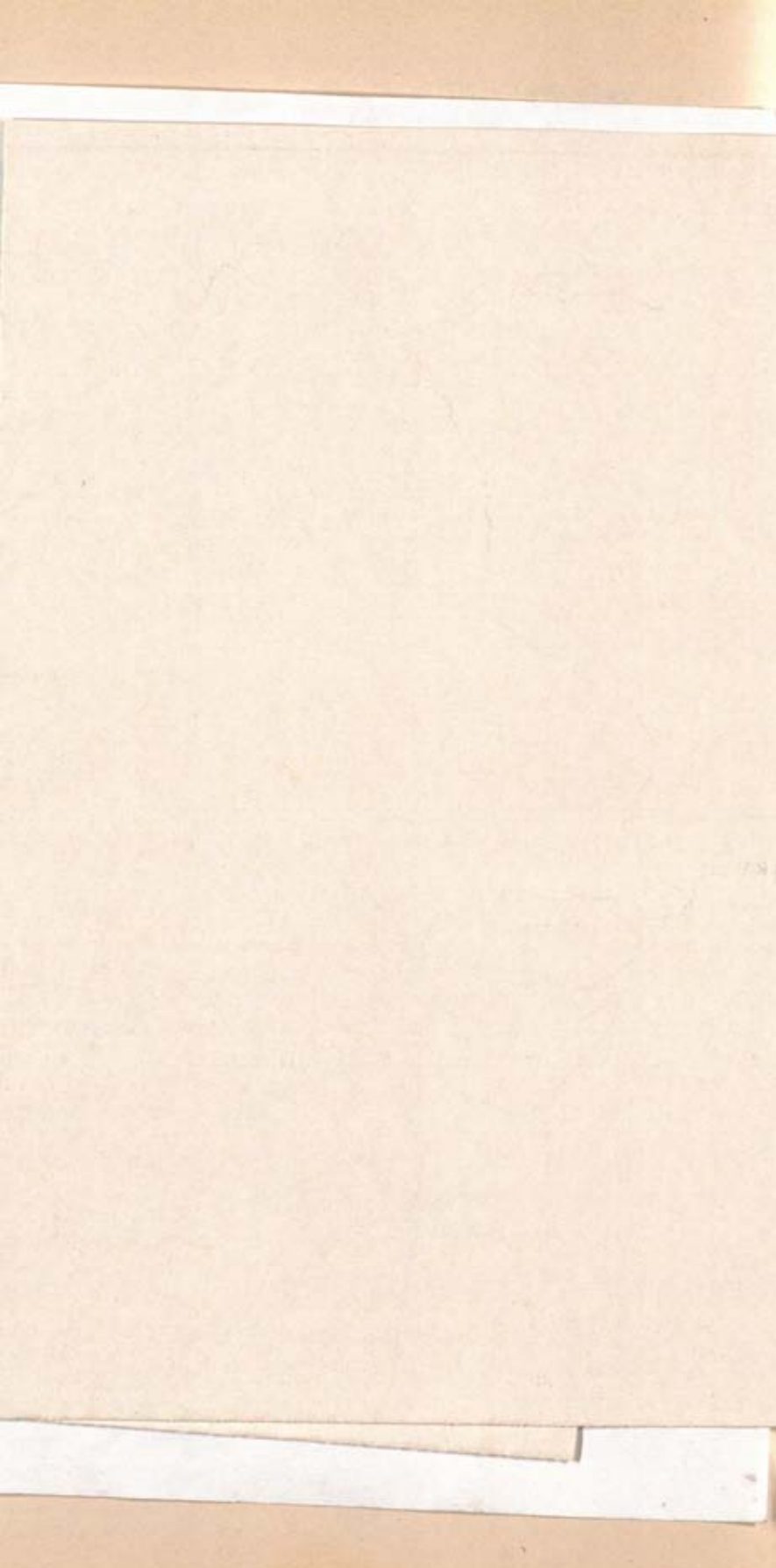
In excavation camps arrangements are to be made for a permanent display of most important antiquities with a brief write-up in the local language and photographic enlargements. In order to attract the attention of the general public in archaeological excavations, indication boards at suitable places will have to be placed. The visitors expect some guidance and explanation at the site and as such necessary arrangements for the same should be made.

The conservative attitude of the earlier days to keep everything secret and restricted to the specialists should not be allowed to continue any longer. A common man has every right to make himself conversant with the aims and objectives of the excavation. As already stated on page 11 Sir John Marshall had to keep the public interest alive by the rich collection of sculptures, which acted as a great saviour for the Department of Archaeology from the doomsday in 1923, when a number of institutions were made a victim of Inchcape Committee and closed. In the present days when man has grown much more conscious of various activities in the country, it is the primary duty of the archaeologist to satisfy his anxiousness to know the aims and objectives of excavation. Summing up the legacy of Wheeler, Graham Clark well said, "Finally, Wheeler believed that publication ought not to stop short at the scholarly level. The dissemination of accurate information to a wider public was seen to be important to enlist support for archaeology, but also to ensure that it contributed in a positive manner to public education and played its part as Lord Curzon foresaw when he revived the Archaeological Survey, in building up a sense of Indian identity."¹

1. Graham Clark, *op. cit.* p. 37.

PRINCIPAL EXPLORED AND EXCAVATED SITES





CHAPTER IX

SEQUENCE OF CULTURES

The first volume of the book 'New Era of Indian Archaeology' will remain incomplete without a reference to the sequence of cultures at important sites. The sequence of cultures will provide a very good insight into the cultural remains left behind by man from time to time. A glimpse into the picture of cultural development of man can also be had with the sequence of cultures. It has been dealt with more or less in a chronological order (Pl. IX).

1. Prehistoric Sohan Culture

Tools of the Early or Old Stone Age were reported from Punjab and Kashmir as long back as 1930. In 1932-33 further works in the region were undertaken by the Yale North India Expedition and the results were published in 1934. The discoveries led to the well-equipped Yale-Cambridge Expedition of 1935, under the leadership of De Terra in association with Dr. Teilhard de Chardin and Dr. T.T. Paterson. In the expedition methods involved in all the sciences like geology, palaeontology and prehistoric archaeology were applied in a cohesive manner. The work of the expedition was concentrated on rivers Sohan, Indus and Jhelum. It was observed by the Expedition that the location of the Stone Age sites was close to the river on terraces which led to the conclusion that the river valleys afforded better area for hunting and also easy mode of travel and habitable ground. In all five terraces were noticed near the outlet of Sohan river at Makhad. The stratigraphy at the site in the words of the authors of the expedition is as follows:

"Here just north of the point where the Indus breaks through the Salt Range, a large basin existed in early Pleistocene time, for the Tatrot-Pinjor series of basal conglomerates, green, brown, and yellow clay and pink marly silts, is over 500 feet thick. The bedding is slightly tilted to the west, but passes conformably upwards, through sands, to the Boulder Conglomerate of second glacial age, which has been reduced to a thickness of 250 feet. The conglomerate in places carries boulders as much as 2 feet in diameter, and is coarse and loose, weathering easily. In second interglacial time this rock was eroded very deeply, leaving a terrace (T1) at 450 feet, with its surface covered with redistributed Boulder Conglomerate, which in places became cemented together. This in turn was cut through during third glacial time, and a conglomerate as much as 30 feet in thickness was deposited. Here are found boulders weathered deep brown and purple like those on T1 contrasting strongly with

1. Ancient India No. 3, pp. 23-26 and A Source Book of Indian Archaeology, ed. by F.R. Allchin and Dilip Chakrabarti, Vol. I, Delhi 1979, pp. 112-123.

the "clean" conglomerate in which they are embedded. This conglomerate is covered by a thick layer of Potwar loess-like silt, which extends even on to T1 and forms the surface of T2 at 380 feet. T3 at 150 feet, was produced by fairly long erosion during third interglacial time and has a basal gravel surmounted by redeposited Potwar. T4, at 90 feet, of fourth glacial age, is composed of gravel, and T5, of latter than fourth glacial age, is still younger. T5 is low, 30 to 40 feet and is sometimes inundated by flood waters of the river"¹

The four glacial and interglacial cycles were based on the same cycle observed in the vicinity of Alps mountain in Europe.

The Stone Age Cultures of the Sohan valley are represented by two main traditions of the same antiquity which developed simultaneously. One of the traditions is known as Madras handaxe tradition and the other Sohan Culture.

The earliest stone tools were found by the expedition to occur near the top of the Boulder Conglomerate (fig. 15). They consisted of large flakes derived from crude split pebbles worked on one side only. All of them were rolled indicating that they were contemporaneous with the process of deposition of the conglomerate. The flakes were big and worn, with large, plain unfaceted striking platforms making high angles (100 to 125 degrees). The bulbs were flat but the cones large and well developed. But for occasional marginal scars the upper surface was usually plain and unflaked. The above mentioned tools were called as pre-Sohan by the authors of the expedition simply to indicate the chronological horizon.

The pre-Sohan industry was followed by Early Sohan tools characterized by a series of pebble and flake implements collected from the surface of the Boulder Conglomerate and Terrace 1. The age assigned to these tools was the later part of the second interglacial stage of Terrace 1, since basal gravels of Terrace 2 yielded rolled specimens of Early Sohan tool.

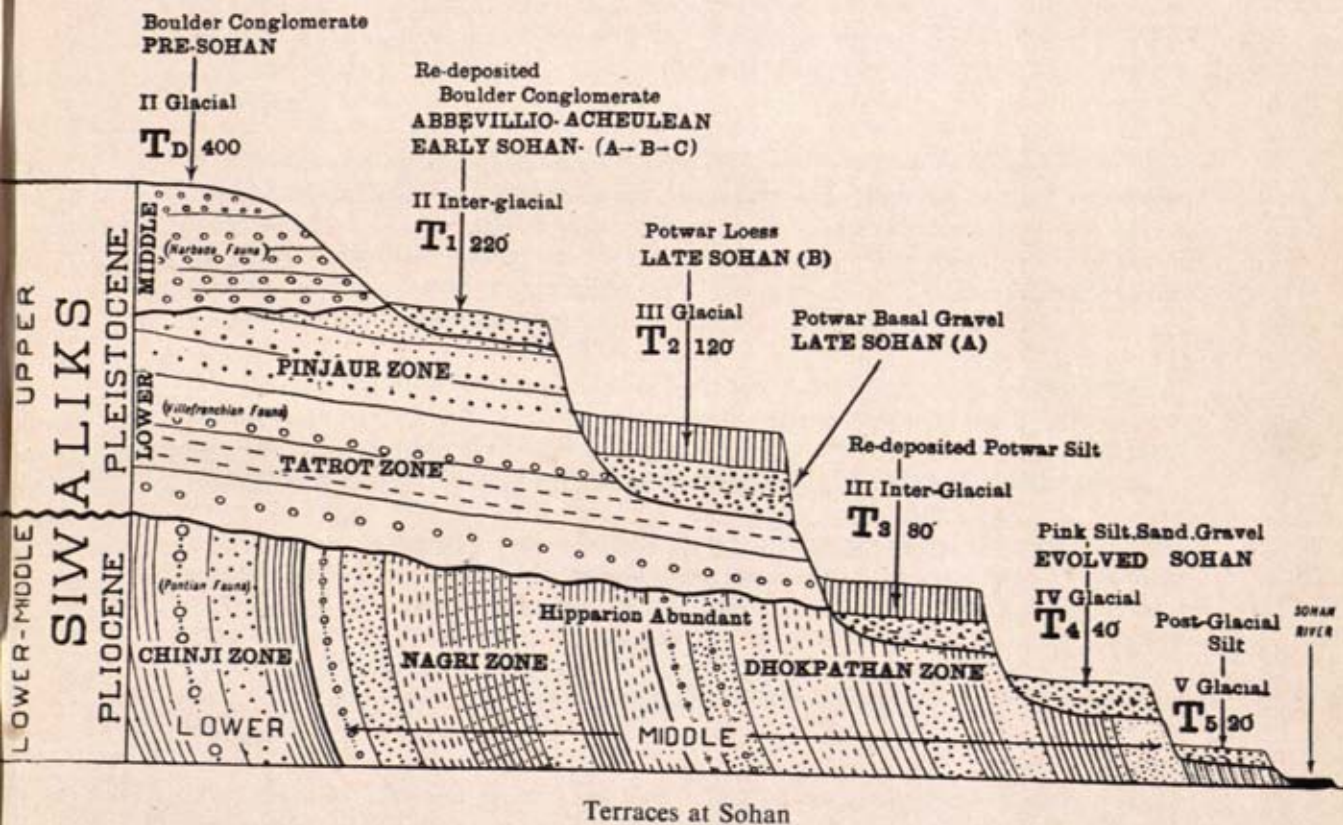
Early Sohan tools were divided into three categories on the grounds of patination. The earliest 'A' was patinated heavily and in addition completely worn out. Specimens of group A were not found in plenty. There were several discoidal cores from which only three or four flakes were removed. A large chopper-like core had pebble butt with two flakes removed from each surface. No flakes of this variety were reported.

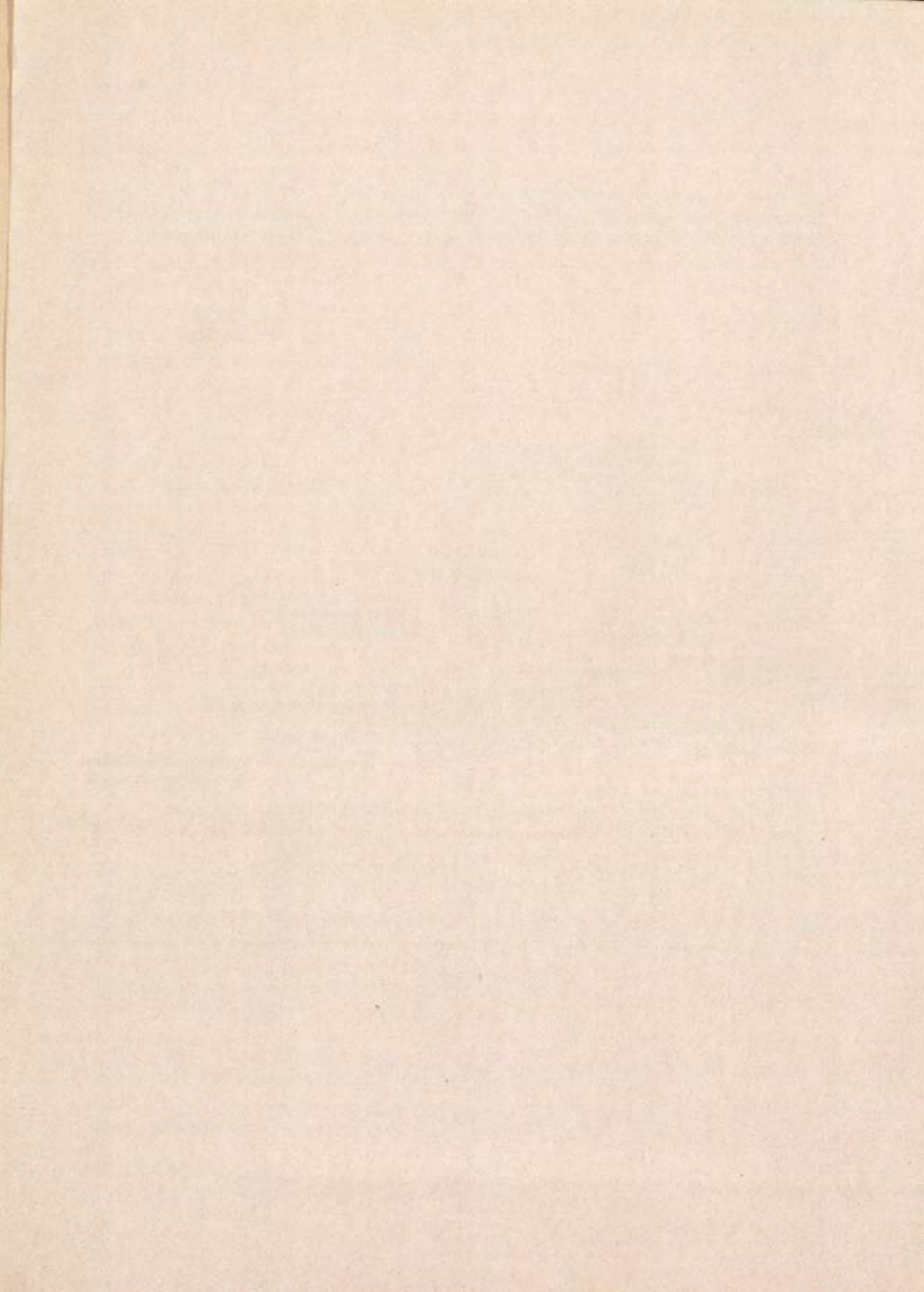
Group B - The tools in this group were a little less but deeply patinated like A but not worn out. They were represented by rough discoidal cores of which one was very large. The cores were fairly neat, flaked more or less all around on one or both sides generally in an alternate fashion. The flakes associated with the cores were having unfaceted platforms with the angles varying from 95° to 130°.

Group C - The tools of this group were the youngest. They were less patinated and looked fresh. The cores were of the discoidal type with alternate lateral flaking with a patch of the cortex often remaining in the centre of one or both the surfaces. These cores resembled the Clactonian or the early Levalloisean forms. Another type of cores

¹. De Terra, H. and T.T. Paterson, *Studies in the Ice Age of Kashmir*, Washington 1939, pp. 301-312.

Fig. 15





more or less akin to Levalloisean form also appeared in this group. These tools are flat with under surface cortex and striking platforms simply prepared at each end by the removal of two or three small flakes. There were two kinds of flakes, one with high-angled plain platforms like early Sohan B but flatter and neater on the whole, accompanied by greater amount of primary flaking, and the other, though fewer in number with low-angled, simply faceted platforms.

A typological development towards smaller and neater forms of tool without any relationship with the stratigraphy was observed from the earliest to the latest stages. All the tools were grouped in two classes viz. (1) flat-based tools and (2) round-pebble tools.

The Early Sohan tools were reported from the valley of Sohan at Adiala, Khaslakalan, Chauntra and Trap near the junction of the Sohan and the Indus rivers and also in the Indus valley at Ghariala at the confluence of the Han and the Indus, at Khushalgarh, Makhad and Injra.

Contemporaneous with the Early Sohan tools, a different facies of tools in the form of handaxe complex attributable to the same second interglacial age (of Terrace 1) were observed. On the basis of typology these tools belonged to the lower Palaeolithic Abbevillio-Acheulian (biface) series found commonly in Peninsular India with its centre at Madras. The tools comprised handaxes, cores and flakes and belonged to the time of the early stage of the second interglacial.

Early Sohan tools were followed by Late Sohan industry which belonged to the third glacial age of Terrace 2. The late Sohan industry was classified into two groups viz. Group A and Group B based on stratigraphy. Group A occurred in the basal gravels of the Potwar and the later Group B came from the Potwar loess lying over the gravels.

Group A - The pebble tools in this group show a large variety. They are all better made and indicate a developed form from the Early Sohan. The number of flake tools in this group is far greater than those in Early Sohan. The distinguishing feature of the flake tools is the Levalloisean technique. The simpler forms of plain, high-angled platform flakes, however, continued to be prominent. Some of the specimens were worn, but there was no typological difference. Retouching in the flake tools was negligible.

Group B - The tools of this group were found from the lower part of the Potwar silt, not far above the basal gravel, in large quantity indicating workshop. They all appeared fresh and there was no admixture of Abbevillio-Acheulian handaxes which meant that the Sohan tradition survived long after the biface industry had come to an end.

2. Prehistoric Guler [Beas and Banganga Valleys, Punjab¹]

After the sub-continent of India was partitioned in 1947, the early Stone Age sites discovered in Sohan and Indus valleys went to Pakistan leaving no typical site of the

¹. Ancient India, No. 12, PP. 59-92.

Sohan Culture on the Indian side. The works of Olaf Prufer, Y.D. Sharma and D. Sen working after the partition brought to light a few Sohan type palaeolithic sites in Punjab. Following the chain B.B. Lal undertook exploration in Beas and Banganga valleys in Kangra and reported four sites viz. Guler, Dehra, Dhaliara and Kangra. Of these the first two yielded a large number of tools. The Beas and Banganga valleys can be considered to be a part of the Indus valley. Suitable pebbles of quartzite were readily available to the man in the river-beds and the terraces turned out to be very convenient for the man for habitation in the prehistoric times. Guler is a station on the Kangra-Pathankot line of the Northern Railway, about 22 kilometres from Kangra. The river Banganga, on the right bank of which Guler is located, meets river Beas six kilometres south-west of Guler.

In all five terraces in the valley of Banganga were observed by B.B. Lal. The bed-rock in the river consisted of pepper-coloured sandstone interbedded with red shales. Erosion in later times has exposed the tilted bed of the river at several places. About three furlongs north of the Guler railway station Terrace 1, at a height of 565 feet from the river level, was noticed. According to the bench-mark available close by, the height from the main sea-level was 1964 feet.

Terrace 1 consisted of large-sized boulders, intermixed with medium to small sized, sub-angular pebbles and earth. The soil was red and sandy. All the tools were stray finds from the surface and not collected from their original position.

Terrace 2 is another mass of flat land at a height of 375 feet from the river-bed i.e. 190 feet lower than Terrace 1.

The stone tools (palaeoliths), unlike Terrace 1 were collected from the exposures alongside a small *nullah* as well as from the slopes.

Terrace 3 is a vast open land in front of the Guler railway station at a height of 150 feet from the river-level. The terrace consisted of medium-sized boulders, closely packed with pebbles and superimposed by a comparatively thin layer of silt. At one of the spots the thickness of the boulder-cum-gravel deposit was as much as 25 feet with the overlying silt about 3 to 4 feet thick.

The stone tools from Terrace 3 were yielded by a rain-gulley cut through the terrace as also the surface from the open stretch of land.

The existence of another terrace numbered as Terrace 4 was doubtful. It did not yield any tool as well.

The youngest of the terraces was numbered as Terrace 5 which was about 30 feet higher than the present river-bed. From bottom upwards it consisted of coarse gravel gradually becoming finer and ultimately superimposed by 4 to 5 feet thick deposit of silt. Terrace 5 also did not yield any tool.

Palaeolithic tools collected from Guler were all made on pebbles of quartzite or on flakes struck therefrom. They vary in shapes from sub-angular, oval to spheroid. The pebbles are generally flat-based in the first two varieties. Since the pebbles used for the tools were normally flat based, a sharp cutting edge could be easily obtained by flaking on one side only. Hence the stone tool industry at Guler was dominated by unifacial 'choppers' whereas bifacial 'chopping-tools' were far less in quantity.

The tools collected from Guler could be classified into six categories viz. (1) Unifacial 'chopper', (2) Bifacial 'chopping tool', (3) Pebble handaxe, (4) Handaxe (5) Cores and (6) Flakes.

(1) Unifacial 'chopper' - These tools are made mostly on sub-angular or oval pebbles with a flat ventral face. The working-edge was prepared by flaking merely a part of the dorsal surface.

(2) Bifacial 'chopping-tool' - For tools of this variety pebbles of spheroid shape were used. The flaking was done on both the sides without which it was not possible to have a sharp cutting edge. The flaking is generally alternate resulting into wavy working edge.

(3) Pebble Handaxe - The tools of this variety were usually made on a roughly oval pebble with a flat ventral surface. Flakes from the dorsal side were removed from two opposite sides in such a fashion that a pointed end was produced. The pointed end is a distinguishing feature. The medial ridge from the point runs roughly along the axis of the tool. The flaking was restricted to a part of the periphery, the rest serving as the butt-end. The tools have some similarity with the handaxe and to distinguish them from the usual handaxe the term pebble handaxe was given to them provisionally.

(4) Handaxe - The usual bifacial handaxes were classified under this group. The tools of this variety were worked on both the surfaces. The handaxes were of the same well known Abbevillian and Acheulian varieties. The tools were rolled in most of the cases.

(5) Cores - The cores were generally discoidal in shape. A large number of them were worked bifacially, the flaking running usually along the entire periphery. Numerous cases in which only one side was fully flaked were also observed. A wavy edge was produced by means of alternate flaking.

(6) Flakes - Four varieties of flakes were distinguished at Guler. They were (1) Clactonian without any retouch the angle being about 120° (2) Clactonian with the edge partly retouched and showing marks of utilization (3) and (4) Proto-Levalloisean.

The tools from Terrace 1 included three unifacial 'choppers', one bifacial 'chopping tool' and two Clactonian flakes. When compared with the tools yielded by terraces 2 and 3, these tools are found to be more crude and patinated. The development of the tools was towards finer and somewhat smaller ones with the passage of time. There was no handaxe in Terrace 1.

Six 'choppers', one 'chopping tool', one pebble handaxe, six Clactonian flakes and three proto-Levalloisean flakes were collected from Terrace 2. Some of the tools are patinated, one of them even rolled, whereas others are comparatively fresh. The patinated and rolled specimens might have been washed down from the earlier terrace and redeposited.

Tools from Terrace 2 are finer and better manufactured than those from Terrace 1. The 'choppers' had a sharp and well-defined edge showing secondary retouch. Pebble handaxe as well as proto-Levalloisean flakes are the new elements in addition to those occurring in the earlier terrace.

Eighteen tools which came partly from Terrace 2 and partly from Terrace 3 included eight unifacial 'choppers', one bifacial 'chopping-tool', one pebble handaxe, two handaxes, two Clactonian flakes and one proto-Levalloisean flake. The tools were mostly fresh, but for a few which showed patination. The pebble handaxe was neatly manufactured. One of the handaxes was of the Abbevillian technique, whereas the other of Acheulian.

Terrace 3 yielded seven unifacial 'choppers' and two Clactonian flakes. Two tools were observed to be patinated, of which one was rolled indicating that both were rolled down and redeposited.

3. Prehistoric Sites In Liddar Valley [Jammu and Kashmir]*

The expedition led by De Terra and Paterson (page 105) observed that there were no Stone Age sites within the proper Kashmir area and as such the same was considered to be of very little importance from the angle of prehistoric studies. In 1970, however, Sankalia and party discovered early palaeolithic tools which comprised a massive flake and a crude (Abbevillian) handaxe. They were collected from well-stratified deposits contemporaneous with the Second Glacial and Second Interglacial deposits in Kashmir. In view of the above mentioned discovery R.V. Joshi and party undertook a detailed Survey of the Liddar valley and studied several sections in the stream on the western fringe of Kashmir basin. Ten early palaeolithic tools were collected from the section at Pahlgam during the course of the study.

The section yielding tools was exposed on the right bank of the Liddar river all along the road leading to the golf-course at a height of about 7100 feet. Pahlgam is about 105 kilometres east of Srinagar, a well known place of tourist attraction in Kashmir. The deposit in the exposed section was in the following order from bottom to top. The bottom most deposit was composed of boulders and clay, a heterogenous mixture of greenish to yellowish clay and boulders ranging between 3 to 4 metre in size. The majority of the boulders were sub-angular to sub-rounded. The deposit was well cemented with calcareous material.

* World Archaeology, 1974, pp. 369-79 reproduced in Source Book of Indian Archaeology Vol. I ed. by F.R. Allchin and Dilip K. Chakrabarti. pp. 124-133.

Superimposing the above deposit in an uneven manner was the bouldery gravel showing faintly laminated clay and better sorted boulder components. The cementing was poor and the rocks were of the same metamorphic type like quartzites, Panjal trap, limestone etc., as observed in the underlying boulder and clay deposit. The early palaeolithic tools were collected from this deposit.

Overlying the bouldery gravel was a brownish sandy silt. Generally it was massive and at places faintly laminated. Bands of humus-rich clays were also observed here and there. Calcareous concretions were conspicuous by their absence in this deposit.

Ganeshpur

The section exposed all along the canal on the right side of the road leading to Pahlgam was very interesting. Right from the bottom to a height of about 20 metre the deposit in the exposed section comprised brown laminated clays and calcareous yellow-brown silt alternating with angular scree material of local metamorphic schists and slaty rocks. The deposit was unquestionably water-laid. Such a type of deposit downstream from Pahlgam was observed for the first time in Liddar valley. The huge boulders occurring upstream were found to be absent here. The bed of the silt was overlain by reddish-brown non-calcareous silt about 6.5 metre thick superimposed by recent scree.

Krungus and Bawan

Fine cliff sections were exposed at Krungus and Bawan not far away from the confluence of rivers Liddar and Jhelum. The section at Krungus was undisturbed and the composition from bottom upwards was a thick 8 metre green sand resting directly on the limestone and superimposed by a 13 metre thick boulder conglomerate. The material was fairly well sorted and compact, though crudely stratified and at places disturbed by cross-bedded sands. The pebbles ranged in size from 15 to 20 cm. Other types of rock material were quartzite, quartz and Panjal trap, the last one being badly weathered. Overlying the boulder conglomerate layers of sand about 20 metre thick were observed. Greenish or brownish in colour the proportion of clay at places was much more than the sand. On the top a 50 metre thick brown silty deposit of Karewas was observed.

Baba Bamuddin

On the left bank of the Liddar river near Baba Bamuddin caves another important section near Bawan village was exposed. At the bottom of the deposit 8 metre thick limestone exposed in the cliff was observed. It was superimposed by a 11 metre thick boulder conglomerate of the same nature as described above. The boulder conglomerate was ultimately overlain by limestone scree derived from the limestone cliff occurring in the background.

The studies undertaken by R.V. Joshi and party led them to derive the conclusion that the boulder beds of Bawan, Krungus and Pahlgam belonged to Middle Pleistocene age. The Early Stone Age tools were thus of the Middle Pleistocene age, particularly because they appeared fresh. The party also believed that there was a strong glaciation in the valley during the Middle Pleistocene times, represented by a moraine at Pahlgam. The climate of the valley was quite congenial to Man for habitation as proved

by the occurrence of Early Stone Age tools at the junction of the boulder bed and the overlying sands and clays.

The team collected ten tools of the Early Stone Age from the exposed section at Pahlgam. Earlier Sankalia had collected ten implements from the Liddar and Sind valleys, therebeing only one from the latter. These tools were collected from the boulder conglomerate and at its junction with the overlying brown silt. The collection comprised flakes, a handaxe, scrapers, borers and choppers. R.V. Joshi and the party's collection included one pointed tool, six choppers and three scrapers. Unifacial and bifacial types of tool were of equal importance as observed by R.V. Joshi in the Liddar Valley at Pahlgam. As compared to the Kangra valley and Peninsular India the handaxe and cleaver components were meagre, rather absent in the tools obtained from Kashmir.

4. Stone Age In The Vindhya And The Ganga Valley*

The Vindhyan Plateau

The Vindhyan Plateau, in the Districts of Allahbad and Mirzapur, bounded on the north by the Ganga valley and on the south by the Son, is divided into two parts. The first is an evenly undulating plateau with a maximum width of about 88 km and an average height ranging from approximately 120 m to 195 m; and the second part is known as Kaimur, situated to the south of the plateau and north of the Son and has a height ranging from 420 m to 510 m. The first part is drained mainly by two rivers, the Karamnasa and Belan, their source being near the present township of the Churk Cement factory. The Karamnasa has generally a south-north course and joins the Ganga; the Belan on the other hand flows east to west and joins the Tons. The Belan has a number of tributaries, the important ones are the Adawa, Seoti, Seoti of Chundri Ghat, Lohanda, Nadoh, Tundiari and Gurma etc. Besides, a number of recent nullahs and rain-gullies have also cut through the valley. These together cover an area more than 5200 sq. km. The area has become important for the study of the Stone Age because of its uniform stratigraphy as revealed by the river-sections and the cuttings in the nullahs. The entire area is rich both in implements and fossils. The earliest formation on the Vindhya is a lateritic deposit resting directly on the weathered top of the Vindhya, now under a soil cover of varying thickness. This lateritic formation appears to be due to *in situ* differential weathering of the surface of the Vindhya. So far no lithic association of this horizon has been established. The sections in the river and the nullahs that cover the entire area have a remarkable uniformity. The most representative one is on the Belan, exposed by the river where, at a certain point near Daiya village, it abandoned its old channel, burst through one of its original meanders and made out its new channel possibly by capturing for some distance the channel of its tributary the Seoti. The section has an average height of 18 m. The first formation of boulder conglomerate is known as Cemented Gravel I (1.5 m thick) strongly cemented and comprising poorly sorted sheet gravel having pebbles ranging in size between

* D.P. Agrawal and A. Ghosh (eds), *Radio-carbon and Indian Archaeology*, Bombay 1973, pp. 106-10. Reproduced in *Source Book of Indian Archaeology*, *op. cit.* pp. 173-177.

2 to 15 cms., and angular slabs of Vindhya, and also lateritic nodule and laterite-plated stone blocks evidently torn out by the river from the laterite covered deposit. It is clear that the slabs have not been carried to any considerable distance and were consolidated in the original area. This deposit is profusely implementiferous and fossiliferous. Lower Palaeolithic tools of the handaxe-cleaver complex, as well as pebble tools, have been recovered from this deposit wherever it is exposed.

Stratification

Cemented Gravel I is overlain by a silt, which measures 3.4 m in thickness and is completely devoid of stone pebbles, tools or fossils. From the nature of its formation it appears to have been deposited under stagnant water.

The silt is overlain by gravel approximately 5 m thick. It is well-cemented and well-sorted. The pebbles and sandstones inside this gravel-Cemented Gravel II-are smaller in size than in Cemented Gravel I. Bigger sandstone slabs are to be found only in the basal portion, some of which have been torn out from the Cemented Gravel II. On account of cross-bedding and intervening silty layers, Cemented Gravel II has been divided into three parts i.e. IIA, IIB and IIC. Cemented Gravel IIB has a maximum thickness of more than 3 m. This gravel is extremely rich in fossils as well as tools which are generally fashioned on crypto-crystalline silica. It has an even top surface. Cemented Gravels I and II were perhaps formed in humid or wet conditions and the silt (mottled clay) was formed in dry conditions. The next formation, resting on Cemented Gravel II, is a reddish sand divided into four sub-parts; (iii) reddish sand; and (iv) a capping pebble bed inside reddish sand. In the main this formation reflects a dry period, with intervening periods of a comparatively wet phase, which led to the formation of sandy cemented sheets (iii) and the pebble bed. The total deposit is c. 10 m. The deposit has also yielded fossils and tools of crypto-crystalline silica. The next deposit is a yellow silt, formed in a dry period and has the appearance of a hill-wash. The deposit is also fossiliferous and the Middle Palaeolithic tools which first occurred in the lower part of Cemented Gravel II continue in this deposit together with the first appearance of a blade industry.

Above the yellow silt is Cemented Gravel III, consisting of calcareous nodules, iron nodules, etc. It contains more calcium than Cemented Gravels I and II and is less consolidated. This formation represents the junction of the dry-humid phases. The upper portion of the hill-wash and the yellow silt underneath were levelled by river action and consolidated to form this Cemented Gravel. Culturally it is significant because it has yielded evidence of an Upper Palaeolithic blade-and-burin industry. Some geologists are of the view that Cemented Gravel III is to be equated with the end of the Pleistocene, but the team of geologists which recently visited the area is inclined to believe that the buried soil or the ancient soil formation above Cemented Gravel III marks the end of the Pleistocene epoch. If this view is correct, it will raise interesting problems for archaeologists because it has yielded besides blade-and-burin tools, non-geometric microliths. If so, the earliest non-geometric microliths will have to be placed at the end of the Pleistocene. Parallels for this view are available in the traditional sites of the Upper Palaeolithic in the USSR. This has necessitated rethinking about the beginnings of the microlithic industry. The last two deposits are aeolian

and sub-aerial formations. The sands are very fine. The Penultimate deposit has yielded geometric microliths without pottery and the last one geometric microliths, with pottery.

Sequence of Industry

Thus, the sequence of industries occurring in succeeding formations is as follows: Cemented Gravel I or the boulder conglomerate has yielded tools of the Lower Palaeolithic Abbevillio-Acheulian complex, comprising pebble tools, handaxes, cleavers and scrapers. The tools of the first phase of the Cemented Gravel II can best be described as belonging to a transitional phase between the Lower and the Middle Palaeolithic. They are generally made on flakes and comprise mainly cleavers and scrapers, sometimes also bearing traces of secondary working. The (ii) and the (iii) phases of Cemented Gravel II have yielded typical tools of the blade-flake-scraper-tradition of the Middle Palaeolithic. This industry continues in the four overlying deposits, i.e., reddish sand, sandy cemented sheets and gravels, reddish sand and pebble bed. Above the pebble bed deposit, in the yellow silt (hill-wash) which also yields Middle Palaeolithic tools, a marked blade tool element appears. The assemblage from the deposit of the Cemented Gravel III can best be described a blade-and-burin industry of the Upper Palaeolithic tradition. Above Cemented Gravel III, the humus soil and the overlying aeolian and sub-aerial deposits have yielded respectively, industries of non-geometric microliths unassociated with pottery and geometric types with pottery.

Factory Sites

A large number of factory sites have also been located at different heights on the slopes of the low hillocks south of the Belan river. So far 17 factory sites of the Lower Palaeolithic, 23 of the Middle Palaeolithic and about half-a-dozen of the Upper Palaeolithic have been discovered. In this region there are numerous factory sites yielding microlithic tools as well. Projecting portions of the hillocks or outcrops detached from the main hill by erosional gullies at the weaker joints have generally been used as factory sites by Lower Palaeolithic man possibly because such outcrops abounded in quartzite boulders.

The factory sites of the Middle Palaeolithic are located at the foot of the hill where the hill-wash forms a horizon higher than the factory sites of the Upper Palaeolithic (microlithic). The levels of the factory sites of the Middle Palaeolithic as well as the Upper Palaeolithic and Microlithic are higher than the highest formation made by the rivers. In terms of levels, therefore, the factory sites from the Lower Palaeolithic to the Microlithic present a reverse picture of the sections in the rivers. Further geological investigation is needed to correlate the factory sites with the alluvial formations. A technology-based analysis of the tools, however, has furnished valuable data for such a correlation. It has also shown that all the factory sites are neither coeval nor coterminal and that they had their own spans of life.

Pratapgarh, Allahabad and Varanasi Districts

Explorations conducted by the University of Allahabad in Pratapgarh, Allahabad and Varanasi Districts have opened a new chapter in the study of the Stone Age in India. To the north of the Allahabad-Phaphamau-Unnao road there are sections having

a thickness of 8 to 10 m. above the flood-plain of the Ganga, which constituted the bank of the river from where it has now receded towards the south. The four top-most layers are significant. A tentative correlation with the Pleistocene section of the Belan and its tributaries has been proposed. The fourth layer from the top is full of lime concretions and on this basis has been equated to Cemented Gravel III of the Belan complex. The next or the third layer from the top is the blackish clay layer which can be equated with the ancient humus layer or the buried soil of the Belan which marked the end of the Pleistocene. Overlying this is the layer of plastic clay on the top of which factory sites of non-geometric microliths have been identified, e.g. Kurha and Pichchia. The last deposit is of sandy soil varying from 1 to 2 m. in thickness and occasionally yielding microliths in the sections. From the presence of pebble nodules, partially split pebbles, finished and unfinished tools with heavy patination but without much rolling, it has been inferred that man brought the stone material from the nearby Vindhya and manufactured the tools at the site itself. Considering the material as well as the typology it can be safely inferred that these factory sites indicate mesolithic seasonal camps. The mesolithic inhabitants of the Vindhya found in the Ganga valley plentiful water-supply and small game and they started coming to these areas bringing with them stone pebbles and made seasonal settlements over a wide area north of the Ganga. This is the first discovery of a regular Stone Age site in a geological context in the Ganga valley.

5. The Stone Age Cultures Of Orissa*

The author (G.C. Mohapatra) carried on his investigations into the prehistoric archaeology of Orissa from the year 1956 to 1959 in the districts of Mayurbhanj, Dhenkanal, Sundergarh and Keonjhar. The work was mainly confined to the valleys of the rivers like the Mahanadi, the Brahmani, the Baitarani, the Burhabalang and the Khadkai. All the Stone Age sites are situated in the hill districts of Orissa, far away from the sea.

Previous to the author's investigations, four Stone Age implements were found by V. Ball in 1875 and an excavation of the Lower Palaeolithic sites at Kuliana in Mayurbhanj was conducted by the University of Calcutta in 1942. Stray palaeoliths and the neolithic polished stone celts were also collected by various persons and presented to the Orissa State Museum from time to time.

The importance of the author's investigations is that, for the first time it has brought to light a succession of Stone Age Cultures in Orissa. Moreover, the Early Stone Age Culture of Orissa is no more confined to Mayurbhanj only, neither the mediocre skill of the Kuliana industry is its sole characteristic. The culture is much wide-spread and its gradual technological development from the crudest to the finest tool-making is clearly seen. The Middle and the Late Stone Age industries, succeeding the Early Stone Age, were not known in Orissa so far. Their discovery in Orissa by the author greatly lends to a broad correlation of the prehistoric cultures of India, especially their distribution and regional variations in this sub-continent.

* Indian Prehistory, Poona 1962. Also reproduced in Source Book of Indian Archaeology, *op. cit.* pp. 183-189.

Apart from the new discoveries the various Pleistocene deposits and the stratigraphic horizons of different Stone Age industries of Orissa, observed in a wider extent, have been compared with other areas in India. On the whole, the present work not only claims the discovery of a few more cultures in Orissa but also brings out their similarities and dissimilarities, both stratigraphic and cultural, with other areas inside India and abroad.

Altogether twenty-two sites of Early Stone Age, twenty-five sites of Middle Stone Age and eight sites of Late Stone Age cultures have been discovered by the author.

Stratigraphy

The following is the general stratigraphy of the river cliff sections with the associated Stone Age industries (correlated).

1. Rock
2. Mottled clay
3. Coarse gravel (or Gravel with tools of Early Stone Age)
4. Red silt
5. Fine gravel (or Gravel II with tools of Middle Stone Age)
6. Red silt.

Microliths of the Late Stone Age occur on the surface and bed of the rivers. Tools of the Early Stone Age also occur in the secondary laterite pits. A few tools of the Middle Stone Age have also been found from the pisolitic laterite pits over the detrital secondary laterites at Bonai.

Probable Climatic Phases

From the evidences of different Pleistocene deposits a succession of wet and dry phases have been worked out. A phase of heavy rainfall which can be called as pluvial starts at the beginning of the Pleistocene times when the primary laterites were formed. After that three dry phases separated by two gradually decreasing wet Phases followed. The last dry phase is continuing till today.

Early Stone Age Culture

1. The Gravel I and the detrital secondary laterite are the main stratigraphic horizons of this industry.
2. Handaxe, cleaver, scraper, crude point, flakes and cores are the main tool-types.
3. The Soanian pebble-chopper and chopping-tools are completely absent.
4. Flaked pebbles form an integral part of the bifacial handaxe-cleaver tradition of the Early Stone Age.
5. There is no marked distinction between the core and flake industries as such.

6. The technique is mainly bifacial and the average standard of tool-making is mediocre. There are a few specimens showing the typical Vaal technique (single and double).

7. No Levalloisean or proto-Levalloisean element is seen. Faceted platform flakes and prepared cores are completely absent.

8. Medium grain, brown quartzite is the common raw material.

9. No evolution of the technique can be worked out by the help of stratigraphy. Tools of both crude and the developed facies occur in one and the same gravel layer.

10. The three stages of tool-making mark a gradual development of the technique from the cruder to the finer ones.

11. Taken as a whole these tools compare well with the Abbevillio-Acheulian tools of Europe and Africa.

12. In India it seems to be the part and parcel of the great peninsular handaxe-cleaver tradition.

13. It is completely different from the Lower Palaeolithic pebble-tool cultures of Soanian, Anyathian, Choukoutienian, Tampanian and Patjitanian.

Middle Stone Age Culture

1. The *in situ* tools of this industry come from the Gravel II of the cliff sections and lateritic murram quarries at Bonai.

2. The industry is characterised by the unprepared platform flakes. The percentage of the prepared platform flakes (Levalloisean) is only 3.43. Tortoise or prepared cores are completely absent.

3. Scraper, point, borer, burin, flake, blade and core are the main types of artifacts.

4. The tools are of smaller dimensions than those of the Early Stone Age and made of finer raw materials (chert, jasper, opal and fine-grain quartzite).

5. Retouches are mainly confined to the margins. Pressure technique, though known, was sparsely used.

6. The technical development of this industry can be traced back to the Stage II of the Early Stone Age industries when the use of the cylinder hammer technique started.

7. The industry presents a crude appearance. Well-finished specimens are very few.

8. In India this culture is called by various names, like Series II, Middle Palaeolithic and Nevasian etc., but basically they show uniform characteristics everywhere with a slight or no regional variation.

9. Outside India it has hardly any strict parallel. However, a rough comparison can be tried with the Middle Palaeolithic of Europe, Proto-Still Bay and other Middle Stone Age industries of Africa and the Sangrian of Indonesia.

10. This culture is typically Indian in character and fairly widespread throughout the length and breadth of this sub-continent.

Late Stone Age Culture [Microliths]

1. Tools belonging to this industry were found loose on the surface and in the dry bed of the rivers.

2. Parallel-sided blade, fluted-core, scrapers of various types, point and lunate are the constituent tool-types.

3. On the whole the industry presents a technically crude appearance. Some of the specimens are also rolled and weathered.

4. They are purely non-geometric in character and no pottery has so far been found with them.

5. The raw materials are the same as those in the case of the tools belonging to the Middle Stone Age.

6. The microlithic industry of Orissa can be compared with that of the Giddalur II, Singrauli basin (Mirzapur), Megnanapuram (Tinnevely-Teri microliths), Nagarjunakonda and Sanganakallu Phase I.

7. The mesolithic non-geometric microliths of Europe typologically present some similarity with the microliths of Orissa.

8. Most probably this industry preceded the Chalcolithic and polished stone celt cultures of Orissa.

Conclusions

1. The Early and Middle Stone Age Cultures started towards the end of the first and the second dry phase respectively and reached their climax in the first half of the succeeding wet phases.

2. The Late Stone Age Culture flourished in the last dry phase (early Holocene) which is still continuing.

3. The three cultures are fairly widespread in Orissa and seem to have been

chronologically continuous.

4. Our comparisons reveal the fact that the Stone Age Cultures of Orissa are closely related with those of the Islands of the Central India, especially the neighbouring regions like Chota Nagpur, Mirzapur, Upper Narmada Valley and the Lower Godavari Valley. In all probability some of these cultures have infiltrated into Orissa from Central India through the valleys of the Mahanadi and the Brahmani, whereas in later time the historic and protohistoric cultures came via its coastal plains both from the south and the north.

5. The author does not contribute to the hypothesis that Orissa is a meeting place of the Soanian pebble chopper-chopping and peninsular bifacial handaxe-cleaver traditions as supposed by many.

6. Prehistoric Hoshangabad [Adamgarh]*

River Narmada at Hoshangabad in Madhya Pradesh forms a demarcation line between two distinct morphological features. Towards the northern side of the river agglomeration of scraps and dissected tableland of the Vindhyan Mountains can be easily observed in contrast to the stretch of alluvial peneplain mostly composed of black cotton soil interspersed here and there by isolated low hilly ranges in the south. One of these isolated hill ranges is known as Adamgarh, situated about 2 kilometres south of Hoshangabad. Adamgarh hill range is famous for stone quarries. Palaeolithic tools from the hill range were collected for the first time in 1935 from three sites, when De Terra and Teilhard de Chardin undertook the prehistoric exploration of the Narmada river at Hoshangabad. The tools were picked up from the deep pockets of the range filled with laterite soil 40 to 50 feet below the hill surface falling on the eastern slope. Two types of composition were observed by De Terra in these pockets, of which one filled with primary laterite did not yield any tool. The other deposit which yielded the tools was composed of rewashed laterite in which angular pieces of iron oxide and laterite are mixed with quartz and sandy silt.

Regarding the tool-bearing deposit De Terra commented, 'the presence of rewashed laterite with implements in Central India was hitherto unknown and is of interest in view of the wealth of early palaeolithic hand-axe cultures represented in similar deposits near Madras. It indicates also that such ancient soils may be widely distributed in the adjoining hills, where fan deposits cover the flanks of the ancient alluvial plain'.

Amongst the tools collected by De Terra were a much rolled core or hand-axe of non-descript type and three crude Abbevillian-like hand-axes, one large flake with edge trimming, one chopper of early Sohan type and two large flakes. All of them came from the rewashed laterite in a hollow two feet below the surface of the ancient red soil on the hill-top about 250 yards north-east of the well-known Adamgarh rock-shelters. Near the southern hill in the talus were found fine discoidal cores (one a primitive tortoise

* Asian Perspectives, 1964, pp. 150-63 and also reproduced in Source Book of Indian Archaeology edited by F.R. Allchin and Dilip Chakrabarti Delhi 1979, pp. 159-173.

core), one flat-bottomed, steep-sided pointed tool and two pebble choppers, all resembling the Early Sohan types found in the lower Narmada group with early palaeolithic hand-axes.

A few stone tools, from the debris adjacent to the rock-shelters were collected by R.V. Joshi in December, 1953. They comprised mostly handaxes, cleavers, discoids and flakes indicating Acheulian characteristics.

During the course of his exploration De Terra had equated the Narmada beds, on the basis of comparative typology and stratigraphy, with those of the Potwar region of West Pakistan investigated by him earlier. In this way he had established a relationship between the Stone Age cultures of the Narmada and the northern region far away from each other.

The palaeolithic site of Adamgarh hill was very promising for the study of Stone Age Man because of being free from any river action and as such undisturbed. In addition to palaeolithic tools, Adamgarh hill also yielded rich microlithic industries from the black soil besides the rare rock paintings. But for a few, all the paintings are very late in date. The exact date or age of any one of them cannot be determined. Adamgarh hill was, therefore, in occupation from palaeolithic to microlithic times. It remained in occupation during the historical period as well.

R.V. Joshi conducted an excavation at the site which brought to light the following stratigraphy. The laterite material was found to rest on or partly enclosed by the blocks of rocks broken off from the scarp face of the hill. The laterite exposed afresh presented the appearance of typical laterite. It was red speckled with white and became sticky wet. The laterite at Adamgarh has been eroded partly and covered by fine gravel and red clay derived from it. Unconsolidated debris composed of sub-rounded blocks and fragments of local rocks were found in the clay and the material overlying it. The palaeolithic tools were yielded by this clay and debris. Both the debris and the clay were laid in such a fashion that no stratification was possible. It was believed that the underlying laterite was badly eroded and the fine clay and rock fragments were deposited in the resultant hollows and depressions.

The tools embedded in the lateritic clays were weathered and worn out. They were, however, not rolled establishing thereby that the tool-bearing deposit was not disturbed. The palaeolithic stratigraphy of the site in brief was a lateritic substratum overlain by a partly hardened sandy deposit and sticky red clay, the last two being derived from the underlying laterite. Overlying and partly enclosed in the red clay and sandy deposit was the fragmentary talus or debris which contained the palaeolithic implements. The soil on the surface resting on the implement-bearing bed was thin and composed of red silty clay, often dark in colour due to humus content which yielded a few microliths.

In Trench 7 at Adamgarh, the palaeolith-bearing debris was overlain by layers of rock fragments containing smaller tools than those of the Early Stone Age. The tools

were generally made of quartzite and rarely of chert, chalcedony or vein quartz. Scrapers, points and flake-blades comparable to Middle Stone Age tools constituted to be the assemblage of tools.

All the tools of the Early Stone Age were made on quartzite and fine-grained sandstones, locally available in the Vindhyan rock. Chert or cherty quartzite were rarely used for the purpose. Pebbles and pebble-flakes were also freely used for manufacturing the tools. The percentage of such tools was 35% out of a total of 280 specimens which included cores and flakes. There was no conglomerate bed in the rock formation. Pebbles could also not be deposited high up on the hill during turbulent floods of the Narmada or the adjoining stream as there is no evidence of flood action in the form of an appreciable pebble-deposit or marks of extensive erosion. Thus the pebbles, as raw material for the tools, appear to have been specially brought by man from the river-bed in the neighbourhood. Pebbles in appreciable number found during the course of excavation showed marks of battering or bruising which indicated that they were used as stone-hammers or tools.

The Man had two advantages in selecting the pebbles for his tools. Firstly they were readily available in the river-bed according to the desired size and shape. Secondly the freshly-exposed pebbles were generally less weathered and hard enough to withstand drastic chipping to reduce the thickness and width for obtaining sharp edges and points. The blocks taken out of the rock were on the other hand, weathered and generally weak and less resistant.

Over 50% of the chopper tools were made from pebbles, whereas their use for manufacturing hand-axes and cleavers was rare. Adamgarh was undoubtedly a factory site as revealed by a large number of unfinished tools.

The flake-scars on the tools are generally shallow and small, indicating controlled flaking by soft hammer. A large number of artifacts also show stepped scars of careful secondary trimming. The cross-sections of finished tools are more or less regular producing symmetrical forms. All these features are Acheulian. Pebbles and other materials used for the tools were dressed in a similar manner.

Two incomplete ovates and four bifacial choppers were found at the lowest depth of 180 centimetres in trench 6. One of the ovates was prepared on a flake and the other on a quartzite block. All the tools were weathered and worn showing Acheulian characteristics. The horizon of 150 cm. was the richest in the yield of tools. The tools from this level were less weathered. Cleavers were limited in number without any varieties. Amongst tools, choppers, thirteen in all, happened to be the largest in number. Four of them are unifacial choppers which were all worked on pebbles, but for one. The rest of the choppers were bifacially trimmed, six on pebbles and three on stone blocks. Points appeared for the first time at this horizon.

The next horizon for the tools was 135 centimetres which was characterized by a marked increase in the number of cleavers of finer shapes and decrease in number of

hand-axes and choppers. There was no fresh hand-axe or cleaver above the horizon of 120 metres which marked the end of the Acheulian phase. The tools from the higher levels were smaller.

A marked change in the composition of tools was observed at the level of 80 centimetre and above. The implements from this horizon were of an unspecialized industry in which points and scrapers constituted to be the bulk. They were all prepared from flakes or nodules of quartzite and sandstone. Amongst the artefacts, thick blades or flake-blades occasionally retouched as side-scrapers had the upper hand. All of them were having an unfaceted striking platform forming an obtuse angle with the primary flake surface. The points are simple leaf-shaped and sometimes even shouldered or tanged, while the scraper group is made up of core-scrapers and flake-scrapers, the latter including hollow-scrapers and side-scrapers. This group of tools represented the Middle Stone Age assemblage. The microliths appeared at approximately 50-60 centimetres horizon and continued upto the surface. Their correlation with the Middle Stone Age assemblage could not, however, be established.

R.V. Joshi arrived at certain important conclusions which were entirely different than the belief generally held by the scholars earlier. He said, "Much importance is attached at present to the occurrence of pebble tools in Indian Early Stone Age industries, ever since these were first reported by De Terra in the Soan Valley of West Pakistan. De Terra (1939) regarded them as an independent tradition distinct from the Madras hand-axe industries of South India. But later, when similar pebble implements were noticed at almost all the palaeolithic sites, their occurrence in remote places was explained as due to either migration or diffusion (Krishnaswamy et al. 1951). A similar argument was advanced when hand-axe industries were found in the Soan Valley. The northward spread of the Madras tradition and southward march of the Soan were considered the only explanation for their occurrence all over this vast country.

"At no site yielding both these industries have pebble tools of Soan type occurred in a deposit stratigraphically earlier than the horizon containing hand-axes and related tools of the Madras tradition. However, the Oldowan pebble culture of Africa is stratigraphically proved to be the earliest Stone Age industry there (Clark, 1962), and since there is a close typological parallel between African and Indian early palaeolithic industries, it had been assumed that Indian pebble industries were similarly earlier.

"In India, pebble tools are inseparable adjuncts of Acheulian and post-Acheulian (Middle Stone Age) cultures. This is evident wherever the total collections from stratified deposits are available. The proportion of pebble tools to hand-axes in a certain collection is not an important factor, for at some sites pebble tools occur in larger quantities than hand-axe tools while at other sites it is the other way about. Even with pebble tools, sometimes the emphasis is on the proportion of unifacial and bifacial types, and if a parallel were drawn with African Kafuan and Oldowan pebble industries, the unifacially trimmed choppers would have to be considered earlier.

"The Adamgarh excavation has conclusively proved that no such distinction can be made, for unifacial types occur even with late Acheulian industries. The term 'pebble tools' is in fact inaccurate, since even the tools of hand-axe category are sometimes made of pebbles (Clark, 1962).

"Therefore, the term 'chopper group' is preferable and should include the tools trimmed in one or both directions. The advantage of pebbles as the raw material for such implements was pointed out above. The predominance of the chopper group in the palaeolithic industries of some sites should be attributed to the ecological aspect of the site, and should not necessarily be regarded as a different tradition until of course it can be demonstrated stratigraphically as well".

7. Prehistoric Bhimbetka, District Raisen, Madhya Pradesh*

The excavation conducted at Bhimbetka by the team headed by Dr. V.N. Mishra of the Poona University in Rock Shelter III revealed a continuous cultural sequence ranging from the late Acheulian to the Mesolithic Period. The total occupational deposit was 3.65 m with the following stratigraphy.

Layer 1 : 5-10 cm thick, dull yellowish soft silty sand. This deposit yielded geometric microlithic tools and fragmentary sherds of plain grey and red wares.

Layer 2 : 10-25 cm thick, slightly darker in colour and finer in composition than layer 1. Microlithic tools were found in this deposit.

Layer 3 : 10-20 cm thick, brown and more sandy than layer 2. A characteristic feature of this layer was the presence of thin, weathered sandstone chips all through the shelter. The quantity of microlithic tools declined in this layer.

Layer 4 : 15-20 cm thick, dull brown, more clayey and with more rock fragments than any of the upper layers. There were no microlithic tools in this layer, whereas quartzite flakes, blades, micro-blades, side-scrappers, and scrapers, etc., occurred.

Layer 5 : 40-50 cm thick, dull yellowish brown, more reddish and compact than layer 4. It contained larger stone blocks and industry of quartzite flakes, scrapers, knives, etc.

Layer 6 : 80-90 cm thick, bright reddish brown similar to layer 5 but slightly more compact and weathered. This layer yielded tools of Acheulian facies.

Layer 7 : 90-100 cm thick, bright reddish brown deeply weathered and far more compact and reddish than layer 6. Acheulian type tools were collected from this layer also.

Layer 8 : 80-90 cm thick, orange, heavily weathered, leading to a mottled appearance of stone blocks and chips. The tools found in this layer were also weathered. The layer was quite compact and yielded Acheulian type of tools.

The entire stratigraphy was divided by the excavator into three major units viz., layers 1 to 4, layers 5-6 and layers 7-8. There was a possibility of layer 8 forming a unit by itself after fully exposed.

The characteristic occupation in the rock shelter with a deposit of 2.40 m belonged to the Acheulian culture. The shelter was in use both for habitation and manufacturing

*Indian Archaeology—A Review 1974-75 and 1976-77 PP. 25 and 29 respectively.

tools without any remains of food or evidence of fire. The tools were used in and near the rock shelter as indicated by the presence of a large number of handaxes, cleavers and other type of tools. Though the tools occurred throughout the occupational deposit, at least at five different levels, they were all found scattered on the floors which indicated deliberate human activity. At a depth between 2 to 2.20 metres a thick concentration of several hundred flakes and a few residual cores, all in a very fresh condition was observed in an area of about 2 sq. m.

The raw material used for the Acheulian tools as also for the later Palaeolithic cultures was quartzite, available in plenty locally. Handaxes and cleavers were made on a dark grey tough quartzite, whereas for other tools a softer yellowish coloured quartzite was used. But for layer 8 the tools of which were heavily weathered, all other layers yielded tools with very little weathering, looking remarkably fresh. The entire material of Acheulian facies had only 26 per cent tools, the rest being in the form of waste-products like flakes, chips, cores, etc. Scrapers of various varieties constituted to be in majority in the finished tools, with a percentage of thirty-nine. Other tools were represented by prepared back and naturally-backed knives, denticulates, notches and truncated flakes. The vast majority of non-biface tools were made on flakes and only a small number on thin tabular pieces. Unretouched Levallois flakes and blades were very common with a percentage of 12.40. The ratio of bifaces to handaxes was 3 : 1. Choppers and chopping tools were completely absent. The cleavers and handaxes were all made on flakes displaying workmanship of a very high standard in the symmetry of the outline. In view of the characteristics mentioned above it was clear that the Bhimbetka Acheulian industry belonged to a very late phase of the Acheulian culture.

The tools yielded by layer 5 were to a considerable extent a continuation of the Acheulian industry. They comprised various kinds of scrapers, denticulates, knives, notches, etc. There were no bifaces. Tools made on thin tabular pieces also increased in proportion. The Middle Palaeolithic industry of Bhimbetka was thus said to have evolved from the indigenous Acheulian culture.

The implements of layer 4 again developed out of the preceding industry of layer 5, but contained more blades. The tools were smaller and the blades narrower and thinner than those encountered in the previous layers. In addition there were a number of micro-blades which became common in the Mesolithic levels.

The microlithic industry of layers 1-3 was made of siliceous material not available locally. It was brought to the site from the source in the basaltic lavas near Barkhera, about 5 km to the south. The microliths were geometric in shape with blunted-back blades, truncated blades, triangles, trapezes and crescents. Blunted-back blades and scalene triangles were most popular with crescent being occasionally present. Quartzite blades, micro-blades and flakes also persisted in a limited quantity. Other materials in the Mesolithic levels consisted of hammers, querns, rubbers and occasional perforated discs, all made largely on basalt. In the topmost layer tiny sherds of plain red and grey wares occurred in small numbers.

Further excavations in Rock Shelter number II yielded the maximum habitation deposit, showing an evolution in the mesolithic culture. The entire occupational deposit was 1.70 m thick, which was divided into the following five layers.

Layer 1 : 5 to 10 cm : Light grey soil over a stone floor. Microliths and plain red and grey potsherds of historical period.

Layer 2 : 30 cm : More greyish and compact than layer 1. At the base of the layer is a stone-paved floor. Geometric microlithic industry of chalcedonic silica. Plain red potsherds of early historical period.

Layer 3 : 80 to 85 cm : Dark clayey earth, very compact and rich in small angular stone debris, extremely rich in microlithic industry, the upper half of this layer contained occasional thin red ware sherds of fine clay, different from those of layer 2, stone querns, rubbers and hammers quite common, small quantities of animal bones, sometimes charred, two human burials.

Layer 4 : 25 to 45 cm : Light red colour, very compact, mainly composed of fine stone rubble held together by clayey matrix, large stone blocks scarce, microlithic industry begins to decline in quantity, three human burials.

Layer 5 : 10 to 20 cm : Light red to grey colour, clayey and compact, thick lenses of calcium carbonate pellets, no cultural material except for stray microliths near the top. This layer appeared to have been formed by the accumulation of water on the uneven shelter floor before the arrival of man.

The microlithic industry of layer 4 was characterized by larger blades and bladelets and a lower proportion of finished tools. The industry was richer in quantity in layer 3. The bladelets were smaller and showed better workmanship in symmetry indicating greater mastery of manufacturing technique. In the latter half of this layer were found thin potsherds red in colour and made out of very fine clay suggesting contact with Chalcolithic communities. The industry declines in layer 2 and coarse red potsherds of early historical period appeared. The deposit of layer 1 was superficial.

8. Prehistoric Sabarmati in Gujarat*

River Sabarmati is the first river of the Peninsula which was examined closely to study the prehistoric remains with the aid of modern geochronological methods. The source of river Sabarmati is Aravalli mountains and it merges with the Arabian Sea in the Gulf of Cambay. The stratigraphy of the section exposed at the site of Hadol, where the river first comes out of the foothills of the mountain ranges, is as follows:-

- Granite
- Gravel conglomerate
- Reddish silt
- Yellowish sandy silt (loess)

Further downstream at Pedhamli and Virpur laterite of varying thickness was found

* H.D. Sankalia, *Investigations into Prehistoric Archaeology of Gujarat*, Baroda 1946 and F.E. Zenner, *Stone Age and Pleistocene chronology in Gujarat*, Poona 1950, pp. 43-44.

to lie over the basal beds of sandstone and shale. The laterite is superimposed by thick cemented gravel, reddish silt and yellowish sand in succession. The gravel conglomerate at Hirpur was found to rest on bluish clay. The gravel is superimposed by reddish silt and a thick deposit of yellowish silty sand (loess).

The characteristic features of the Gujarat palaeolithic industry at Hadol were as follows:-

The tools from Hadol were collected from the (1) junction of gravel and granite, granite, (2) the gravel conglomerate, and (3) the granite or gravel surface (exposed). They were all made of quartzite, some of which were rolled, whereas the rest fresh. The tools comprised ovate and sub-triangular hand-axes, cleavers and discoids, pebble tools and flakes. They were classified into two groups viz., (i) tools with irregular outline, rough 'step' flaking and pebble cortex at the butt-end, or over part of both the surfaces, and (ii) tools with regular outline, wavy edge, comparatively smooth 'step' flaking, and no pebble cortex or the cortex patch at a definite place.

The quality of workmanship i.e. improvement from inferior to superior could not be related to the stratigraphy of the site. Tools representing each quality of workmanship were found even in the lowest stratum.

At Pedhamli the tools were found at four places everywhere from the (1) gravel conglomerate, (2) the junction of the gravel conglomerate and reddish silt, and (3) the reddish silt at various depths. The tools were all made of quartzite and looked fresh but for a few which were rolled. They comprised a large number of handaxes of various types, a few real cleavers and discoids, pebble-tools and Levallois-like and ordinary flakes. Like Hadol the industry at Pedhamli also displayed both inferior and superior workmanship in a mixed condition. The almost perfectly shaped cleavers, ovate and pear-shaped hand-axes were, however, found only in the upper alluvium. There was only a slight improvement in workmanship in the higher levels.

A majority of the flakes had a high-angled platform and prominent bulb, whereas a few had platforms almost at right angles, though no true Levallois flake was found. There was no tortoise core as well.

The Climatic Sequence and the Problem of Tropical Pluvials

The Sabarmati sections reveal repeated oscillations of the climate between drier and wetter conditions. The earliest evidence of wetter conditions is that of the laterite phase, which suggests a rainfall higher than the present. It is the only period which could legitimately be called a pluvial, although it too must have had a dry season. The evidence so far accumulated is not sufficient to say whether this period preceded the formation of the Palaeolithic gravels immediately, or with a long interval. The first view is slightly more probable. After the initial period, the climate oscillated around present-day conditions. It was first moderately humid and then became drier (phases Q, R and S). It became moderately humid again (phase T, red soil) and once more became drier. After these two major cycles the present land surface was formed, probably under conditions resembling those of the present day. There followed two subsequent minor periods of increased aridity, of which the last is quite insignificant.

This sequence shows that since the formation of the Palaeolithic gravels Northern Gujarat has not experienced any periods which had a rainfall heavier than at present. Since these gravels, on typological evidence, are of Upper Pleistocene or earlier age, one would have expected to find evidence of damper conditions on the grounds of the current theory of pluvials.

The theory holds that pluvials occur all over the world during the phases of glaciation in temperate latitudes. Whilst it can be shown (Zeuner, 1945) that this theory is justified in the strict chronological sense for the Mediterranean, i.e. north of the Dry Belt, it is by no means certain whether the pluvial phases in the equatorial and monsoonal belts (collectively called the Tropical Zone) were contemporary with the northern glaciations or not. The assumption has often been made that they were, but it has never been possible to prove this. The evidence obtained on the Sabarmati now suggests that the situation is more complex, and that the interpretation of Pleistocene deposits in terms of climate has to be worked out independently for the Tropical Zone, before a climatic correlation is attempted.

Geographical Zonation

The deposits of the several river systems investigated suggest a decrease in the intensity of the wind action as one proceeds from north to south. It is also evident that there were times when drier conditions than those of the present day obtained as far south as the upper Godavari. It appears, therefore, that the Dry Belt, on the fringe of which Northern Gujarat is situated, extended farther south from time to time.

Correlation of Tropical Pluvial with Glaciations

The relatively small distance between the area investigated and the Himalayas, which were heavily glaciated during the Pleistocene, causes one to expect evidence for corresponding pluvials. In the absence of fossils from most of the areas discussed in this paper, one might tentatively use the Palaeolithic industries to assess relative ages. The Sabarmati industry can hardly be correlated with the lower Sohan complex of Paterson, Movius and others but rather with the late Sohan. In De Terra's sequence for North-west India, based on Kashmir and Northern Punjab, the late Sohan is contemporary with the Penultimate Glaciation. If we assume, for the sake of argument, that the Sabarmati industry is of an approximately similar age, it is evident that there is on the Sabarmati no evidence of true pluvial corresponding to the Last Glaciation. The only possible equivalent would be the red soil (T), but this for pedological reasons can hardly be taken as indicating a climate with a rainfall much heavier than the present. The whole problem of the relation of tropical pluvials to glacial phases needs fresh consideration, and India affords particularly favourable conditions for such work.

The Age of the Palaeolithic Industry of the Sabarmati

That the Sabarmati industry postdates the last humid period (of the formation of the laterite) does not mean that it is geologically young. It is covered by a formidable sequence of later deposits. Two ways are open at present for dating it. The typological correlation has been pointed out in the previous paragraph. According to this and assuming that De Terra's dating of the Sohan is right, the industry would be of

Penultimate Glaciation age or perhaps a little later. This is the most likely interpretation. On the other hand if one chooses to correlate the Sabarmati cemented gravel with the upper cemented gravel on the Godavari at Nandur, the industry would be contemporary with *Elephas namadicus*, a fossil also known from the upper gravels of the sequence of the middle Narbada (De Terra, 1936, P. 821). This zone, too, is correlated by De Terra with the Penultimate Glaciation and the tentative age obtained by the first method is thus confirmed. It has been pointed out, however, that the conditions at Nandur are not unambiguous (P. 40), nor is *Elephas namadicus* restricted to the gravels of the upper zone of the middle Narbada. More work is necessary, therefore, to substantiate the suggested age.

Assuming that the Penultimate Glaciation of the Himalayas is contemporary with that of Europe (and there is reason to believe that this is so), the age in years of the Sabarmati industry may be estimated in a very tentative way applying either Penck's geological dating method or the Astronomical Theory. According to either it would be of the order of 150-200,000 years.

9. Prehistoric Chirki-On-Pravara*

Recent excavations at Chirki have resulted in the discovery of the first Palaeolithic camp and factory site yet to be found in India. Earlier field-work had indicated the presence, in a colluvio-alluvial gravel, of a great many artefacts, distinguishable typologically into three series : (a) Series I, consisting of Early to Middle Acheulian handaxes, cleavers with oblique and straight cutting edges, hammerstones, polyhedrons and spheroids, big flakes and chopping tools and (a new tool-type for India) large scrapers-on-flakes with both a long cutting edge and an oblique cleaver edge on the upper end. These tools are made of the fine-grained grey basalt and of the amygdaloid red basalt of the area, whose spheroidal and columnar weathering made them a suitable raw material, and also, to a great extent, of a very fine-grained dark-grey dolerite with conchoidal fracture, a material which has not yet been found nearer than six miles downstream from the site; (b) Series II, consisting of a flake industry with Levallois influence (the so-called Nevasian)-scrapers, borers, points, and flakes of chalcedony, chert, jasper, heliotrope, moss-agate, etc. (materials found in veins and nodules in the upper of two distinct flows of basalt at the site) 1-2 inches, rarely 3 inches in length; (c) Series III, consisting of blades, blade flakes, and cores of chalcedony. These tools are an indication of a distinct upper Palaeolithic, pre-microolithic culture, which was supposed for a long time to be absent in India. They are found only on the surface. Artefacts of all three series occurred on the surface, and those of Series I (only a few) and II were both found in the gravel of the first six trenches made at the site. The stratigraphic relations among the series remained to be clarified by further excavation.

A seventh trench, dug half a kilometer north of the first excavations, revealed a boulder horizon containing many Early Palaeolithic tools. The horizon, only 10-40 cm. thick, lies directly on bedrock and is overlain by a 0.60-1 m. thick layer of gravel of the

* Current Anthropology, 1968, pp. 216-218 and reproduced in Source Book of Indian Archaeology Vol. I *op. cit.* pp. 187-189.

same type as that of the earlier excavations and a layer of gravelly brown soil 0.80-1 m. thick containing potsherd and an iron arrowhead. Its angular boulders of basalt appear to have accumulated more through colluvial than through alluvial action. The dolerite blocks in the horizon were undoubtedly introduced by man.

When the horizon was completely exposed by an L-shaped trench with dimensions of 3 x 6 m. and 8 x 7 m. it was found to contain 694 implements of Series I. Both the quantity of tools and their distribution suggest that the site was a factory. Tools tend to concentrate around large boulders; for example 70 tools were found within arm's length of a broad flat block that may have served as a seat. A particularly heavy concentration of finished and unfinished tools in the southern part of the trench suggest that this was the location of the workshop. A rectangular arrangement of stones in the northern part of the trench may have been the foundation for a wind of sunscreen or for a bush-camp. Fewer tools were found here than elsewhere in the trench, but those found are mostly of dolerite; the dolerite tools here are in general better-worked and better-preserved than tools of other materials. Bones are rare; one tusk-end of *Elephas*, a horn of (probably) *Bos namadicus*, and a few other bone fragments were found. The bone is highly clarified but very brittle, making preservation poor.

The gravel overlying the boulder horizon (which reaches, at places, a thickness of 7-8 m.) contains many artefacts of Series II, along with occasional Series I tools whose presence can be explained in terms of lateral erosion from the slopes. In the upper part of this gravel and on its surface were found several thousand flakes, scrapers, borers, and points of Series II.

The excavation of Trench VII permits the following outline of the stratigraphy at Chirki.

(1) Erosional phase (due to tectonic disturbances), with the river flowing at a lower level than at present—deposit of a thin colluvial boulder fan over smooth bedrock; occupation by Early Palaeolithic Man.

(2) Sealing off the boulder horizon by alluvial gravels during an aggradational period in the Upper Pleistocene; occupation by users of "Nevasian" tools.

(3) Renewed downcutting of the river to its present level (13-15 m. below the alluvium in question); microlithic tools found on top of the alluvium across the river from Chirki.

The excavation has also confirmed the original impression that the site was a factory in Early Palaeolithic times. Further excavations at Chirki in the autumn of 1967 are expected to produce more detailed evidence as to the nature and extent of the occupation.

10. Prehistoric Pallavaram*

M.C. Burkitt analysed a vast collection of tools of Old Stone Age collected by

*Antiquity, 1930, pp. 327-39 and Ancient India No. 3 PP. 30-32. PP.

various scholars from Pallavaram and the surrounding region in the inland Deccan. The implements were grouped into four categories on the basis of typology and stratigraphy as also their state of preservation. All the four were supposed to belong to distinct cultures of different dates. The four categories in order of their dates were as follows:-

(1) Earliest - Handaxes and cleavers, mainly the earlier made of quartzite. They were of various varieties and had parallels in Africa.

(2) Next in date were flake industries mixed with neatly made handaxes of quartzite, sandstone and chalcedony.

(3) Of a subsequent date were the slender blades with blunted backs, a few burins, planing tools and end-scrapers. The material used for such tools was often of a flinty nature.

(4) Last of all were the microlithic tools which outnumbered all implements of normal size. They were all made of agate and quartzite and represented tools like crescents, triangles, scrapers and cores. The finding of a small polished and shouldered celt of Burmese type near the Godavari river with this series was very interesting.

But for the earliest group the industries of every other group were found to be mixed with other groups e.g. the flake industries always included a few examples of the earliest group in combination with one or two tools of group 3. Likewise, the industries of group 3 always contained tools of group 2, though no specimen of handaxe of group 1 was found.

The study of the stone implements in the region along with the climatic cycles is very closely connected with the question of the origin of laterite occurring widely. Weathering of many kinds of rocks such as gneiss, basalt, granite, etc. is responsible for the formation of laterite. In the region around Madras no laterite is formed these days, but the presence of laterite deposit extensively indicates that in the past ages the climatic conditions must have been similar to that which occur at present in Malabar i.e. heavy rainfall (pluvial). Since the formation of laterite is very slow, the pluvial period as mentioned above must have lasted for a long time. Heavy rainfall for a long time resulted in dense tropical forests along the east coast. There was no occupation by Man during this period, probably because he was deterred by the dense forests. The Man always preferred an open surrounding.

A dry climate ensued after the formation of laterite as a result of which the upper part of the laterite was weathered. The tools of the earliest series came from this weathered laterite either *in situ* or washed down and redeposited. The surroundings during this period are, therefore, supposed to have been much more congenial to Man allowing him to make his first occupation on the laterite. A second damp climate must have ensued as indicated by the washing down and redeposition of the weathered laterite. It was again followed by a second dry phase succeeded by another phase of greater humidity.

The succession of climatic cycles was as follows:-

1. Long damp period on account of heavy rainfall which led to the formation of laterite between rivers Kistna and Palar. No remains of Man were found from this deposit.

2. Long dry period when the forests and swamps of the laterite period withered away thereby creating plain open lands. The authors of the handaxes etc. of group 1 occupied these plain lands.

3. Period of heavy rain which washed down the remains of earlier inhabitants alongwith the rocks. They were carried away no doubt, but, instead of being deposited into river channels or as river gravels, were settled in shallow beds deprived of any stratification. With these detrital beds, which were formed, the flourishing hand axe culture of group 1 came to an end.

4. A dry period ensued again during which sparse population occupied the newly formed beds of detrital laterite and clays. The new people used flakes and tools mentioned under group 2, though of course, a few handaxes survived.

5. Period of a humid climate followed during which no laterite was formed nor any material was washed down. Of course, the rainfall was far more heavier than at the present time. There was deposition of alluvium in the rivers which yielded tools of group 2.

6. and 7. Period of decrease in rainfall followed by a period of denudation which resulted in the present conditions. Tools of group 3 and 4 were associated with these periods.

The observations of climatic cycles were made during the course of study of a large number of sites. The following chart will present the entire picture with the ages of various formations and tools at a glance.

Age	Deposits	Industries	Climate
Post-Pleistocene	Red clay overlain by red sand	(3) and (4) cultures Microlithic and Late Sohan (?)	VI-VII Dry Phase followed by denudation leading to present conditions
Upper-Pleistocene	River Deposits, Laterization absent Gravels and clays	Flake Industry (2) Sohan Flake Industry of (2) comes in, Handaxes survive	Humid Pluvial V Dry Phase IV
Mid-Pleistocene	River gravels Open plain	Handaxes of Period (1) come to an end Handaxe of Period (1) Sterile	Violent Pluvial III Dry Phase II
Early-Pleistocene	Laterite formation on East Coast		Long Pluvial I

The general similarity in the existence of the seven climatic stages in this region as decided by Burkitt with those of the seven glacial stages discovered by De Terra in the north is of great interest.

11. Prehistoric Madras*

Paterson was the first scholar to detect four fold Pleistocene terrace sequence in Madras as already observed in North western India. The terrace geology as worked out in river Kortalaray or Old Palar was as follows.

The deposit of the detrital laterite over a white boulder conglomerate was dissected leading to the formation of three terraces, 1, 2 and 3 at heights of 60 feet, 20 feet and 8 feet above the present river-bed of the Kortalaray valley. Terrace 1 appeared to be erosional and not well preserved, whereas Terrace 2 was aggradational in origin and well developed at Attirampakkam. Palaeolithic tools were found in those terraces. The stone tools at Vadamadurai found from the Boulder Conglomerate were divided into three following groups.

(1) Earliest Group - Non-laterized, with heavy cream-coloured (cortex) patination. The tools were rolled and belonged to pre-lateritic age and contemporary with the boulder conglomerate. This group was further sub-divided into two on the basis of patination and typology.

(a) Early Series : Handaxes and cores with a heavy white (cortex) patination. Abbevillian type of handaxes, crude and irregular with thick pebble butts and much cortex. Primary flaking denotes stone technique producing deep irregular flake scars with little or no retouch. Cores are very large and irregular and of no definite type. Flakes indicate primitive flaking with much cortex.

(b) Late Series : Less patinated than the previous. Shows typological advance, especially in cores. Handaxes resemble Early Acheulian, regular in form. Step flaking was initiated, though free flaking was still common. Cores were mostly discoidal with fairly regular alternate flaking. Faceting of platform was absent from the flakes. The portion of cortex was less and primary flaking on the upper surface was more than the Early Series. There was no retouch.

(2) Second Group : Stained red through contact with lateritic gravel laid down on top of conglomerate. Definite advance in typology over the Earliest Group was observed. Hand axes displayed Mid-Acheulian technique. They were flatter and neater with more of step flaking. The common shapes were pear and ovate. Cores were mainly of discoidal type as in the late series of the first group but with more regular flaking. More primary flaking was observed on the flakes and none of them had faceted platform.

(3) Third Group : No staining of laterite and patination very little. Hand-axes made by wood-technique resembled Upper Acheulian technique and were of two types viz. (1) ovates with flat step flaking, and (2) a long pointed type with thick pebble butt. Cleavers in this group were limited in number. Besides the discoidal cores, a flat type of core with prepared platform for removing flakes from one surface also occurred.

* Ancient India No. 3 pp.32-35.

The flakes were thin but showed no signs of faceting the platform. A limited number of flakes were retouched to be used as side-scrappers.

Attirampakkam Terrace

The stratigraphic evolution of the Acheulian culture from the lateritic basal gravel to the loam on the top in the exposed section of the terrace at Attirampakkam was clearly observed. The quantity of tools yielded by the terrace was very large. A limited number of the stone tools could be called derived series (rolled) corresponding typologically to the first two groups from Vadamadurai, whereas the rest of the tools were fresh and contemporaneous with the basal lateritic gravels. They were of the same age as the latest series in Vadamadurai. The hand axes displayed very late Acheulian technique of Europe and Africa. Made on flakes they were thin, flat and elongated. Varied forms of cleavers were abundant in number. Cores and flakes exhibiting Sohan technique were also found along with the dominant bifaces. The flakes from the loam were Levallois-like and showed faceted platforms with much primary flaking on the upper surface.

The most important discovery from this terrace at Attirampakkam was a human bone probably tibia as recognised by Profs. Busk and Dawkins. The articulations of both the tibia were lost.

12. Prehistoric Khandivli [Bombay]*

A large quantity of gravel and clay was dug out at Khandivli from an area about 600 metres wide and 1000 metres long as a result of which many sections were exposed. The lower clay ranging in thickness between 3 to 50 inches was of bluish-brown colour. It rested on the uneven surface of a weathered rock below. Rough tools and flakes recalling Clactonian technique were found in the clay called lower clay. The tools were sometimes tabular in form.

On the top of the clay a similar industry in 'mint' condition comprising scrapers, cores, and choppers was observed. An early rostrate handaxe was collected from this level. The lower clay was superimposed by a reddish-brown gravel called lower gravel which was lateritized. It was 1 to 6 feet in thickness and contained big boulders of basalt which indicated a strong pluvial condition. The tools from this horizon were in varying states of preservation made on chert and indurated shale. They resemble the Abbevillian and Clactonian types of tool.

On the top of the lower gravel fresh tools of the Clactonian as well as late Acheulian types represented by handaxes and cleavers were found. They were all fresh. The handaxes and cleavers could be compared to Madras complex. The flake-implements from this horizon were also Acheulian in technique.

Overlying the lower gravel was a clay deposit called as middle clay. It was bluish in colour merging into reddish brown in the middle sections and turning into a sandy

*Journal of the Royal Anthropological Institute 1939, pp. 257-72 and reproduced in Source Book of Indian Archaeology, Vol. I, *op. cit.* pp. 143-155.

deposit towards the western side. In the area to the south the middle clay was represented by a laterisation on the upper part of the lower gravel which indicated milder conditions. No tools were found in the middle clay. On the top of the middle clay, however, a blade industry comprising cores, scrapers and blades was encountered. The blade industry was found mixed with a few small handaxes having on one side a plain flake surface.

Overlying the middle clay was the upper gravel similar in character to the lower. A tooth of *Equus*, which may be *Equus namadicus* of the lower Narmada was found in the gravel.

On the top of the upper gravel a blade and burin industry was found to occur. The tools were made of indurated shale. It was a working site as indicated by the occurrence of blocks of indurated shale with small heaps of flakes and finished tools.

Over the upper gravel a brown clay deposit called as upper clay was observed. This deposit yielded tools of the same industry as on the top of the upper gravel but more developed. These tools included polyhedral and angle burins as well as one of the parrot-beak type.

Finally a microlithic industry similar to those occurring in the coastal areas appeared.

13. Teri Sites of Tinnevely District [Tamil Nadu]*

A series of Late Stone Age sites lie near the coast in Tuticorin and Tiruchendur Taluks of Tinnevely District in Tamil Nadu. They are well known as Teri sites because of their close association with the large *teris* i.e. sand dunes of the area.

The Taluka places of Tuticorin and Tiruchendur are situated on the north and south of Tambraparni river. The areas north and south of the river-mouth have late Pleistocene formations. All the *teri* sites are located some distance inland.

An outer bar is being formed at a distance of about 3 km from the main coast line at Tuticorin to-day. It is constituted of mainly coral sand and coarse fragments of marine organisms. To the south of Tuticorin Bay the lagoon between the bar and the coastline has been filled in completely and dunes are being formed over the lagoon-filling by the action of the wind. Dune-formations of such a kind exist in considerable number on the main coast-line north of Tuticorin. They appear there as superimposed on the next higher level of 20 ft. Thus dunes are being blown on to older land.

As one proceeds inland, a large number of morphological steps can be observed. They all appear to represent successive lagoon-floors of a greater age. The lines of tanks constructed on the bluff between two levels mark the steps. The first group of tanks is about 2½ miles west of Tuticorin. The dune-sands are encountered immediately behind it. They are covered with forest showing a mature soil-profile with about

*Ancient India No. 12, pp. 4-20.

2 ft. of a bleached A-horizon and about 5 ft. of red cemented B-horizon (site at mile 26 on Tuticorin-Palamatta road). No implements were found at this site, but the soil-profile is one and the same further inland. At many places the A-horizon has been blown away following deforestation leaving the surface of the B-horizon exposed. The tools which might have been incorporated in the A-horizon part of the profile or were lying on the original land-surface would thus have sunk down into the surface of B-horizon. Concentration in a process like this must have made the *teri* - surface sites very rich.

The section at milestone 26 lies on the 20 ft. level. The next higher level is 50 ft. above the sea and is again marked by a line of tanks stretching from Kuttampalli to Eral on the Tambraparni river. Further inland from this line of tanks the land is 50 to 100 ft. with many superimposed dunes (*teris*) attaining sometimes a height of 200 ft. above sea-level. These dunes consisted of reddened sand and were in all likelihood fossil-dunes originally, revived by deforestation and also added to by A-horizon material from the soil sections in the manner described above.

Three microlithic sites were observed round the *teris* north of Sawyerpuram. Of them Kuttampalli and Sawyerpuram were located in the south and Kuttalangulam on the west. The microlithic tools were stained heavily which indicated that they came from the weathered sand of the original soil-sections. They were, therefore, supposed to be older, though not much than the *teri* - accumulation. They were, however, certainly older than the red weathering, which was confirmed by a site south-west of Subrahmanyapuram. At that place the B-horizon was cut into by erosion, where both cores and flakes occur in the iron-cemented sand.

After the formation of the dune-sand and lagoons there was a weathering followed by a second phase of wind-activity, which may be equated with the recent or sub-recent phase also represented by the modern lagoons. The weathering took place during the time lapse between the earlier lagoon-phase and the modern ones. It corresponded with the drop of the sea-level from 20 ft. to zero or even to negative. The prehistoric sites were located on a level about 20 to 30 ft. higher than to-day. The original *teri* sands were thus comparable with the recent sand-accumulations north of Tuticorin. The important conclusion which was derived was that the microlithic sites belonged to an older phase than the ancient weathering and occurred at a level somewhat higher than the present sea-level.

Three alternatives were considered to adjust the phase into the scheme of climatic chronology. The first alternative was that it belonged to the last interglacial phase, which was rejected on account of the immature condition of the soils observed. According to the second alternative it could be placed in the Last Glaciation of the north temperate zone in the Upper Pleistocene. In order to establish this premise, further geological investigations are essential. The third alternative, according to which it could be of the post-glacial climatic optimum of Europe, was considered to be most convincing, because it did not present any typological difficulty. The post-glacial climatic optimum of Europe has been assigned various dates, but the maximum effect appears

to have been at a time round about 4000 B.C. This is the date suggested tentatively for the *teri* sites. There is a likelihood of the date being pushed back to Pleistocene if further geological investigations are undertaken. In the absence of specific dates of the microliths in India the date worked out at the *teri*-sites is very important.

The existence of a higher land-surface at about 100 ft. above the sea-level in the area is likely. This land surface, however, cannot be demarcated easily from the 50 ft. level.

To the west of Tiruchendur the coast-line turns to south-west. Near Megnanapuram important microlithic sites were discovered. The A-horizon has been denuded here on the 50 ft. land surface and the B-horizon not only exposed but cut into and destroyed at several places. The industry at Megnanapuram differed from that observed at other sites. It had very few geometric forms and as such is likely to be older than the other industries associated with the 50 ft. land surface. The microlithic tools from Megnanapuram displayed absence of blades of geometric forms and points of all kinds. The similarity of the discoids and chopping tools found at the site with others in the neighbourhood might be considered as a link between them. Their occurrence can, however, be also owing to the long duration of local tradition in technique. The tools were deeply stained as observed at a majority of the sites. They were all from 50 ft. level.

The tools from Megnanapuram comprised hammer-stone on a quartz pebble battered at both ends; flakes and other pieces showing signs of considerable use; discoids, both of bifacial and unifacial types; chopping tool; concave scraper on a flake and a simple point.

All the sites but for Pondicherry, appeared to belong to one phase, i.e. the *Teri* industry proper with Sawyerpuram as the typical site. The tools from Sawyerpuram (Sayapuram) were collected from the cemented B-horizon. The raw material consisted of quartz and chert in more or less equal quantities. Amongst the tools which were heavily stained mention may be made of hammer-stone on a quartz pebble battered at both ends; flakes, blade-flakes and fragments, of which many were used, some had retouch and some had right-angled platform, blades short and thick, backed blades, some thick with steep retouch and battering along one edge, discoids, lunates, transverse arrow-heads, asymmetrical point, biface almond-shaped point, and a micro-burin, the last three represented by one specimen each.

The tools from all the sites with the probable exception of Megnanapuram belonged to one industrial tradition and can very well be designated as an industry. Since the material from all the sites except Kulattur was more or less heavily stained, it must have been derived from the soil-profile in process of denudation. Hence it was called Tinnevely *Teri* industry. The characteristic features of the industry were the use of quartz and chert as raw materials and the presence of geometric forms made indiscriminately on flakes and blades, together with discoids, small chopping tools and points of various types, including a small number of bifacial pressure-flaked

specimens. The short thick blades and amorphous cores are typical of the South Indian industries. The choice of quartz as raw material when other more tractable materials were available is a mystery.

14. Bagor (Rajasthan)*

Bagor, a small village on the left bank of the Kothari river, a tributary of Banas, is situated 25 km west of the District headquarters Bhilwara in Rajasthan. On the basis of the rich variety of the tools found by V.N. Mishra, it can be declared as the largest mesolithic habitation site discovered in India. Extensive occupational floors were brought to light as a result of horizontal excavations conducted at the site. The site provides a very good sequence in the development of stone age culture through contact with farming cultures. Bagor happens to be the most accurately dated mesolithic site in India on account of the largest number of radio carbon dates. The prehistoric site is located on a large and prominent sand dune. Large scale excavations were conducted at the site during three seasons from 1968 to 1970 jointly by the Poona University, Deccan College Post-graduate and Research Institute, Poona and the Department of Archaeology and Museums, Rajasthan State.

In the centre of Mewar plain, Bagor lies in the shadow of the Aravalli Hills. The sand dune where excavations were conducted is spread over an area of 200 m east-west and 150 m north-south with a total height of 6 m above the surrounding level. The appreciable height and as a sequel the commanding view of the river must have been considered to be very favourable for occupation by the prehistoric man. During the earliest phase of the settlement an area of 6000 square metres or a little more was under occupation.

The dune was composed of wind-blown sand and the material remains were found to occur throughout the sandy-deposit. It was a very good evidence to prove that the dune was under active formation when it was under the occupation of prehistoric man. Five layers in all based mainly on the changes in colour were distinguished. Since the occupational deposit happened to be homogenous it was not possible to dig on the principles of stratification. An arbitrary thickness of 10 cm was, therefore, taken for excavation at a time as a broad stratigraphic division.

Layer 1 was 5 to 10 cm thick and composed of whitish sand which appeared to be more or less of recent origin. Layer 2 was of dark brown sand with a thickness ranging between 80 to 90 cm. This layer yielded most of the occupational deposit. Layer 3, 70 to 80 cm thick was composed of light brown sand. Occupational remains declined at the middle level of this layer and completely disappeared from the lower levels. Layer 4, 30 to 60 cm thick did not yield any tool. The composition of the layer was yellowish sand. Layer 5 was composed of white, highly micaceous sand rich in concretion pellets. The climatic condition during which this layer was formed must have been entirely different as revealed by the marked contrast to the overlying deposit.

* World Archaeology, 1974, pp. 92-110 and reproduced in Source Book of Indian Archaeology, Vol. I. *op. cit.* pp. 243-261.

The total occupational deposit at the site was 1.50 m thick. The site was under continuous occupation over a period of five millenia immediately before Christ. There was a continuous evolution in the culture, which was based on stone technology and hunting-pastoral economy, as revealed by the introduction of new cultural traits and the decline or disappearance of others. The material which continued right through the occupation abundantly was the distinctive microlithic industry. There was no break in the occupation. Three phases were distinguished in the occupational remains on the basis of changes in material culture.

Phase I (c. 5000-2800 B.C.) : It was represented by the lower 50 to 80 cm of occupational deposit. The characteristic features of this phase were microliths and animal remains in a large quantity. The economy was based on hunting, gathering and herding. The inhabitants lived in huts with stone-paved floors. The walls were probably made of wattle. Burial in an extended position in the east-west orientation was in practice.

Phase II (c. 2800-600 B.C.) was represented by the next 30 to 50 cm of occupational deposit. The microlithic tools and animal bones decline in quantity and copper or bronze tools with pottery make their appearance. The pottery was handmade and carried incised decoration. The burial practice changed to a flexed position, but the orientation remained the same. The graves were richly furnished with pots, metal tools, ornaments and food offerings. Days of material prosperity implied a secure and stable economy. Plant agriculture was most probably introduced. There was greater reliance on domestication of animals.

Phase III (c. 600 B.C. to A.D. 200) : The occupation during this phase was restricted to the central part of the mound with a total thickness of 35 to 75 cm. The microlithic tools declined greatly in quantity and the animal bones were scarce and fragmentary. Iron implements were introduced and the pottery, all wheel made, was found in plenty. Glass beads were used in ornaments. Bricks, tiles and stone were made use of in the structures. The dead bodies continued to be buried in an extended position, but the orientation was changed to north-south.

Microlithic Industry

No other site in India has yielded such a large quantity of microlithic tools as found at Bagor. The flake stone industry was unusually rich with several hundred thousand worked pieces. The even distribution of the tools indicated that they were manufactured there itself and every family or social unit produced them according to their requirement. There was no marked typological change in the tools from the lower to upper levels. Quartz and chert were usually used as raw materials.

The stone industry at Bagor was truly microlithic on account of the mass production of micro-blades and their conversion into various microlithic forms. Large tools like scrapers and burins made on flakes or cores were rare. Amongst the main types of tools were blades with flat retouch; blunted-back blades; obliquely truncated blades; obliquely truncated and blunted-back blades; triangles mainly scalene or isosceles;

trapezes; transverse arrow-heads; rhomboids; crescents; and points. The crested guiding ridge technique was conspicuous by its absence.

Copper Tools

Besides fragmentary pieces of copper or bronze, five well-defined objects were found in burials of Phase II. They included one spear head, one thin rod, and three arrow heads. The arrow-heads are very interesting because the same type, though without holes, has been found at several Harappan sites in north Rajasthan, Sind, Punjab and Baluchistan. They have, however, not been reported from any Chalcolithic site in peninsular India.

Iron Tools

In addition to many fragmentary pieces the deposits of Phase III yielded two well-preserved arrow-heads. One of them was socketed, whereas the other tanged. Besides these weapons, a small square-shaped metal object, which also appeared to be made of iron, was found at the neck of a skeleton in Phase III. It turned out to be a Muslim period coin after chemical cleaning, which made the excavator believe that the associated burial was a later interment and did not belong to Phase III.

Pottery

A very limited number of pottery fragments not more than 1 to 2 cm in size was found to occur almost upto the lowest deposit. They were, however, considered to have been derived from the upper levels through infiltration by means of decaying rootlets and burrowing activity of rodents. Pottery appeared in considerable quantity only in the top 80 to 90 cm of the deposit and the size of the pottery fragments are large enough to conceive an idea of shape.

There were two main fabrics viz. A and B. The former was characteristic of Phase I, whereas the latter appeared only at the end of the occupation in this phase and became popular in Phase III. Fabric A was made of gritty and micaceous clay. One or both the surfaces were found to be applied with a slip of fine clay. In many cases the slip was further worked up by a burnish. The wash of bright red colour applied over the slip had faded from a large number of vessels resulting in a dull brown colour on the surface. The pots were fired on low temperature producing smoky core and very fragile pieces. Clear striation marks were not visible on the pots and as such it was believed that they were handmade or produced on the slow wheel. A small number of pots were made of fine clay and well fired. A few sherds with a black inner surface led the excavator to believe that they were the attempts to produce black-and-red ware.

Of more than a dozen complete pots, all but one were found from the three burials. They represented broad-mouthed jars of various sizes, small *lota* - like pots, large shallow basins, smaller and deeper basins, and bowls of various sizes. A few miniature pots might have been used for rituals. A pair of holes on the sides of two pots suggested that they were either meant for suspension by strings to carry food or to protect them from pests within home or for fixing a lid. The complete pots did not carry any design, but many of the fragments did. The designs were all incised and included groups of

parallel bands, chevrons, herring-bone patterns, criss-crosses, groups of short strokes and finger-nail incisions. Though the pottery wheel appeared to be absent, Bagor pottery belonged to a mature tradition as revealed by several carinated shapes which suggested copying in clay of shapes natural to metal. Some affinities with Ahar Culture in Mewar and Kayatha in Malwa were postulated by scholars but according to the excavators the Bagor pottery was inspired from some as yet unexplored culture in the Mewar or Malwa region which also had close links with the Ahar and Kayatha cultures.

Fabric B of Phase III was entirely different and did not evolve from Fabric A. It was entirely hand-made. The clay used in this case was also gritty and micaceous, but it was fired at a higher temperature. The pots in this fabric were thinner, lighter and stronger. They had a brick-red surface and reddish or bluish core. Slip or wash was rarely applied and the surface was easily rubbed off. The representative shapes were large jars with externally grooved rims, small cylindrical pots with externally bevelled rims and bowls with broad mouths and narrow flat bases. Decoration in this fabric was rare and the limited designs were restricted to simple incisions. The representative types were generally utilitarian without any aesthetic appeal.

Structures

In Phases I and II floors were made of schist slabs with occasional pebbles. In some places the stones appeared to be aligned in a circular fashion, which might have been arranged on the outer periphery of circular wattle huts or wind breaks to protect them from strong winds. Small areas paved with tightly packed stones and containing a concentration of animal bones appeared to be butchering floors. Burnt-bricks, mostly fragmentary, were also used in structures in Phase III. One wall, nearly 3 m. long and 1 m. wide was made of massive and partly dressed stones.

Disposal of the Dead

All the five burials were found within the settlement, a practice prevalent in Mesolithic as well as Neolithic and Chalcolithic times in peninsular India. The burials were furnished with all types of grave goods like pots, metal objects, pieces of meat, and ornaments including beads.

Ornaments

A few stone beads in Phase I which were similar to those in Phase II, appeared to have occurred as infiltration. In Phase II they were very common and made of banded agate, carnelian or garnet. The shape was short tubular or barrel. There were a few tiny bone beads as well. In Phase III glass beads were also used alongwith several kinds of stone pendants.

Food and Economy

The reconstruction of food and economy was based on the large quantity of animal bones which were mostly charred and fragmentary. They indicated that the meat was roasted on open fires and the bones broken and split open for the extraction of marrow. The abundance of animal bones in Phases I and II suggested that animal food was much more popular in the earlier stages of the occupation. The distribution of animal bones

and microlithic tools corroborated that hunting formed an important part of the economy in Phase I and to a lesser degree in Phase II as well, when there was greater reliance on food production. In Phase III agriculture was well-established as revealed by the iron tools, wheel-made pottery, burnt bricks, tiles and dressed stone.

15. Langhnaj (Gujarat)*

In the year 1942 excavations were conducted by Sankalia at Langhnaj during the course of which he came across 6 feet of sandy silt of loess divisible into two or at the most three strata on the basis of the colour of the soil, its hardness, texture and lime content. The composition of the soil in the first three feet or so was dark brown and more compact. The soil below 3 feet tended to be lighter in colour with a more porous texture, *kankary* mixed with lime concretions. The soil below 4 feet was all light brown and more *kankary*. Skeletons and a majority of large animal remains as well as microlithic tools came from that level. Their occurrence could not be accounted for by stratigraphic intentions, since the soil in the section as well as on the plan looked identical in colour and texture.

All efforts by the excavators with the help of well known scientists failed to distinguish clear strata. No pit line could be observed and the entire deposit appeared like one mass of light (grey) brown, calcareous, sandy silt within which human and animal remains as well as microliths and a few large stone fragments of sandstone and quartzite occurred. This soil of light grey or brown sand merged with a grey-yellow calcareous sand full of large and small *kankar* nodules at a depth of about five feet.

Mechanical as well as chemical analysis of the soil led the excavator to arrive at the following conclusions.

The climate was continuously dry and arid, which led to the formation of huge masses of sandy silt. In such an environment only very light forest could be expected to grow. According to F.E. Zeuner the rhinoceros must have moved in the vicinity of the river and its *nullahs* where the vegetation was thicker all the year round. It was hunted by man there and the carcass brought to the mound for consumption. The vegetation, in whatever form the same might have been, did not leave its remains in the form of humus or pollen grains and as such it was not possible to have further information.

It was presumed that the man who inhabited these hillocks had nothing but *babul* (acacia) thickets to protect him from wind and rain. But for these wind-screens, the possibility of wattle-and-daub houses would have contributed to the formation of the soil after the destruction of the mud walls either as a distinct layer or as a mixed layer of sand and clay and ash. It was because of the absence of wattle-and-daub houses that the ancient habitation deposit had the appearance of light brown sandy soil. It became conspicuously whitish or light grey by the leaching of lime for a very long time. The presence of lime was not a little responsible for preserving the animal and human bones. Many bones were fully calcified.

* H.D. Sankalia, Investigations into Prehistoric Archaeology of Gujarat, Baroda 1946, p. 64 and Proceedings of the Prehistoric Society, 1973 pp. 132-33.

Once the mound was deserted by man, thick scrub vegetation started growing to such an extent that the deposit looked dark. The impression of this vegetational growth was left on the top layer of the mound. Besides imparting its humus to the soil, the binding effect made the deposit compact. The top layer was, therefore, always uniformly dark brown and compact.

It was after the formation of this deposit i.e. after the growth of thick scrub vegetation that the man who used wheel-made pottery of modern type appeared on the scene for a short time. Iron arrows with reed shaft, as indicated by the long tang of the arrow-head at a depth of 2½ feet, were made use of by the man. Since the later occupation by man was immediately on the top of the refuse of the microlith using man, there was some admixture of the two deposits. The admixture must have been caused by burrowing animals.

The presence of one ring-stone of quartzite and the copper hunting knife and two small miniature ground axes of chlorite schist was surprising. The only explanation which could be given was that these objects belonged to the late phase of the microlithic culture since they occurred at the top level of the real microlithic horizon.

The fragments of pottery with burnished black interior and red-slipped exterior suggested that the microlithic man of Langhnaj had contacts with the cultures in which the pottery was used in Saurashtra, Rajasthan and the Deccan. Amongst other types of pottery mention may be made of light brown burnished ware with smoky core, a non-descript ware and an incised ware, unslipped, unburnished with a light brown surface. They could be treated as contemporaneous with the earliest microlithic phase at Langhnaj. At the depth of 4-5 ft. the sherds were so fragmentary that the shapes of the pot could not be determined.

Most of the human skeletons, animal bones, as well as microliths which were all heavily encrusted with lime were found at a depth ranging between 6 to 3 feet. A few fragments of pottery all weathered were also found in association. At the junction of light brown and dark brown earth, microliths, a ring stone, a copper knife associated with a black-and-red ware pottery were found.

16. Kuchal (Orissa)*

A small scale excavation at Kuchal under B.K. Thapar brought to light very interesting results. Kuchal is located in Mayurbhanj District of Orissa about 8 km north of the District town of Baripada along the national highway to Keonjhar and 5 to 6 km east of the Burhabalang river.

The lowest occupational deposit could not be excavated because of sub-soil water, which was encountered at 1.4 m depth. The deposit upto that depth was divided into two. The upper 40 to 45 cm of clayey deposit yielded neolithic implements in association with a coarse grit-tempered red ware, which was often slipped and showed incised or finger-tip decoration. The excavated implements were all of the butt-end variety.

*Indian Archaeology—A Review 1961-62, p. 36.

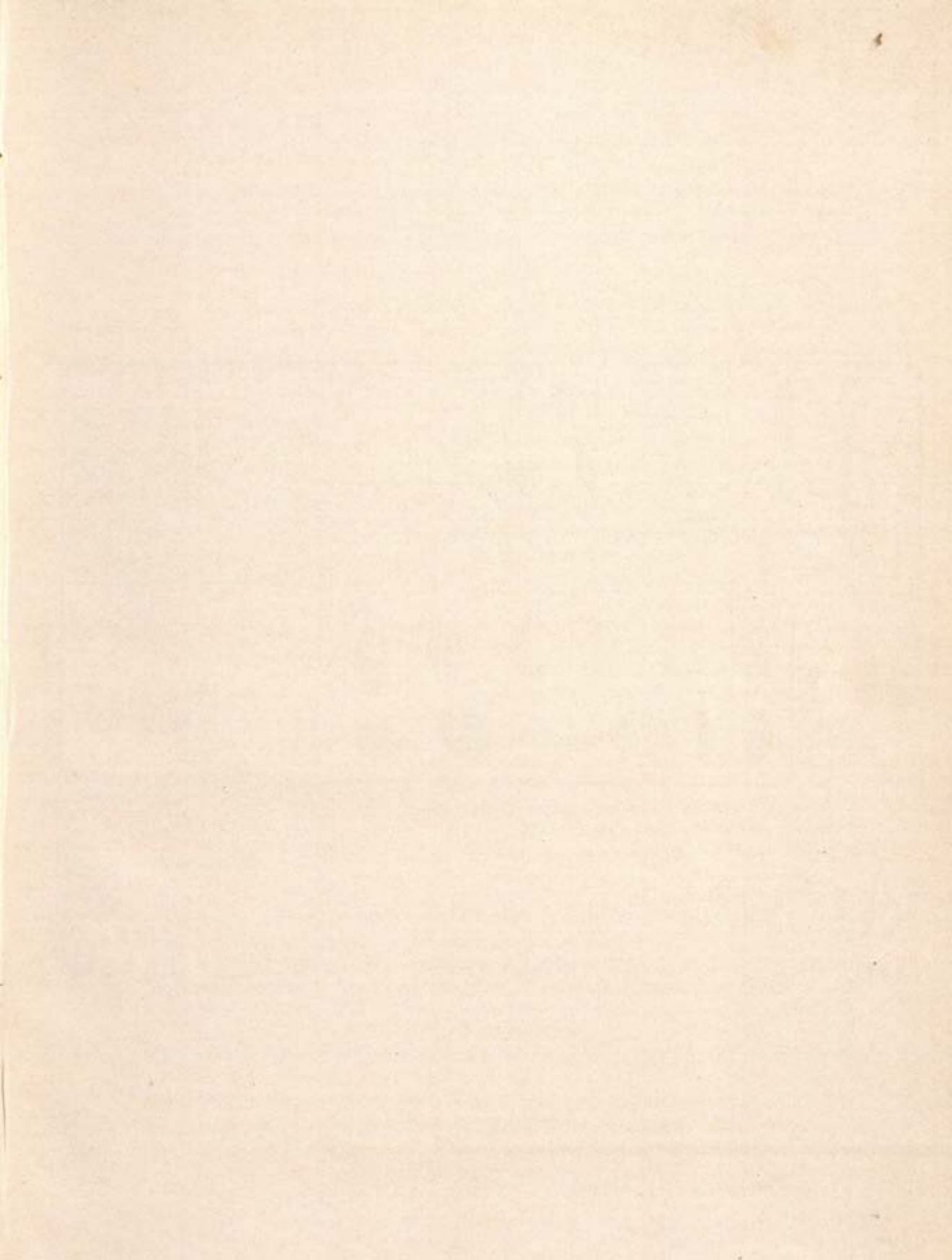
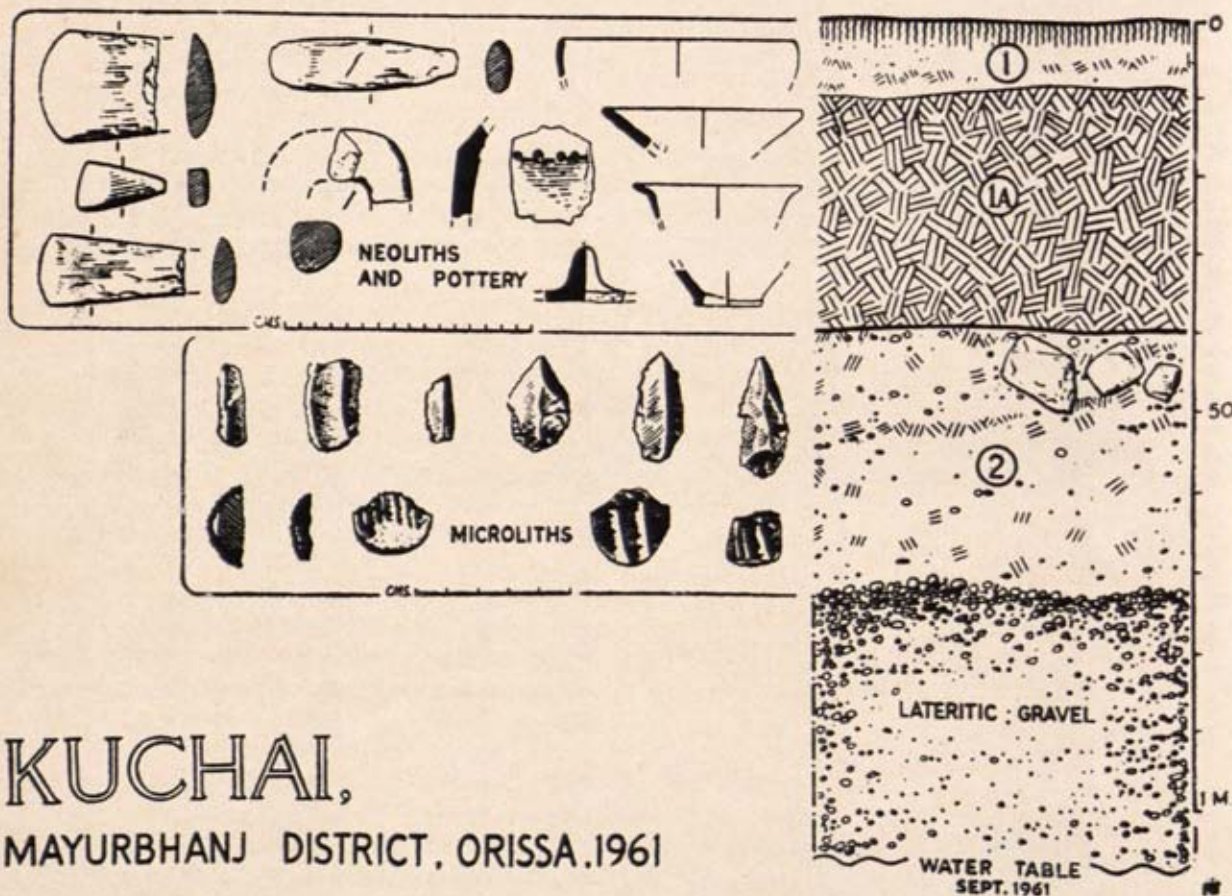


Fig. 16



KUCHAI,

MAYURBHANJ DISTRICT, ORISSA.1961

Sequence at Kuchai

though a shouldered adze was earlier collected from the surface.

The lower deposit was composed of gravel mixed with greyish earth and loose laterite. It yielded microliths of an essentially non-geometric type. The tools included blades, points, lunates, scrapers, etc. No pottery was found in association with the microliths (fig. 16).

It was not possible to determine the exact age and the environmental conditions of the microlithic industry because of high water table. The pottery associated with the neolithic implements in succession to a microlithic industry without any pottery was of great interest in the study of Late Sone Age in Orissa.

17. **Burzahom** (Kashmir)*

Situated at a distance of about 24 kilometres north-east of Srinagar, Burzahom was well known as a Megalithic site. A systematic and scientific excavation at the site, however, brought to light a new type of Neolithic occupation so far not reported from any part of the country. The entire occupational deposit was divided into four Periods. The earliest occupants of the site represented in Period I used pits, cut into the upper Karewa beds, as their dwellings. The pits were roughly circular or oval on plan and varied from 1½ to 2½ metres in depth. In certain cases the mouth of the pit was very narrow. The bottom of the pit was flat, over which in a couple of examples, ashy deposits indicating human occupation were observed. The other interesting features of the pit were the provision of a landing step in a deep pit, excavation of a few niches in some cases and in one case interconnection of two nearby pits by means of a small arched corridor plastered with mud. Charred reeds and post-holes were provided over the pit. The occupational deposit of the pit yielded a few polished stone axes with flat rectangular cross section, longitudinally-bent body and straight cutting edge; bone tools represented by harvesters, graters with curved and oblique working edge and awl; mat-impressed pottery, generally hand-made; steel grey pottery, the more common types in the last-named group being the deep bowl with pedestal base and jar with flaring rim. A limited number of wheel-made burnished sherds of red ware were also noticed. A bead-shaped mace-head with hour-glass section in stone was also interesting.

The next Period, though continued to represent the Neolithic culture broadly, was distinguished by structures of mud and mud-bricks; a black burnished ware; polished stone tools represented by shoe-last type double-edge picks; perforated picks and double-edged points; and a large number of polished bone tools comprising awls, arrow-heads, harpoons, etc. The polished stone tools made of the Himalayan trap, were typologically different from their southern and eastern counterparts. A few copper objects in the form of arrow-heads and a coil were also reported. Different from the well-known Northern Black Polished Ware, the burnished black ware was represented by the funnel-shaped vessel, basin with obliquely-cut rim and jar with splayed-out rim, occasionally decorated externally with triangular incisions. Two wheel-made black painted red ware pots, one of which contained nine hundred and fifty beads of

*Indian Archaeology, A—Review 1960-61 p. 11 and 1962-63, p. 9.

carnelian and agate were of great interest. The existence of a communal hearth was indicated by the occurrence of a large number of animal bones, especially of the deer. The superstructure was most probably of timber as revealed by the post-holes around the house-floors. Other types of structure included mud-platforms with partitions and storage-pits. In the upper levels of the Period a rectangular structure, formed by upright slabs, was also exposed. Burnt material spread over the floors in successive deposits testified to the incidence of fire at various levels of the occupation. The use of red ochre on the floors was also noticed.

Burials, both human and animal, found within the habitation area itself, happened to be the most interesting feature of this Period. There were no burials in Period I. The use of red ochre on the human bones in the burials was altogether a new feature. The pits dug for interment were normally circular or oval on plan and in most of the cases narrow at the top and wide at the base. The inner sides of the pit were often plastered with lime. Burials were both of primary and secondary nature, the former containing extended articulated skeletons and the latter only selected bones. Of the human skeletons, four were laid in a crouching position. But for a few cases, there was no grave-furniture in the burials. In certain cases pet animals or their bones were deposited with the human skeletal material. One of the burials provided evidence of trepanning with seven finished and four unfinished circular holes on the skull. The animal burials were also represented by both articulated and incomplete skeletons. The most interesting among these burials was that showing skeletal remains belonging to five wild dogs and antler's horn. The animals represented in the burials were dog, wolf and ibex.

The third Period of occupation was characterised by the massive Megalithic complex, of which only six stones appeared to be in position, five of them in a vertical position now leaning and the sixth lying flat. They form a rough semi-circle. The purpose for which the stones were erected could not be determined, but it was certain that they belonged to the post-neolithic period. A few specimens of the black burnished ware in a coarse fabric with a polish of low order, a few polished stone axes and bone tools were the distinguishing features of the Period. The pottery, in which the red ware dominated, was generally wheel-turned, the most distinct type being the miniature vase which probably served as a toy or had a ritualistic purpose. The Black-and-Red Ware generally associated with the Megaliths was conspicuous by its absence.

The last Period IV belonged to historical period of the third-fourth century A.D.

Based on the C14 analysis it can be said that Period I was not earlier than 2500 B.C. and not later than 1500 B.C. Sankalia desired the dating to be cross-checked with an interesting discovery in 1966-67. It was a large painting of a bucranian bull head in black on a globular vessel of fine red ware with parallel grooves on the belly.

18. Koldihwa*

The recent excavations conducted at Koldihwa in District Allahabad of Uttar

*V.D. Mishra, *Some Aspects of Indian Archaeology*, Allahabad 1977, pp. 107-119.

Pradesh by the Institute of Archaeology, University of Allahabad have brought to light very interesting and altogether new evidence on the Neolithic and Chalcolithic cultures of Northern India. Koldihwa is a small village situated at a distance of about eighty kilometres south-east of Allahabad on the left bank of river Belan in the Meja sub-division of the District.

The maximum thickness of the occupational debris, being 1.90 metres, was observed on the eastern fringe of the mound.

Three cultural Periods in all were distinguished at the ancient site during the course of excavation. The three Periods were designated by the excavator as : (1) Neolithic, (2) Chalcolithic and (3) Iron Age.

Period I : Representing Neolithic times, Period I was characterized by a corded ware (mat-impressed) of thick fabric, the plain red ware and the crude black-and-red ware. All the wares reported from Period I were hand-made. Straw and rice husk were used as degreasing. The corded ware, a special feature of Neolithic times, predominated all the ceramic industries at the site. It is rather surprising to note that though the excavator agrees that the ancient site of Chirand in District Saran of Bihar has an identical cultural sequence, he categorically remarked that Chirand did not yield corded ware. The excavator said, "The corded ware, an essential feature of the Neolithic Koldihwa, is absent at Chirand". Corded ware is found at Chirand as well.

The percentage of the various ceramic industries at the site was, corded ware 69.27 per cent; plain red ware 28.15 per cent and black-and-red ware 2.58 per cent only. Unlike Chirand, the Neolithic pottery from Koldihwa was devoid of any painting. Decoration was restricted to corded patterns and incisions comprising criss-cross, zig-zag, oblique, horizontal or vertical parallel lines. Finger prints were also observed on a few sherds. A few pots were burnished.

Generally thick in fabric, the corded ware of Koldihwa was dull yellowish in colour. Fragments of thinner fabric were very much restricted in number. Plain red ware was also produced in both thick and thin fabric. An ochrous slip was applied on both the surfaces. Shallow, deep, straight-sided and lipped bowls, basins, vases with broad mouth and carinated neck, deep trough, storage jars and vessels with tubular spouts were the main utilitarian types in the pottery.

The excavator was not in a position to assess the exact nature and type of the black-and-red ware, since the sherds were all too fragmentary. They were also ill-fired.

Amongst the associated antiquities of the Period, mention may be made of rounded celts with flat sides and rectangular cross-section; microlithic parallel-sided blades, blunted blades and scrapers in chert, chalcedony, agate, carnelian, jasper and quartz; querns and mullers. No bone tools have been reported.

Domestication of animal has been presumed by the excavator on the basis of the evidence of the ancient site of Mahagara, just opposite Koldihwa on the right bank of river Belan. The use of domesticated variety of rice has been confirmed by the examination of rice husk impressions on the pottery.

No structural remain was observed during the course of excavation. Occurrence of burnt clay pieces with wattle and daub impressions have, however, led the excavator to believe that the Neolithic people lived in thatched houses made of bamboo and wooden post with mud-plastered screen walls.

Period II

The succeeding cultural Period at the site was Chalcolithic, represented by a metre thick occupational debris. Corded ware and fragments of some small-sized Neolithic celts made in basalt of the preceding Period continued to occur in this Period, though in a limited quantity. Though certain marked innovations in pottery and antiquity were observed by the excavator, he was not certain regarding the people who brought about the change in the cultural pattern. According to him they were either the Neolithic people of the preceding Period, who evolved a new cultural pattern at the site or an altogether new stream of people arrived at the scene after sometime to introduce the new Chalcolithic culture.

Period II was distinguished by the occurrence of black-and-red, black-slipped and ordinary red wares. Use of the wheel for producing pots out of well levigated clay, multiplication of shapes and the use of sand as tampering material and painting were some of the new features completely unknown in Period I. The fabric, firing and finish of the pots also presented a marked improvement. Bowls, shallow and convex-sided dishes, basins (plain and lipped), funnel-shaped lids, medium-sized vases, troughs, big storage jars, footed and perforated vessels were some of the types represented in red ware. The shapes in black-slipped ware were restricted to bowls (some of which were pedestalled), dishes, basins and funnel-shaped lids. Bowls (including pedestalled ones), dishes, lipped and plain basins, small vases, straight-sided troughs and funnel-shaped lids were the shapes produced in black-and-red ware. According to the excavator, only small and medium-sized pots were produced in the black-slipped and black-and-red wares, of which the former happened to be the table ware of the Period. The assumption is based on the shining surface of the black-slipped ware.

The red ware was occasionally painted in black on the exterior surface. The designs were limited to thick horizontal bands, strokes and zig-zags. A restricted number of the black-and-red ware fragments were also painted internally in white pigment. The motifs consisted of oblique strokes and dots only. The most interesting and altogether new feature in the black-and-red ware is the confinement of the painting exclusively to the incised cavities, a combination of incision and painting. Decoration, otherwise, was scarce.

Microliths and bone tools were the main antiquities of the Chalcolithic Period. The microliths comprised cores and flakes and finished tools in the form of parallel-sided blades, blunted-back blades, points, lunates, scrapers and triangle on chert and chalcedony. In bone tools, arrow-heads, both of socketed and tanged variety, were

found in a great quantity. Engraved circlets were a marked feature on the socketed variety of arrow-heads. The other finds from the Period included fragmentary copper pieces; beads of terracotta, bone, shell and semi-precious stones; and fragments of quern and muller. One of the copper pieces is a broken blade with a very thin section.

Animal bones, most probably of Bovid, with cut marks were also reported in a great quantity.

Though not entirely absent, structural remains in the Period were very scanty. On the basis of the available evidence, the excavator felt that the Chalcolithic people lived in houses of wattle and daub, for which wooden posts were used. As a safeguard from bad weather, screen-walls of reed and bamboo were also constructed. The screen walls were, in all likelihood, plastered on both sides.

The Chalcolithic people of Koldihwa cultivated rice. The other items of diet were meat and fish.

Period III

The Chalcolithic Period was followed by the Iron Age culture without any break. The ceramic industries of the Period included plain and slipped-red wares, black-slipped ware and the black-and-red ware. The functional and typological shapes, according to the excavator, were identical with their counterparts of the Chalcolithic Period, with the exception that no sherd of corded ware was reported from the Period.

Unperforated axe and an arrow-head in iron, besides crucibles and iron slags were found in Period III. The introduction of iron did not lead to any revolutionary change in the cultural pattern of the people. Bone arrow-heads, mostly double-pointed, socketed and barbed, and bone caps to secure bone points; fragments of quern, both saddle and footed; worn-out mullers; beads of terracotta and semi-precious stones; and charred grains of wheat, rice and *moong* were the other finds from Period III.

The structural remains of the Period were restricted to floors, partly burnt, along with an open circular hearth and a single-mouthed *chulha*.

The Neolithic complex i.e., Period I at the site has not been dated on the basis of C14 determination. The radio-carbon dates are, however, available for the early Chalcolithic Period of Koldihwa. They are 5440 ± 240 B.C. and 4530 ± 185 B.C. In view of such an early dating for the Chalcolithic culture, the excavator has derived certain hazardous hypothesis. He said, "It is not unlikely that the Neolithic culture of Assam and adjoining areas might have a more respectable antiquity than assigned to it so far. In that eventuality, the Neolithic culture of the Belan valley, probably a derivative from the Neolithic complex of Assam with which it shares rounded celts and corded ware, may claim a similar high antiquity." There is no justification for such a hypothesis, since a large tract between Assam and Uttar Pradesh is still unexplored and the Neolithic-Chalcolithic sites excavated in Eastern India are only numbered.

19. Chirand*

Chirand in District Saran of Bihar is the pre-eminent site in Eastern India for the study of the Neolithic-Chalcolithic cultures. For the first time the black-and-red ware was found to occur at the site in Neolithic context. The excavations at the ancient site have established four Periods of occupation with a sub-division in Period II.

Period I

Period I represented a full-fledged Neolithic culture, the equipments of which included black-and-red ware as one of the ceramic industries. The Neolithic deposit was very rich in antiquities which comprised a variety of bone objects like needles, point, borers, pins, styluses, tanged and socketed arrow-heads, pendants, personal ornaments like bangles (prepared out of tortoise bone), reel-shaped objects such as celts (two long examples); pestles, balls, querns, hammers, etc. of stone; microliths, including parallel-sided blades, scrapers, tanged arrow-heads, points, lunates and borers; beads of chalcedony, agate, jasper, steatite and faience, including a few unfinished ones indicating local industry; terracotta figurines showing humped bulls, birds and naga alongwith other terracotta objects like bangles, marbles, perforated discs, perhaps used as spindle whorls, toy-cart wheels, pendants with incised and punctured decoration. The ceramics used by the Neolithic people were red, grey, black and black-and-red wares. It is interesting to note that the entire ceramic complex of the Neolithic Period was hand-made. According to the excavator the forms and the fabric of the black-and-red ware varied completely from those of the succeeding deposits of the Chalcolithic Period. Some of the grey ware pots were burnished, whereas others were rusticated. The neck-portion of the vases in this fabric was often decorated with applique designs to conceal the luting. Post firing graffiti were also noticed on some of the pots. Mat impression on a sherd indicated the use of mats prepared out of reeds. The shapes represented in different wares included : (i) vases, sometimes spouted, (ii) bowls, occasionally lipped or perforated or having channel spout, and (iii) footed cups, etc.

A post firing painting in ochre was very often observed on the grey ware. This feature was common in red and black-and-red wares as well. The design repertoire was essentially linear, such as criss-crosses, concentric semi-circles and rim-bands.

Rice was the staple food of the Neolithic people. Though agriculture was very well practised in the Period, bone tools in plenty indicate that hunting was also a source of subsistence.

The earliest occupation of the Neolithic Period has been dated to 2000 B.C. in view of 3.50 meters thick deposit below the Chalcolithic Culture, which was dated to 1650 B.C. on the basis of C14 tests. Vishnu Mittre, however thinks that the bottom layers of Chirand Neolithic may be dated around 4000-3000 B.C.

Period IIA

Period IIA was characterized by the restricted use of copper, microliths and

* Indian Archaeology—A Review 1963-64, p. 6 and also Potteries in Ancient India e.d. B.P. Sinha, Patna 1969, p.100.

painted black-and-red ware. The painted motif on the bowls and dishes of the black-and-red ware included group of dashes, wavy and straight lines in dirty white pigment. Vases were painted on their necks and shoulders in creamish-white colour. Other ceramic industries of the Period included plain and painted black ware and a few fragments of steel grey and red wares. Terracotta *ghata*-shaped and chalcedony beads and bone arrow-heads, both of tanged and socketed variety, were some of the important associated antiquities.

Period IIB

Iron was introduced in the top layer of Period IIB. The assemblages of the preceding sub-Period, otherwise, are said to have remained unchanged. Further investigation to demarcate the Periods and sub-Periods is essential to confirm the above issue, because the association of iron with the antiquities mentioned above is unusual. The antiquities of Period I and IIA also need close study for the clear cut demarcation of the Periods.

Period III

Period III was distinguished by the advent of Northern Black Polished Ware in different shades. The black-and-red ware continued in this period but disappeared from the succeeding Period IV. No structural remains were encountered in this Period. Noteworthy finds included a *naga* figure in terracotta, a few copper coins, heavily corroded and a solitary stone celt.

Period IV

Period IV was represented by a red ware of medium to coarse fabric. The Northern Black Polished Ware and the black-and-red ware of the earlier Period were completely absent. The well known sprinkler in the red ware was an important type. Five phases of structural remains, most probably representing monasteries were identified in this Period. Broken terracotta tiles, found associated with the early phases, indicated the use of tiles as a roofing-material for the structures.

Amongst the associated finds mention may be made of terracotta figurines with marked foreign influence of the Kushan period; terracotta plaques, representing different symbols and figures; a terracotta standing nude male figure, probably a Jaina monk; objects of ivory, bone, copper, iron, stone, glass, etc., and corroded Kushan coins.

20. Brahmagiri*

The cultural remains at Brahmagiri in District Chitradurg of Karnataka was divided into three overlapping Periods. Period I was Neolithic-Chalcolithic characterized throughout by the presence of polished pointed-butt axes of Trap rock. Some of the earlier examples were distinguished by a flattened section, though those with a lenticular section were the normal type. Crude microliths of jasper, flint, agate, common opal and rock-crystal also occurred with the stone axes. The main types of the microlithic tools were trapeze and triangle. Crescent was very rare. A copper chisel from the middle level of the occupation and two small rods, one of copper and the other of bronze indicated the knowledge of the metal. There was no iron associated

*Ancient India No. 4, pp 181-310.

with this Period. The pottery was invariably hand-made in which coarse grey ware was dominant. A few sherds of painted and incised ware were reported from the lowest stratum of the Period which was sub-divided into IA and IB. These wares were absent from the upper levels i.e. in sub-Period IB. A weathered surface was noticed between the occupations of IA and IB. The burials were of two kinds. The children were buried in large roughly made urns of uniform type. The infant was folded up into close compass and packed into the pot. The other kind was represented by two inhumation burials. Both of them were extended. Only one of them (of a child 8-10 years old) could be completely exposed. The orientation was with the head lying towards the east (95° magnetic). Two earthen bowls were placed near the upper ends of the two femurs, and a vessel with a funnel-spout was found above the skull. Post-holes exposed during the limited scale of excavation, indicated that the houses were mostly of timber, occasionally supplemented by basic lines or low walls of rough granite blocks. The rectangular plan of a structure was revealed by a straight line of post-holes, observed in one of the trenches.

Period II

An intensive iron-using Megalithic culture well-known by the variety of burials and equipped with tools and weapons represented Period II. Polished stone axes and microliths occasionally occurred at the town-site in the lower levels of this Period, but they were not in general use. This can be accounted for by survival or overlap. The pottery of this Period was distinctive in shape and fabric. It was turned on a slow wheel, polished, and is characteristically black inside and black or more often, black and red outside, with the black confined to the upper part of the vessel. The ceramic was well known as the Black-and-Red Ware. The shapes in this fabric were usually plain and utilitarian in character with bowls, dishes, vases and lid as the distinctive types. Dull red and black-polished wares were the other ceramics of the Period. Iron played a dominant role in the cultural equipments of the Period. Implements like tanged arrow-heads, knives, daggers, wedge-like blades, sickles, lances, sword, barbed arrow-heads and spears made out of the metal were in general use. Copper continued to be in use and a large number of bangles were manufactured. Among other antiquities, mention may be made of tiny white beads of magnesite or dolomite, beads of terracotta, jasper, shell, gold and steatite, conical button of steatite with V-shaped decoration, and terracotta discs. No structures were reported from the Period, though of course occasional post-holes indicated the continuance of timber-construction, at least for ordinary domestic buildings.

The Megalithic people had a burial complex, varying from simple pits and urns to the most elaborate cists and circles with orthostats and clinostats.

Period III

The Period was labelled as Andhra Culture. It was characterized by a far more sophisticated ceramic than its predecessors. Normally it was turned on a fast wheel. But for occasional occurrence of Rouletted Ware, the distinguishing ceramic of this Period had a rectilinear decoration (notably a criss-cross pattern) in white pigment of lime or kaoline under a wash of russet-coloured ochre. Salt-glazing was observed on

a limited number of the specimens. This ceramic was considered to be characteristic of the main Andhra period and as such this Period was called as Andhra culture. At the town-site of Chandravalli, a number of potin coins were found with this culture. These coins were very rare at Brahmagiri. Glass bangles appeared for the first time in this Period both at Brahmagiri and the town site.

Wheeler fixed the chronology of different Periods at Brahmagiri in a very romantic manner. Taking the Andhra dynasty, Satavahna and Roman coins and Rouletted Ware as the basic evidences, he dated the end of the Megalithic Culture (Period II) to the middle of the first century A.D. A period of two centuries was assigned to the occupational deposit of the Period ranging between three to four feet. The specific period of duration of two centuries was taken for granted by Wheeler, simply to adjust his theory of synchronising the spread of Megalithic Culture with the dislocation of Mauryan Empire following the death of Asoka in 236 B.C. Hence Wheeler ascribed a provisional date of c. 200 B.C. to A.D. 50 to Period II. The preceding and the succeeding Periods were dated between the earlier half of the first millenium and 200 B.C. and A.D. 50 to 300 respectively.

A much earlier date for the beginning of the Black-and-Red Ware, on the basis of evidences from Cists V and VI as well as by a comparative study with the remains at other sites, could easily be postulated. Wheeler on his own admitted it and said clearly, "Three pots (fig. 17, 1-3) occurred together in an accumulation which overlay a floor partially covered with stone slabs and underlay the surface soil existing at the time of the construction of Cist V. They are presumably, therefore, of appreciably earlier date. He repeated the same fact regarding Cist VI and said, "Eleven pots (fig. 17, 4-13) were found in a pit partially floored with slabs beside and prior to Cist VI in a layer precisely equivalent to that containing Group A".

21. Tekkalkota *

The excavation at Tekkalkota in Siruguppa Taluk of Bellary District of Karnataka revealed two cultural Periods.

Period I was represented by polished axes, blades on chert, chalcedony and rarely opal; gold objects; beads of steatite and semi-precious stones; bone tools; and a solitary copper axe. The ceramic industry consisted mainly of grey ware in varieties of pale grey, burnished grey with or without ochre painting, brown and buff wares. Fractional burials with or without burial appendage were the distinguishing characteristics.

Period II was distinguished by the appearance of Black-and-Red Ware and a dull red ware, with a few painted black-on-red fragments. One fragment of Black-and-Red Ware was also painted. Ochre painted ware was completely absent and pale grey ware occurred in an insignificant quantity. Amongst the antiquities, mention may be made of a few copper objects; microliths; ground axes; and beads, mainly of carnelian.

*M.S. Nagaraja Rao, *Stone Age Hill Dwellers of Tekkalkota*, Poona 1965.

There was a change in burial practice also. In place of fractional burials, the burials were extended in Period II. They were well furnished with funerary appendages. Fractional burial in multiple pots was also practiced.

For residential purposes, the inhabitants levelled up the rocky surfaces by giving a bedding of chips of stone with a sort of mud-mortar. After levelling, a circular structure was raised. The walls were of mud with plaster on split bamboos as believed by the excavator from the remains of burnt daub with bamboo impressions. The circular plan was determined by the arrangement of the boulders.

Period II has been dated to seventeenth century B.C. on the basis of C14 analysis.

22. Hallur *

The excavation at Hallur, a border village in the Hirekerur Taluka of Dharwar District of Karnataka State, was undertaken to reveal the nature of Neolithic culture observed in the mounds located on river banks as against that excavated from the hilly terrain in Districts Chitradurga, Bellary and Raichur. The ancient site of Hallur is located on the left bank of river Tungabhadra. Of the other two main objectives in view for undertaking the excavation, the first was to ascertain the stratigraphic position of the painted Black-and-Red Ware, because the fabric and shapes of the ceramic recalled those of the Iron Age Megalithic burials, whereas the tradition of painting in white was known only from Chalcolithic sites. The second objective was to determine the chronology of the Iron Age people.

During the course of excavation, two main Periods were distinguished on the basis of pottery and associated cultural assemblage. There were two sub-Periods in Period I. The Black-and-Red Ware occurred only in Period II.

Sub-Period IA

Sub-Period IA was characterised by pale grey and burnished wares, often painted in red ochre, a coarse blackish grey and a meagre quantity of reddish brown ware with pre-firing painting in purple colour. The sub-Period has been designated as Early Neolithic on account of the occurrence of a few crude polished stone tools manufactured from the locally available schist slabs. The edges of the tools were ground. The typical Neolithic stone blades were completely absent. Stone quern, discoidal hammer and shell beads in very restricted number were the other antiquities. No metal object was found.

Sub-Period IB

Sub-Period IB was marked by the change in ceramics, occurrence of specialised type of copper implements, a popular blade industry and increase in the yield of antiquities as a whole. The black-burnished ware of sub-Period IA continued to be in use. The other ceramic industries were brown-and-black ware, coarse dull red ware and painted black-on-red ware in a very limited quantity. The earlier three ceramics were occasionally painted in ochre colour. Pale grey ware of sub-Period IA disappeared

*M.S. Nagaraja Rao, *Protohistoric Cultures of the Tungabhadra Valley—A Report on Hallur Excavations*. Bangalore 1971.

completely.

The number of Neolithic tools increased in number substantially. Dolerite and trap took the place of schist in the manufacturing of tools. The characteristic blade industry with parallel-sided blades, lunates etc., came to be popular. Copper also made its appearance with double-edged axes and fish-hooks as the main tools. Bone tools; shell and steatite beads; rubber stones; and stone discs constituted to be the other antiquities.

The houses were probably constructed of wooden posts and bamboo screens, the pattern being circular huts. The floors were made of schist stone chips.

Period II

Period II was distinguished by the advent of iron. But for the blade industry, all other features of sub-Period IB continued. Typical Black-and-Red Ware also made its appearance in this Period. The other ceramics were black and red-slipped wares. Painted variety of the Black-and-Red Ware and black ware also occurred. Iron implements comprised arrow-heads, spear heads and knife blades. Stone hammers; beads of bone, carnelian, terracotta, green stone, antler and gold were the other associated antiquities. On the western fringe of the site Megalithic burials were observed.

The top deposits of Period II were very much disturbed. They yielded russet-coated painted ware, red-slipped ware, black ware and black-and-red ware of the early historical period.

On the basis of C14 analysis the following dates were assigned to the two cultural Periods:

Sub-Period IA	c. 1800 to 1500 B.C.
Sub-Period IB	c. 1500 to 1100 B.C.
Period II	c. 1100 to 800 B.C.

23. Kalibangan [Rajasthan]*

The large scale excavations at Kalibangan in District Sri Ganganagar of Rajasthan have established that the pre-Harappan sites were not confined to Sind and the Punjab. The occupation at Kalibangan was located on the southern bank of river Ghaggar (ancient Saraswati) which has dried up. It was spread over an area of a quarter of a kilometre with two distinct mounds, eastern and western. Both the mounds were closely connected. The ancient mound looked very prominent on account of the dark brown nodules, mud-bricks and potsherds peeping through the occupational debris on the slopes. The occupational debris at Kalibangan revealed two cultural Periods viz. Pre-Harappan and Harappan.

*Indian Archaeology—A Review 1962-63, p. 20 and Prehistory and Protohistory of India and Pakistan by H.D. Sankalia, Poona 1974, p. 342.

Pre-Harappan

The first inhabitants of the Ghaggar settled on an elevated surface at least 5 to 6 m. high. They were the pre-Harappans whose total occupational deposit happened to be 1.60 m. thick. In all there were five structural phases. The characteristic features of the pre-Harappan occupation could be easily distinguished from the Harappan.

The houses of the pre-Harappans were uniformly made of mud-bricks of the size of 30 x 20 x 10 cm. A course of the mud-brick in headers was followed by stretchers. Such a system of laying bricks is known as "the English bond". Specially made wedge-shaped bricks to avoid awkward corners were also used by the pre-Harappans. Their habitation like the Harappans was well planned as revealed by a well-aligned street between a row of houses. The ovens were both of the overground and underground variety. The latter had mud-plastered walls.

The pre-Harappan occupation was fortified by means of a thick mud-brick wall. In the beginning the wall was about 2 metres thick but in the later stages it was almost doubled with a width ranging between 3.70 and 4.10 m. The tools used by the pre-Harappans were made of agate, chalcedony and carnelian unlike the Harappans, who used chert. Straight-sided blades including serrated and backed, lunates and trapezes were some of the representative types.

Pottery happened to be the main basis on which the pre-Harappan occupation was distinguished. There was a striking difference between the fabric yielded by the pre-Harappan levels and those of the Harappan. In contrast to the bright dark sturdy red pottery of the Harappans, the pre-Harappans used a fabric pinkish in colour and comparatively thinner. It is not so well fired as the Harappan pottery. One of the carelessly made varieties, though well potted, had its outer surface, particularly the lower part roughened or rusticated. Another variety of pottery, represented mainly by basins, was decorated all over by obtusely incised patterns on the outside accompanied by a single or multiple rows of cord-impressions on the interior surface. In addition to the variety, the shapes of the pottery used by the pre-Harappans also differed. Graceful Harappan painted vases, the goblet, the perforated jar and the footed dishes were completely absent. The usual types were small and medium-sized.

In all six fabrics, which characterized the pre-Harappan occupation, were marked at Kalibangan. They were called Fabric A to F. Fabric A was carelessly potted, comparatively light and thin in section and red to pinkish in colour. Majority of the vessels in this group were painted in black occasionally combined with white over a dull red surface. The painting was confined to the upper part of the vessel. The painted designs comprised horizontal bands, sometimes very thick, loops fringed below or enclosed by horizontal bands, criss-cross verticals enclosing chain, grouped converging lines enclosing opposite triangles or rhombs, latticed triangles, ladders enclosing open opposed triangles, pendant, latticed leaves bordered above by horizontal bands, lenticular with multiple horizontal, scallops, moustache-like design, etc. The most characteristic design was a symmetrically joined semi-circles with intervening space giving the effect of pendant concave-sided triangles. Amongst the designs to fill up

mention may be made of radiating lines ending in discs, four-petalled flowers, cacti-like plants and squares with radiating triangles at the end.

The limited number of shapes in this fabric were represented by vases with out-turned or out-curved rims and disc – or ring bases, bowls with tapering or convex sides and the pedestal bowl.

The vessels of Fabric B were carefully potted and treated with a red slip upto the shoulder. The slipped area was painted in black with horizontal bands. The remaining area was roughened. Over this rusticated surface naturalistic designs, floral animal and bird (stag, ibex, bull, scorpion, duck etc.) were painted in black. A single shape represented in this fabric was a globular jar with variant rim-forms.

Fabric C was made of a finer-textured paste smoothed all over by a slip in shades of red and plum or purple-red. The vessels in this fabric were painted in black. The painted designs included besides the horizontal bands, loops or criss-cross, borders of plant, scale, latticed loops or pendant triangles. The panelling of palm-tree with a bird by criss-cross, butterfly or double-axe motif, wavy verticals and the Indus scale were very interesting. Globular and ovoid vases with disc-bases, lids, straight-sided bowls, dishes and offering stands were the common shapes.

Fabric D was characterized by vessels with thick sturdy section and red-slipped surface. Heavy jars, bowls, basins or trough were the normal shapes. The basins with a ring-base were decorated internally on the sides with sharp-ridged incisions of varying patterns often bordered by wavy lines and on the outsides with single or multiple rows of cord impressions. The designs were executed by a reed-fragment when the vessel was leather-hard. Bowls, flat-bottomed basins were decorated in grouped wavy lines. Occasionally the vessels in this fabric were painted in black horizontal bands and loops.

Fabric E was buff or reddish buff in colour. Large and medium-sized jars, lids, bowls, offering stands and dishes including a small chalice were the common shapes. The painted decorations consisted of horizontal bands, oblique lines with fronds, sigmas in horizontal sequence above joined semi-circles, borders of scales, latticed or plain scallops, loops, multi-petalled flowers, fish, cock (?) and stylized butterfly or double-axe within wavy verticals.

Fabric F was represented by a grey-coloured pottery. The shapes were similar to those found in other fabrics viz. dish-on-stand, basins, bowls and vases. The vessels were painted in both black and white pigment.

Amongst the associated finds mention may be made of small-sized blades of chalcedony and agate, sometimes serrated or backed; beads of steatite, shell, carnelian, terracotta and copper; shell bangles; terracotta objects comprising a fragmentary bull, toy cart-wheel with single-sided hub, bangles, quern-stones with mullers, a bone point, and copper objects comprising a celt, a bangle, a non-descript cutting tool and a

few other fragmentary objects.

The outstanding discovery at Kalibangan was a ploughed field showing a grid of furrows, with one set being closely spaced at a distance of 30 cm. running east west, and the other widely spaced at 1.90 cm. in north-south alignment. The ploughed field is similar to modern ploughing.

Harappan

Like other Harappan sites, Kalibangan had also two habitations viz. 'Citadel' Mound and the 'Lower City', the former lying to the western side located on the earlier pre-Harappan settlement overlooking the ancient Sarasvati, and the latter on the eastern side. The speciality of the ancient site of Kalibangan was that both the 'Citadel' and the 'Lower City' appeared to have been enclosed by a separate mud-brick fortification wall. Blocks of mud and mud-brick, each separate from the other were rebuilt or enlarged. Important structures were raised over these platforms. Some of the structures were meant for ritualistic purposes as supported by an elaborate drainage at successive levels. Rectangular fire-places were also observed within the enclosure of a room.

The 'Lower City' brought to light once again the high standard of planning observed at the Harappan sites in Sind and Punjab. The excavations uncovered the characteristic Indus chess-board plan with oblong blocks of houses, sub-divided by lanes and thoroughfares. In accordance with strict rules the width of the main arterial thoroughfare was maintained at 7 m right through the occupation. The encroachments on this street was in the form of curious rectangular trough or bazar-platforms outside some of the houses. Unlike other Harappan sites, no street-drains were found. Successive drains from a house-block discharged refuse water into the street. Normally the drains emptied themselves in soakage-jars. But for the last phase, the street was not metalled. Patches of mud-brick flooring, sometimes with brick-on-edge were observed in front of some of the houses. It was observed that each house opened or had frontage on at least two or three streets. Each block of houses consisted of a series of rooms with a courtyard. The houses were built of mud-bricks of the size of 30 x 15 x 7.50 cm. Burnt-bricks were used only in the drains or well. A well-preserved stairway with four extant treads was meant probably to lead to the flat roof or the upper storey. A cylindrical or rectangular block was fixed in a shallow pit meant for fire. Terracotta cakes were used most probably in the performance of the rituals.

The Harappan Period yielded typical Indus pottery, both plain and painted. The ceramic forms comprised goblets with pointed bases; perforated cylindrical jars; offering stands or dishes-on-stands; cylindrical beakers; perforated handled cups; tall jars with S-shaped profile and flanged rim; globular vessels with flanged rims, etc. The pottery which was sturdy like those at other Harappan sites was painted in distinctive Indus designs like a medley of intersecting circles, scales, *pipal* - leaves, rosettes, etc. Some of the sherds carried Indus script or graffiti. The associated finds were also typically Harappan and included chert blades; seals and sealings; weights; terracotta figurines, animal, birds and human; terracotta bangles; copper implements;

beads of steatite, carnelian, jasper, faience and copper; and a variety of terracotta cakes.

The ceramics of the Harappan Period overlapped with those of the pre-Harappan occupation.

The Harappans consumed both vegetarian and non-vegetarian diet. Traces of barley were found during the course of excavation. The animals known to them included humped cattle (cow/bull), buffalo, pig, *barasingha*, elephant, ass (domesticated), rhinoceros and camel. Remains of horse have also been observed by A.K. Sharma.

The dead body was normally buried like those at Harappa and Lothal. Three types of grave were excavated. In the first type, fairly common, an oblong pit was dug into the ground. The dead body was laid in the pit in an extended position with the head towards the north. Grave goods in the form of pots, dishes, platters, small water vessels, cups were placed normally around the head. In the second type of graves the pit was oval or circular on plan. The third variety did not yield any skeletal remains. The grave pit in this case was rectangular or oval on plan with the larger axis oriented north-south.

Evidence of trepanning in the form of six circular holes in the skull of a child was found.

24. Lothal*

When the British rule over the Indian sub-continent came to an end in 1947 and the country was partitioned into two, India suffered the greatest set back in losing the honour of being one of the three oldest centres of civilization. The entire area covering the Indus Valley sites, which represented the third centre of civilization went to the share of Pakistan. Indian archaeologists, however, undertook extensive exploration in Gujarat and Rajasthan and brought to light a large number of sites, where the so-called Indus Valley Civilization flourished in the third millennium B.C. Lothal (Saragwala) in District Ahmadabad of Gujarat was the first urban site in India where it was established beyond doubt that the Indus Valley Civilization, better known as Harappa Culture, was not confined to the limits of Pakistan, but extended further south. All the characteristics of the Indus Valley Civilization including seals and sealings were represented at Lothal. Lothal in Gujarati is a combination of two words *Loth* and *thal* (sthal) meaning 'the mound of the dead'. The word Mohenjodaro in Sindhi also means the same thing.

Situated at a distance of eighty kilometres south of Ahmadabad, the ancient remains at Lothal are now approachable by a good all-weather motorable road. The site is located almost at the meeting point of the Saurashtra peninsula and the mainland of Gujarat. The cultural remains at Lothal were divided into two Periods A and B with four sub-Periods in the former.

*Memoirs of the Archaeological Survey of India, No. 78, Lothal, A Harappan Port Town (1955-62) Vol. I by S.R. Rao.

Period A

Phase I

The earliest levels of this phase were represented by an indigenous culture which happened to be more dominant than the Harappa Culture. It was characterized by the Micaceous Red Ware, the black-and-red ware and the coarse grey ware which were found in larger quantities than the Harappan Red and Buff Wares. In both the cases the pottery was well fired and shapes well formed. In the later levels of this phase Harappan pottery occurred in greater quantity. The common shapes were the beaker, goblet, perforated jar, tall jar with S-shaped profile, dish-on-stand, jar with a bulbous body and basin. They were painted in black over red in designs like *pipal* leaf, intersecting circles, rosettes, peacocks, palm and derivative leaf-patterns characteristic of the Indus pottery. In addition there were paintings of cranes and fish-eating storks and caprids in outline. Amongst the associated antiquities mention may be made of steatite seals; cubical stone weights; long parallel-sided chert blades; disc beads of steatite and shell; and copper fish hooks.

Phase B

Floods destroyed the small settlement of Phase I. The damaged peripheral mud wall was strengthened and enlarged with mud-bricks and reinforced with burnt-bricks on the northern side near the *nullah* which posed regular danger. As a measure of protection from floods the houses were raised on artificial platforms of mud-bricks and mud. The Acropolis stood on a 14 feet high platform. A dockyard, for the first time reported from a Harappan site, was also built to the east of the Acropolis. Like Mohenjodaro, the lay-out of the city was based on a gridiron pattern with main streets running north-south and east-west connecting all the blocks. The sanitary arrangement was superb with the help of underground drains, surface drains and soakage jars. The bath-rooms were paved with baked-bricks. The streets flanked by houses varied in width from 10 to 22 feet.

The prosperity of the town during this phase could be observed from the exuberance of the Harappan ceramic wares specially the painted vessels. Red and Buff Wares were more popular. S-shaped vessels with a flanged rim, perforated jars, dishes-on-stand, beakers and basins were far more in number in Phases II-IV than in Phase I.

Etched carnelian beads, segmented beads of faience, disc beads of gold; shell-inlays; ivory rods; bone-pins; copper chisels and fish hooks; chert blades; and cubical weights were the other associated antiquities in Phases II to IV.

Fire-worship and serpent-worship were in practice according to the excavator. The typical Mother Goddess of the Indus Valley was conspicuously absent.

Phase III

A flood of greater intensity destroyed the city in Phase II. The mud-brick platforms on which the ruler's mansion stood were badly damaged. The inhabitants were, however, not deterred by the destruction. The conditions were improved by the

increase in the number of spacious houses and industrial establishments, better civic amenities and exuberance of costly ornaments and imported goods. Sea-borne trade was at its height in this Phase as proved by the 'Persian Gulf seal'. The intelligence of the inhabitants of Lothal in this Phase was established by an instrument comparable to the modern cross-staff made of shell and used in surveying lands and measuring angles. A bronze auger or twist-drill was another example.

Animal sacrifice assumed greater importance.

Phase IV

A turbulent flood at the end of Phase III forced the inhabitants to abandon Lothal and migrate to safer regions in the interior of the Peninsula. A limited number of them, however, returned back after the recession of flood-waters and rebuilt their houses. The ill-paved bath-rooms, the unregulated constructions and the encroachments on streets during this Phase proved that the administrative control in such matters was absent. Within a short time the people of Lothal particularly the merchants tried to revive the trade. Some factories for manufacturing copper and bronze implements, beads of gemstones and shell were established. A bead factory with large open courtyard, a working platform surrounded by a closed gallery and some rooms for workers were constructed on the flood-debris near the Acropolis. Among other establishments of this Phase were shops of coppersmith, a lapidary and a shell-worker. The Acropolis was occupied by the ivory-workers and bone-workers indicating that it lost its importance completely.

The Harappa Culture at Lothal could not maintain the high standard at the end of Phase IV and a decadent stage set in. The vessels were of a poorer variety owing to imperfect firing and presence of impurities in the clay. A limited number of vessels were applied with a thick slip. In many cases the painting was restricted to horizontal bands over a limited area, but the Harappan tradition was not dead. A few sturdy vessels treated with a thick slip and painted in an attractive manner in derivative leaf-patterns, peacocks, palms and cross-hatched panels in the typical Indus style continued to be in use. Beakers, goblets, perforated jars and S-shaped vessels were produced in a very limited quantity. The convex-sided bowl, both in the Micaceous Red Ware and the Harappan Red and Buff Wares developed straight sides. Certain naturalistic motifs such as the crane and the fish eating bird continued to be painted. The wavy lines were now isolated from other naturalistic and geometric designs and sometimes painted exclusively on their own.

Period B

Phase V

A devastating flood destroyed the prosperous Harappan city at Lothal completely. Buildings, both public and private, collapsed, reducing the city to a heap of ruins. The inhabitants had to take refuge elsewhere. The dockyard was also rendered unserviceable because of accumulation of silt. "The handful of men", according to the excavator, "comprising farmers, fishermen and sailors who returned to Lothal after the recession

of the flood found the town in utter ruins''. The limited number of people were not in a position to bring back the old prosperity of the city. They had to remain contented with the jerry-built houses with mud-floors, reed walls and thatched roof which were in marked contrast to the well laid-out houses of the earlier days. In place of complete bricks in the bath room only brickbats were used. The ceramic wares and lithic tools, however, continued to exhibit the Harappan technique, though slightly different in form.

After a lapse of time the late Harappans exploited the indigenous material to improve their condition. The long chert blades were replaced by short parallel-sided blades of jasper and agate. Weights of fine-grained stones were replaced by sandstone and granite. The shape of cuboid weight changed to truncated spheroid. Copper was also now scarce and as such was used to manufacture only most essential tools. A new type of copper ring with double spirals and shell bangles in place of terracotta were the new ornaments. Certain innovations in pottery were also made. The innovations were attributed by the excavator to evolution from the earlier types which were ultimately thrown into oblivion. The new forms were a bowl with a carinated shoulder and ovoid jar with a high neck evolved from the convex-sided bowl and small globular jar respectively of the preceding Period. The dish of the dish-on-stand lost its carination and the stand became squattish. The short stud-handle of the indigenous bowl was elongated, and the pinched lip of the oil lamp was replaced by a neatly-incurved rim. Beakers and goblets so commonly used in Period A were completely forgotten. The perforated jar gradually disappeared. In painting stylized animals and vegetable motifs, besides simple designs like group of wavy lines, loops, fronds, hatched triangles on a restricted area were adopted.

The black-and-red ware remained in use, though the types were changed slightly. The bowls were now deeper with tapering sides. A new form was the bowl with splayed-out rim and carinated shoulder. Stud-handled bowl in this ware was also produced.

Burying the dead was the general practice in both the Periods. The normal orientation of the bodies in the grave was north-south, though instances of east-west were not wanting. In some of the graves two bodies were interred together. A large number of pots were placed in the graves as funerary goods.

On the basis of C14 determinations Period A could be assigned a date between 2450 and 1900 B.C. and Period B between 1900 and 1600 B.C.

25. Rangpur*

Unlike Lothal, Rangpur in Limbdi Taluka of Surendranagar District of Gujarat was a rural settlement of Harappa Culture. The excavation at Rangpur revealed three main cultural Periods with three sub-divisions in Period II.

*Ancient India Nos. 18 and 19 PP. 5 - 207.

Period I

Period I was a pre-pottery microlithic culture represented by triangle, trapeze, blade, point and arrow-head in jasper and agate. They were found from the gravel lens, the remains of which were observed deep into the trench below the Harappan deposit. The gravel lens indicated that the river Bhadar once washed the northern and western edges of the mound. The microlithic industry was essentially a flake industry with very small cores.

Period II A

This sub-Period, though represented a late phase of the mature Harappa Culture, almost all the major ceramic types, tools and weapons and personal ornaments characteristic of the Harappa culture were in use. The important types of pottery of Harappa Culture found in this sub-Period were perforated jar, dish-on-stand, dish with a projected rim, thick storage jar with a heavy flat rim, small jar with a bulbous body and jar-stand. They were all sturdy and well-fired producing a smooth exterior surface. The vessels were painted in black over red. Occasionally the pots were painted in a chocolate colour over a buff surface. The painted designs were normally geometric and comprised hatched diamonds, loops and horizontal bands. Naturalistic designs like fish-net, fish-scale and plant were executed in a limited number of cases. But for a few, the painting was confined to the upper part of the vessels. Beakers and goblets were very much restricted in use. Micaceous Red Ware was a new fabric of an equally superior variety. It was often painted with a fine brush in black over red. In this Ware the common shapes were a bowl with a handle and a small jar with a flaring rim. A sturdy ware buff in colour and painted in chocolate over a buff or greenish buff background was an additional element encountered in this sub-Period. Jar and dish were the common shapes in this fabric.

Cylindrical carnelian beads, lenticular agate beads, disk beads of steatite and gold; parallel-sided blades of chert; cubical weights of agate; copper pins and celts; and steatite ornaments, reminiscent of the Harappa Culture were the important antiquities of the sub-Period. Amongst structures mention may be made of mud-brick platforms and houses and a long burnt-brick drain.

Period II B

The occupation of sub-Period IIA was destroyed by floods in river Bhadar resulting in decline in the prosperity of the Harappan Culture at Rangpur. The pottery of this sub-Period had a coarse appearance on account of indifferent treatment. Red Ware continued to occur in large quantity, but Buff Ware was very much limited in use. They were painted in black over red, and chocolate over buff as before, though in a careless manner. Occasionally the use of an additional pinkish slip produced a bichrome effect. The use of the Micaceous Red Ware was also limited, the main types being the small jar with a flaring rim and convex-sided bowl. The bulk of the pottery was not painted with any intricate pattern. Peacock happened to be the only important animal-motif. Goblets, beakers and perforated jars were used in a very limited quantity.

The utter scarcity of steatite ornaments; cylindrical carnelian beads; cubical stone weights; and chert flakes, all of which used to be imported in sub-Period II A indicated the adverse days of the people. The economic condition of the inhabitants was so bad that they could not construct even mud-brick houses and as such there was no question of paved bathrooms and burnt-brick drain.

Period II C

A revival of certain earlier traditions and evolution of new ones marked sub-Period II C. Besides the deep bowl with a sharp carinated shoulder and ring-footed base carrying rich variety of paintings both geometric as well as naturalistic in a new ceramic, well-known as the Lustrous Red Ware, there were several other types which have been pointed out by the excavator as a contribution of the Harappans by way of gradual evolution. Certain painted motifs such as loops with fronds, tendrils, fish-nets, leaves, row of birds, bull with x-shaped horns and running deer are quite new to this sub-Period. In addition to these, blades were now produced out of jasper instead of chert and their size also was smaller. The black-and-red ware, however, continued to be in limited use.

Period III

The Lustrous Red Ware alongwith other accompaniments of the preceding sub-Period came into full form in Period III. Smaller vessels with thin section became the characteristic of the ceramics. Painting was now restricted to the upper part of the vessel and was executed in a deep black pigment over a deep shining red surface. The excavator remarked, "New forms were derived from the Harappa types as can be made out from the undermentioned details. The convex sided bowl with a sharp or featureless rim of sub-Period IIA, which developed a blunt-carinated shoulder and a slightly everted rim in sub-Period IIC, became sharp carinated at the shoulder with a concavo-convex profile in Period III. The dish-on-stand of sub-Period IIA, which had a projected rim and carinated shoulder, became non-carinated and the rim of its dish-part was shortened. Sometimes it became smaller in size but deeper and its stem thin and short, ultimately taking the shape of a short-stemmed bowl in Period III. A third type which underwent similar change was the large dish with a projecting rim and carinated shoulder of sub-Period IIA. The dish of sub-Period IIC was non-carinated and the rim rounded slightly. It developed a fully-beaded rim in Period III. The bulbous jar, which had a small neck in sub-Period IIA and slightly-high neck in sub-Period IIC developed an ovoid body and very high neck in Period III. The fabric was coarse".

Besides the above mentioned developments in pottery forms, certain new features were also observed in antiquities. In place of faience, agate and steatite beads, terracotta beads came in common use. The long cylindrical beads of carnelian and terracotta fell completely in disuse. Shell bangles and beads, terracotta animal figures, particularly horse with a mare, bull, dog and pig were some of the important finds. As already pointed out, small pebbles of jasper and agate replaced chert for manufacturing tools.

The most important feature to be taken note of in Period III was the sophistication of the black-and-red ware. The finish of the pots was of a very high order. In the earlier Periods the types which could be determined from the fragmentary sherds were

restricted to two or three, but in Period III as many as twenty shapes were determined. In majority of the cases, the pots were painted unlike the preceding Periods. They are very good grounds to prove the popularity of this ceramic during this Period. The basic and fundamental difference which could be observed was that, besides the interior, a part of the exterior was also black, when in the earlier Periods the black was restricted to the interior. This must have happened on account of some modification in taste of the inhabitants.

Bowls, particularly with sharp carination at the shoulder and ring-footed base, was the principal type in use.

Houses in sub-Periods IIB and IIC and Period III, wherever available, were all made of mud-bricks.

Though no C14 dates were available for the site, the following dates have been assigned by the excavator to different Periods and sub-Periods. Period I - 3000 B.C., Period IIA - 2000 to 1500 B.C., Period IIB - 1500 to 1100 B.C., Period IIC - 1100 to 1000 B.C., Period III - 1000 to 800 B.C.

26. Surkotada*

Extensive explorations by the author followed by Soundararajan and Jagat Pati Joshi have now established that the Harappan occupation was spread over the entire area of Kutch. During the course of their stay in Kutch, the so-called Harappans also absorbed certain new cultural elements of a later date. Another interesting feature at the sites of Kutch was the existence of fortification in one form or the other. They were all a substantially large settlement with a 'Citadel' and a 'Lower Town' on a pattern similar to Indus Valley sites, though on a much smaller scale.

Besides exhibiting all the characteristic features of the mature Harappa Culture, the sites in Kutch possessed some new features completely unknown to the Harappans. Sankalia felt that the Harappa Culture in Kutch was developed at a later stage by new people or the Harappans themselves. He said, "The third interesting and important feature is that the Harappan outpost at Surkotada and probably elsewhere was developed by a later people or culture which we know as the white-painted black-and-red ware or Ahar Culture, and a people from Saurashtra who used the stud-handled bowl"¹.

In Rapar Taluka of Kutch District, about three kilometres north-west of Sanwa village, Surkotada is an important Harappan site in Kutch (Gujarat). Situated in a hilly terrain with a scant scrub vegetation, the ancient site is 160 metres in length and 125 metres in width, with a higher area on the western side and lower on the eastern. The occupational deposit at the site varied between five to eight metres. It is a single culture site sub-divided into three viz., IA, IB and IC. Plain and painted black-and-red

* Indian Archaeology—A Review 1970-71, p. 13 and

H.D. Sankalia, *Prehistory and Protohistory of India and Pakistan*, Poona 1974, p. 360.

ware occurred in the last sub-Period I.e., IC with black painted red and other characteristic wares of the Harappans. The distinguishing feature of the sub-Period was the introduction of a hand-made red ware of granulated texture, which accounted for 40 to 70 per cent of the ceramic yield. The ware was decorated in simple applique and incised designs. An undecorated crude black-and-red ware and a few red or cream fragments, having among others, spirals painted in black or purple were also found. Pointed-bottomed Indus goblets occurred in a relatively higher proportion as compared to lower levels.

Coarse red ware was less frequent.

Important finds of the sub-Period consisted of one hoard of steatite and carnelian beads, including two etched ones; cores and blades of semi-precious stones; terracotta bulls, spindle whorls, a fragment of a square tank, cart frames and wheels; and inscribed terracotta seal without any animal; copper chisel and a hoard of copper beads and bangles. The chert blades used in the earlier sub-Periods increased in frequency in sub-Period IC.

Amongst the important ceramics of sub-Period IA, mention may be made of: (1) typical Harappan pottery, (2) a few polychrome sherds painted in black and white, which also included a few vases with matt surface decorated in black and broad bands as in the pre-Harappan occupation of Kalibangan, (3) a red-slipped polychrome ware made on a fast wheel, (4) a polytone cream-slipped ware having vases with long or short concave necks, and (5) a reserved-slip ware. Three vessel types found at Surkotada are unknown from any site in India. They are : (i) hole-mouthed globular bottles, (ii) concave-necked vases, and (iii) basin with incurved rim.

In sub-Period IB deterioration in the fabric of the pottery was observed. Bowl with a channel stud-handle was a completely new type. A large heavy copper celt constituted to be one of the important finds.

There were in all eight structural phases, three belonging to sub-Period IA, two to IB and three to IC. In sub-Period IA, both the citadel and the residential area were fortified. The mud-brick and mud-lump fortification was built over a platform of hard yellowish rammed earth about 1.50 metres in height. The fortification in the citadel area was reinforced by rubble facing inside, having five to eight courses. The citadel had two entrances, one on the southern side and the other on the eastern side. The width of the fortification was reduced in sub-Period IB, but it was reinforced on the eastern side as well by the use of mud-bricks on the inner side.

Remarkable changes in the material used for the structure were observed in sub-Period IC, when rubble and dressed stone became very popular. Besides a central gateway, two square bastions on the southern side were also provided in the rampart. Ramp and steps of the projected central gateway led to the main entrance of the citadel. The residential area was also fortified during the sub-Period.

On the north-western fringe of the mound four pot-burials were exposed. They contained only a few human bones and vessels. An oval pit in the same area contained a few pots and a dish-on-stand covered by a massive stone slab. There were no bones in the pit.

Eight carbon samples from the site were examined and on that basis a date between c. 2000 and 1600 B.C. was assigned to the cultural occupation at Surkotada.

27. Ahar*

Sheltered by Aravalli mountains on the north-west, south-eastern Rajasthan drained by rivers Ahar, Berach, Banas and their affluents happened to be the nuclear region for the study of black-and-red ware. In 1955, the thick deposit and rich variety of the ware at Ahar revealed its great importance for the first time.

The valley in which the Ahar Culture flourished provided a homely environment for occupation. The land was very fertile. The Aravalli ranges on the north-west brought adequate rainfall round the year rendering irrigation very easy. It was also a very good region for hunting purposes. Both types of animal viz., wild as well as deer and boar were available in plenty. For manufacturing tools and weapons, copper was readily available in the rocks not far away. In structures, the inhabitants could easily use the schist slabs, a local material. They could also use quartz nodules to decorate the mud walls.

The ancient site of Ahar, on the banks of a rivulet of the same name and locally known as Dhulkot is located at a distance of about a kilometre from Udaipur railway station of the Western Railway. The road from the railway station has cut the mound in two unequal parts. Udaipur is a District headquarter in Rajasthan. Of all the ancient sites in India, Ahar possesses an unique place in throwing enormous light on the various stages through which the ceramic black-and-red ware passed. The thick cultural deposit of black-and-red ware has also played a very important role in establishing relationship between different cultures, which flourished in different parts of India.

The huge mound of Ahar with more than twelve metres thick occupational debris was subjected to large scale excavation by H.D. Sankalia. He divided the remains into two Periods viz. I, Protohistoric and II, Early historic. Period I was further sub-divided into IA, IB and IC. The black-and-red ware was the principal ceramic industry of all the sub-Periods. Various ceramic industries on the basis of which the sub-Periods were distinguished mainly are as follows:

IA—Mostly convex-sided bowls in black-and-red ware, buff and imitation buff-slipped ware; absence of Jorwe Ware; and absence of sharply carinated bowls.

IB—Absence of the buff-slipped ware; profuse grey ware; cut ware and ribbed wares in red.

*H.D. Sankalia and others, *Excavations at Ahar (Tambavati)*, Poona 1969.

IC—Sharply carinated bowls in black-and-red ware and red ware; absence of metallic wares; occurrence of Lustrous Red Ware, akin to that of Rangpur; and the absence of the dish-on-stand.

It is essential to describe the details of pottery which constituted the bulk of finds at Ahar. The associated antiquities were relatively very scarce. In fact the sub-Periods were divided mainly on the basis of pottery. The earlier impression that the black-and-red ware was the only important ceramic industry at the site needs a change on account of the rich and varied types of red and grey wares obtained during the large scale excavation.

Period IA

Black-and-red ware : This ceramic industry has been classified into six groups which are as follows:

- (a) the plain black-and-red with one or both surfaces burnished.
- (b) Similar to a (a) but with paintings in dull white both on the exterior and interior.
- (c) The black-and-red with matt surface.
- (d) The black-and-red with some portions having a pre-firing brick-red slip, mostly on the black portions.
- (e) The entirely black-burnished pottery.
- (f) The black-and-red with gritty core and surfaces.

Bowl is the predominant type in the black-and-red ware. Bowl-on-stand, shallow pan, pots with globular body and pots with elongated globular body are the other shapes represented.

Paintings on the black-and-red ware were executed in the pre-firing stage both on the interior and exterior surface. The large number of patterns comprised geometric designs like strokes and lines of various varieties in groups, dots, triangles, hatched diamonds, circles, arcs, etc.

The other associated wares were as follows:

1. Grey ware : It has been represented in three fabrics viz. (a) with the outer surface smoothed by a slip, (b) similar to (a) but with the slip burnished, and (c) partly burnished and partly coarse. Globular vessels, lids, and dish-on-stand, are the main types. They are often decorated on the outer surface in incised and cut designs.

2. Buff and buff-slipped ware : There are two varieties viz. (a) made of Kaoline throughout (the core and the slip) and (b) buff-or-cream-slipped ware in which the surface has a buff or cream-coloured slip, while the core is pinkish.

3. Tan wares : There are two varieties viz. (a) metallic tan with beautifully tan-yellow-red slips highly burnished and (b) thick drab tan-slipped.

The tan ware represented some characteristic shapes of Indus Valley e.g. stepped dish-on-stand. The heaviness, sturdiness, the uniformity of pinkish core and metallic ring suggest possibility of link with the late Harappan as at Rangpur. Dish-on-stand, ribbed pots, basins with a variety of bases and ribbed globular pots were the main types.

4. Burnished grey ware with white painting : Only two sherds which are burnished in a nice manner were found.

5. Tan-slipped ware with white paintings : Forty fragments of this ware were found. They have a red-slipped exterior and the interior is either red or black or blotchy. This ceramic is more or less a variant of black-and-red ware in fabric, shapes and painted designs.

6. Chocolate-slipped metallic ware : Two types of fabric have been reported in this ware. They are (a) with reddish brown slip and (b) with dark chocolate slip. This group is simply a variety of tan ware. In addition to the types in tan ware, two new types viz. (a) rimless bowl and (b) bowls with convex sides were produced in this fabric.

7. Red ware : It constituted the bulk of the pottery at Ahar with a number of varieties viz., (a) thick red-slipped, (b) with red wash, (c) with dull brown mechanical slip, (d) with rusticated exterior, (e) red-slipped metallic ware, and (f) drab red ware. The main types were : (1) Dish carinated, (2) Dish stepped, (3) Bowl-on-stand, (4) Pan, (5) Dish stemmed, (6) Pot-rest, (7) Ribbed vessel, (8) Lota, (9) Basin, (10) Globular vessel, (11) Bowl-on-stand with carination, (12) Pans with roughened exterior, and (14) Stems.

A considerable number of decorated thick grey and red fragments also formed part of the cultural complex.

Period I B

Sub-Period IB was characterized by abundance of red ware, increase in the use of black-and-red ware and introduction of certain new wares.

1. Black-and-red ware : The shapes of sub-Period IA are repeated, but the quantity is much more. A marked tendency towards providing a carination to the rimless bowl was observed in sub-Period IB. Both the exterior and the interior are beautifully burnished.

2. Tan ware : This fabric has been classified into seven groups which are : (a) with metallic ring, tan core and deep red slip, (b) similar to (a) but with a dull red slip, (c) similar to (a) but with orange red slip, (d) similar to (a) but with chocolate-coloured slip, (e) tan ware with porous brown core and mechanised tan slip, (f) plain tan-red ware with well fired pinkish red core, and (g) with tannish red core and red wash. The popular shapes were stepped dish, shallow dish, corrugated stem, basin, ring stands, globular pot and pot-rest.

3. Grey ware : There are three varieties viz. (a) burnished, (b) partially burnished, and (c) unburnished. All these varieties existed in IA as well, but the quantity in IB was reduced. Most of the types of IA also continued.

4. Chocolate-slipped metallic ware : The quantity of this fabric as compared to IA was reduced. The main shapes were stepped dish, deeper dish, ringed pot-rest, smaller stepped dish, hollow stem of stand and hollow stand bases with flared sides.

5. Tan-slipped ware : There was hardly any difference when compared with IA. The common shapes were stepped dish, hollow stems, deep and large-sized dishes-on-stand and hollow flared bases.

6. Red-slipped ware : The quantity of this ware increased in IB. Three varieties have been observed in it. They are : (a) thin red-slipped with metallic ring, (b) thick red-slipped ware, and (c) coarse red ware. The popular shapes were vessels with low concave neck and medium high cylindrical neck, bowl with convex sides and everted rim, hollow cylindrical stems with corrugations, small convex-sided bowl with ribbings, low hollow small stems and globular vessels with slightly out-turned rim.

Almost all the shapes of sub-Period IA continued, but the most notable was a thick corrugated storage jar.

7. Coarse red ware : The quantity of coarse red ware was much less in IB. Decorated sherds like IA were also reported.

Period IC

The quantity of pottery was very much reduced in IC as compared to IA and IB. Two significant features were distinguished in this sub-Period. They were : (a) large variety of painted wares introduced, and (b) apart from the painted black-and-red ware and a couple of grey ware sherds with white paintings, the metallic tan wares and the medium thin tan ware with white paintings were conspicuous by their absence. Two fragments of Rangpur Lustrous Red Ware were also a new feature in addition to a score of other painted sherds showing black paintings on different types of red ware.

The principal wares were : (a) black-and-red ware with sharply-carinated shoulder in the bowl as the chief characteristic, (b) thick-red-slipped, (c) thin burnished slipped, and (d) coarse red. Very little quantity of grey ware occurred. The brown-slipped black-and-red ware disappeared.

The distribution of the meagre antiquities in the three sub-Periods at Ahar was as follows:

IA - Microliths in the form of hollow and side scrapers, fluted cores, all in quartz; beads of faience, schist and terracotta; ear-stud and bangle of terracotta; copper bangle; stone balls; stone saddle quern; bone point and ground tool.

IB - Microlithic fluted cores and blunted-back blade in quartz; beads of agate, bone, calcite, carnelian, faience, jasper, schist, shell, steatite and terracotta; skin-rubber, head-scratcher, ear-studs, votive tanks, crucibles, dice, bull, horse, elephant, pendants, bangles, human figurine, finials and pipes of terracotta; copper rings, bangles, kohl sticks, celts and knife blade.

IC - Microlithic convex scrapers, borer-cum-hollow scrapers and borers in quartz; beads of carnelian, crystal, glass, jasper, lapiz, schist, shell and terracotta; skin rubbers, ear-studs, votive tank, crucible, bulls, elephant, stoppers, pendants, bangles, balls and pipe of terracotta and copper rings.

The structures at Ahar were all made of mud walls over a plinth of roughly dressed schist slabs. Mud-bricks were also used occasionally in the walls. The roofs were in all likelihood supported on wooden posts and beams. Clay was mixed up with river gravel to prepare the floor of the houses. In a number of cases hard burnt clay was also used in the floors. The houses, fairly large in size, were raised in quick succession over the earlier debris.

Several C14 samples were examined and the following dates were assigned to the three sub-Periods.

IA - 1940 to 1765 B.C.

IB - 1725 \pm 110 B.C. Actually a cultural continuation of IA.

IC - 1550 to 1270 B.C.

Period II

Period II was marked by the advent of iron Northern Black Polished Ware, innovations in pottery tradition and civil architecture and knowledge of writing.

Period II was sub-divided into three Phases designated as IIA, IIB and IIC.

The deposits of sub-Period IIA were characterized by the occurrence of the Northern Black Polished Ware, socketed arrow-heads of iron and a mixture of coarse red, slipped-red, plain black-and-red and black-painted red wares, which indicated an interlock with the preceding Period. Sub-Period IIB belonged to Kushan times with the typical bowl and other types. Remains of floor-levels with sunk wooden posts, ringed soak-pits, terracotta votive tanks, shell bangles and ear-studs characteristic of the first to third century A.D. were encountered. Two terracotta sealings bearing legends in Brahmi script of the second century B.C. to the second century A.D. were also found in pits of this sub-Period. The topmost sub-Period IIC was distinguished by the find of mica-coated pottery belonging to the early medieval period.

28. Kayatha *

The huge mound at Kayatha is located on the right bank of Choti Kali Sind, a tributary of the Kali Sind which in its turn, is the tributary of Chambal. Kayatha

*Z.D. Ansari and M.K. Dhavalikar, Excavations at Kayatha, Pune 1975.

village is about twenty-five kilometres east of Ujjain on the Ujjain-Maksi road. Five Periods of occupation were distinguished at the site as a result of systematic excavation. They were as follows:

- Period I - Kayatha Culture
- Period II - Ahar Culture
- Period III - Malwa Culture
- Period IV - Early Historical
- Period V - Sunga-Kushan-Gupta

Period I

The cultural equipments of this Period were entirely different from any other Chalcolithic culture of Central India. According to the excavators the culture had not developed at the site, but seemed to have evolved elsewhere. The inhabitants i.e. the first occupants of the site used copper or bronze tools on a restricted scale and a specialized blade industry made on chalcedony and agate. They lived in houses of mud or wattle-and-daub with the floors made of hard compact yellowish river silt. The roof was probably supported on wooden posts.

The ceramic industries were represented by three characteristic wares, the most important of which was a sturdy variety having a broad zone of thick dark brown slip, usually from lip to shoulder and occasionally extending upto the base. Painted designs in violet were executed on the dark brown background. The design patterns were poor. They were all linear e.g. bold strokes, either vertical or oblique and loops and zig-zags. Jars with globular profile and bowls with thickened incurved rim and a carinated shoulder were the main shapes. The occurrence of huge storage jars with heavy beaded rims showing significant similarities with the Harappan form was of great importance. A majority of the vessels had a ring base with a limited number having disc base only. Since this particular ceramic came to light for the first time at Kayatha, it was labelled as Kayatha Ware. It was made of extremely fine pinkish paste of well levigated clay without any grit or other impurities. Two varieties, one thick and the other thin, were found in this fabric. Amongst other ceramic industries mention may be made of red painted buff ware, Kayatha Buff Painted Ware and Kayatha Combed Ware. The first one constituted to be another distinguishing feature of Kayatha culture. It was also made of fine clay and the fabric is therefore of a high standard. It was thin and painted in linear patterns in a red pigment over a buff surface. The common designs were sets of parallel lines, usually oblique, and loops and festoons. Typical Indian *lota*, a small water vessel with flaring mouth, round bottom and a carinated body was the principal type in this ware. A bigger variety of the vessel was also found. The second category i.e. Kayatha Buff Painted Ware was also unique and not found anywhere else. Kayatha Combed Ware was a red pottery usually with slip or wash, though occasionally red-slipped. It was decorated in incised patterns comprising zig-zag or wavy horizontal lines executed by a comb-like instrument. Bowls and dishes were the only shapes in this Ware. It was sturdy with a fine fabric and recalled to the mind the incised ware of pre-Harappan levels at Kalibangan. The fundamental difference between the two was that the ware at Kalibangan had incised

pattern on the interior, whereas at Kayatha the same was on the exterior. A coarse hand-made pottery with incised and applique designs was also associated with the above-mentioned ceramics.

Two fine copper axes and a number of copper bangles indicated the advanced knowledge of technology possessed by the Kayatha people. The scarcity of the metal was, however, proved by the use of microlithic tools generally in the shape of parallel-sided blades and pen-knife blades on a large scale. A mace-head or ring stone was used probably as an agricultural implement. Two necklaces made of 175 and 160 beads of semi-precious stones found in two red painted buff pots were valuable. The beads were mostly large barrels and short-cones and were made of agate and carnelian. In addition to a few shell beads. 40,000 micro-beads of steatite were also found in a pot.

Period II

The excavators of Kayatha felt that the inhabitants of Period II came from south-eastern Rajasthan and that is why it was labelled as Ahar Culture. Such an impression was based on the prolific use of the black-and-red ware, a characteristic of the Period. The ceramic is painted in white, usually on the exterior, but occasionally also on the interior of the vessels. The painted designs were mostly geometric. Red-slipped ware with variants like tan, orange, chocolate and brown-slipped, hand-made coarse red/grey and a few sherds of Kayatha Ware, obviously an infiltration from the preceding Period were the other ceramic industries.

Amongst the important antiquities mention may be made of microliths represented by a full-fledged blade industry; necklaces of shell beads; terracotta animal figurines of unique variety, particularly bulls and occasionally rams; short bicone terracotta beads bearing punctured designs; terracotta lamp, cake and sling balls.

The structures of the inhabitants of Period II were humble and made of mud. Impression of wall fragments indicated the use of reed screens which were probably covered with a thick plaster of mud.

Period III

The painted black-and-red ware continued in Period II. According to the excavator, the industry was undoubtedly a survival of the preceding Period. Bowls and dishes were the common shapes. The associated new ceramic industry was the black-on-red painted variety commonly known as the Malwa Ware, but the coarse hand-made red and grey wares of the earlier Period continued to be in use. Microlithic blades were used by the people of this Period as well. Terracotta figurines of bull, naturalistic and stylized; beads of carnelian, agate, terracotta, shell and glass; terracotta ear-stud, sling balls, spindle whorl; ring, rubber and hammer stones and stone sling balls, were the important antiquities of the Period.

Period IV

The ancient site of Kayatha came under occupation of a new set of people, having mastery over the technology of iron, again sometime in 6th century B.C. after a long break. The copper and stone tools of the preceding Periods were no longer used. They were replaced by a large number of iron tools and implements. The well-known ceramic Northern Black Polished Ware was introduced in this Period. Black-and-red ware and the plain grey wares were the other ceramic industries. A few sherds of the plain grey ware usually associated with the Painted Grey Ware in Northern India were also found. The black-and-red ware was coarser in fabric as compared to earlier Periods and also devoid of any painting.

Amongst the associated antiquities mention may be made of a few coins with the typical Ujjain symbol; terracotta spindle whorls, sling balls, stoppers, skin rubbers, votive tanks, bangles and ear-studs; glass spools; bone styli; and beads of glass, terracotta and semi-precious stones.

Period V

The Period was characterized by six ceramic industries viz. red ware, the red-slipped ware, the grey ware, the red painted ware, the coarse hand-made ware and the glazed ware. Red-slipped ware and the red ware were the most prominent. The well-known shape of carinated-*handi* was produced in this variety of pottery. In addition, typical Sunga and Gupta cups with a sharp edge were also present in a large number. The minor antiquities of the Period included terracotta spools, discs, lamps, ear-studs, toy-cart-wheels, flesh rubbers, votive tanks, miniature pots and a crucible; shell bangles; bone points; stone rubbers, dabbers and querns.

Several C14 samples from the site were examined on the basis of which different Periods were dated as follows:-

- I. Kayatha Culture (c.2000-1800 B.C.)
- II. Ahar Culture (c.1700-1500 B.C.)
- III. Malwa Culture (c.1500-1200 B.C.)
- IV. Early Historical (c.600-200 B.C.)
- V. Sunga-Kushan-Gupta (c.200 B.C. - A.D.600)

29. Navdatoli *

The ancient site of Navdatoli is situated on river Narmada in District Nimar West of Madhya Pradesh.

A large scale horizontal excavation at Navdatoli was undertaken in order to lay bare the streets and houses and also to understand if possible the socio-economic background of the people who inhabited it. The excavations revealed two Periods, of which Period I was Chalcolithic, further divisible into four sub-Periods. Period II belonged to Iron Age and later times.

*H.D. Sankali and others, Chalcolithic Navdatoli, Poona 1971.

Sub-Period IA

Phase I of the Chalcolithic Period was characterized by white painted black-and-red ware, cream-slipped ware and painted black-on-red ware (Malwa Ware). The mud houses and the lime floor over black cotton soil were destroyed by fire. According to the excavator, "The black-and-red ware with graceful forms either imitate those in the black-on-red and cream slipped ware or show a parallel development. Similar is the position at Ahar in Eastern Rajasthan, from which the technique alone seems to have been borrowed".

Sub-Period IB

All the wares of Phase I continued in Phase II, but for the bichrome painted ware and hand-made coarse red ware. Certain new wares were also introduced. They were: (i) burnished red-slipped ware, (ii) metallic ware with snuff colour slip, (iii) metallic red ware and (iv) Jorwe Ware. The types in the black-and-red ware were now simple and more utilitarian consisting of water pots, dishes, and basins. The quantity as compared to other wares was, however, very restricted. The Jorwe Ware had a great impact on the life of the people in Phase II and continued to flourish with the Malwa Ware. Navdatoli was again a victim of devastating fire.

Sub-Period IC

The use of painted black-and-red ware, disappeared in Phase III, though a few bowls with painting in white did continue. They were considered to be either survivals from earlier Phase or derived while levelling the debris of the earlier habitation. The other wares like the Malwa, cream-slipped, coarse red, grey, Lustrous Red, metallic, mat and Jorwe also continued. Red-slipped, burnished and metallic wares were newly introduced. Bichrome wares were totally absent.

Sub-Period ID

All the wares of Phase III except the cream-slipped ware continued in Phase IV. An unpainted variety of black-and-red ware was also used. A sturdy ware painted externally and a coarse red ware with applique designs were introduced. Frequencies of various types of pottery used in Phase IV were as follows:

1. No cream ware.
2. Jorwe relatively more than that in Phase III.
3. Malwa ware abundant; channel-spouted maximum.
4. Coarse red matt.
5. Coarse red, applique patterns maximum.
6. Malwa dishes with ridges totally absent.
7. No bichrome painted/no grey with applique roundels.
8. No incised designs/no antelope designs.

The associated antiquities of the Chalcolithic Period comprised microliths (mainly blades of crested guiding ridge technique); grinding stones; stone querns; beads of agate, amazonite, bone, carnelian, chalcedony, copper, coral, crystal, faience, glass, gold, jasper, lapiz, opal, quartz, quartzite, sandstone, shell, steatite and terracotta;

terracotta discs, skin-rubbers, lamps, ear-studs, ring, sharpeners, wheels, toys, horse (?), amulets, whorls and marbles; copper celts, chisel, arrow-heads, sword, beads, bangles, rings, poker, pointed rods, point-cum-engraver, fish hooks and nails; bone points, kohl-sticks, bangles, discs or whorls, pulley-like objects, dagger, pendant and ornamental object, a perforated and a polished rib piece; an ornamental disc in ivory; and shell ear studs, whorls, bangles and ring. Commenting on the settlement at Navdatoli Sankalia said, "The earliest settlement took place on a 80 ft. high terrace. This was made up of pebbles and boulders at the base, but its upper half was pure alluvial silt, yellowish brownish in colour. The topmost portion of this silt had developed into a blackish weathered soil. This black soil layer gives some idea of how the region looked when the first settlers had arrived at Navdatoli (and other Chalcolithic sites). Observation of numerous sections and sites, archaeological and otherwise, as well as chemical tests of the existing black soils and the fossil soils by Dr. G.G. Majumdar have shown that such soils develop only when there is considerable vegetation and a fairly good humid climate. That is, the rainfall must be around 30 inches per annum

.....
Clearance of such a forest by burning and felling of trees must have preceded the first occupation of the mound or the terrace. Presumably the trees were cut by copper and/or stone axes, though so far only five of the former and only one of the latter, and that too from the surface have been found".

The structures, according to the excavators, were round or rectangular. They were built of round wooden posts. The wooden framework was further supplemented by split bamboo screen, plastered with brownish clay silt and cowdung and white-washed with lime. The floors were made of various materials like pure river silt, black-brown clay, and occasionally river gravel. They were given a lime coat.

Several samples of carbon from the site were examined and a date between c. 1600 and 1300 B.C. was assigned to the Chalcolithic Period of Navdatoli.

Period II

The occupation in Period II was very flimsy. There were hardly any remains of houses. Besides the iron objects, the Period was distinguished by the occurrence of stray glass bangles, Red Polished Ware as well as the black-and-red ware and coins. The tools and weapons in iron included knives, arrow-heads, nails and rings. The occupation during this Period was of a temporary nature.

30. Eran*

Eran in District Sagar of Madhya Pradesh is one of the most important Chalcolithic sites in Malwa. The high mound on the bank of river Bina is situated about sixteen kilometres from Bina Junction railway station of the Central Railway. The great importance of the site can be judged by the protection which was provided to it from all sides. In the first instance it was sheltered by the meander of river Bina. Further

* U.V. Singh, Excavation at Eran, *Journal of Madhya Pradesh Itihas Parishad*, No. 4, 1962, pp. 41-44.

protection to the city came from the fortification raised in Chalcolithic times. A moat running by the side of the fortification was an additional source of strength.

The cultural remains at Eran were divided into four Periods viz., Period I, Chalcolithic, assignable to the second half of the second millennium B.C., Period II, covering a few centuries prior to the Christian era; Period III, covering the first five centuries of the Christian era; and Period IV, from circa sixteenth to eighteenth century.

Period I

Period I was characterized by the presence of microliths and painted black-and-red, thick grey and black-on-red wares, the last being mostly of the Malwa fabric. The occurrence of a few specimens of plain and thin coarse grey ware is noteworthy. A solitary sherd of coarse grey ware had a thick white coating on the exterior. A few sherds of thick grey ware were painted in light red pigment with linear patterns. Two fragmentary channel spouts in red ware were also obtained. The associated finds included terracotta animal figurines; beads of steatite, carnelian, shell and terracotta; stone fragments; terracotta and shell bangles; a small copper piece; signet-ring; circular gold pieces and a fragment of a bone pin.

The painted black-and-red ware of the Period had its own individual characteristic, not reported so far from any other site in India. The black portion in this fabric was restricted to the interior alone. The upper part of the exterior rim, unlike other sites, was all red. The pots were painted in a variety of designs like oblique and wavy lines and cross-hatched diamonds. Though of course the black-and-red ware was a flourishing industry at Eran, it could not claim the privileged position, which it occupied in south-eastern Rajasthan. In South-eastern Rajasthan, the black-and-red ware was the principal ceramic industry. There is some difference in the chronology also. In view of the fact that the black-on-red painted ware was contemporaneous with the earliest black-and-red ware at Eran, when the former was introduced at Ahar only in Period IC, it can safely be assumed that the latter industry started much later at Eran.

Thick grey ware painted is, however, a new element at Eran. Some of the designs and types in this ceramic are similar to those in black-and-red ware. In spite of the fact that this type of grey ware is entirely different from the Painted Grey Ware of the Indo-Gangetic basin, cultural influence from that region could not be ruled out.

Since the excavation was on a restricted scale based on the vertical system, it was not possible to determine the type of the houses or structures. In all probability the houses were made of perishable materials like mud with roofs supported on wooden posts and beams. The floors were made up of rammed clay mixed with kankar.

Period II

Period II was marked by the introduction of iron and the Northern Black Polished Ware, besides the disappearance of most of the earlier wares. The plain black-and-red ware, however, continued throughout the occupation of this Period.

The black-and-red ware disappeared completely in Periods III and IV.

A few samples from the site were no doubt subjected to Carbon 14 tests, but the results achieved were confusing. In the circumstances, therefore, the dates ascribed by the excavator must be considered as final. The excavator assigned a date of 1700 B.C. to the earliest remains.

Period III

Period III was associated with the Red Polished Ware and a black-painted red ware. Several coins of the Western Kshatrapa and Naga rulers, silver and copper punch-marked coins, various beads; objects of iron and copper; terracotta inscribed seal and sealing were some of the important antiquities. One copper object, probably part of a sword, was carved with an elephant. The sealing with the legend *maha-danda-nayaka Simhanandi* was very important to throw light on the importance of the town of Eran.

Period IV

Period IV belonged to the late medieval times as testified by the medieval coins and those of former princely states, glass and lac bangles and a Vishnu image.

31. Bahal & Tekwada*

The ancient sites of Bahal and Tekwada are located in Jalgaon District of Maharashtra. The last excavation at Bahal in 1956-57 brought to light five periods of occupation with breaks between Periods I and II and III and IV.

Period I

Period I was sub-divided into IA and IB, both of which represented all the characteristic features of the Chalcolithic cultures of Central and Western India. It is very surprising to note that not a single fragment of the black-and-red ware was found in either of the sub-Periods, particularly when the same occurs in the levels equivalent to IB at Tekwada. The ancient site of Tekwada is situated just opposite Bahal. One of the burials at Tekwada yielded painted Black-and-Red Ware, which was placed at the feet of the skeleton. This was the first site excavated in India, where painted Black-and-Red Ware was found in a Megalithic burial. Another interesting feature was the absence of iron from the burials.

The facts mentioned above can play a role of vital importance in establishing cultural relationship between the Chalcolithic and Megalithic Cultures of India. Besides the painting on the Black-and-Red Ware, a characteristic of Chalcolithic cultures, the types of the Black-and-Red Ware used for funerary purposes at Tekwada are in no way different from those found at Brahmagiri. Almost all the vessels of Black-and-Red Ware at Tekwada are elongated deep bowls with incurved rim and carinated shoulder, which are characteristic of the Megalithic burials at Brahmagiri. The burials at Tekwada have been equated with Period IB at Bahal on the basis of the painted black-on-red ware of the Chalcolithic facies. Besides the painted animal figures on this

*Indian Archaeology—A Review 1956-57, pp. 17-19.

ware, the other important finds of the sub-Period included a few sherds of the Lustrous Red Ware; beads of terracotta, shell and paste; microliths of chalcedony, agate and jasper, mostly parallel-sided blades, sometimes serrated and less frequently lunates and trapezes; terracotta combs and hones; and a limited number of copper objects. Carinated bowl and spouted vessel of the Nasik-Jorwe type and a few sherds of burnished grey ware occurred in the upper levels of the sub-Period.

It may be pointed out that the globular jar with flaring rim in sub-Period IA at Bahal is reminiscent of Brahmagiri burial urn.

Period II

The emergence of iron in Period II brought about a complete change in the life of the people. The Black-and-Red Ware, however, continued to be in use, with the red exterior surface occasionally changed to buff or cream. The surface of the vessels was highly burnished and the common shapes were rimless bowl and shallow dish. In the associated red ware with a gritty core, the common types were globular jar and carinated *handi*. Highly polished faceted beads of carnelian, jasper, crystal and opal; ear ornaments of agate with mirror-like polish; iron spear-heads, arrow-heads, knives, daggers, sickles, etc., were some of the other important finds.

Period III

Period III, as already stated, was sub-divided into A and B. Sub-Period IIIA was characterized by the Northern Black Polished Ware, whereas IIIB by the Red Polished Ware. The Black-and-Red Ware as such, without the variants of a buff or cream exterior as in the preceding Period, survived only in sub-Period IIIA. Gritty red-slipped ware with a crackled surface was another important ceramic of the sub-Period. The antiquities consisted of beads of agate, carnelian and bangles of crystal and shell.

In the absence of any C14 date, the dates assigned by the excavator are to be accepted. He has dated Period II between c. 600 B.C. and 300 B.C. How much earlier the beginnings of Period I can be placed is a matter of speculation. However, on the basis of comparative study, they can safely be placed in the earlier half of the second millennium B.C. The burials at Tekwada, which have been equated with sub-Period IB at Bahal must, therefore, be dated to about 1700 B.C. This is a very good evidence to prove that the Megalithic burials in India had a much earlier beginning than c. 200 B.C., as assigned by Wheeler. When the Megalithic burials can be so early, naturally the Black-and-Red Ware used in them as funerary vessels must also be of a much earlier date.

Period III has been dated between c. 300 B.C. and A.D. 100.

Period IV

With the end of Period III, the site was a victim of severe floods leaving behind deposits of river-sand in several bands. After a long gap of twelve hundred years the site was again occupied in Period IV, during the Yadava and Muslim times (A.D. 1300 to 1700). The deposits of the Period were found to be badly disturbed by

pits of the subsequent Period. The pottery was crude, grey and red in colour, but the Mughul glazed ware and Chinese celadon ware, together with the polychrome Bahmani bangles and stray coins, were very helpful for the purpose of dating.

Period V

Period V represented the occupation of the Maratha times of eighteenth century. Remains of pottery conduit-pipes embedded in brick work constituted to be the main remains of the Period.

32. Prakash*

Prakash is a very important site in District Dhulia of Maharashtra, since it provided a connecting link between the Chalcolithic cultures of the Deccan and the Megalithic cultures of South India through the black-and-red ware. The cultural deposit at Prakash was divided into four Periods with a sub-division in Period I.

Sub-Period IA

This sub-Period was characterized by the occurrence of blades and microliths, hammerstones, a restricted use of copper or low-grade bronze and four ceramic industries. The blade and microlithic industry constituted to be the principal component of the sub-Period in which blades were dominant. In blades, parallel-sided flakes or plain blades without any retouching were found in an overwhelming majority. Amongst the tools with secondary working, the serrated blades, blunted-back blades and pen-knife blades occurred in a larger percentage. Points, lunates and trapezes happened to be the next in frequency. Copper was too scarce and only one solitary bit of the metal found.

Beads of carnelian, shell and paste, including a distinctive spacer and a chisel-ended tooth-pick pendant; fragments of shell bangles; curious terracotta 'hones'; a painted terracotta toy-cart-wheel and a painted terracotta bull were some of the important antiquities of the sub-Period.

Pale-grey ware, often burnt black-and-grey and adorned with painted designs in a white pigment both on the exterior and the interior (with a marked preference for the latter); black-painted red pottery of the Malwa Ware; other decorated ware showing incised and applied designs; and a coarse burnished grey were the four ceramics representing sub-Period IA. Deep bowl, spheroid or ovoid in profile, the *lota*-shaped vase, and a vase with pronounced shoulder occurred in the first variety of the ceramics. According to the excavator there was a solitary sherd of the related white-painted black-and-red ware of the Ahar fabric from the lowest levels. The distinction between the black-and-red ware of the Ahar fabric and that occurring at Prakash and called as black-and-grey ware requires close and detailed study. The painted designs on the black-and-grey ware comprised obliquely converging lines in groups of one to four (on the outside); converging lines, groups of dots, dashes, comma-like strokes, herring-bones and wavy meanders (on the interior).

*B.K. Thapar, Prakash 1955, *Ancient India* Nos. 20 and 21.

The second variety of pottery (Malwa) was painted in numerous designs in a thin purplish to brown-black pigment. The designs comprised a medley of loops; rayed joined volutes; rows of criss-cross; hatched or latticed diamonds; triangles, pendant or upright; grouped wavy or converging lines; concentric circles; chevrons; latticed or ladder-hatched lines. Animals and birds like spotted deer, cranes, peacocks (often stylized) were also painted. Vase, jar with clubbed or collared rim, dish and dish-on-stand were the common types in the ware.

The third variety of ceramic was of a poor nature with a burnished surface and fired at a low temperature. The colour of the pots was mottled grey and tan. Simple patterns like oblique or vertical slashes, herring-bones, chevrons, criss-cross and circlets were some of the decorative designs. Tortoise was also decorated occasionally. Shallow dish, decorated on the inner side with continuous herring-bones, was the distinctive shape.

The last group of ceramic was represented in a blotchy grey or drab colour with a burnished surface, heavy body occasionally carrying an ochreous paint on the rim. Dish or platter and lid were the common shapes. A dish with looped feet was very interesting. The plain red ware was almost similar to the Malwa Ware.

Sub-Period IB

The occurrence of two new ceramics distinguished this Period. They were the black-painted red pottery of the Jorwe Ware and the Lustrous Red Ware. The other ceramic industries of the preceding sub-Period continued to be in use.

The Jorwe Ware had well-baked sections and smooth red-slipped surface, occasionally bearing painted designs in black. Amongst the designs mention may be made of vertical or converging lines; zig zags; wavy lines; criss-cross; and running loops forming latticed diamonds or upright triangles. Each painted design was enclosed in a panel of horizontal bands. Concave-sided carinated bowl or dish tubular spouted vase and high-necked globular vase were the only three types found in this ware.

The Lustrous Red Ware was distinguished by its glossy-surface and black-painted designs. Only six sherds of this Ware were found in the excavation. The Ware was represented at Prakash only in the concave-sided bowl. The design pattern was the same as on the Jorwe Ware.

Blades and microliths with a larger percentage of parallel-sided flakes or blades, pen-knife blade and points; spheroid balls or hammerstones; beads of carnelian, coral, paste and shell including a tortoise amulet; shell bangles; and bone styluses constituted to be the associated antiquities. In microliths, trapezes were found to be absent.

No house plans were encountered either in sub-Period IA or IB.

Period II

There was a lapse of six centuries between the end of sub-Period IB and beginning

of Period II, which was characterized by the introduction of iron. Amongst iron objects, which were found in plenty, knife-blades, ferrules, sickles, nails, clamps, arrow and spear-heads, celt-like axe-heads, etc. occupied an important place. Though copper was more common, it continued to occupy a subordinate position. Bangles and rings, antimony rods and a lid were the main objects produced in copper. Grinding-stones or querns along with pestles and rubbers; beads of quartz, rock crystal, carnelian, agate, jasper, coral, terracotta and bone; bangles of shell and glass; terracotta caskets; bone styluses including borer; perfume-casket; and the familiar pulley-shaped ear-ornaments constituted to be the other important finds. The later levels of the Period yielded two badly-corroded and defaced punch-marked coins.

In addition to the Northern Black Polished Ware, black-and-red ware and other plain wares were in use. Of the *de-luxe* ware Northern Black Polished Ware, only ten sherds were found. The shapes in black-and-red ware comprised bowl, dish and small globular vase. A bowl with multi-grooved profile was very interesting. The pottery was comparatively low-fired. Among other wares, mention may be made of a relatively low-fired blotchy red ware with a vesiculated paste represented in the shape of pan (occasionally ring-handled) and medium-sized vases.

No house-plans could be recovered during the course of excavation. Terracotta ring-wells and pierced pots were, however, in use.

Period III

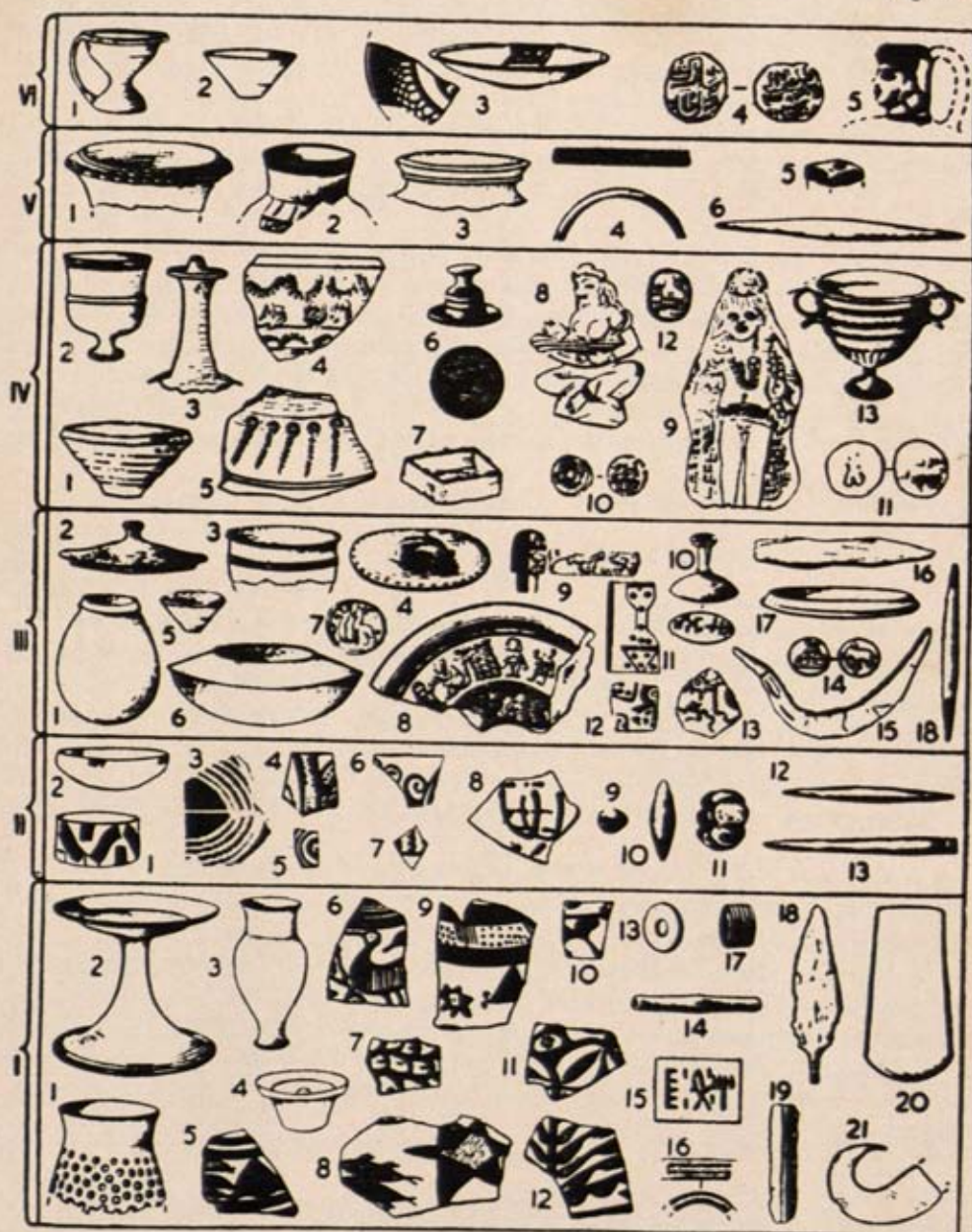
An overlap between Periods II and III was observed. The distinguishing ceramic industries of the preceding Period were no longer in use. They were replaced by a non-descript poorly-made red ware which was essentially plain. It was represented by a few shapes like the widely distributed lid, bowl, basin occasionally with pinched lip and vase. The dish was conspicuously absent. The middle and upper levels of the Period yielded the typical Red Polished Ware with sprinkler. Along with it Kshatrappa painted sherds, diversified by white and black bands on the shoulder also occurred.

Iron bangle fragments, a chopper, a shaft-hole axe, a bobbin-like object and a punch; copper antimony rods, two bells, a pin and a fragmentary bangle; two lead objects; quern-stones with legs, mullers, and a soapstone casket decorated with incised hatched lines; beads of terracotta, carnelian, rock crystal, quartz, glass, coral and shell; terracotta human figurines produced by the single-mould technique; shell bangles; bone styluses including an awl; four glass bangle-fragments and a finger ring; three coins, two of the tribal Ujjaini type, were the notable antiquities of the Period. In the terracotta human figurines one showing a standing female with a child was of special interest.

Period IV

Like the earlier Period, the occupations of Period IV also overlapped with those of Period III. Period IV, however, was distinguished by the profusion of opaque glass bangles including the polychrome type and the use of two varieties of pottery viz. the darkish grey and the mica-dusted light-brown ware. Shell bangles; iron dish, a

Fig. 17



Sequence at Rupar

shaft-hole axe, nails, clamp, ring-fasteners; beads of terracotta, glass, carnelian, shell, paste, quartz, coral and agate; terracotta objects in the form of a human arm, a bird, a toy-cart wheel with protruding hubs and a stopper, all with poor workmanship; and three coins constituted to be the important antiquities.

The occupational deposits at Prakash were dated as follows on the basis of comparative study.

Period I (Chalcolithic): *circa* 1700-1300 B.C. - sub-Period IA, 1700-1500 B.C. and sub-Period IB, *circa* 1500-1300 B.C.

Period II (Early Iron Age): *circa* 600-100 B.C. with a margin on the earlier side.

Period III (Early historical): middle of the second century B.C. to the end of the sixth century A.D.

Period IV (Historical): about the end of the sixth century A.D. to the eleventh century.

33. Rupar *

The excavations at Rupar in District Ambala of Panjab were undertaken to bridge the wide gulf between the end of the Harappa Culture in the mid-second millennium B.C. and the beginning of the historical period about the epoch of Buddha. The ancient site of Rupar is about 100 km. north of Ambala. During the course of excavations an almost continuous sequence of occupations from the Harappa to the medieval times divisible into five Periods were revealed (fig. 17).

Period I

The first settlers at the site were the Harappans who continued to occupy the site for about half a millennium. They settled on a thin fluvial deposit of sand and pebbles and were distinguished by almost the whole of the essential equipments of the Harappa Culture including the characteristic pottery, beads, bronze celts, chert blades, faience ornaments, terracotta cakes, etc. Of all the finds, the most important was an inscribed steatite seal, which corroborated the identification of the Harappans at Rupar.

Like other Harappan sites a cemetery area was located at Rupar as well. The burials were subjected to excavation in 1954-55. The grave-pits were of various dimensions. On an average they were 8 ft. by 3 ft. and 2 ft. deep. The body was placed in the pit generally with the head towards the north-west. One of the skeletons, however, lay north-south. While a few of the burials contained no funerary goods, most of them had an assemblage of pots at the head, feet and on the sides of the body. The vessels were normally placed at the level of the body, but in one case the pots were arranged and then covered with earth. The number of pots varied from two to twenty-six. Personal ornaments placed with the skeletons included bangles of faience and

*Indian Archaeology—A Review 1953-54, p. 7.

shell, copper ring and beads. One faience bangle was found on the left wrist of the dead body and a copper ring on the middle finger of the right hand. The grave-pit was filled with the excavated earth flush with the ground-surface.

Period II

After the site was abandoned by the Harappans, it came under occupation again after a lapse of time. The reasons for the desertion of the site by the Harappans could not be determined. However, the new settlers were a completely new set of people well known by their pottery Painted Grey Ware. The Painted Grey Ware people settled at the site sometime in 1100-1000 B.C. As is the case at other sites, the Painted Grey Ware occupation was very poor in the yield of antiquities and other remains. No structural remains were encountered at Rupar.

Period III

The succeeding Period was characterized by the introduction of the Northern Black Polished Ware, the occupation of which commenced sometime in sixth century B.C. Several datable antiquities in the form of inscribed seals, coins and typical terracottas were yielded by the deposits of this Period. An inscribed ivory seal inscribed with the legend *Bhadopalakasa* in Mauryan Brahmi characters was unique amongst the finds of the Period.

The most important structure of the Period was a 12 ft. wide brick wall, preserved to a height of 2½ ft. and consisting of more than twelve courses. It appeared to be an enclosure wall of some important structure, probably an edifice. Ring wells were also found.

Period IV

The beginning of the next Period was dated to about second century B.C. and the occupation continued till about sixth century A.D. It was divided into two sub-Periods on the basis of coins, seals, terracottas, etc. The coins ranged from the Indo-Greek (Antialkidas, Soter, Megas and a mould prepared from a coin of Apollodotus II) to a gold issue of Chandragupta I. Taxila, Audumbara and Mathura type of coins occurred in fair numbers. A large hoard of over six hundred copper coins, mostly Kushan, was also encountered in this Period.

Period V

This Period belonged to medieval times and was characterized by glazed and painted polychrome pottery and Muslim coins.

34. Hastinapur *

The ancient site of Hastinapur, said to have been the capital of the Pandavas, is located in Mawana Tehsil of Meerut District in Uttar Pradesh. The excavations at the site revealed five cultural Periods.

*B.B. Lal, Excavations at Hastinapur, Ancient India Nos. 10 and 11.

Period I

Period I was characterized by a sporadic settlement represented by rolled fragments of a ware, which was popularly called as 'Ochre-coloured Ware'. Made of medium-grained clay, the Ware was not well-fired. The Ware was probably applied with a wash ranging in colour from orange-red to deep-red. The wash used to rub off very easily, probably on account of water logging conditions. A red slip was applied on a limited number of fragments. Since the pieces of the 'Ochre-coloured Ware' were too fragmentary it was not possible to determine any shape. It was also difficult to say if the same was wheel-turned on account of the rolling. Period I was devoid of any structure or antiquity.

Period II

It was distinguished by the well-known and distinctive ceramic Painted Grey Ware. It had generally a very fine fabric and the colour varied from ashy to dark grey. It was believed that the grey colour was owing to the reducing conditions of firing. The specimens were normally wheel turned. The vessels had painted designs, usually in black over grey but sometimes the painting was executed in chocolate or reddish-brown. The painting was executed when the pots were in a leather-hard condition before firing. The painted designs comprised simple band round the rim, both inside and outside; groups of vertical, oblique or criss-cross lines normally on the exterior; rows of dots or dashes or dots alternating with simple lines; chain of short spirals on the exterior; concentric circles or semi-circles; sigmas and *svastikas* either on the exterior or on the interior of the base. A ceramic with a reddish-brown slip and grey core was found associated with it. Black-slipped ware which might have been the fore-runner of the Northern Black Polished Ware and a few sherds of the black-and-red ware also appeared in this Period.

The presence of mud-plaster with prominent reed-impressions indicated that the houses had walls of reed plastered over with mud mixed with rice-husk. A fragmentary piece in one of the pits of this Period led to the impression that baked-bricks were also in use, though no regular structure was encountered.

Copper was the chief metal of the Period according to the excavator, though lumps of iron and slags were reported from the upper levels. It must be pointed out in this connection that iron did occur with Painted Grey Ware at several sites as reported from several excavations conducted later on. The objects in copper comprised an antimony rod, an arrow-head, a nail parer, besides a few fragmentary objects. Amongst other antiquities mention may be made of chert and jasper cylindrical objects (probably used as weights); terracotta animal figurines, discs, feeding cup, pendant and stamp; whetstone of slate; beads; and a variety of bone objects. The beads were made of agate, jasper, carnelian and bone.

Charred grains of rice were an interesting discovery. Animal remains of humped cattle, buffalo, sheep, pig, etc., with cut marks indicated that they were slaughtered for food. The skeletal remains of a horse during this Period were of great significance.

Period III

The occupational deposits of 6-7 ft. of Period II were washed away by floods destroying a considerable portion of the settlement. In the subsequent Period the well-known Northern Black Polished Ware was introduced. Producing a metallic ring the pieces were made of nicely-levigated clay and well fired. Besides black, the other shades in the ceramic included steel blue, golden or silvery-white with the usual mirror-like surface. Some of the shapes in this fabric like bowls and dishes with straight or convex sides and sagger base probably developed from the black-slipped ware of the preceding Period. In addition to the Northern Black Polished Ware the inhabitants used plain grey and red wares also. The grey ware was of a coarser variety with a thick section, but bowls and dishes in it were similar to those in Painted Grey Ware. *Handis* and basins with collared rim were, however, the additional types. Impressed designs of concentric circles or rosettes appeared on some of the comparatively finer dishes on the interior of the base. In red ware of a medium fabric without any slip, pear-shaped vases, carinated *handis*, footed bowls and basins with long handles were the common types.

For constructing houses, burnt-bricks were now used on a fairly large scale, though the use of mud-bricks and mud-clods was not completely ignored. In structures like barns and cappings of ring-wells etc. trapezoidal bricks were used. Iron was the principal metal of this Period. Important objects in the metal included barbed and socketed arrow-head, a chisel and sickle-blade and antimony rods. Amongst the copper objects mention may be made of antimony rods, nail parers, latch, ferrule and reel.

Punch-marked coins, both of copper and silver and also uninscribed cast coins of copper were noteworthy features of the Period. The terracotta animal figurines of the Period were found to be well-finished. Elephant happened to be the most popular in the figurines. Some of the human figurines were prepared with the help of a mould in contrast to animal figurines which were all hand-made. A parrot sitting over the left hand of a female figurine with the right hand holding a bunch of fruits was most interesting in the terracottas. The female figures had elaborate head-dress, ear-ornaments and necklaces with profuse and flowing dress. A therianthrope figure with human face and animal body was an unique find.

Terracotta flesh rubbers, a disc, a seal-impression showing loops in four quadrants; beads of terracotta, quartz, etched carnelian, agate and glass; bangles of glass and copper; and rings of copper, chalcedony and horn comprised other notable antiquities of the Period.

Period IV

After a break of about a century the site again came under occupation. Period IV was characterized by an exclusively red ware industry. The vessels were all wheel-made, the important types being bowls with incurved rims, spouted basins, button-knobbed lids and lids like ink-pot, bottle-necked sprinklers and *handi*-shaped miniature vases. The pottery occasionally carried stamped or incised decorations, the patterns being *triratna*, fish, leaves, flowers, loops, lozenges, circles and other geometric combinations.

All the houses were made of burnt-bricks. Terracotta figurines, both hand-made and moulded; copper antimony rods, pins, stoppers and a small-sized bell; iron nails, axe-adze, a sickle, a bell and a pan with huge handles; terracotta discs, reels, spindle whorls, wheels, a toy-cart and votive tank; lids and rotary querns of stone; beads of carnelian, jasper and terracotta; one inscribed terracotta seal and identifiable coins of Mathura and Yaudheya kings were some of the notable antiquities. The late levels of the Period yielded a coin of Kushana king Vasudeva. The figure of a Bodhisattva Maitreya was also very important.

Period V

The site was occupied again after a break. Period V was distinguished by wheel-turned dull-red pottery of a coarse fabric. Amongst the important types mention may be made of *handis*, knife-edged bowls, flat plates, pedestalled cups with strap handle, thick sturdy basins and lids with hollow conical knobs. Glazed ware also appeared in the main to the late levels. The glazed ware was represented in shallow bowls and dishes with ring base and the vessels bore pleasing floral and geometric patterns. It was ascribable to the time of Balban (A.D. 1266-87).

The structures of the Period were poor and made of brickbats. A variety of iron objects were yielded by the occupation of this Period. Copper was restricted in use. The terracotta figurines showed poor workmanship.

The five Periods were dated as follows:-

- Period I : pre-1200 B.C.
- Period II : c. 1100 to c. 800 B.C.
- Period III : early sixth to early third century B.C.
- Period IV : early second century B.C. to the end of third century A.D..
- Period V : late eleventh to early fifteenth century A.D.

35. Atranjikhhera*

The ancient site of Atranjikhhera occupies an important position in the study of black-and-red ware in the Indo-Gangetic basin. This was the first site which brought to light a clear-cut deposit of black-and-red ware superimposed by the Painted Grey Ware.

The excavation established three Periods of occupation distinguished respectively by the occurrence of the Ochre-coloured Ware, the black-and-red ware and the Painted Grey Ware.

Period I

Period I was dated to the middle of the second millenium B.C. It was characterized by the Ochre-coloured Ware with indifferent firing, thick and porous sections, rolled edges and a bright ochreous wash, which easily rubs off. Important shapes in the Ware are dish-on-stand, pedestal, handles, channel-like spout of some large vessels, deep

*Indian Archaeology—A Review, 1962-63 and 1963-64 pp. 43 and 45.

basin or bowl and vase with chord-like collar at the neck. A special feature of the Ware at this site was the incised decoration showing lines on applied chords, dashes, deep dots and notches, arranged in straight, oblique, angular or wavy lines.

Period II

Period II was distinguished by the use of black-and-red ware, microlithic flakes and cores and copper. Among the associated ceramics, mention may be made of black-slipped, grey, red-slipped as well as plain red wares. Of all the ceramics, the black-and-red ware and black-slipped ware, which constituted nearly forty-five per cent of the total, were usually of a fine fabric and were represented mostly by bowls and dishes. Some shapes, however, were exclusive to each ware. The black-and-red ware was devoid of any painting. A coarse and perhaps hand-made black-and-red ware was also reported. A few pots in this ware appeared greyish in surface-colour, largely due perhaps to ill firing. The red ware, both slipped and unslipped, was represented by vase, bowl, basin, dish, miniature bowl, etc. A few bowls carried painted decoration.

The associated antiquities of the Period comprised carnelian and shell beads; two copper objects including an ear-ring; a bone comb; fragment of a pestle; and a large number of flakes of chalcedony, agate, etc., and cores with ripple flaking.

Period III

Period III saw the emergence of the Painted Grey Ware. Plain grey, black-and-red, black-slipped, red-slipped and coarse grey wares were also in use. It is significant to note that while some of the shapes of the black-and-red ware were similar to those obtained in Period II, there were a few others which were comparable with those in Painted Grey Ware.

Amongst the finds, special mention may be made of the occurrence of iron objects, the objects being spear-heads, arrow-heads, knives, chisels, hook, etc. Copper rings and bangles, hooks and chisels; terracotta discs, bearing incised patterns; bone styluses, awls, knitting-needle, gamesmen or weights etc; net-sinkers, pestles and a large number of beads of terracotta and semi-precious stones constituted other important antiquities.

On the basis of C14 analysis of certain samples, Period II has been dated to 1025 ± 110 B.C.

CHAPTER X

GLOSSARY

Abbevillian—This is a culture of the Stone Age times named after the typical stone tools found at Abbevilla in northern France of Europe. The tools belonged to the interglacial period of the early Pleistocene times. They are well known by a characteristic tool, handaxe in the shape of a pear, with a heavy butt and pointed end. The flakes which were removed for preparing the tool were large leaving behind deep flake scars. The flakes were removed from alternate sides all around the edge, thus resulting into a wavy edge. The tools were crudely made.

Absolute Dating—See page 93.

Acheullan—The type-site after which the name has been given is St. Acheul in northern France. It is represented by handaxes of the Stone Age in a developed form. The flakes removed for preparing the tools are much smaller resulting in better finished tools. It is a developed variety of Abbevillian and represented by two types viz. (1) those with a point and a round butt for holding, and (2) ovates which were trimmed to a thin edge round the whole circumference.

Aerial Photography—Photograph of the site and the environment taken from air. It provides detailed information about sites and their relationship to the landscape without excavation.

Alluvium—Material deposited by rivers particularly when the same overflows its banks.

Antennae Sword—Sword with the hilt divided like the antennae of an insect. The sword is a special type of the 'Copper Hoard Culture'.

Anthropomorphic Figure—The representation of a human form. (From Greek word *anthropos* = man and *morphe* = form).

Archaeomagnetism—(From Greek word *arkhalos* = ancient and *magneic* = magnetism). See page 95.

Archaeobotany—The study of botanical remains from archaeological sites.

Archaeozoology—The study of animal bones from archaeological sites.

Area Excavation—See page 36.

Argon Potassium Dating—See page 94.

Artefact [Artifact]—Any object which has been made, modified or used by man.

Articulation—The pattern of bones, in relation to each other, as it was during life time.

Ash Mounds—Mounds formed by cycles of accumulation and conflagration of dung and stockade in cattle-pens associated with the Southern Neolithic Culture in India.

Assemblage—A set of objects found in association with each other thereby constituting a group.

Association—Objects are said to be in association with each other when they are found together in levels of simultaneous deposition.

Auger—A drilling tool.

Awl—Pointed tool of stone, bone or metal for piercing hole in leather, wood, etc.

Baulk—A strip of unexcavated area left between pegs and the cutting edges.

Bifacial—A stone tool from which flakes have been removed from both upper and lower faces.

Bulb of percussion—The point at which the hammerstone strikes for preparing a stone tool is the point of percussion and on the flake struck off there is a rounded, slightly convex shape around this point which is called bulb of percussion. On the core there is a corresponding concave bulb.

Burin—A prehistoric stone tool for engraving.

Burnish—A method by which the surface of the pot is polished before firing.

Carbon 14 Dating—See page 93.

Celt—Chisel, axe or adze of stone, bronze or iron.

Chalcolithic—The word refers to the age when both stone and copper were used for producing tools and weapons.

Chopper—An Early Stone Age tool, made on pebble by flaking a part of the periphery on the upper face.

Chopping Tool—An Early Stone Age tool, made on pebble by flaking a part of the periphery by working on both the sides.

Clactonian—Named after the type-site Clacton-on-sea in the old channel of Thames in England. Its characteristic tools were thick, squat flakes upto six inches across with high angles.

Cleaver—An Early Stone Age tool having a wide chisel-edge formed by the intersection of two large flake scars.

Context—The term refers to the framework within which the archaeological object is found. The framework includes the spatial and chronological horizon alongwith the relationship with other artifacts.

Core—The central part of a stone tool from which it is prepared.

Culture—The term refers to the way of life of man in a particular group as a whole.

Culture Sequence—The order in which the different stages of cultural development follow each other in an archaeological excavation, the older being at the lower level and the younger one at a higher level.

Datum Point—Fixed point from which all measurements are taken in archaeological drawing and also while recording the finds.

Daub—Clay which is plastered onto a structure of timber or wattle as a finish.

Dendrochronology—See page 94.

Diffusion—The term means the spread of ideas, traits or peoples from one area to another.

Distribution—The word refers to the spatial location of particular type of antiquities, structures or settlement types in a landscape.

Environmental Archaeology—The study of the artifacts in relation to the environment.

Flake—A piece taken out from a bigger stone or pebble for preparing a better finished tool.

Flourine Dating—See page 93.

Glaciation—The name is given to a period when a large part of the world's surface was covered by ice-sheets or glaciers.

Glaze—It is a substance (vitreous) used to produce a shining surface by way of coating.

Grid Method—Same as Area Excavation on grid pattern.

Handaxe—A tool found mostly in Early Stone Age context. It is an almond or pear-

shaped tool prepared by removing flakes usually from both upper and lower faces.

Harpoon—A tool with a barbed pointed head and also barbed-shaft.

Hieroglyph—Ancient picture writing in Egypt.

Horizontal Excavation—See page 36.

Industry—A set of artefacts considered to be the product of a single group of people or society.

Interglacial—The warm period following the Glaciation.

Level—An instrument to measure various vertical heights, used generally in surveying.

Levalloisean—A technique of preparing Stone Tool named after the type-site located in the suburbs of Paris (France). It marked a great advancement in the preparation of Stone Tools. In this technique the core was carefully trimmed to prepare a platform. Thereafter by striking at the platform almost at right angles a large flake was removed.

Loess—Wind-blown sediments, silts derived from glacial deposits and carried hundreds of kilometres before its deposition. It is very fertile for occupation by the agriculturists.

Madrasian—Early Stone Age tools of Southern India, characterized by bifacial hand-axes and cleavers. Named after the tools found near Madras.

Malwa Ware—Named after the region of Malwa. The pottery has a pale-brown to red surface painted with designs in black or chocolate colour. Stemmed chalice and the channel-spouted bowls are the prominent types.

Megaliths—The term is based on Greek word *megas* = great and *lithos* = stone. A particular type of burials in which large stones were used.

Menhir—A tall upright single stone, believed to have been erected as a memorial, particularly over a burial.

Mesolithic—Middle Stone Age falling between the Old and New Stone Age. It may be taken to represent the food-producing age as opposed to food gathering in the Old Stone Age.

Microlith—Based on the Greek words *mikros* = small and *lithos* = stone. The term refers to the tiny tools made on fine-grained stones like quartz, chalcedony, jasper, agate, carnelian and chert.

Neolithic—Based on the Greek words *neos* = new and *lithos* = stone and as such named as New Stone Age. It is characterized by a settled economy in the form of

agriculture and domestication of animals and sometimes pottery as well. The stone tools generally used were polished.

Northern Black Polished Ware --A pottery found mainly in the Gangetic valley and is distinguished by a mirror-like polish usually black, but sometimes also in steel-grey, silvery or golden colour.

Ochre-coloured Ware --A type of pottery with orange to deep-red surface which rubs off easily leaving an ochreous colour on the fingers.

Painted Grey Ware -- A typical pottery found mainly in the Gangetic valley. It is grey in colour and painted with linear and dotted patterns in black. It is wheel-made, thin-sectioned and well-fired. The common shapes are bowls and dishes.

Palaeobotany --The study of plant remains of the past.

Palaeolithic -- Based on Greek words meaning Old Stone Age. In palaeolithic times the tools were of a larger size.

Palaeontology --The study of fossils.

Patina --This is the outer surface layer of an artefact which may differ in colour, texture and substance from the inner part because of physical or chemical alteration due to the environment.

Plan --The alignment of any structure or object observed by looking from the top.

Pleistocene --Based on Greek words *pleistos* = most and *kainos* = new, recent. It is a geological period immediately preceding the present (Holocene). In the earlier part of this period man appeared on the scene.

Pluvial --A period of heavy rainfall.

Posthole -- A hole dug into the ground to fix a wooden upright post.

Potassium-Argon Dating -- See page 94.

Prehistory -- The term refers to the age when writing was unknown to man.

Quadrant Method -- See page 40.

Quern -- A hand-mill for grinding corn into flour.

Radio-carbon Dating -- See page 93.

Robber's Trench --The word is used to refer to the pit dug for robbing the original material.

Rouletted Ware—Pottery characterized by concentric dotted bands produced with the help of a roulette (a toothed wheel) on the interior of the vessel. It is fine-grained, well-fired and grey to black in colour, producing a metallic sound. Found mainly in South India.

Russet-coated Painted Ware—Pottery having rectilinear or curvilinear designs in lime or kaoline paste over which a coating of russet-coloured ochre was given. Bowls and dishes are the main shapes. Found mainly in South India.

Rustication—Roughening of the surface of the pottery.

Scientific Excavation—Excavation based on the principles of stratification. Also see page 43.

Scraper—Implement of stone, bone or metal specially made for scraping hides and smoothening wood.

Section—The appearance of any structure or object when it is cut across. In excavation it generally refers to the cutting-edges of the trench.

Slip—A mixture of clay and water applied as a coating on pottery before firing.

Stratification or Stratigraphy—See page 43.

Stratum—A layer distinguished in excavation. See also Stratigraphy.

Stray Find—Any object not found in archaeological context.

Striking Platform—The part of the stone which is struck to remove a flake.

Teri-sites—See page 134.

Terrace—Land forms in a step-like fashion near the banks of river developed after the recession of turbulent floods in the river.

Terracottas—Based on the words *terra* = earth and *cotta* = baked. The word refers to statuettes and figurines made of baked clay.

Thermoluminescence Dating—See page 94.

Trait—It is used to denote any individual artifact or aspect of man's culture.

Tree-ring Dating—See page 94.

Trepanning—An operation for removing part of the bone of the skull to cure any disease.

Typology-- A technique to classify the objects found in excavation on the basis of their form and decoration.

Unifacial-- A tool which is flaked on one face only.

Vertical Excavation-- See page 36.

Ware-- The term is used to denote a specific type of pottery.



69601

Archaeology - India

2515936

"A book that is shut is but a block"

CENTRAL ARCHAEOLOGICAL LIBRARY
GOVT. OF INDIA
Department of Archaeology
NEW DELHI

Please help us to keep the book
clean and moving.
