KARNATAKA STATE OPEN UNIVERSITY

Muktha Gangothri, Mysore - 570 006

Master of Arts in
ANCIENT HISTORY AND ARCHAEOLOGY
M.A. Previous

Archaeology – Principles and Methods

Course: AHA – 1 **Block: 1 – 6**

Karnataka State Open University

Muktha Gangotri, Mysore- 570 006

DEPARTMENT OF STUDIES AND RESEARCH IN ANCIENT HISTORY AND ARCHAEOLOGY

M.A. (PREVIOUS)

COURSE – 1: ARCHAEOLOGY – PRINCIPLES AND METHODS

PAGE NO.

BLOCK – 5: DATING METHODS, STUDY OF ANTIQUITIES AND INTERPRETATION

BLOCK – 6: STUDY OF EXCAVATION REPORTS

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BLOCK INTRODUCTION

Dear Learners,

M.A. Previous Course entitled Archaeology- Principles and Methods is divided into VI Blocks:

The Block I contains 4 Units. It introduces to History of Archaeology, its nature, scope and aims. Explains its relationship with natural and social sciences. Its developments with special reference to Europe to the end of 19th Century and also during 20th century and after.

The Block II introduces the development of Archaeology in India from the beginning to 1947 and aftermath.

The Block III explains the meaning of Exploration, its aims, methods of Exploration and types of Scientific methods of exploration.

The Block IV introduces to the world of excavation, its meaning and aims. Equipments used during excavation, methods of excavation.

The Block V gives details about dating methods, study of antiquities namely pottery and clay objects, organic objects, metal and other objects.

The Block VI introduces to eminent archaeologists and the places they carried out the excavation. Hunasagi by K. Paddayya, Inamgaon by H.D. Sankalia and M.K. Dhavalikar, T. Narasipura by M. Sheshadri and Talakad by Devaraj D.V.

Thus the M.A. Previous, Course I contains 20 units providing adequate reading materials to the students and enrich their knowledge.

INTRODUCTION

Dear Learners,

I am extremely happy to invite you to the family of Karnataka State Open University. It is my pleasure to welcome you to the world of archaeology. In the words of Mortimer Wheeler, "The archaeologist is digging up, not things but people, the bits and pieces with which he deals should be alive to him". There is no rigid time limit for archaeology.

An invaluable contribution of archaeology is that it enables us to have a better understanding of our cultural heritage and social traditions. As has been aptly observed by Martha Jowkowsky, "The essence of archaeology is that it makes our world much more meaningful. Through archaeological finds, many things that we have taken for granted begin to mean something. The past is not really dead. It lives on, in words, customs and attitudes. Archaeology deepens our understanding of humanity and society. We are fascinated by the study of archaeology not only because it informs us, but more importantly because it orients us to our own environments and commitments to ourselves".

This year you will be studying Archaeology-Principles and Methods. It covers the development of Archaeology from the beginning till 1947 and Scientific Methods in Excavation and Exploration. The study presents the latest trends and theories on the subject in an easy and intelligible manner. The study materials provided by KSOU, not only makes you to understand Archaeology but also enrich your knowledge.

I hope you will enjoy the study and wish you good success.

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BLOCK – 1: INTRODUCTION AND HISTORY OF ARCHAEOLOGY

UNIT-1 NATURE - SCOPE AND AIMS OF ARCHAEOLOGY

Structure

1.0 OBJECTIVES

This unit will help the reader to understand,

- Constituent of Archaeology as a discipline
- Nature of Archaeology and pattern of changes occurring
- Scope of Archaeology with reference of areas of work and emerging specialized sub subjects under the discipline
- Aims of Archaeology

1.1 INTRODUCTION

The popular perception of Archaeology is, a team of dusty individuals in wide-brimmed hats unearthing treasures from a Harappan site or an ancient collection of historical artifacts. A lot of people's perceptions are based on what we call today as classical archaeology (such as the study of ancient Harappan sites), or on the discovery of temples or the biggest palace. Many of us have taken up Archaeology because we do perceive the same and are excited. This excitement comes because you think of using your archaeological imagination to go where you can never travel, that is to the past, to think about time and objects on very different ways from those of our everyday experience. We do this to understand better who we are, by knowing where we have come from. Such an archaeological imagination was always been part and parcel of human's from time immemorial. This imagination as time proceeded and as human emerged continued till it has been shaped and refined into a professional discipline over the past 200 years. In this chapter we would try and understand the very basics of this discipline including what it study, what its scope, nature and aims.

Etymologically the word "Archaeology" is derived from Greek words 'archaeos' and 'logos' meaning "ancient" and "knowledge" respectively, it has been therefore defined as "the study of antiquity or the science of ancient things".

The word Archaeology was first used in the English language to mean ancient history in general. But in actual, this doesn't define the complete gamut of

what archaeology deals with, which is discussed later in detail in this unit. However, in its broadest sense one can say that archaeology is the study of man's past. It is also a set of methods for eliciting information and a manner of investigating the past that is a reflection, both of the data that are available and of the academic training and theoretical orientation of Archaeologists.

One cannot see Archaeology emerging as a recognizable discipline until the later nineteenth century. The seeds from which modern Archaeology grew were planted by the British Antiquarians Camden and Abury in the sixteenth and seventeenth centuries just prior to Industrialization.

Until last quarters of 20th century it was widely believed and treated that Archaeology was not a distinct discipline. Many scholars like Watson, Leblace, Redment were of the opinion that Archaeology has its own data and a few techniques and concepts but most of these are barrowed from geology, history and or anthropology. For Eg., Clark opines that Archaeology should be treated as a method of reconstructing the past from the surviving traces and not as a established discipline. Even Walter Taylor stated that "Archaeology is no more than a method and a set of specialized techniques for recovering cultural information and the Archaeologist is nothing but a technician".

However, these views started changing later as a scholar when he starts exploring Archaeology his role is definitely above being just a technician. In this regard Sir Mortimer Wheeler opinions or mentions 2 basic roles of an Archaeologist.

1. Archaeologist is a fact finder, but his facts are the material records of human achievements therefore he is a humanist.
2. Reviving or humanizing his materials with a controlled imagination that inevitably partakes of the qualities of art and even of philosophy.

On the same line, Isaac mentions that Archaeological studies are at their most significant when the attempt to elucidate the development of relations both amongst men and between men and the material world.

1.2 DEFINITION OF ARCHAEOLOGY

Earlier we did read the etymological origin of the word "Archaeology" as well as understood that is 'the study of everything ancient', and hence archaeology takes every trace of human activity into account. As this has etymological significance only it can be more appropriately understood and defined by looking into important definitions of the archaeology were given by archaeologists and academicians to have a far wider perspective:

According to Clive Gamble "Archaeology is basically about things: objects, landscapes and what we make of them. It is quite simply the study of the past through its material remains".
K.R. Dark "I define archaeology as the study of the past using material evidence, although one might equally well apply archaeological approaches to the present".

Philip Rahtz "Archaeology is the study of material culture in its relationship to human behavior-the physical manifestations of man's activities, his rubbish and his treasure, his building and his graves".

William and Michael Schiffer "Archaeology is a specialized field of study within anthropology, which itself is a behavioral science that studies human societies and the cultures, language and biology of their people".

Jane McIntosh "Archaeology is a total study. It involves analyzing everything that remains from the past with the aim of reconstructing the past as fully as possible".

T. Douglas "Archaeology is the study of our human past, combining the themes of time and change, using the material remains that have survived".

1.3 NATURE OF ARCHAEOLOGY

When we discuss on the nature of any discipline it is always trying to answer the question whether it is a Science or art or Social science? However, before that there is one more point of discussion under the nature of archaeology. While summarizing the meaning and definitions of archaeology we learnt that archaeologists have two basic roles one to get material remains with reference to the specific environment (social, physical) they are obtained in and secondly, how these material remains are understood and interpreted for many purposes.

In the beginning these two concepts were recognized into two divergent traditions or contexts in archaeology. First tradition in Europe, where archaeology from an early period was linked to both history and natural science, especially geology while in America, archaeology originated from and is still considered part of anthropology.

These two special traditions created archaeology's affiliation towards either history (as in European context) or towards Anthropology (as in the case of USA). Under Europe's influence finding of material cultural remains by excavation and museumizing (keeping them in museums) the obtained materials (as artifacts and eco-facts) grew without much enforce on humanistic side of the material interpretation. This led to the consideration and division of archaeology into time brackets as Pre Historic, Historic and little later (because of the overlapping periods and differentiated material cultures across the world) led to the creation of Proto history referring to a period of the earliest script and then classical archaeology (because of the excavation of classical civilizations). All these four areas developed into historical and archaeological research. This defined archaeological practices in the beginning of the discipline. However, during later periods traditional archaeology has freed itself from the constraining temporal boundaries of prehistory and began to include first medieval, then later historical epochs, culminating in the archaeology of today.

Both these traditions culminated and to some extent determined the expansion of archaeological practice that has taken place during the last 30 years.

Since then, major changes in disciplinary borderlines have occurred, especially in North America and in England, which are now being adopted around the world.

There were several reasons for this development. The growing heritage sector increasingly protected historical archaeological monuments, and raise of interdisciplinary management environment in the newly established national agencies where archaeologists, historians and architects worked together in excavating, recording and restoring historical sites and monuments. Also, the protection of historical landscapes was increasingly linked to archaeological surveying. In Europe urban expansion at the same time led to an expansion of medieval and later historical archaeology, which gradually evolved into other forms, such as industrial archaeology, the archaeology of capitalism, and the archaeology of indigenous people.

These developments have created a whole new disciplinary frontier between archaeology, ethnology, history of technology, cultural heritage management, psychology and social anthropology to mention only the most important. Thus, in the academic affiliation of archaeology European and American traditions diverge. The role of excavation as a defining criterion has faded, but is still found in writings related to introduction to archaeological source criticism, or archaeological formation processes and remains as classics in this field. Today it has been replaced by writings which contains no definition, but stresses the interdisciplinary nature of archaeology.

1.3.1 Is Archaeology Science, Social science or Art

This debate has raged long and has been hard fought, in twentieth century archaeology. That it has continued for such a long time, with such vigor, seems to show that this is an important issue to archaeologists. The reasons for its importance are complex, but include questions of research direction, methodology, disciplinary identity, prestige and of course, as Anderson points out, funding. The obvious question at this juncture is why does it matter whether archaeology is classified as an art, a science, or something different. A simple answer is that the procedure of archaeology, upon which its findings depend, is a product of its self-

image. This is because what is considered admissible as evidence, method and reasoning and the scope and purpose of archaeology that lead to specific questions being examined is a reflection of what archaeologists believe that they are doing.

It is this aspect of the long-standing debate about the character of archaeology that has recently become one of the discipline's greatest controversies. This derives from the emergence of a school of thought proposing that the subject can only proceed in an entirely subjective way, its interpretations un-testable. This is in drastic contrast to the mainstream of modern archaeological thought, as it has developed since the 1960s, stressing its scientific character. This is the longstanding debate, in the scientific and academic community. Let's try and understand these perspectives in little detail.

1.3.2 Archaeology as a science

The individuals who favor and consider archaeology as a science put the following views in favor of their argument: According to them archaeologist is first a descriptive worker: he has to describe, classify and analyze the artifacts he studies. An adequate and objective arrangement is the basis of all archaeology and many good archaeologists spend their lives in this activity of description and classification.

Both today and in the past the natural sciences, geology and zoology especially- have been important contributors to the formation of archaeology as a scientific discipline. Principles of geology and zoological determination of stratigraphically layered bones and shell middens formed the basis for the first recognition of an early stone age of hunters and fishers in Europe. This breakthrough took place in Denmark and in France during the 1850s. This helped to free archaeology from its status as an auxiliary discipline to history, illuminating historical myths. New findings here were cleverly used to establish archaeology as a discipline in its own right, contributing to the emerging acceptance of the evolution of mankind which had been launched by Darwin during the same decade. It further laid the foundation for a permanent cooperation, if not integration, between archaeology and the natural sciences, that has grown in scale and in subjects ever since. Today archaeology would be unthinkable without the

assistance of environmental sciences, zoology, natural sciences of age determination and technological and medical/physical science.

Increasingly, many scientific techniques are used by the archaeologists in the field and they use the scientific expertise of many persons who are not archaeologists and are drawn from many scientific disciplines. The artifacts he studies must often be studied in their environmental contexts, and botanists, zoologists, soil scientists and geologists may be brought into to identify and describe plants, animals, soils and rocks. Radioactive carbon dating, which has revolutionized much archaeological chronology, is a by-product of research in atomic in physics. Archaeology uses extensively the methods, techniques and results of the physical and biological science.

The dividing line between arts and sciences in philosophical terms has been a matter of much debate. A broad and hopefully, generally acceptable view of the contrast between arts and sciences is that sciences are those subjects in which the relative plausibility of rival hypotheses is capable of evaluation by some form of testing. By such broad definitions, archaeology is of necessity, a scientific discipline. Data are compared numerically, or in terms of numbers of shared traits, or patterns, all methods ultimately reducible to mathematical terms. Modern archaeological excavation itself constantly uses such methods to evaluate the date and meaning of both artifacts and structures.

Using the comparative approach one may observe that archaeological practice, like that of all science, but not that of all arts subjects, involves the systematic collection of information in as objective (or, at least, as comparable) a way as possible. This is usually followed by analysis according to the logical frameworks outlined. These data, and the results of analysis, are then, properly, disseminated for others to employ.

In terms of location, research in archaeology is usually based in the field, laboratory, library or study room. The latter characteristic is shared with all academic disciplines: the former two principally belong to the science. However,

this is not particularly useful as a way of deciding whether archaeology is either an art or a science.

Archaeology then shares both a theoretical base and much of its practice, with science but does contain arts elements within that practice. This is not unique among scientific disciplines: take for example botanical illustration as an instance of 'arts' methods within a scientific context. Nor is archaeology's concern with humanity 'unscientific', for biology and psychology, let alone medicine, are also so concerned. Archaeology is on these grounds a science.

Archaeological practice defined in this way thus indicates far greater correlation with the sciences (especially perhaps with ecology and geology) than with the arts. Even archaeological drawing is primarily conducted as part of systematic recording, seeking objectivity, or as part of the analysis of shared traits, or patterns, as mentioned above.

So there has come to be a division between those who consider archaeology an explanatory science, capable of producing testable hypotheses (processualists) as processualism is rooted in the scientific aspirations of the 'new archaeology' movement.

1.3.3 Is Archaeology a Social Science?

If archaeology is a science, is it a social science? This is a harder question, not least because there seems some dissent over what in theory, rather in practice, a social science is. In this regard a definition of 'science of society' mentions it as a science which has as its main goal the understanding of human society; this would include, for example, politics and sociology. Archaeology would not by this definition be a social science, because, although much of archaeology does aim to understand past human society, there are many archaeologists, such as environmental archaeologists, specialists on ancient technology and on survey techniques (for example, geophysical survey), whose work is both in theory and practice not always primarily aimed at examining human society. That is not to say that specialists in these areas are uninterested in social questions, but that social

issues do not form the central theme of all research in these fields. Again archaeology is in a similar position to ecology, which can include studies of society, but need not do so.

On the other hand although archaeology doesn't exclusively aims to understand past human societies but it does and is the single discipline that try to understand and interconnects, interwove the material culture and draws interpretations related to larger aspects of the social and individual life of the people across time and geographies. Whereas, in other social sciences subject scope is limited to only those societies (past and present) which can provide certain amount of literary and oral sources. In such a condition you can say that Archaeology is a social far above other similar subjects which does draw interpretations even only depending on the material cultural remains.

1.3.4 Is Archaeology Art?

There are many in fact a complete group a scholars who are not just in favor of considering archaeology as a art but are also absolutely against considering it as a science. They believe it to be capable only of 'artistic', highly subjective, evaluations or even to be incapable of differentiating between competing hypotheses. They are called post- or anti- processualists. Just as processualism is rooted in the scientific aspirations of the 'new archaeology' movement , so the post-processualist movement may be seen as a swing away from a scientific identity for archaeology to one as an art, even, as some have claimed, as literature. These people consider archaeology as arts those in which objective assessments can be made.

They are not in favor of highly science based methods in the subject. These people (post processualists) view that naturalization 'taken for granted' of these highly science-based methods of excavation, recording and classification they criticize it for example in recent years, most strongly by Shanks and Tilley. They argue that it homogenizes the archaeological data and thereby also their interpretation, leaving too little scope for discussion, reflection, and alternative

interpretations, a situation which later led Ian Hodder to develop the concept of 'reflexive excavation'.

Methodological routines versus ongoing interpretation is of course a basic dilemma in all science, but the debate reflects once more archaeology's position between science and the humanities, and it suggests that the boundaries between them are not static, but subject to change. This was demonstrated in a work by Marie Louise Stig Sorensen in her research on historical analysis of the Bronze-Iron Age transition; she classified the prevailing explanations according to their reliance on natural science or culture historical factors. This revealed a cyclical change in the dominance of one or the other over time, corresponding to a more subjective diagram of cyclical changes over time between the dominance of general evolutionary explanations versus culture-historical explanations in archaeology.

Archaeology is undeniably multi-faceted. Scholars in this field employ laboratory-based physical, chemical, and biological analyses, alongside those derived from art-history, and other arts subjects. To some scholars, such as Lewis Binford, a leading American archaeologist, this discipline is certainly a science, despite the overlap with arts techniques. Where as to Dr. Smith, of ASU's School of Human Evolution and Social Change "archaeology as a social science advances how we interpret sites and how we do research". To others, such as the British academic David Clarke, archaeology is neither an art nor a science, but a distinct type of subject in itself- "archaeology is archaeology" he claimed. Yet another view is that archaeology is unclassifiable, a position taken in a article by Sue Anderson. She suggests this is because of the wide range of techniques employed within it.

So for the question whether Archaeology should be regarded as a science, social science or art one can conclude that archaeology possesses both elements of "hard science" and field specific theories concerning human behavior. Therefore Archaeology is both science and an art there by a social science also. It is a scientifically ordered branch of knowledge on a certain subject, namely the remains of ancient human activity. It is a science because it brings out some

absolute indisputable fact. To that extent it is a science. But, as archaeology deals with human activity, there is possibility of subjective and relative thinking and hence interpretation is inevitable, which makes it an art as well as social science.

1.4 SCOPE OF ARCHAEOLOGY

Archaeology has expanded its theoretical and methodological gamut along with the expansion of its temporal domains, now encompassing the material culture of human history from the origin of modern humans to industrial society. This diversification is exemplified in the formation of new specializations and fields of work. The scope of archaeology is perhaps wider than any other discipline. Archaeology being multidisciplinary in nature has larger scope and involves professionals from multidisciplinary fields. Under this topic we would consider the scope of Archaeology from two perspectives namely, the specialized fields in Archaeology or what popularly called types of Archaeology and secondly common professional areas in which a person from academic background of archeology can get associated with.

Let us start with the specialized fields with in Archaeology. In the beginning we understood that Archaeology possesses both elements of "hard science" and field specific theories concerning human behavior considering what is expected out of Archaeology. Many techniques and methods from many disciplines got added considering what an archaeologist get from a site and even where an Archaeologists gets a site. For example findings of bone added biological sciences, plant remains added botanical sciences, and underwater remains added underwater or nautical Archaeology etc. In this way the field of Archaeology kept on exploring each and every possibility leading to many specialized fields. Following is a list of specializations under archaeology (however this is definitely not a complete list)

Geo Archaeology
Ethno Archaeology
Anthropological Archaeology
Eco Archaeology
Physical Archaeology
Astro Archaeology
Mineral Archaeology
Pre historic Archaeology

Landscape Archaeology
Urban Archaeology
Bio Archaeology
Salvage Archaeology
Social Archaeology
Archaeozoology
Industrial Archaeology
Forensic Archaeology
Digital Archaeology
Protohistoric Archaeology
Historic Archaeology
Medieval Archaeology
Underwater Archaeology
Agro Archaeology
Cognitive Archaeology
Battle field Archaeology
Archaeobotony

Secondly, when we consider the career options for a student from Archaeological background we can divide these fields broadly in to the following fields.

Excavation: There exists a popular association between archaeology and excavation. It was made popular by Mortimer Wheeler in books and later by television and it still captivates the popular mind through many programs in television, web, books etc. Archaeologists are digging up the past, yes, indeed they are-but that only takes up some of their time, and excavation has come to mean many things.

Digital Documentation: This is one of the emerging trends at the world scenario and is in its very beginning stages in India. This field of Archaeology involves many of the digital documentation and reconstruction techniques involved in wide range of Archaeological activities starting from discovering new site to preserving sites and objects (from all kinds of threats including human caused to nature caused) to representing and reconstructing. This involves hi end technology involvement like laser, 3D, Sonic Wave, X-ray technologies independently as in amalgamation.

Cultural Heritage: Archaeologists also take care of the thousands of monuments and sites preserved above ground. Some of these are presented to the public and demand continuous care and maintenance. This task has become increasingly important with the growth of tourism and outrageous cry to preserve and sustain

cultural heritage. It is often termed ‘heritage management’, and a body of literature has emerged that describes these professional skills. Again cultural Heritage management in broader sense involves tangible and intangible heritage with many overlaps and dependencies. For example Archaeological site and artifacts are tangible heritage where as cultural landscape and cultural interpretation of the same becomes intangible heritage. Therefore one can (at broader level) indicate that Archaeologists are concerned with tangible heritage however their work won’t be complete without intangible heritage.

Conservation and Preservation: Many archaeologists are working on the conservation and presentation of the archaeological past in museums and Sites (excavating excavated and monuments). Their skills related to museum are formalized under the academic term ‘muselolgy', which has produced a range of new literature and job opportunities.

1.5 AIMS OF ARCHAEOLOGY

When we consider the aims of Archaeology we need to look it from different perspectives. They would include,

- The use to which Archaeology may be put
- The kinds of things that ought to be investigated
- The ways that Archaeology should be done that would include the theoretical basis of Archaeology and the technical ways of doing it.

In an introduction to archaeological practice, Ian Hodder discusses this disparity in aims and objectives, stating, that: ‘The apparent “discipline” of archaeology thus appears much undisciplined’. He sees this as a healthy condition reflecting the diversity of interests in modern society, whereas others decry this very same diversity, as it entails the risk of a fragmentation of the discipline. In such circumstances for the study purpose, to a large extent we must infer that the goals have been from the work that has been done, for the simple reason that aims change as understanding of the past develops as chance forms of great significance are discovered and as techniques in ancillary fields are developed.

Therefore we need to accept and understand that the aims of any discipline can be revised as per the changes occurs in the theory, practice of the discipline as a result of many factors within discipline as well as in ancillary fields or disciplines. Presently for the purpose of our understanding let us consider the broad aims of Archaeology as listed by P. Watson depending on the uses to which Archaeology is put

- To furnish collector's items and museum objects
- To furnish documentation for the study of art history or the history of architecture.
- To attain knowledge of sequence of event and chronologies in the absence of written documents.
- To help furnish data for much fuller historical studies (historiography, structural or constructive theory) with particularistic/ideographic goals.

As it's mentioned early one can observe or broaden the meaning and scope of these aims in consideration with present scenario. Today disciplines like Archaeology are evolving. Two or three decades back where they were concerned about collecting, documenting and interpreting of Human culture, are today broadened their field by extending it to preserving, conserving and managing the obtained and observed cultural Heritage. Documentation today is not just for the purpose of study, research and understanding but also for reviving the lost and living culture and cultural heritage. When natural-science analysis of data from excavations, such as macrofossils, pollen, bones and so on, became an integrated part of rescue archaeology, new laboratories appeared, as well as new teaching programs. Academic departments were generally quick to add these new areas to their teaching and research, thereby expanding the role and identity of archaeology as a discipline.

Archaeology is the study and preservation of the material remains of past societies and their environment that nowadays also includes modern material culture. The objective is likewise twofold: to reconstruct past life-worlds in order to understand and explain the historical conditions that governed people's life as it unfolded, both in their local settings and on a larger historical scale of prehistoric

and historic societies; and to preserve the archaeological record in the landscape and in museums for future study and use. This duality of practice-the study of the past and the preservation of the past-should be a constituting property of any definition of archaeology. Although they often go hand in hand, they create different conditions for archaeological practice.

1.6 LET US SUM UP

This unit would have contributed to your understanding of what comprises Archaeology and its multidisciplinary nature which made it a unique discipline. It had enabled you to comprehend nature of the subject and its aims as well as changes yielding to the widening of functions and changing paradigms in the field and discipline. This unit also aids your understanding on scope of the discipline with special reference to specialized fields within the discipline and the possible professional fields to choose from.

1.7 KEY WORDS

1. Archaeology- The study of human history and prehistory though the excavation of sites and the analysis of artefacts and other physical remains.
2. Museum- Museum is an institution that cares for (conserves) a collection of artifacts and other objects of scientific, artistic, cultural or historical importance.

1.8 CHECK YOUR PROGRESS

1. Define and briefly describe the nature of Archaeology
2. Is archaeology a Science or Art? Elucidate with proper example
3. Write a note on the Scope of Archaeology as a professional discipline
4. Critically analyze the present paradigm shift in the Archaeology considering changes in its aims.

1.9 ANSWER TO CHECK YOUR PROGRESS

1. Answer to question No. 1 can be found under Section 1.2 and 1.3
2. Answer to question No. 2 can be found under Section 1.3.1, 1.3.2 and 1.3.4
3. Answer to question No. 3 can be found under Section 1.4
4. Answer to question No. 4 can be found under Section 1.5

1.10 SUGGESTED READINGS

1. An Introduction to Prehistoric Archaeology (3rd Edition); Frank Hole & Robert F. Heizer (1973); Holt, Rinehart and Winston, Inc; USA
2. Archaeology an Introduction (4th Edition); Kevin Greene (2002); Routledge Publications; London
3. The Science of Archaeology; Kenneth Rainsbury Dark; Philosophy Now, Issue 3 (1992); London (a Journal Article)
4. The Oxford Handbook of Archaeology (part 1); Cunliffe et. al. (2008); Oxford University Publications; London
5. Archaeology the Basics (2nd Edition); Clive Gamble (2008); Routledge Publications; London.

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UNIT- 2 RELATIONSHIP OF ARCHAEOLOGY WITH NATURAL AND SOCIAL SCIENCES

Structure

2.0 OBJECTIVES

This unit will help the reader to understand,

- Multidisciplinary nature of Archaeology in detail
- Archaeology's relationship with Natural Science and its application
- Archaeology's relationship with Social Science and its application

2.1 INTRODUCTION

Archaeology has expanded its theoretical and methodological gamut along with the expansion of its temporal domains, now encompassing the material culture of human history from the origin of modern humans to industrial society. In this respect its roots lie in the disciplines of geology and other natural sciences, while its contemporary conceptual framework is anthropological. This diversification is exemplified in the formation of new journals on material culture, social archaeology, archaeological theory, world archaeology, historical and industrial archaeology, maritime archaeology, public archaeology, environmental archaeology, geo archaeology, archaeological geology, ecosystems to name but a few. In addition, this development has also led to a diversification of approaches to archaeological interpretation drawn from science, social science and art disciplines.

2.2 ARCHAEOLOGY: A MULTIDISCIPLINARY SUBJECT

We had already discussed in the previous chapter nature of archaeology and at the end concluded that it is a multidisciplinary subject. Here we will just try and understand over the years how the theory and practice of archaeology came to be considered as a multidisciplinary by quoting few observations of the scholars in the field.

Observations by scholars in the field, clearly indicates changes in archaeological theory and practice from mid of 20th Century. These observations indicates the inclination of archaeology towards science beginning from 1950's

(Processual Archaeology) then again moving towards Social sciences (Post Preocessual) in order to interpret the data obtained and reconstruct the past. This can be understood more specifically by reading following quotes from scholars.

According to Binford, "Turning to more recent changes in the relationship between science and the humanities, we note that the rise of 'new archaeology' or 'processual archaeology' was heavily inspired by the terminology of science, both in basic classification methods (beginning already during the 1950's) and in theory and testing procedures (from the 1960's onwards)".

According to Hodder, "The theoretical shift during last few decades to postprocessual, culture-historical, and contextual archaeology has been accompanied by a retreat from former quantitative methods of analysis and replaced by a return to historical interpretations and hermeneutics".

According to Baker and Thomas, "This shift towards the humanities and culture, however, has also introduced or reintroduced a critical concern with the use of the past in the present, by employing critical theory, a most welcome and much-needed approach for the heritage sector whose work is so closely interwoven with the ideological fabric of historical identities".

According to Bender and Wickham Jones, "As archaeology presently stands, we can only say that it is a multidisciplinary subject which inclined towards both social science and science. It uses theory, methods and techniques from both in order to achieve its goal of finding and interpreting past through material remains. For all the changes occurring and sub fields are forming we can rightly say, it is still too early to evaluate the future impact of these new frontiers for archaeological theory and practice. The combination of nature conservation and historical conservation at a national and world level will eventually provoke the further development of historical archaeology and landscape archaeology as the environment and landscape biographies being the new integrating concepts". In few parts of the world, such as America, Australia, and New Zealand, the concept of colonization and settler archaeology is at the forefront of historical archaeology. Still other traditions, with a stronger emphasis on recent historical oral traditions

and their archaeology prevail in Africa and in many parts of the former colonized world, which have revitalized and reformed the relationship between social anthropology and archaeology.

2.3 ARCHAEOLOGY AND SCIENCES

2.3.1 Archaeology and Geology

Geology is a science discipline which deals with the physical structure and substance of the earth and its life especially as recorded in rocks. This discipline was associated with archaeology from its early days of development. To understand how it is related we can look at few most important uses of geology in archaeology. The Geological layers formed at sites help us construct the climatic conditions prevalent at a certain time and environments in which ancient cultures existed. All objects made from metal and stone originally come from a geological source. This alone makes Geology an integral discipline within the field of Archaeology. Geological principles play a very big part in the indirect dating and relative age calculations of sites and artifacts. The principle of stratification is one of the basic principles in Archaeological dating, this states that the lower layers are usually the oldest (with some exceptions) this is a geological principle. Also stratigraphic-geo morphological dating method plays a role. This form of dating is based on association of sites, artifacts with local geological phenomena, and the age and sequence of these phenomena in general terms. The study of ancient glacial deposits and changes it brought to the landscape is important for Archaeology. The whole chronology of the Pleistocene is based on the interpretation of natural and geological phenomena created by the glaciers. Also, further on, pedagogical investigations concerns itself with the study of the rate of the building up of certain soils as a means to deduce climatic conditions that cause that build up of soil and the rate thereof.

According to Mcgovern, “Geophysical prospecting, surveying allows a prediction of the location of sites or the location of features within sites. Geophysical exploration can detect a feature at any depth and also is a relative cheap form of

surveying. For example its application was done at the site of ancient Sybaris, in Italy, where the Greeks established a colony renowned for its 'sybaritic' lifestyle. Over the period from 1962 to 1967, the archeologist worked on site in Italy for a total of about two years and made between 300,000 and 400,000 magnetic measurements. This enabled the archaic roof tiles of Sybaris to be located at a depth of 4 m beneath the alluvium that had accumulated over 2,500 years".

One can identify two sub disciplines which emerged as(majorly out of interaction of these two disciplines. They are Geoarchaeology and Archaeological geology. If we try to make a distinction between both then we can say that in Geoarchaeology geology is used to solve expressly archaeological problems (geo modifies archaeology), and in archaeological geology (with geology as noun) where expressly geological investigations contribute knowledge of importance to archaeology. An example of the archaeological geology would be the use of sedimentology in studying the strata in an archaeological excavation. Archaeological geology also grades imperceptionably into environmental geology, depending on when the human/environment interaction took place.

2.3.2 Archaeology and Zoology

Zoology is a science which deals or studies animal physiology and all the concerns related to that. It is one of the biological sciences. The assumption that the spread of animal species is determined by environmental conditions allows us to make inferences about the environment by studying faunal remains. This is particularly important to point out subsistence patterns. This need led to the beginning of a new multi discipline combining both disciplines called Zooarchaeology It refers to the study of animal remains from archaeological sites where in the goal of the discipline is to gain a better understanding of the relationship between humans and their environment, especially between humans and other animal population. This involves the application of many physical, biological, ecological and anthropological concepts and methods to the study of animal remains throughout by scholars with a wide range of theoretical interests and training.

The Perception of what faunal analysts do and should do varies among archaeologists. At one end faunal analysis is a set of procedures to identify and record animal bone remains with a view toward documenting the history of human impact on animals and at the other end this analysis and interpretation of faunal remains in the context of particular archaeological problems with a focus on interactions between humans and animals within a specific social and cultural context. Both methods draw direct relationship to Archaeological research. These studies include broad variety of issues like environmental evolution and the impact of humans of the landscape from the perspective of animals, anthropological interests in nutrition, resource use, economies, other aspects of human behavior, zoogeographical distributions, morphological characteristics, population structure, the history of domestication, paleo-environmental conditions and ecological relationship of extinct fauna using sub-fossil materials to provide historical perspective etc.

Till mid 1960 the zoological studies were more or less confined to the identification of species and description of osteological parameters. The material approach to the study of animal remains made it possible to distinguish the closely related animal taxa and to develop criteria for identifying domesticated animals, distinguishing them print age rest in the faunal assemblage. After 1960's, the paleopathology of animals (both diseases and human induced deformities) began to assert an important place. Specialists from the Deccan College, Pune, the M. S. University of Baroda, Vadodara and the University of Allahabad within the country, the Dutch and American scholars from abroad, are responsible for the growth of this science in India. Faunal remains recovered from a large number of excavated sites have been studied in Indian centers, keeping pace with the methodological developments in the west. The identification of diverse species and intra - site faunal variability in relation to ecological opportunities through time are some of the major achievements of the Indian archaeozoological studies. Despite these advances, it is regrettable to note that most of the excavators continue to treat the archeofaunal data merely as an appendage to their report and rarely attempt to relate their implications for understanding the man - animal relationship.

2.3.3 Archaeology and Botany

Botany is a natural science which studies the flora and all related concerns. We clearly know that no matter what the time period or geographical area, plants played an important role in human culture. As data about the natural environment, land-use practices, diet, architecture, and trade in exotic plant materials, plant remains also reflect many aspects of society; including social practices, such as eating, the organization of labor and status differentiation etc.

The three major categories of archaeobotanical materials are macro-remains, pollen, and phytoliths. Macro-remains are relatively large items that generally comprise the bulk of plant remains re-covered from archaeological sites. They include seeds and seed-like plant structures, fruits, wood, leaves, tubers, etc. Palynology is the study of pollen grains and spores. Pollen analysis (also fossil pollen analysis), the science concerned with the study of pollen spores, play an important role in the determination of climatic change and ecological conditions. Many micro-botanical remains such pollen and phytoliths are able to survive after the plant has died or burned. This quality makes it much useful in a lot of sites. Dendrochronology also forms part of this field. This dating technique determines dates and ages of artifacts and sites by the analysis of growth rings in trees associated to archaeological objects. Pollen analysis also serves as an important form of indirect dating in Archaeology. Especially in arid, waterlogged or acidic deposits (that facilitates preservation of pollen) it has been used extensively to reconstruct the vegetation of a certain area and time frame. Excluding these an archeobotanist identifies wild domesticated plants, investigates the origins of domestication of plants and traces the progress made in ancient agricultural practices. The full potential of archaeobotany for the investigation of ancient culture is yet to be realized. Plant remains enable us to assess human impact on the environment. As direct, site-specific evidence of agricultural and culinary activities, they enrich our understanding of how people lived.

Since its beginnings, archeobotanical data obtained from excavation is been increasing allowing qualitative and quantitative analysis of these data majorly post independence in India. For example recent Soil floatation method at Harappa (still

ongoing) has provided new lights into the Agricultural pattern and changes occurred. According to this in Harappa many aspects of the subsistence system were stable, notably the use of wheat and barley, new plants were introduced as the agricultural system evolved. It is observed that a significant shift in agricultural strategies may have begun as early as 2200 B.C.

2.3.4 Archaeology and Physical Anthropology

The study of human remains from archaeological contexts is one of the many research areas comprising physical anthropology. They are directed toward determining population origins and kinship, nutrition, disease status, and longevity of past populations.

Skeletal analyses offer unique perspectives on past societies and individuals, and can provide specific answers to questions that cannot be addressed by other means. The latest innovation is nuclear and mitochondrial DNA analysis of ancient skeletal remains and mummified tissues, which promises to be a very powerful technique with wide application. A supplementary approach to population studies has been the use of dental traits, which have been found to be extremely reliable in studies of the population affinities of modern and ancient societies.

Natufian skeletal remains, re-covered from the sites of Shukbah, Kebara, El Wad, Eynan, Nahal Oren, Erq el Ahmar, and Hayonim in Israel and the West Bank has focused studies on population affinities, disease, and diet. Small sample sizes similarly limited the analyses of craniofacial parameters. Fortunately, mandibles are better preserved than other skeletal elements, and the number available for analysis is sufficient for basic inferences. The data show that a significant reduction in mandibular robusticity occurred during the Natufian period, thus corroborating the evidence for changing diets and reduced selective pressures on jaws based on patterns of dental disease. Dental disease patterns in Natufian populations indicate increased consumption of cooked carbohydrates over time. The dental disease patterns of the Natufians more nearly resemble those of early agriculturalists than those of hunter-gatherers in rates of attrition, caries, and periodontal disease.

2.3.5 Archaeology and Ecology

Ecology is the study of environments considering all its elements - humans, animals, plants, geo-physical nature, climate etc. Here we are discussing ecology with more emphasis on environment and wherein it views humans and animals as part of the ecological system or eco system. Ecologists and conservation biologists have discovered the deep human past, long before that of archaeologists for their own purposes. Using environment data and ecology in archaeology is lot more recent. The environment governs human life: latitude and altitude, landforms and climate determine the vegetation, which in turn determines animal life. And all these things taken together determine how and where humans have lived or at least they did until very recently. Archaeology can provide information on human actions and their environmental consequences over very long periods of time.

With a few exceptions, little attention was paid by archaeologists to non-artefactual (ecofactual) evidence until recent decades. Sites were studied more or less as self-contained packages of evidence, rather than in their context within their surrounding landscape. It is now regarded as important to see sites in their setting and to consider the geomorphological and biological processes occurring in and around them. The environment is seen now as a variable, not as something which is constant or homogenous through spaces and time.

However, recent books and journals show growing number of studies that consider archaeological evidence to explain and manage current environments. This trend can be tied to (a) an increasing interest in how historical processes shape modem landscapes, (b) the recognition that humans are part of landscape history even in areas long thought of as pristine, and (c) the emergence of restoration ecology with its goal of aiding the recovery of degraded ecosystems using historical reference conditions. At the same time, archaeologists have begun to realize the potential application of their work to current environmental research, management, and policy. In this way both the disciplines have been contributing to each other and are emerging into a sub discipline called Environmental Archaeology.

Environmental Archaeology aims can be broadly divided into two. In the first place a broader study of world climatic succession and related human studies and secondly finer grade studies that are particularly relevant to the site. Therefore it involves studies at macro level called macro environmental studies and at micro level called micro environmental studies. Owning to the poor preservation of many forms of evidence, and to the distorted samples, one finds it very difficult to arrive at the true facts for past environments. Therefore one simply needs to aim at the best approximation possible. No single method will give an adequate picture (as all are distorted in one way or other) therefore as many methods as data and funds will allow need to be applied to build up a composite image.

For example in Rohira (in Punjab) in order to find out the complete picture of the exploration of timber taxa from 2300 -2000 B.C. wood charcoal remains were used. Which indicated the use of henna or mehendi and grape - vine in pre-Harappan periods only. The evidence of hena's cultivation at Rohira is of considerable significance and indicator of cultural continuity.

2.3.6 Archaeology and Biology

Recent studies in the field include dermatoglyphics, genetic markers and their association to diseases, pattern of physical growth, adaptation etc. Bio-archaeology is a specific research approach to past cultures that requires interdisciplinary cooperation between archaeologist and biological anthropologists. Integration of research designs, concepts, methods and interpretations from biological anthropology and archaeology is essential to the success of a bio-archaeological research program.

Bio-archaeology is a specific research approach to past cultures that requires interdisciplinary cooperation between archaeologists and biological anthropologists. Integration of research designs, concepts, methods, and interpretations from biological anthropology and archaeology is essential to the success of a bio-archeological research program. The goals of bio-archaeology is the holistic and unified reconstruction of subsistence economy and behavioral patterns associated with prehistoric cultures, through synthetic integration of

biological data from human skeletons with archaeological data from material culture. Also known as the bio-cultural approach, bio-archaeology originated in response to the excavation and analysis of Native American mortuary sites and skeletal remains. This perspective on past cultures has historical depth, a well-established methodology, and has dramatically improved our knowledge of the dynamic nature of bio-cultural change in prehistory. The advancement in the field of DNA also built much stronger relationship between archaeology and biology.

A bio-archaeological analysis at Harappa related to dental disease and the ration of occurrence ultimately attributed to the possible prevalence of the difference in dietary content and distinctive sex-based activity patterns.

2.3.7 Archaeology and Physical sciences (Physics & Chemistry)

Relationship between archaeology and physical sciences was long been established. Although early formulations of the field included the natural as well as physical sciences, most contemporary usages are restricted to applications of physics and chemistry. This seems much evident as natural and biological science applications have come into their own in archaeology as geoarchaeology, zooarchaeology, paleoethnobotony etc. This interactive or multidiscipline (archaeology, physics and chemistry) field of study has come to be called as Archeometry. This field is broadly divided into a number of subfields: prospecting, provenance studies, dating methods and material science applications.

Prospecting: It refers to the process of used by using different and dissimilar methods to find appropriate places to dig which at present extended to generate data about archaeological phenomena that supplement those acquired by traditional means. The methods used are Remote Sensing, Photogrametry, Satellite imagery, shuttle based photography, Global Positioning system, magnetometry, resistivity, ground penetrating radar.

Provenance Studies: Where material and artifacts are studied for their compositions or deposits on them in laboratory in turn to use the data obtained

from them to understand the components in them to dating them. For example, composition studies (to identify the raw material, other components, performance and technology) like X-ray fluorescence, proton induced X-ray emission, Instrumental neutron activation analysis, inductively coupled plasma etc.

Material science: This is the newest of the archaeometric subfields, yields hard evidence on artifact function and performance by determining the physical and mechanical properties of materials and objects. In traditional archaeology, object function was largely a matter of analogical speculation or replicative "Experiment". As on date it has become important to know what work objects did, to explain their occurrence. In this regard mechanical testing has come to play an increasingly prominent role.

The archaeological chemistry provides a set of chemical methods specifically to restore and conserve archeological artifacts, including stone, soil, metal and organic materials. These methods are also applied to determine the composition and properties of materials used in the past. The conservation and preservation techniques are employed to retrieve the physical and chemical properties of artefactual materials which are closed to visual observation. The knowledge of physical and chemical properties of artefactual material helps to explain the ancient method of production, fabrication, choice and provenance of raw material. Research in archaeological chemistry has kept pace not only with the spurt of excavation, but also with the changing methodology evolved from time to and how these methods have served the cause of the conservation of monuments, the most visible face of our cultural heritage. Excluding this even chemical analysis are used to assess and understand the nature and extent of human activity at excavated sites by the analysis of phosphate in the anthrosols (soils associated with human activity), chemical analysis of bones, in terms of their fluorine, phosphate ratios from bones which serve as a handy tool for determining the relative chronology. These methods have been standardized specially to serve the Indian prehistoric sites.

Archaeology & metallurgy

Metallurgy deals with the techniques and methods of smelting, alloying, casting, craftsmanship of smiths etc. In archaeology it helps in exploring the prehistoric techniques of procurement (by means of trade, exchange, mining/quarrying, etc) and sourcing of raw material. The chemical analyses of a variety of metal objects from the Neolithic -Chalcolithic, Chalcolithic, Iron Age and Harappan site have resulted in provenance studies of metals, mineral resources and alloying techniques. It is now evident that mature Harappan phase witnessed an upsurge of metallurgical activity and that Harappan copper technology was far superior to that of the Ganaga Valley copper hoard culture of later period. Though metal alloying continued in the post - Harappan times, as attested by the Chalcolithic sites in the Deccan and Central India, the casting techniques are found to be far inferior to those of the Harappan.

2.3.8 Archaeology and Geography

In its earliest beginning geography used to be purely descriptive, 'drawing maps and representing places with symbols and scales. Today, geography is one of the fastest moving disciplines, which explains, analyzes, manages, and even predicts geographical phenomenon and features. They read special types of maps to predict what may happen in the future. In dealing with demographics, land values, site locations, environmental hazards, and much more, geography is utilized and has a proven track record.

Its relation to archaeology can be understood once we look into subject matter of geography. It includes anything having to do with spatially referenced data. The important thing to keep in mind is that whether on land or under water, spatially referenced data falls within the discipline of geography. And it is Geography that is poised to be on the most powerful and useful tools in the near future. Its potential applications in archeology are just beginning to be appreciated.

2.3.9 Archaeology and Statistics

It is impossible to fail to notice that many aspects of archaeological information are numerical and that archaeological analysis has an unavoidably quantitative component. Standard statistical are commonly applied in straight forwards well as unusual and ingenious ways to archaeological problems, and new approaches have been invented to cope with the special quirks of archaeological analysis. The literature on quantitative analysis in archaeology has grown to prodigious size in the past 25 to 30 years. However, use of statistic in qualitative analysis is not widely used as well as its use is restricted in quantitative analysis as archaeologists are not trained to use statistics at least in Indian scenario.

2.3.10 Archaeology and Engineering Sciences

The application of computers to deal with archeological problems has evolved from the statistical applications of the late 1950's and early 1960's to the current information technology (IT) approach.

Computer science: Creation of computer data banks in archaeology where bodies of related data are stored in computer files in such a way that archeologists can easily retrieve them or extract information from them. Construction and used of databanks in archaeology followed the introduction of quantitative methods in a second wave of applications in the 1970's.

Computer simulation: The initiation of a process, undertaken to expand understanding of that process. Although the imitation usually takes place on a computer, other media can function in the same way. Numerical and statistical analysis, word and data processing, storage and manipulation of graphical data, hyper and multimedia techniques, dissemination of collected data, results of scientific analysis of methods of prospection, catalogs and descriptions of artifacts, records of field excavations, reports, image analysis and graphical applications.

2.4 ARCHAEOLOGY AND SOCIAL SCIENCES

2.4.1 Archaeology and Sociology

Sociology is the study of development, structure and functioning of human society. Use of sociology and its concepts is of the most interesting questions we can ask about early societies are social in nature. They are about people and about relations between people, about the exercise of power and about the nature and scale of organization.

Two disciplines have evolved into a sub multidisciplinary subject called Social Archaeology. As generally in the case of archaeology, the data do not speak for themselves; we have to ask the right questions, and devise the means of answering them. There is a contrast here with cultural of social anthropology, where the observer can visit the living society and rapidly form conclusions about its social and power structures as well as other social matters. Where as a social archaeologist has to work systematically to gain even basic details, but the prize is a rich one; an understanding of the social organization not just of societies in the present or very recent past but of societies at many different points in time, with all the scope that offers for studying change. Only the archaeologist can obtain that perspective and hence seek some understanding of the process if long-term change.

At broader sense this study would include knowing the size or scale of the society, was a specific site is part of a bigger society, was it dominating the other sites and societies, it had a catchment area to feed on, its internal organization etc as example. As society and people change does the questions to be asked and what need to be studied and interpreted for each society and or a site varies. Social archaeologists might use investigation of settlement and settlement patterns, variability's within a specific site, distribution of artifacts in vast geographical area and even in a specific site, relationship between sites, functions of the different organized areas within a site, site catchment analysis, intensive surface survey, ritual remains, analysis of art objects, written records, oral traditions and ethno archaeological approaches etc.

2.4.2 Archaeology and History

The subject matter of archaeology and history is the study of human past. However, there is a basic difference between the two; archaeology, seeks the knowledge of the human past through material remains whereas history seeks the information through written documents. The change in obtaining the source of information leads to the change in methodology. History does not move beyond the textual sources. Archaeology goes beyond the period of deciphered textual documents. It is either undeciphering the written documents or even anything to do with pre or proto historic record where even any script or written materials are locked. Archaeology tries to unlock the undeciphered scripts as well as other evidences and gives it back to history as authentic document to work on and to rebuild the events of the human past through these sources. Sometimes, the scientific and technological advancement made by our ancestors could not be inferred only from written sources. The human race has existed for hundreds of thousands of years, but written records are not found anywhere before about 3000 B.C. or even later; this skill was confined to a few people, and it was slow to spread. Archaeology on the other hand, takes every traces of human activity into account. Archaeology's documents are authentic, and when they are read correctly the past takes on new life. For instance, the discovery of great Indus civilization is the result of archaeology. Or even for instance the Upper Paleolithic burial remains of south India. Therefore, the study of archaeology and history is highly complementary in nature.

2.4.3 Archaeology and Languages

It is mostly assumed that relationships between or among languages are a sign of ancient cultural and ethnic affiliations. The criteria of integrating linguistic and archaeological evidence vary according to the nature of the problem and the questions posed. The use of linguistic evidence in archaeological analysis also varies in type and degree depending upon the theoretical approach of the researcher. Generally, linguistic reconstructions help archaeologists to test hypotheses regarding social and political change and regional interactions, to

explain the distribution of intrusive archeological assemblage and changes in settlement patterns, and to identify the linguistic structure and identity of ancient texts.

Many archaeologists use reconstructions derived from historical linguistics as a supplement to research, and especially in the production of models of ancient societies. This is not surprising, since one of the archaeologist's main objectives in the delineation of ancient human groups analogous to those seen in the world today. One of the central elements in any human society is languages, mother tongues and linguae francae, languages spoken well and badly, the shifting borderlands between dialect and languages and the relationship between multilingualism and cultural interchange. Language plays a central part in most definitions of ethnicity, mediating common cultural elements, claims of common origin, and the relationship of identification that act reflexively between the individual and the collective. Linguistic research can yield information about social relationships and cultural institutions otherwise difficult for archaeologists to obtain. These are powerful attractions, and it is not surprising that archaeologists have tried to establish links between prehistoric traditions and protolanguages through historical linguistics research.

19th Century European linguists working at the University of Leipzig, referred to as Neogrammarians, developed principles and a method of comparison that successfully accounted for linguistic change over time. They demonstrated that the linguistic process that produced change in prehistoric languages is observable and operative in transforming living languages. They showed how most of the modern linguistic groups in Europe and others in the near East and India developed from a common ancestral language, Indo-European. Neogrammarians were able to reconstruct a basic vocabulary and associated cultural traits for a proto-languages they called Proto - Indo-European and to propose a geographical homeland for the Indo-European people.

2.4.4 Archaeology and Anthropology

Though anthropology as a discipline is about five hundred years old, modem anthropology which deals with human activities, cultural behavior, structure of language and communication, physical attributes etc., is not older than a century and half. A close collaboration between anthropologists and archaeologists is strongly felt, for such an integrated approach would help establish a meaningful relationship between material culture, sustenance, human biology and environment. Archaeology should look to anthropology for theoretical frameworks necessary for social interpretations of archaeological remains at the same time anthropology has to look to archaeology for material remains of past.

Archaeology in many countries (like USA) is considered as the sub discipline of the anthropology. In this case anthropology is divided into three subfields namely physical -anthropology, cultural anthropology and archaeology. Archaeology and anthropology have had a longstanding and often changing relationship, marked by periodic rapprochement and distancing. Some decades ago the New Archaeologists claimed that "archaeology is anthropology or it is nothing": a view in which archaeology was meant to address an anthropological research agenda albeit with less ideal data. Today, the interaction between the two disciplines has evolved to a more balanced partnership, in which we note an increasing convergence of ideas and approaches, epitomized by the rise of material culture studies: an anthropological sub-discipline that was developed in part by archaeologists.

2.4.5 Archaeology and Museology

Museology in its general sense refers to the study of museums. It serves as a Meta theory as well as provides ethics for all institutions involved in museum management. Museums in their early beginnings (in modem context) were collecting and displaying art, industrial art, craft and geological objects. Later on with the development archaeology, started acquiring archaeological objects for display. Today we have number of museums serving different purposes and derive their themes from different fields of study like anthropology, ethnology, biological sciences, natural sciences etc. However, museums which possess archaeological

collections are high in number than any other museums at least in the Indian context. Many of the Indian state operated, central operated and ASI operated museums major collection are of archaeology in nature.

Museums today are perceived as cultural institutions which work towards the preservation and conservation of present culture and or cultural remains. Archaeological objects are considered as cultural remains of past (or tangible) which are preserved and conserved by the museums. Museums are like preservation, conservation, display and communication partners for all those excavated objects. Therefore, we can say that archaeology provides objects to museums to preserve and conserve the cultural patrimony and at the same time adopted many methods of conservation from museum practices for its excavated site conservation. Both the disciplines complement each other and largely contribute to the field of Heritage management.

2.5 LET US SUM UP

To conclude we can brief that since archaeology is fundamentally the study of the human past, which is what the word 'archaeology' connotes according to its Greek etymology, it is part of the social sciences. Archaeology was born as part of the Enlightenment project to establish a rational means of inquiry into questions of how humans lived, formed societies, developed settlements, farming, cities, and states. Archaeologists thus questioned philosophical speculations about how people lived in a 'state of nature' and have established chronologies for remains left by the earliest humans and by less distant ancestors. Archaeologists have explored ancient civilizations that were dimly known in religious and historical writings and also discovered whole new societies and cultures that were utterly unknown before archaeological research. Our knowledge of the antiquity of humanity is a result of less than two hundred years of archaeological.

However, to be sure, the meticulous work demanded of archaeologists that archaeologists systematically recover and examine materials in a scientific manner. Whereas teams of researchers are not usually found in humanistic research, it is critical that archaeologists as well as archaeology as a discipline collaborate with

specialists from other disciplines methods and techniques in chemistry, physics, geology, anatomy, botany, and other scientific areas in their investigations. Archaeologists also employ quantitative techniques characteristics of the social sciences. Comparisons among human societies, their interactions with neighbors and environments are standard practices in archaeology. Indeed, archaeology is an academic hybrid of humanities, science, and social science and archaeologists are pleased to live in the interstices of many academic disciplines.

This unit would have contributed to your detailed understanding of Archaeology's multidisciplinary nature, which made it a unique discipline. It had enabled you to grasp the kind of relationship between archaeology and other disciplines which are from natural, physical, biological and or social gamete of science. This unit in brief explained how different disciplines have contributed and also how many other disciplines draw and use archaeological finds for their purpose and understanding. The sub-disciplines formed by the integration of archaeology and each discipline are also briefly introduced to enable students understanding.

2.6 KEY WORDS

1. Archaeology and sciences – Archaeological science, also known as archaeometry consists of the application of scientific techniques to the analysis of archaeological materials.
2. Meticulous – Showing great attention to detail and precise

2.7 CHECK YOUR PROGRESS

1. Explicate the association between Archaeology and Biological sciences with appropriate examples.
2. “Archaeology and History complement each other”. Explain the statement.
3. Define Geoarchaeology and Archaeological Geology? Is there a difference between these two sub disciplines? Elucidate your opinion.

4. “Archaeology and Language both can be integrated towards understanding past of a society or community”. Provide an example.
5. In few words elucidate the role of Social Sciences in Archaeology.
6. “Multidisciplinary nature of Archaeology enhanced its effectiveness”. What do you think? Back your opinion by suitable examples.

2.8 ANSWER TO CHECK YOUR PROGRESS

1. Answer to question No. 1 can be found under Section 2.3
2. Answer to question No. 2 can be found under Section 2.4
3. Answer to question No. 3 can be found under Section 2.3
4. Answer to question No. 4 can be found under Section 2.4.3
5. Answer to question No. 5 can be found under Section 2.4
6. Answer to question No. 6 can be found under Section 2.2, 2.3 and 2.4

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UNIT- 3 DEVELOPMENT OF ARCHAEOLOGY - 1 (WITH SPECIAL REFERENCE TO EUROPE TO THE END OF 19TH CENTURY)

Structure

3.0 OBJECTIVES

This unit will help the reader to understand the following with special reference to Europe,

- The origin of the Archaeology
- Progress made by Archaeology to become an established discipline
- Concepts and theories that contributed to the growth of Archaeology
- Important scholars who contributed to the growth of Archaeology
- Different stages of discipline development

3.1 INTRODUCTION

Being students of Archaeology it is very important to know its origin and roots. Many of these roots and steps might seem very meager to be of any considerable importance at this juncture considering the present established status of the discipline. But however, they were major breakthroughs without which the discipline wouldn't have been came this far. This unit try's to provide you with a concise account of many aspects that contributed to the origin and growth of this very young discipline. We may learn a great deal by examining how early antiquaries and archaeologists tackled the formidable problem of making sense of the human past without the help of the libraries, museums, travel and technical facilities available today.

While it is true that in the 6th century B.C the princess Belshalti-Nanner, sister of Belchazzar, has a special room in her house for her collection of local antiquities, and that her father Nabonidus, the last king of Babylon, engaged in antiquarian research and dug at Ur, there was no archaeology, properly speaking, in the ancient world. Greeks like Herodotus made ethnographical observations of great values, and indeed could be called, in a way, anthropologists: and some of their travels brought then into contact with barbarians surviving from prehistory. But there was no Greek Archaeology as such before Europeans of the last two centuries who wrote the beginnings of the archaeology or archaeological thought. At the same time it is also true that Chinese by 52 A.D set out a sequence of a

stone, Bronze, and Iron Age as a technological succession period of humankind and mark able stages of his evolution.

Archaeology is the product of last 200 plus years. It is one of the youngest disciplines. Its beginning as a formal discipline can be traced to when antiquity of man was established and the three –age system was developed by Scandinavians. However, here you will find a brief on this groping towards archaeology in the antiquarianism and these pre archaeological beginnings that are addressed.

3.2 ANTIQUARIANISM

It is important that the benefit of retrospection does not make us forget the constraints of the social and intellectual context in which antiquaries lived and worked. It was in France, Britain and Scandinavia, that archaeology was born – the beginnings are of two kinds. There are first the antiquarians whom we can call as local antiquarians who were into their own country, hoping by studying the visible remains of the past and the stray objects found by accident, to understand the past. In the second place, there were the antiquarians and collectors who brought back from the Mediterranean and Near East the visible remains of the past to their homelands. However, one need to note that there were antiquarians in France by 14th Century and Britain, had them starting from 16th century down to 18th century. Many of these antiquarians were very famous. The most important names among them include Camden, Aubrey, Lhwyd, Rowlands and Stukeley.

Camden (1551 – 1623): He traveled across the Britain extensively studying its visible antiquities. He was 35 when he produced his first literary work called Britannia, the first general guide for the antiquities of the Britain. It went through many editions even after his death. The first edition of his book was published in the year 1586 which according to Sir Thomas Kendrick, was the first illustration in an English archaeological work. Camden was a careful observer who was able to observe what we today call as Crop marks (observing from ground) in the absence of aireal photography.

John Aubrey (1626 – 97): He was an antiquarian completely delighted by his field work and experiences. He lacked the depth of education however possessed a desire to approach any subject from a sound basis of classification and comparison. In addition to antiquities, he included natural and artificial phenomena in accounts of his beloved Wiltshire. He was the first person to bring Avebury and Stonehenge into a context of archaeology and prehistory. His Monumenta Britanica was unfortunately never published. However, its manuscript was gifted to and maintained by Bodleian Library in Oxford.

Edward Lhwyd (1660 – 1708): He is a fine example of the late seventeenth Century polymaths and antiquaries. He was a friend and correspondent of John Aubrey; he was at first, assistant to his old tutor Dr. Robert Plot, the first keeper of the newly found Ashmolean Museum in Oxford. When Plot went away to London to become Secretary of the Royal Society, Lhwyd succeeded him as keeper, and died, in the museum itself, at the early age of 48. By then he had published the first figured catalogue of fossils. He had travelled extensively studying and recording natural history, languages, antiquities, and customs. He published the first column of his Archaeologia Britannica in 1707.

Sir Henry Rowlands (1655-1723): He was a priest of Llanidan on the island of Anglessey, and a close friend and correspondent of Edward Lhwyd. He wrote a book, published in Dublin in 1723 entitled Mona Antiqua Restaurata; an Archaeological Discourse on the Antiquities, Natural and Historical, of the Isles of Anglesey, the Ancient Seat of the British Druids.

William Stukeley (1687 – 1765): He was an accurate field archaeologist and just like Lhwyd, had made observations of a basic archaeological character. Piggott in appreciation of Stukeley credits him with 3 important view points as based on basic archaeological principles. Firstly, Stukeley was able to recognize the long pre-Roman period over which the field antiquities could be distributed (in Europe), secondly is his appreciation of the possibility that various prehistoric cultures might arrived in Southern England by means of invasion or immigrations from the continent, and finally is the application of the geographical and topographical method to the study of a group related structures (the linear earthwork) in order to

interpret them as a coherent whole in the light such historical knowledge as was available.

Again in the beginning of 19th century there were many antiquaries like Giovanni Belzoni and Dr. Edward Clarke. Former being famous as a splendid and adventurous antiquarian whereas later was a Professor of Mineralogy in the University of Cambridge and Librarian to the University. Both of their area of work was Egypt. The discipline made its beginning move towards becoming an established scholarly discipline when Napolean - I invaded Egypt. As he transported with him a large body of scholars - including artists, antiquarians and scientists and their mission was to complete the record of the land of the Nile and its monuments and curiosities. The Fresh Institute of Cairo was founded by and for these scholars, and many volumes of the Description Del' Egypte were published between 1809 and 1813. One member of this team was D. V. Denon, who's Travels in Upper and Lower Egypt during the Campaigns of General Bonaparte first published in French, appeared in an English translation in London in 1802. Men like Denon, and the staff of the French Institute in Cairo as a whole, showed that a serious and organized approach to the study of the past through archaeology was beginning, and the antiquaries and dilettanti, the travelers and the tomb robbers, were soon to give way to professional archaeologists.

3.3 DEVELOPMENTS IN GEOLOGY AND ANTIQUITY OF MAN

Antiquarians like Lhwyd and Stukeley, and travellors and dilettanti like Belzoni and Clarke could not create the discipline of archaeology. They had, and they stimulated, an interest in the remote past of man, and they hoped to know about that past, but through all their efforts they did not get very far. Two things were necessary; first, an appreciation of the depth of the human past, and secondly, some system of relative chronology within that defined depth. The first problem that is an acceptance of the long human past and even more long period from earth's creation was hindered by the bible time periods and its calculation of evolution of human. This hindrance was needed to be addressed and long human

past with all possible slow evolution process was to be accepted for the growth of archaeology and prehistory in specific. This happened in the 19th century. These developments are briefed here below and the second question of relative chronology will be discussed under the next heading.

This major advance in thinking about man's past involved three main things: first the recognition as human artifacts of stones hitherto described as elf-shot or thunderbolts; secondly a change in geological thinking from the catastropism of Buckland and other to the diluvialism of men like Bukland's pupil, Lyell; and thirdly the finding of artifacts and remains of human beings in undisturbed contexts which, according to the new geology, must be very old indeed.

One man in England at the end of the 18th century had the courage to make the right deductions from what he observed in a gravel pit. This was John Frere (1740-1807), a fellow of the Royal society living at Roydon Hall, Nor Folk. He set out the nature of his discoveries and his views if their meanings in this celebrated letter to the secretary of the Society of Antiquaries of London. He mentioned that, "Flints found in the parish of Hoxne, in the country of Suffolk, which, if not particularly objects of curiosity in themselves, must be considered in that light from the situation in which they were found. They are, evidently weapons of war, fabricated and used by the people who had not used metals. They lay in great numbers at the depth of about 12 feet, in a stratified soil, which has dug into for the purpose of raising clay for bricks. In the same stratum are frequently found small fragments of wood, very perfect when first dug up, but which soon decompose on being exposed to the air; and in the stratum of sand, were found some extraordinary bones, particularly a jaw – bone of enormous size, of some unknown animal, with the teeth remaining in it". John Frere's letter attracted little attention, and it was not for nearly half a century that people looked back to what he said in view of the discoveries that were being made by Boucher De Paerthes in Somme Valley and by Macenery, Pengelly and other in South Devon. Even after the discoveries made by all these people, the findings were questioned drastically and were not accepted and appreciated. For example for the finds of Mac Enery wherein he found the artifacts with the remains of extinct animals in an undisturbed stratum in the soil and interpreted that these artifacts are possibly

belonged to humans who were contemporary of the extinct animals. For this Buckland opinioned that they were remains of feasts of the Ancient Britons, who scooped out ovens in the stalactite, and thus the artifacts, got down apparently into undisturbed strata. This way, many of these researchers were confronted with constraints in establishing actually truth. However, Boucher De Perthes was the real key figure in the recognition of the antiquity of man. His studies were published in a book entitled as "De l'homme antediluvian et ses auvers" authored by himself in Paris in 1860. His discoveries were at first greeted with skepticism by his French colleagues, and it was English geologists and archaeologists like Sir John Prestwich, and Sir John Evans (1823 – 1908) who were converted to his views and who then converted the learned world to accept the great antiquity of man.

Joseph Prestwich (1812 – 96): he presented his paper on 26th May 1859, on occurrence of flint implements with remains of animals of extinct species on a same undisturbed bed at Royal Society. This paper tried establishing four facts mainly,

1. The flint implements are the work of man
2. That they were found in undisturbed ground
3. That they are associated with the remains of extinct mammailia
4. The possible period was a late geological one, and anterior to the surface assuming its present outline, so far as some of its minor features is concerned.

Prestwish findings were backed up by Mr. Evans. Who pointed out that, in form and workmanship it was able to differentiate between the found implements in different places. He fully concurs with Mr. Prestwich, that the beds of drift in which they were found were entirely undisturbed.

Edouard Lartet (1801 – 71): A magistrate in the oduth of France who gave up the pursuit of the law to study fossil animals, and through whom paleontology came to the study of the cultural fossils of man, was one of the great 19th century French pioneers of archaeology. His work followed on and supplemented that of Boucher de Perthes. It was Later, assisted by the Englishman Henry Christy

(18180 – 65), who began the systematic exploration of rock –shelters and was responsible for the discovery and appreciation of Upper Paleolithic mobiliary art.

Sir Charles Lyell (1797 – 1875): He has been one of the pioneers of the new geology. Himself a pupil of Dean Buckland at Oxford, he had broken way from the catastrophic and duluvialist geology of Buckland and Conybeare, and, went to London as Professor of Geology, taught the doctrine of uniformatarianism and the new fluviatilist geology. He taught that no process could be admitted in the past which did not happen at the present and that it was changes in land and sea level, and the work of rivers that was mainly responsible for strata – not universal disasters and great floods. Lyell's Principles of Geology was published in 3 volumes from1830 to 1833, and these volumes were a prime of the new geology. The implications of Lyell's theory for the archaeologists was that artifacts deposited in undisturbed grave many feet below the present ground level were very old, and indeed belonged to a time which John Frere has described in his letter to the Society of Antiquaries of London as 'Beyond that of the present world, Artifact – the cultural fossils of man – were only one of the evidences of mans's antiquity. Actual skeletal remains of man himself in similar geological circumstances were more exciting and, are readily understood by the average person.

In 1857, two years before Prestwich had lectured to the Royal Society and Darwin has published the origin of Species, the long bones and the skull (cap of a man) like being has been discovered in a limestone cave at Neanderthal in Rhenish Prussia. In his the Geological Evidences of the Antiquity of Man (1863), Lyell discusses the problem of Neanderthal Man. The cast of the cranium was shown to Professor Huxley, who remarked at once that it was the most ape-like skull he had ever seen. Mr. Musk added valuable comments on the characters on which this skull approached that of the gorilla and Chimpanzee. Professor Huxley studied the cast and discovered that it has quite an abnormal in the shape in its occipital, frontal or superciliary region.

3.4 THE THREE AGE SYSTEM

Under the previous heading Geology and the Antiquity of Man we discussed that two things were necessary to create archaeology as a discipline: First, an appreciation of the depth of the human past which was established by the efforts of scholars and researches with the establishment of New geology as we discussed in the previous head. Now we are concerned about the second criteria, establishing some system of relative chronology within the defined age depth. This issue was answered to a large extent by the three age system. Now let's have certain level of understanding to this.

Although the idea of an age existed in the writings of Greek ogilosophers and historian, and the recognition of stone implements as such by antiquaries and geologists in the 16th, 17th and 18th centuries had prepared the way for the recognition as a historical fact, a stone age in the human past, it was the writings of Scandinavian historians and archaeologists, and their work in museum and in excavation, that established not only the idea of a stone age, but a sequence of three ages in the prehistoric past – stone, bronze and iron. The three age system has very properly been described by Joseph Dechelette as 'the basis of prehistory', and by R. A. S. Macalister as 'the corner stone of Modern archaeology'.

The clearest statement of this concept was in the writings of L. S. Vedel Simonsen, particularly in his Udsigt over National histories aeldste og maekeligste Perioder published in 1813 – 16. He opinioned that, "At first the tools and weapons of the earliest inhabitants of Scandinavia were made of stone or wood. Then the Scandinavians learnt to work on copper and then to smelt it and harden it… and then latterly to work on iron. From this point of view the development of their culture can be divided into a Stone Age, a Copper Age and an Iron Age. These three ages cannot be separated from each other by exact limits, for they encroach on each other without any doubt the use of stone implements continued among the more impoverished groups after the introduction of copper, and similarly objects of copper were used after the introduction of Iron … Artifacts of wood have naturally decomposed, those of iron are rusted in the ground and it is those of stone and copper which are the best preserved".

Professor Rasmus Nyerup (1759 – 1829), of the University of Copenhagen, Published in 1806 his Oversyn Over Gaedrelandets Mindesmaerker Fra Oldtiden, in which he advocated the formation of a National Danish Museum of Antiquities. A year after the publication of this book, Danish Government set up Royal Committee for the Preservation and Collection of National Antiquities, although it failed to open a Museum. This committee was charged with the job of forming a national museum of Danish antiquity, see to the preservation of the ancient and historic monuments of Denmark, and also of making known to the general public the importance and value of antiquities. Nyerup himself was the first secretary of this committee. The collections which he and his staff made in the peat bogs, burial chambers and kitchen middens of Denmark formed the nucleus of the National Museum in Copenhagen.

Christian Jurgensen Thomsen (1788 – 1865) succeeded Nyerup as secretary of the Committee in 1816: at the same time he was appointed the first curator of the National Museum, a post which he held until his death. Thomsen arranged the collections by classifying them into three ages of stone, Bronze and Iron on the basis of the material used in making weapons and implements. He claimed that the classification represented three chronologically successive ages. In 1819 the Danish National Museum was open to the public. They found it organized on the Three – Age system: it was the first museum or for that matter private collection to be organized. He paid very special attention in his guide lectures to peasants, 'because', he said, 'it is by them that we shall have our collections enlarged'. In 1836 a guide book to the National Museum was published entitled Ledetraad til Nordisk Oldkyndighed. An English edition of this guide appeared in 1848 translated by Lord Ellesmere and called A guide to Northern Antiquities.

Thomson was helped in the Museum by a young law student of Copenhagen, who, in his home Jutland, had been collecting antiquities and excavating barrows for some while. This was Jens Jacob Asmussen Worsaae (1821-85). In due course he succeeded Thomsen as Director of the National Museum, was Inspector General of Antiquities in Denmark, Riksantiqvariet, and Professor of Archaeology in the University of Copenhagen. He was, in the words of Professor Brondsted, 'the first professional Archaeologist'. He is to be remembered for that alone, but he was far

in advance of his time. In 1843, when he was only 29 years old, he published Danmarks Oldtid Oplyst ved Oldsager og Gravhoje, which was translated into English by William J, Thoms and published by parkers in Oxford in 1849 as The Primeval 'Antiquities of Denmark. In his book he clearly provides three major reasons why one needs to follow three age system. The reasons are, Firstly exposition of the principles of excavation, secondly to enhance the awareness of the comparative method and finally to interest the public in archaeological matters. No words are too lavish in trying to estimate Worsaae's contribution. Many of the scholars consider him as the father of Modern Archaeology. They are of the view that although archaeology had grown up long befoit became a mature discipline in the period of Worsaae by his works in Denmark. However, it took half a century for it to develop in Western Europe. By this time associating national pride to its historicity had came into existence. It is believed that longer the nation's inhabitation higher it's pride. These can be understood by the works of Worsaae who opinions that, "A nation which respects itself and its independence cannot possibly rest satisfied with the consideration of its present situation alone. It must of necessity, direct its attention to bygone times; with the view of enquiring to what original stock it belongs, in what relations it stands to other nations, whether it has inhabited the country from primeval times or immigrated thither at a later period, to what fate it has been exposed; so as to ascertain by what means it has arrived at its present character and condition. For it is not until these facts are thoroughly understood, that the people acquire a clear perception of their own character, that they are in a situation to defend their independence with energy, and to labor with success at the progressive development, and thus to promote the honor and well-being of their country".

Worsaae was not just a great archaeologist who knew how to study pre history from intractable material of archaeology but also in true sense a real Comparative archaeologist. His belief of comparative method and his passionate awareness of the necessity of getting the public interested in archaeology was an established factor and are found in many of his works. He was much concerned about excavation and interpretation. He was the first one to express importance of preservation and conservation of the excavated remains and antiquities. This idea was expressed in his easy entitled 'On the Examination of Barrows and the

Preservation of Antiquities. It is remarkable in its modern outlook particularly when we realize that it was first published in Denmark as early as 1843. He opinioned that, "in general, it is not to be desired that the ancient barrows belonging to the times of Paganism, should be either opened or removed. It is true they occur, in certain part of the country, in such numbers as to offer serious impediments to agriculture; while they contain beside large masses of stone, which in many cases might be used with advantage. Still they deserve to be protected and preserved, in as great number as possible. They are national memorials, which may be said to cover the ashes of our forefathers; and by this constitute a national possession, which has been handed down for centuries. Would we then unconcernedly destroy those venerable remains of ancient times, without any regard to our posterity? Would we disturb the peace of the dead, for the sake of some trifling gain? He not just discusses the importance of preservation of the monuments but he also discusses how to excavate.

The three age system organized by Scandinavian archaeologists suggested the way in which the long prehistory of man could be divided which is also been supported by many excavation. But still the question persisted; how long was the man's ancestry, and about his origin. These are addressed further by Darwin, which we will discuss in this section.

Till the last segment, one cannot see much contribution from English scholars in the growth of archaeology but however in the mid 19th century many of English scholars contributed a lot for the birth of archaeology. The time period of 1849 – 1860 saw many scientists from British origin contributing to the growth of archaeology. The most important names include Chrales Darwin and Thomas Huxley as well as Charles Lyell, Joseph Prestwich, John Evans, George Busk, John Lubbock, Hugh Falconer, Francis Galton, E.B. Tylor. Let's look into few major contributions that directly affected the growth of archaeology as a discipline.

Charles Darwin's Origin of Species; the theory of evolution was published in 1859. Darwin at first expressed no opinion on the effect of his theory on the question of man's ancestry, nor did he in the origin of species comment on the off-repeated anatomical likeness between man and the apes except to say much light

will be thrown on the origin of man and his history. The extension of Darvinism to man was largely the contribution of Dr. Huxley, who published his Man's Place in Nature: Darwin's own Descent of Man came out in 1871. It is some time argued that Origin of Species which was really responsible for the development of archaeology. At the same time other's asserts the birth of modern archaeology and anthropology was not the result of Origin of species. For all these viewpoints we can rightly summarize that the origin of any subject is complex and can rarely be attributed to one cause or single event or person. The new archaeology, geology, the three age system, the discovery of the antiquities in Egypt and the Mediterranean, the doctrines of evolution – all these brought the discipline of archaeology into existence in the sixties of the nineteenth century. Certainly the doctrine of evolution, if accepted, produced a new climate of thought in which archaeology and anthropology could grow and flourish.

Not just the scholars from England but there were comparable men from other countries also. We may see the birth and early stages of the development of archaeology in the writings of three men from 3 separate countries – Morlot in Switzerland, Lubbock in England and Montelius in Sweden.

Morlot: Professor of Geology in the Academy of Lausanne, was much interested in the development of the Danish Three – Age system; indeed he once said that the growth of prehistoric archaeology was really due to the diffusion of the ideas of Thomsen, Worsaae and Nilsson through Europe. This system was adopted in Switzerland, and when, during the very dry winter of 1853 – 54, the low lake levels of Lake Zurish revealed the remains of wooden piles, as well as stone axes, pottery and charred wood, the Swiss soon found that they had their own proof of the Three age system in the lake dwellings from the Stone Age, Bronze – Age and Iron Age. Dr. Ferdinand Keller of Zurish examined these various finds from the Swiss lake dwellings. His memoirs, with additions, were translated into English and published in 1866 under the title of The Lake Dwellings of Switzerland and other parts of Europe. Morlot, in his book published in 1860, summarized these lake dwellings discoveries. In the same year he published his book on archaeology which was later translated into English with the title General Views on Archaeology by Smithsonian Institute in 1861. In this book he mentions

the role and relationship between archaeology and other disciplines namely Geology, History and ethnology and ethnography. He does explain how these disciplines contribute to archaeology there by enforcing upon the multidisciplinary nature of archaeology. He was well aware of the historical background of his subject, its limitations, possibilities and future. His remarks on chronology are sound and sage. He looked forwards to geochronological techniques for dating as early as 1860.

John Lubbock (1834 – 1913): Sir John Lubbock and later Lord Avebury, was not a professional scholar. Indeed he did not go to a university. He was a banker and a politician. He was responsible for getting passed into law thirty bills, including the Ancient Monuments Act of 1882 and to Bank Holidays Act of 1871. These professional activities he combined with an intense interest and great competence in natural history and archaeology. He had an amazing capacity for work. He was particularly fascinated by archaeology and the development of prehistory into civilization, and his first book, Prehistoric Times as illustrated by ancient remains and the manners and customs of modern savages, published in 1865, was, as the title shows, an archaeological and ethnographical treatise. In this book we find for first time the words Paleolithic and Neolithic. In the last chapter he explained his principles, and set out his views about the origins of man and civilization and the value of studying archaeology and the past, and reaffirmed his belief in progress and the future man. In addition to Prehistoric times, he wrote archaeological and anthropological treatise called The Origin of Civilization and the Primitive Condition of Man: Mental and Social Condition of Savage. Both his books were widely read and both went through many revisions. He showed himself to be strongly in favor of independent invention and indeed of a natural cultural evolution in man.

Oscar Montelius (1843 – 1921): Following in the wake of northern European pioneers of archaeology, Thomsen, Worsaae and Nilsson, came the Swedish Oscar Montelius. He travelled extensively in Europe and in the Mediterranean. He realized the possibilities of cross – dating and was prepared to give exact dates to the sub – divisions of the Bronze Age. He distinguished five or six sub-divisions of the Bronze Age and four in Neolithic. He published a book called The Civilization

of Sweden in Heathen Times, London, 1888. His writings were like midway between Thomsen and the systematists of the 1920's.

3.5 ANTHROPOLOGY'S GROWTH AND INFLUENCE ON ARCHAEOLOGY

Just as archaeology was born in the 2 decades from 1850 to 1870, so was its collateral science of anthropology. Indeed anthropology, defined as the study of man, at least in theory, and the study of primitive man in practice, might be said to include some aspects of archaeology. This is certainly how it was understood by some of the pioneers of anthropology like E. B. Tylor, and how it is still understood in many Universities, particularly in America, where prehistoric archaeology is part of anthropology. But all archaeology is not part of anthropology, and where anthropology and archaeology meet is in prehistory. The development of prehistoric archaeology in the middle of the 19th century was much helped by the development of anthropology. Indeed for 50 years and more there was cross-fertilization between prehistoric archaeology and anthropology, the development of the idea of culture in prehistory was a direct effect of anthropology. There are two scholars who contributed for this growth. One is from Europe and another one is from America.

Edward Burnett Tylor (1832 – 1917): His casual interaction with Henry Christy who played a major role in the discovery of Paleolithic art in 1856 led him to develop interest in anthropology. He wrote many books like Maxico and Mexicans, Ancient and Modern, Researches into the Early History of Mankind and the Development of Civilization, Primitive culture and Anthropology. Tylor was made Reader in Anthropology in the University of Oxford in 1884, and the Professor in 1896. In his inaugural address to the University he declared that "To trace the development of civilization and the laws by which it is governed nothing is as valuable as the possession of material objects", and he was always very well aware of the importance of archaeology although he himself was an anthropologist. He opinioned that, "When similar art, customs, beliefs, or legends are found in several distant regions, among people not known to be of the same stock, how is this

similarity to be accounted for? Sometimes it may be ascribed to the like working of men's minds under like conditions, and sometimes it is the proof of blood relationship, direct or indirect, between the races among whom it is found. In the one case it has no historical value whatever, while in the other it has this value in a high degree, and the ever recurring problem is how to distinguish between the two". Therefore he always enforced that civilization, being a process of long and complex growth, can be thoroughly understood when studied through its entire range; that the past is continually needed to explain the present, and the whole to explain the part. Edward Burnett Tylor published his first book on Anthropology titled "Pre-History". He again set the social evolution periods for human history into savages, barbaric and civilized.

Lewis H. Morgan (1818-81): He was the American counterpart of E. B. Tylor. Although his studies were related to American Indians and their origin, his contribution to the field of anthropology there by to the field of Archaeology in Europe was influential. In 1977 he published his Ancient Society or Researches in the Lines of Human Progress from Savagery through Barbarism to Civilization, and it was here that he set out his ethnical periods in human history. He divided first 3 stages again into 3 sub stages as Lower Status, Middle status and Upper status. He was able to identify certain of his seven ethical periods with existing primitive peoples.

Other developments

Photography and its use in Archaeology were initiated almost in the same period. C. T. Newton had already made use of Photography in his excavations in Greece and Turkey, but while he used photography on his excavations he had lithographs made from the photographs to illustrate his report.

Alexander Conze dug Samothrace in 1873 and 1875. His his excavations report, perhaps the first modern archaeological excavation account we have, was illustrated by photographs, and this is probably the first time photographs were used in such a way. Conze's illustrated excavation report shows that archaeology had really come of age in the quarter century following 1859.

3.6 DISCOVERY AND DECIPHERMENT

The previous four sections have given us a picture of the origins of archaeology from its antiquarian and dilettante beginnings. For example Great Exhibition at London in 1851 did not had any dedicated section for the display of archaeological artifacts where as the Paris Exhibition which occurred after around one half decade (late 1960's) had a dedicated section for archaeological objects. Even a guide book was written on the archaeological collections of the Paris Exhibitions by Gabriel de Mortillet. Considering these factors Tylor in his book Primitive Culture rightly said: 'the history and prehistory of man have taken their proper places in the general scheme of knowledge'. From early 1870's onwrads there was no longer question of the origin of archaeology, the story from now on is a story of growth, and in this long, complicated and exciting story of growth and development we can only select few essential themes. The the first is Discovery and Decipherment.

Of the many great archaeological discoveries made in these early beginnings by chance and by deliberate excavations, very few examples are discussed here. Upper palaeolithic art was first established by the proper recognition of art mobilier, small decorated objects found in the debris of rock-shelters where Upper Palaeolithic had lived, fifteen to thirty thousand years ago. Lartet and Christy through their book entitled Reliquiae Aquitanicae established this factor firmly.

One of the French archaeologists, Joseph Dechelette tried to complete a general guide to the prehistoric and protohistoric archaeology of Europe particularly France and Western Europe. However, his untimely death at the age of 52 in 1914 brought a full stop for this effort which has not been taken by an archaeologist later. However his book published in 1908 speaks about the discoveries of upper palaeolithic art in Europe. In the same way many sites like Altamira, La Mouthe, Cave of Enlene, Les Trois Freres, Lascaux and Pair-on-pair etc were discovered. Other important names in this regard are Professor Emile Carthilhac (Professor of Prehistory at Toulouse) and Henri Breuil. Most of the Upper Paloelithic Caves with upper paloelithic art were mostly discovered by chance.

Next discovery of this period came from Heinrich Schlimamann 1822-90, the German Businessman and banker who, having collected together a great fortune, retired at Forty-six to devote himself to the archaeology of the East Mediterranean. He as a child believed that Troy existed and the reconnaissance and excavations would reveal the material culture of the great ones of Homer. He excavated Hissarlik (on the west coast of Asia Minor), Myscenae, Tiryns, Orchomenos on the main land of Greece leading to the discovery of Trojan. He wrote a book on these excavations called Illios, the City and Country of the Trojans.

The excavator deciphers the past by his careful surgery of the ground. Sometimes he meets inscriptions which could give him an answer to his work. Here we will take up very few examples under decipherment in the 19th century. One of them is Egyptian Hieroglyphics and the second the Mesopotamian cuneiform.

The Rosetta Stone, black basalt stone slab that found on July 1799 near the mouth of the arm of the Nile near to the city of Rashid (or Rosetta in its Europeanised form) the finder, a French officer named Bouchard, noticed that it bore inscriptions in three different scripts and percipiently and rightly supposed that here were three versions of the same text. The last of the inscription was in Greek, which could of course be read, and it was immediately realized that this stone might be of the greatest importance for the decipherment of the hieroglyphics in which the first inscription was written. The decipherment of Egyptian script was initiated later. Reverend Stephen Weston was translated Greek text, later the Englishmen Thomas Young recognized that Egyptian writing consisted mainly of Phonetic signs and lastly in 1882 Jean Francois Champollion corrected the previous work of Young and finalized and deciphered the Egyptian hieroglyphic writing.

Some work has been happened on Mesopotamian writing and was carried on by Karsten Niebuhr and Georg Grotefend. However, it was the work of Sir Henry Creswicke Rawlinson that brought decipherment to a successful conclusion. This way Discovery and decipherments aided the development of the Archaeology and

even broadened the gamete of evidences and references, as well as how to use these to interpret past.

3.7 EXCAVATIONS

Excavation is of course not the be all and end all of archaeology, but without excavations there could be no systematic development of the subject. The development of a systematic discipline on excavation is, in one way, the story of the development of the systematic discipline of archaeology. There were of course excavations long before the 19th century, and we have referred to the long sighted observations of stratigraphy and association made by a 17th century antiquary like Edward Lhwyd or a late 18th century antiquary like John Frere. We have also quoted from the clear and definite instructions on field of archaeology in general set out by Worsaae. Under this heading what we look for is basically growth of Excavation, modern techniques development in excavation contributing towards the progress of the discipline till the end of 19th century. However, there are few excavations which are discussed under this topic. There are from 20th century which couldn't be eliminated considering technical point of view.

Many excavations marked the beginning of disciplined and specifically defined techniques of excavating. One can say early beginning were made in the year 1784 when Thomas Jefferson the 3rd President of USA had initiated excavation at Kent mound in Virginia which is a burial mound. He not just excavated the mound but also studied its stratigraphy and complete structure and analytically interpreted the same.

60 years after this in 1844 the British Archaeological Association was founded. It was a breakaway from the tradition of a society like the society of Antiquaries of London. It intended to meet in the country, to visit monument, museums, private collections, and to excavate or at least visit excavations. Its first meeting was held in Canterbury under the presidency of Lord Albert Conyngham. He had participated and initiated many excavations mostly including mounds which were burials.

Then the excavations at Egypt by European scholars initiated by Mariette 1821-81 who was sent out to Egypt in 1850 by the Louvre to search for Coptic manuscripts became at once interested in field monuments than the manuscripts. In the same year excavated the Serapeum at Memphis, the great temple of Osiris-Apis. As the monument was completely buried under sand, the plan different excavating this mound than the previous mound. However, his excavation methods have often been decried, he himself excavated over thirty sites. This clearly indicates that he was more concerned with getting good results and finding splendid things. However, this kind of practices changed late as the discipline proceeded and new methods and concerns were included.

Works of **Sir Flinders Petrie** (1853 – 1942) who is long been associated with Egyptian excavations are commendably provide a fresh and essential perspective in relation to how a site should be handled while excavating and what are the issues that need to be taken care. He raised his concerns about the way Mariette has conducted his excavation. He said, "Nothing was done, with any uniform plan, work commenced and left unfinished. No regard is paid to the future requirements of exploration and no civilized labor –saving appliances are used. It is sickening to see the rate at which everything is being destroyed, and the little regard paid to preservation". Thus, he enforced on a specific pre defined plan and specific strategy, for the sensitive handling of the site with all respect to its historicity and authenticity. The methods and techniques adopted in the present excavation should consider future exploration and other requirements. In 1883 Egypt Exploration Fund (later Egypt Exploration Society) was founded and W. M. Flinders Petrie became first field Director. He published two most important books one related to his excavations and one about the discipline. His book 'Ten years Digging in Egypt' was published in 1892 and in 1904 Methods and Aims in Archaeology was published. This book speaks about the challenges faced in the field and about the archaeologists who need to possess multidisciplinary skill to be effective in the field, passion for excavation with all due respect to the physical difficulties, labor management, importance of drawings, reporting and awareness of the required languages etc. He was certainly one of the founders of modern excavation. However, the contribution of Pitt Rivers was remarkable in this regard. Few even consider him as founder of modern excavation in Western Europe.

Pitt Rivers (1827 – 1900): Augustus Lane Fox who changed his name to Pitt Rivers, was a soldier in his early years. He had made few excavations before 1880 as Colonel Augustus Lane Fox, however his excavation after 1880 with the name of General Pitt Rivers are remarkably marked in the history of archaeology and its developments. He excavated many sites like woodcuts, Rotherley, Woodyates, Wor Barrow, Bokerly Dyke and Wansdyke. Considering limitation in resources at that early juncture he was still able to make his excavations a model of scientific excavations. He published a book on his excavations in four volumes between 1887 and 1898 entitled Excavations in Cramborne Chase. These volumes had in detail explanation of excavations. They also reveal his thought about the principles and practice of excavation.

3.8 LET US SUM UP

Interest in landscape and travel promoted the recognition and recording of ancient sites. Visits to sites, together with the habit of collecting ancient artifacts and works of art (antiquarianism), eventually led to deeper investigations (with the help of excavation) of early civilizations. The study of human origins stimulated profound thinking about concepts of time and forged lasting links between archaeology and the natural sciences, notably biology and geology. It also underlined the importance of being able to identify and interpret artifacts made by early humans. The word prehistory was invented in the nineteenth century to describe the long periods of human existence which has undocumented in historical source. It was revealed by newly developed archaeological methods. Later these methods were applied to the study of other fundamental phenomena such as the transition from hunting to farming and the origins of urbanism. Many sites discovered in the early beginnings were mostly by chance. Decipherment techniques as well as excavation methods and techniques were developed contributing to the growth of the discipline and to the growth of theories later from 20th century

This unit would have contributed to your understanding of roots from which archaeology emerged and its early beginnings. Roles played by different scholars and their work and views. Here, in this unit we learnt how some fundamental

principles and methods emerged and combined to form the modern discipline known as archaeology.

3.9 KEY WORDS

1. Greeks – The Greeks are an ethnic group native to Greece, Cyprus, Anatolia, Southern Italy and other regions.
2. Bronze Age – The Bronze Age in a time period characterized by the use of bronze, proto writing and other early features of urban civilization.

3.10 CHECK YOUR PROGRESS

1. Elucidate that Antiquarianism was the bare beginning of archaeology
2. Explain Three Age system and role played by the concept in the development of Archaeology
3. Explain role played by important antiquarians in the development of archaeology
4. Role played by anthropology and anthropologists in the development of archaeology as a discipline.
5. Briefly describe the important role played by Decipherment, Discovery of sites and excavation till the growth of archaeology till 19th century
6. Elucidate and detail the growth of archaeology as a discipline from its early beginning to the end of 19th century in Europe.

3.11 ANSWER TO CHECK YOUR PROGRESS

1. Answer to question No. 1 can be found under Section 3.2
2. Answer to question No. 2 can be found under Section 3.4
3. Answer to question No. 4 can be found under Section 3.2
4. Answer to question No. 5 can be found under Section 3.5
5. Answer to question No. 6 can be found under Section 3.6 and 3.7
6. Answer to question No. 7 can be found under Section 3.2 to 3.7

3.12 SUGGESTED READINGS

1. *An Introduction to Prehistoric Archaeology* (3rd Edition); Frank Hole & Robert F. Heizer (1973); Holt, Rinehart and Winston, Inc; USA
2. *Archaeology an Introduction* (4th Edition); Kevin Greene (2002); Routledge Publications; London
3. *The origins and Growth of Archaeology*; Glyn Daniel (1967); Penguin Books Ltd; Harmondsworth, England
4. *The Cambridge Illustrated History of Archaeology*; Bahn (1996); Cambridge University Press Pub; Cambridge

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UNIT-4 DEVELOPMENT OF ARCHAEOLOGY-2 (WITH SPECIAL REFERENCE TO EUROPE DURING 20TH CENTURY AND AFTER)

Structure

4.0 OBJECTIVES

The main objective of this unit is to know about the Development of Archaeology in Europe during 20th century and after.

- Excavations in Europe.
- Development of Archaeology in Europe during World War II and after.
- Political Map of Europe changed.
- How Marxist Countries influenced Archaeologist.

4.1 INTRODUCTION

Archaeology is the study of human activity in the past, primarily through the recovery and analysis of which includes artefacts, architecture, biofacts (also known as eco-facts) and cultural landscapes (the archaeological record). Because archaeology employs a wide range of different procedures, it can be considered to be both a science and humanity, and in the United States it is thought of as a branch of anthropology, although in Europe it is viewed as a separate discipline.

Archaeology studies human prehistory and history from the development of the first stone tools in eastern Africa 4 million years ago up until recent decades. It is of most importance for learning about prehistoric societies, when there are no written records for historians to study, making up over 99% of total human history, from the Paleolithic until the advent of literacy in any given society. Archaeology has various goals, which range from studying human evolution to cultural evolution and understanding culture history.

The discipline involves surveying, excavation and eventually analysis of data collected to learn more about the past. In broad scope, archaeology relies on cross-disciplinary research. It draws upon anthropology,history, art history, classics, ethnology, geology, linguistics, semiology, physics, information sciences, chemistry, statistics, paleoecology, paleozoology, paleoethnobotany, and paleobotany.

Archaeology developed out of antiquarianism in Europe during the 19th century, and has since become a discipline practiced across the world. Since its early development, various specific sub-disciplines of archaeology have developed, including maritime archaeology, feminist archaeology and archaeoastronomy, and numerous different scientific techniques have been developed to aid archaeological investigation.

Archaeology became a professional activity in the first half of the 20th Century, and it became possible to study archaeology as a subject in universities and even schools. By the end of the 20th century nearly all professional archaeologists, at least in developed countries, were graduates. Further adaptation and innovation in archaeology continued in this period, when maritime archaeology and urban archaeology became more prevalent and rescue archaeology was developed as a result of increasing commercial development.

4.2 EUROPEAN ARCHAEOLOGY

In the second half of the nineteenth century, prehistoric archaeology came into existence in Europe. Since then numerous excavations have been conducted, thousands of publications covering various topics have been published, and new theories and methods have been applied to archaeological research. From a small number of pioneering scholars the profession has grown to include the thousands of men and women who are responsible for the present standing of archaeology in Europe.

British archaeologists dominate histories written by Anglo-American scholars such as Glyn Daniel and Brian Fagan. Even in Tim Murray's (1999) Encyclopedia of Archaeology: "The Great Archaeologists". Out of 58 archaeologists, 21 are English and 14 are American. Only three Germans, Gustaf Kossinna (1858–1931), Heinrich Schliemann (1822–1990), and Johann Winckelmann (1717–1768), are included. The three volumes of Encyclopedia of Archaeology: History and Discovery by Tim Murray have short summaries about many archaeologists and the history of archaeology of most countries of this world.For the European archaeologists, the Czech archaeologist's Jan Filip

publication, the Enzyklopädisches Handbuchzur Ur- und Frühgeschichte Europas, contains a treasury of information about archaeologists and sites.

Scholars like Henri Breuil, V. Gordon Childe, Oscar Montelius 1843–1921, and Grahame Clark 1907–1995 whose fame rests on the pan-European achievements such as Clark's Prehistoric Europe: The Economic Basis, translated into several languages. It should be pointed out that the number of pan-European archaeologists is small. Unfortunately, there were no women operating at this level in the past. There are archaeologists, such as the French Paleolithic scholar François Bordes 1919–1981, who was famous for contributions to a specific archaeological period. Sir Arthur Evans 1851–1941 became famous by excavating the spectacular site of Knossos. Scholars from small countries or regional specialistsare seldom remembered beyond their homelands. Bohumil Soudský 1922–1976 in the Czech Republic, Vasile Pârvan 1882–1927 in Romania, Moritz Hoernes 1852–1917 in Austria, János Banner 1888–1981 in Hungary, MilojeVasi´c 1869–1956 in Serbia, Józef Kostrzewski 1885–1969 in Poland, V.A. Gorodtsov 1860–1945 in Russia, Albert E. van Giffen 1884–1973 in the Netherlands, Michael J. O'Kelly 1915–1982 in Ireland, Gerovon Merhart 1886–1959 in Germany, Sophus Müller 1846–1934 in Denmark, André Leroi-Gourhan 1911–1986 in France, Richard Indreko 1900–1961 in Estonia, Vikenty Khvoika 1850–1914 in Ukraine, Hasan Ceka 1900–1998 in Albania, Christos Tsountas 1857–1934 in Greece, Josip Korošec 1909–1966 in Slovenia, and Jonas Puzinas 1905–1978 in Lithuania are all considered outstanding figures in their own countries, but not across, or outside Europe.

4.2.1 Impact on Archaeology

Large and rich European countries have much more impact on archaeology than poor, especially small countries. Neustupný 1997–1998 wrote an interesting article about mainstream and minority communities in European archaeology. These communities are mainly based on modern state boundaries. Archaeological power and influence lies with the mainstream communities. "It is difficult to imagine how an archaeological community in a country with several million inhabitants and a poor economy could flourish". Neustupný suggests that "Britain

houses a mainstream community, the Czech Republic a minority community, and that Polish archaeology is heading towards mainstream status." It is not only language problems, that is publishing in Albanian, Bulgarian, Estonian, Finnish, Hungarian, Latvian, Lithuanian, Portuguese, Romanian,Serbian, Slovakian, Slovenian etc., that hinder the impact of archaeologists from minority communities.Even if they publish in English, French, or German, their theoretical and methodological contributions are ignored, in favour of factual information. For all its talk about science and theory, archaeology is still very geographically compartmentalized, unlike chemistry or physics.

The theoretical trends and various interpretations of the European past cannot be separated from the historical events that have played such important roles in influencing or even determining the direction of the field in the twentieth century. Archaeologists were involved as volunteers or conscripts in wars of the twentieth century, R.E.M. Wheeler being the best known British example. Memoirs, biographies, obituaries, archive documents, and histories of national archaeologies reflect the vast diversity of interpretations of the events that affected their lives and their profession. And as the time goes by, the various developments in European archaeology are being reinterpreted and rewritten the past and the role that archaeologists played in creating it keep changing. As Stanisław Tabaczynski has stated, "Archaeologists have always acted within society and for a society. The differences of cultural traditions as well as the changing political situations of these societies had and continue to have no small effect on the investigation of their ancient and more recent past."

The 1930's in Europe can be referred to as the age of dictators; by the mid-1930s there were 18 dictatorships in Europe. Czechoslovakia remained the only democracy in central and eastern Europe until its dismembering by Nazi Germany in 1938. It was ideal periods for archaeologiststo advance themselves via ideology. Fascist scholars took advantage of the political climate in Germany and Italy to gain great influence over the study of the past. In Italy, Mussolini was dreaming of recreating the boundaries of the RomanEmpire, thus hoping to expand the territory of Italy in the Balkans and Africa. It should be no surprise that classical archaeology played a dominant role in Italy during the Fascist period. After

Franco's victory in the Spanish Civil War in 1939, the Falangist archaeologists such as Julio Martinez Santa–Olalla (1905–1972), obtained powerful positions within the scholarly institutions in Spain.

4.2.2 Excavations in Europe

Glyn Daniel has pointed out that "without excavation there could be no systematic development of the subject that is archaeology, and from the 1920 up to 1939, numerous major excavations were conducted in various countries. The amount of archaeological data generated by European archaeologists in the interwar period is impressive and in this short historical overview, I can give only a few examples. Miloje Vasi´c conducted excavations at Vinˇca in the former Yugoslavia. Józef Kostrzewski 1936 excavated the Iron Age fortified settlement of Biskupin in Poland. Danuta Piotrowska 1997–1998 wrote an interesting article on how Biskupin became entangled in the Polish and German nationalistic conflicts in the late 1930 and the early 1940.Werner Buttler and Waldemar Haberey 1936 dug the Linear Pottery settlement of Köln-Lindenthal in Germany. Mortimer Wheeler 1943 excavated the Iron Age hill fort at Maiden Castlein England and he used innovative field techniques such as the grid system.

4.2.3 Development of Archaeology in Europe during World War II

Before World War II, German archaeology and the German language in publications were very influential in continental Europe. Many central and southeastern European archaeologists received their academic training at German universities. German archaeologists contributed to the foundations of European "archaeology as a discipline by developing methods of chronology, artefact analysis and excavation". Prehistorians, such as Gustaf Kossinna 1858–1931, Hans Jürgen Eggers 1906–1974, Carl Schuchhardt 1859–1943, Ernst Wahle 1889–1981, and Paul Reinecke 1872–1958 were frequently cited by archaeologists in the Netherlands, Hungary, Poland,Romania, Denmark, Spain, Sweden, Latvia, and elsewhere. If you had asked European archaeologists in 1930 who were the five greatest living prehistorians, Kossinna's name would have figured prominently.

Even V. Gordon Childe respected Kossinna for his scholarly achievements in archaeology. “The early publications of Vere Gordon Childe, for example, reveal the strong influence of Kossinna’s methodology”.

At the end of World War II, however, most archaeologists wanted to forget him as an embarrassment to our profession. “In Germany, both West and East, Kossinna seemed to have vanished in to thin air”. His racist and nationalistic views had been embraced by Nazi Germany. Throughout his life he had emphasized the greatness of Germans in the past, although he died in1931 before Hitler came to power in 1933. Daniel’s book, A Hundred Years of Archaeology, only briefly refers to him; he is not even included in the index. Kossinna thorugh he was nationalistic and racist though he was, contributed notably to the development of European archaeology, and should be credited with the definition of archaeological cultures, cartography (mapping ofarchaeological cultures), and cultural historical studies. Kossinna’s definition of archaeological cultures was refined by V.G. Childe. Through his “settlement archaeology” method (siedlungs-archäologische method) he tried to give ethnicity an archaeological form, arguing that the Milisauskas distribution of distinctive artifact types can reflect cultural provinces, which in turn can be associated with the settlement areas of ethnic groups. Though now discredited, this approach was used in the Soviet Union in the 1950 and 1960.

4.2.4 Traditional Archaeology

Traditional archaeology, that is culture history, dominated the pre-World War II Europe. In the USA, traditional archaeology is referred to as the culture-history mode. At the end of World War I as the great empires of Austro-Hungary, Germany, and Russia collapsed, the previously suppressed nationalities, Croats, Slovenes, Finns, Poles, Lithuanians, Czechs, Slovaks, Latvians, and Estonians could finally write their own prehistories and histories. Various territorial and boundary problems in Germany, Poland, and Hungary inspired higher levels of nationalism. Some archaeologists, as defenders of national interests, became involved in these disputes. For example, Józef Kostrzewski defended Poland’s territorial rights against Kossinna’s Germanic expansionism. Kostrzewski had

received his doctorate under Kossinna in Berlin and he used his teacher's methods to define Slavic territories in the past. The association of archaeological cultures with specific ethnic groups in prehistoric times is, of course, problematic, but in the early twentieth century "One of the prime functions of archaeology was to provide a history for the regions now occupied by modern states, more the better if it could provide information confirming the antiquity and glorious past of the nation currently living there".

After the Bolshevik Revolution in 1917, most Russian archaeologists continued their research under the traditional mode. However, it would be a mistake to classify the pre-1930 Russian archaeology as being only empiricist. There were different "schools" of archaeology, Historical Observations on European Archaeology such as the Gorodtsov and the paleoethnological schools. In 1928 the first Five Year Plan was imposed on the country and scholarly disciplines were likewise harnessed to the communist party's goals. V.I.Ravdonikas' publication, Zamarksistskuyuistoriya material'noikul'tury (For a Marxist history of material culture), signaled that from then on only Marxism would be accepted as the dogma guiding Soviet archaeology. He criticized the empiricism of the "old" archaeologists and tried to discredit Russian archaeology before the 1930s. Platonova stresses that many western archaeologists have accepted Ravdonikas' distorted history of Russian archaeology before the 1930s.Between late 1929 and 1933 many archaeologists were dismissed, exiled to Siberia, or shot. Tikhonov diplomatically states that "almost all researchers were repressed at the St Petersburg University." A new cadre of young archaeologists came to power to dominate Soviet archaeology. As Tallgren wrote after visiting the Soviet Union in 1935, "How rich humanity must be, if it can dispense with such good men! Not all these people have lost their lives, but they have been deported." It should be pointed out that many Soviet archaeologists were doing empirical archaeology by the 1950s and 1960s as their predecessors did in the 1920s.

4.2.5 Impact of World War II

World War II had a devastating effect on many archaeologists, sites, museums, collections, and libraries. In the discipline, as in so much else, 1939–

1945 was Europe's new Dark Age. Destruction of various institutions and killing of archaeologists greatly affected many European countries. German archaeologists died on eastern and western fronts. Werner Buttler died in France in 1940, Ernst Petersen and Walter Kersten on the eastern front. Some Polish archaeologists were shot by the Germans. Scholars fled the occupations of their homelands by the Germans or the Soviets. Latvian archaeologist Francis Balodis and Estonian prehistorian Richard Indreko left their countries for Sweden. Lithuanian archaeologists Jonas Puzinas and Marija Gimbutas moved to the USA. The Polish archaeologist Tadeusz Sulimirski escaped to England as did Gerhard Bersu, to avoid anti-semitic persecution in Nazi Germany. Bersu returned to Germany at the end of World War II and again became in 1950 the Director of the Römisch-Germanischen Kommission in Frankfurt. The Spanish CivilWar (1936–1939) drove archaeologists such as P. Bosch-Gimperato Mexico to escape Franco's fascist regime.

The murder of millions on account of their ethnicity, religion, or ideology during World War II had a major impact on archaeological interpretations in Western Europe. To forget this great human tragedy, many archaeologists tried to ignore the role of warfare in culture change. Ethnic and linguistic interpretations of archaeological data became unfashionable.

4.2.6 After the World War II

At the end of World War II some countries, such as Germany, Poland, Czechoslovakia, the Soviet Union, Romania and Italy, received new boundaries. The borders of the less fortunate, like the Baltic countries, simply vanished. These boundary changes drove out floods of refugees, who abruptly found they had the wrong ethnicities in the wrong geographies. Some Polish archaeologists had to leave Lwów (present day L'viv in Ukraine) to the post-1945 Poland. Changes in place names occurred with bewildering speed. For example, German site names in former East Prussia (atpresent the Kaliningrad district of Russia) were changed to Russian. The famous Zedmar site became Serov as Zedmar disappeared from the map.

After the World War II, Europe was divided into two major ideological blocks. The Soviet Union and its satellites, and the western democracies. Spain and Portugal remained the right wing dictatorships until the 1970s. Marxism was imposed as the official state ideology on scholarly fields including archaeology in Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, Yugoslaviaand Albania broke away from the Soviet Union's domination and practiced their own brands of Milisauskas Marxism. This does not mean that non-Marxist approaches in archaeology disappeared in Poland, Hungary, and other countries. True, the Stalinist period (1948–1955) offered little leeway in archaeological interpretation. This is well illustrated by Jacek Lech's translated passage from W. Antoniewicz and Z. Wartołowska's article in Polish about the aims of archaeology during the Stalinist period. "Archaeology, therefore, in accordance with J. Stalin's guiding principles for historical sciences, is concerned with the essential problem of the development of primitive, ancient and early class societies, learning about the history of the producers of material goods, the history of the working masses, the history of peoples". Karl-Heinz Otto and Joachim Herrmann, the leading communist pre-historians in East Germany, championed this approach in archaeological research and produced many publications.However, most of their East German colleagues continued to do culture-history, irrespective of Otto'sand Herrmann's push for the Marxist-oriented research.

4.2.7 Post World War II

In the post-World War II period, most archaeologists in Europe, including the communist countries, continued to do what they had always been doing, culture-history, or traditional or continental archaeology. Very few European archaeologists looked at archaeological developments from the perspective of the entire continent. Most were regional or local specialists in the prehistory of their own country or region.

After 1950 radiocarbon dating had a great impact on the chronologies of various prehistoric cultures.Dates for innovations such as the origins of metallurgy, wheeled vehicles, and monumental structures became easier. V.G. Childe's book

‘Dawn of European Civilization’ still used the short pre-14C method if finding the chronology; for example the test suggested that the Neolithic age started after 3,000 BC in central Europe, radio carbon dating carbon method located the earliest farmers around 5,600 BC. Thus in central Europe the Neolithic(including the Copper Age) lasted over 3,000 years. Renfrew, using radiocarbon dates, demonstrated that megalithic monuments in Europe were earlier than the monumental architecture of Near East. At present, accelerated mass spectrometry (AMS) dating is yielding much finer chronologies.Bone chemistry studies, aerial reconnaissance, and remote sensing techniques have increased our knowledge of the past. Archaeozoology and archaeo-botany have become much more common in field projects. Since the 1980s molecular genetics research has made an impact on our understanding of past European populations.

Many major archaeological discoveries were made in the post-World War II period are the cave art at Chauvet in France, the Copper Age cemetery of Varna in Bulgaria, the megalithic passage grave of Barnenez in Brittany, France, the Hochdorf burial in Germany dated to the mid-sixth century BC, and the Iron Age spectacular burial mound of Vix in France. Two German hikers in the Tyrolean Alps found the frozen body of the Copper Ageman, the Iceman or Ötzi, in 1991.

As in many other scholarly disciplines, women were under-represented in archaeology for many years. Since the 1950s we have many more women archaeologists and they have made significant contributions to European archaeology. A few examples follow: Ella Kivikoski 1901–1990 of Finland, Ida Bognár-Kutzián 1918–2001 of Hungary, Zofia Podkowi´nska 1894–1975 of Poland, Tat’jana Sergeevna Passek 1903–1968 of Russia, Regina Volkait˙e-Kulikauskien˙e 1916–2007 of Lithuania, Aleksandra Mano 1924–2005 of Albania and Patricia Phillips 1935–1999 of England. It is still not easy for women to attain the top positions in archaeological institutions, men continue to dominate the field in most countries. There are some positive examples such as Norway, where in the 1990s out of 11 professors of archaeology, five were women.

As pointed out by John Bintliff about Anglo-American archaeology, “Since the late1950s the discipline has been rent by endless academic disputes about the

ways we should think about the past and its material remains, and how to make deeper sense of earlier societies." During the late1960 and 1970, processual archaeology or the "scientific anthropology of the past" has been championed by Americans like Lewis Binford and some British like David Clarke 1936–1976. Clarke's publication on the Analytical Archaeology had a major impact on some British and Scandinavian archaeologists. Processual archaeologists attempt to explain how and why culture change occurs.There is much greater emphasis on long-term processes in the past.

4.2.8 After 1980 European Archaeology Developed

After 1980, a counter movement, post-processual archaeology appeared in England and later in Scandinavia and other European countries. This embraces a diverse range of post-modern approaches, gender studies, emphasis of ideology and symbolism, Neo-Marxism, critical theory, and the importance of individuals in prehistory. Although processualist and post-processualist archaeologists disagree on many points, they concur that archaeological research should be theory driven.

The archaeological data remain constant in quality and quantity; only around it swirls a vast cloud of new and old interpretations or reinterpretations. This development is clearly illustrated by Paul Mellars (2009) as it relates to the famous Mesolithic site of Star Carr in England, "The repeated re-interpretations of the site have arguably served as a kind of barometer of the successive swings and fashions in archaeological interpretation over the past 50 years, ranging from the strongly ecological and 'functionalist' interpretations of Grahame Clark himself and the ensuing generation of equally ecologically functionally-oriented adherents of the 'new,' 'processual' archaeology in the 1960s and1970s, to the current wave of passionately anti-functionalist, 'post-processualist' approaches which has increasingly gripped the younger generations of prehistorians from the later 1980s onwards."

Archaeology borrows theoretical constructs from ethnology, evolutionary biology, the physical sciences, geography, literary criticism, history, sociology, philosophy, and cultural studies. France's Annales historical school has influenced

a number of archaeologists as have the ideas of French historians, sociologists, and philosophers, such as Fernand Braudel, Pierre Bourdieu, and Michel Foucault. The World Systems approach championed by the American sociologist Immanuel Wallerstein and the structuration theory and reflexity of the British sociologist Anthony Giddens have influenced European archaeologists. These competing theoretical approaches have had a greater impact on younger archaeologists, but most European scholars are still doing culture history.

4.2.9 Political Map of Europe Changed

The political map of Europe has changed drastically since 1989 and these changes have mostly been for the better in archaeology. Between 1989 and 1991 the Soviet Union collapsed, leading to the emergence or reemergence of numerous independent states, such as Armenia, Belarus, Estonia, Georgia, Latvia, Lithuania, and the Ukraine. Yugoslavia broke up into Bosnia-Herzegovina, Croatia, Macedonia, Slovenia, and the remainder of old Yugoslavia. Lately the former Yugoslavia totally disintegrated with the separation of Kosovo and Montenegro from Serbia, but not all European countries recognize Kosovo's independence. Now, we have the Czech Republic and Slovakia, instead of Czechoslovakia. East and West Germany have become a unified state. The disappearance of the Iron Curtain created novel opportunities for interaction and research that previously were not possible for most archaeologists. For the first time in many years, archaeologists and historians could write and express their honest views and interpretations in central and Eastern Europe without worrying about offending the guardians of a Marxist social utopia or state censors of books. Michelbertas (2001) has noted that during the Soviet times in Lithuania, any archaeologist professing processual or post-processual views would have been immediately fired from his or her job. The number of archaeologists increased greatly during the Marxist period in central and Western Europe and also in North America. There were 40 archaeologists in 1947 in Poland and approximately 550 archeaologists by 1996. We should not over emphasize the isolation of archaeologists in Marxist countries from the archaeologists in Western Europe. Although Soviet archaeologists had only little direct contact with the West, such was not the case for most satellite states. Polish archaeologists conducted or participated in archaeological projects in

Algeria, Egypt, France, Italy, and Spain. A study of citations by Ewa Krupic in the Polish archaeological journal Archeologia Polski between 1957 and 1975 indicates that numerous western European archaeologists were cited. A few American, Austrian, French, German, and British institutions conducted archaeological research in Marxist countries. Archaeological meetings organized by Polish, Czech, Slovak, Hungarian, and Bulgarian scholars brought western, central, and eastern Europeans together. For example, the conference on the Linear Pottery culture in 1981 at Nové Vozokany in Slovakia attracted scholars from Austria, East Germany, France, Hungary, the Netherlands, Poland, USA, West Germany, and former Czechoslovakia. There were some problems in obtaining western publications in the so-called socialist countries. However, archaeologists exchanged reprints and books and most European archaeological institutions continue to exchange their publications. By exchanging publications, the Institute of the History of Material Culture, Polish Academy of Sciences, "has built up an archaeological library that is among the best in Europe". Now, the internet is making, it much easier for archaeologists to exchange information, journals, site reports, and discussions.

A number of archaeologists from the former Marxist countries made significant contributions to method and theory in our discipline. Leo Klejn of Russia, Evžen Neustupný of the former Czechoslovakia, and Stanisław Tabaczynski of Poland made contributions to the theoretical debatesin archaeology. One of the earliest systematic regional settlement studies in Europe was carried out in the late 1960s by Janusz Kruk in the loess uplands of the Cracow region in Poland.He examined the relationship of Neolithic sites to different ecological zones in a specific region nd studied changes in land and resource utilization through time. Sergej Semenov, a Russian scholar, pioneered use-wear studies of stone tools that clarified their function in the past. David Anthony mentions that Efremov of Russia developed taphonomy. The Czech Bohumil Soudský carried out large-scale horizontal exposures using earth moving Historical Observations on European Archaeology 15 equipment at Bylany and was one of the first archaeologists to use computers for the recording of ceramics. Several distinguished archaeologists, such as Jean-Paul Demoule, Jan Lichardus, Ivan Pavlu, and Ruth Tringham, received training in field techniques at Soudský's

excavations. Hungarian and Polish archaeologists have carried out ambitious national surveys (Magyarország Régészeti Topográfia – Archaeological Topography of Hungary, Archaeological Map of Poland –Archaeologiczne Zdjecie Polski) trying to record all archaeological sites in their countries. The Polish national survey of sites began in 1978. Hungarian archaeologists conducted micro regional research programs. The spectacular excavations of theMiddle and Upper Paleolithic sites by Russian and Ukrainian archaeologists made our field much richer.

R. Chapman has suggested that since the death of right-wing dictators, Francoand Salazar, Portuguese and Spanish archaeologists should not simply follow the latest theoretical and methodological trends from the English-speaking world. The same might be said of central and eastern European archaeologists. Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, and Ukraine have their own archaeological traditions. The social, cultural, and political conditions were different for archaeology's development in central and Eastern Europe. The Slovenian archaeologist Predrag Novakovic has pointed out that "Archaeology in central and eastern Europe was, in general much more historical in its approach,simply because this was expected from it in the conditions of continuous competition between nations, religions and states until the mid-20th century, and much of this legacy has pervaded in recent times as well." It would be a mistake to replicate the processual and post-processual debate, by now quite sterile, that dominated Anglo-American and Scandinavian archaeology during the last three decades.

4.2.10 Marxist Countries Influenced Archaeologist

Since the collapse of the Iron Curtain, the former Marxist countries are increasingly influenced by Western intellectual trends including archaeology. Lewis Binford and Ian Hodder became familiar names among the younger archaeologists. For example, Hodder's (1986) Reading the Past was even translated into Lithuanian. Renfrew and Bahn's excellent book Archaeology: Theory, Methods, and Practice has been translated into some 30 languages. As long as local archaeologists do not abandon their research and just try to imitate

some western pre-historians, the pan-European influences of Anglo-American archaeologists can have positive results.They can benefit from the delayed exposure to processual and post-processual archaeology as shown by developments in Spain.

Since the late 1990 the eastern and central European countries that were admitted to the EuropeanUnion benefited from large sums of money allocated for highway construction. These funds benefited archaeology and numerous archaeologists got involved in the "highway archaeology," what we in North America call cultural resource management (CRM). A number of very successful archaeological projects were carried out in Hungary, eastern Germany, Poland, and other countries.

During the last 25 years, there has been an emphasis on archaeological conservation or heritage management in Europe. This type of archaeology tries to preserve the remains of the past cultures, but at the same time focuses "on historical origins and local histories within the framework of national history". The local political authorities are in favor of the heritage archaeology since it helps the economy and attracts tourists. The majority of jobs in archaeology are in the heritage.

The disintegration of Yugoslavia in the 1990s unleashed nationalistic conflicts that led to the destruction or damage of archaeological heritage in Bosnia-Herzegovina, Croatia, Kosovo, and Serbia. It was difficult to imagine for many westerners that extreme nationalism was still alive in parts of Europe.

4.2.11 European Association

In the early 1990s the European Association of Archaeologists (EAA) was formed. Some of the aims of this organization include the promotion of archaeological research and the promotion of managementand interpretation of the European archaeological heritage. The official language of the EAA is English. Every year it holds meetings and publishes the European Journal of Archaeology. There are approximately 20,000 archaeologists in Europe, but roughly only 1,000

(5%) belong to the EAA. All organizations have hierarchies of membership, English, German, and Scandinavian archaeologists tend to dominate the EAA.

The language issue in European archaeology was discussed by numerous scholars. Recently Harding sensibly discussed the positive and negative implications of English as a lingua franca in European archaeology. Some archaeologists, such as Bernbeck, are very negative about the dominant role that the English language plays in our discipline. He argues that English forces were "non-Anglo" archaeologists "into a pattern of valuations in which the Anglo-American preference for theory over other archaeological concerns reigns supreme".

We need one or two languages for communication among the thousands of archaeologists of various nationalities. Presently English is the dominant language in scientific fields, thus it is not surprising that it became the most commonly used language by archaeologists. Before World War II German was the dominant language in central, eastern, and northern Europe, but its importance has decreased since 1945. Ideally English, French, and German could be the three official languages, but since most young Europeans study English as the first foreign language, the three-language solution is unrealistic. European 15–24-year-olds "are five times more likely to speak English as a foreign language than either German or French" according to a Eurobarometer survey. If archaeologists want to reach a wider audience in the first decade of the twenty first century they need to publish in English. If there is a choice for archaeologists to publish in German or English, they should choose English. Almost all German archaeologists know English, but only a small percentage of the Anglo-American archaeologists know German. Great ideas can be published in Estonian or Albanian, but at best only a few archaeologists know those languages. Even Slavic languages are known only by a small number of archaeologists in Western Europe. Venclová described how Czech archaeologists deal with a language problem for a wider audience. "English is currently used by the Czechs in international communication in contributions on theory, informatics, spatial and landscape archaeology, and of course, bioarchaeology, partly even in medieval or post-medieval archaeology. For other

fields, German is traditional and quite common and French may be used for some aspects of Iron Age archaeology." Naturally, Czech is used in many publications.

4.3 LET US SUM UP

Since the 1960 over 130 Americans have conducted archaeological research in Europe and they have generally had a positive impact. Americans usually do not conduct research within the framework of national archaeologies in Europe. They are aware of national archaeologies, but frequently apply research models from other continents or regions such as Africa or Mesoamerica. Americans are active participants in various archaeological conferences in Europe and most of them belong to the European Association of Archaeologists.

We can assume that in the future the new generation of archaeologists will be more pan-European in their outlook. There will be much more cooperation and interaction among archaeologists. At present European Union is supporting heritage studies with large sums of money. The generosity of the European Union will probably decrease toward archaeology in the future.

Hopefully, the European archaeological community will remain multi-vocal and national, and regional traditions will not disappear in the future. Thus, they will continue to be different versions of the European past, only in a totalitarian system can there be one version. This is clearly expressed by a Latvian archaeologist Sne "The past gets its meaning in our interpretations of it, so it is upto us to create pasts, not the past." European archaeology is entering its golden age in the twenty-first century, archaeology can be practiced at local, national, and international levels. With the passage of time, the extreme nationalisms and vulgar Marxism will be just a distant memory.

4.4 KEY WORDS

1. Prehistoric – It refers to the period of human existence before the availability of those written records.

2. Geology – is an earth Science comprising the study of solid Earth and the rocks of which it is composed.

4.5 CHECK YOUR PROGRESS

1. Explain briefly the development of Archaeology in Europe during 20th Century.

4.6 ANSWER TO CHECK YOUR PROGRESS

1. 4.2

4.7 SUGGESTED READINGS

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2. Clarke, D.L, Analytical Archaeology, London, 1968.
3. Kristiansen, K, Archaeology of Europe, 2008.

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BLOCK – 2: HSTORY OF ARCHAEOLOGY IN INDIA

UNIT-5 DEVELOPMENT OF ARCHAEOLOGY IN INDIA UPTO 1947

Structure

5.0 OBJECTIVES

After studying this unit you should be able to,

- Describe history and early aspects of development of Archaeology.
- Understand development during Islamic rule.
- Know the contributions of Britishers.
- Know the origin and development of Archaeology.
- Explain about the origin and development till 1947.

5.1 INTRODUCTION

The studies in Archaeology is a new subject and constantly its grown from stage to stage. Archaeology is not like any other traditional subjects or social sciences or science subjects. It is a new branch of a study taken into a great shape from time to time. In India plenty of new objects which have been prepared by human beings for his daily use were hidden inside the earth and those things accidentally came out and such things created curiosity in the minds of the people about the objects of the people about 250 to 300 years back. It became so interesting in the minds of Britishers who were ruling us during those time, particularly the military officers and geologists took special interest in collecting them and making a study to know more about those artifacts. This curiosity to know more about the artifacts of India which have been prepared by our own ancient people. Because of this curiosity about our precious artifacts of ancient India particularly the prehistoric and early historic artifacts and unknown structures the new subject Archaeology have taken birth in India, I can say it is just because of Britishers, This way in India the birth of subject Archaeology took place.

In India the study of scientific Archaeology is completely a modern development but at the same time the treasure was a very old practice in the country like India. The curiosity to know about the past and its remains can be traced back to the classical times. The Greeks were very much interested in the problem of origin and development of man. They tried to know about the ancient civilizations of the Egyptians and Persians. A scientific research on the evolution

of man proposed by Charles Darwin and his theory of 'origin of species' emphasized the long past of man and also the idea of human evolution. Some very important new developments were taken place which had their impact on the concept and technique of Archaeology. The development of scientific Archaeology has been rightly attributed to the three such development i.e., (i) geological revolution, (ii) an antiquarian revolution and (iii) the doctrine of evolution. This is the opinion of Glyn Daniel.

5.2 DEVELOPMENT OF STUDIES IN ARCHAEOLOGY

In the development of studies in Archaeology the C.J. Thomson's contribution is very important. In 1836 he established the 'Three Age System' in the classification and the study of artifact in the Danish National Museum. Thomson grouped the artifacts on the basis of the three successive ages of Stone, Bronze and Iron; I think this is the first of its kind in the development of study of the development of Archaeology. After this his successor Worsae showed the correctness of the classification by stratigraphical evidence found in the Danish Peat Bogs and Barrows. The excavations in the Swiss lake dwellings conformed the succession of technological stages. This is termed as 'Antiquaraian Revolution' by Glyn Daniel. This concept of new development in the studies of Archaeology in the form of three age system is flourished well and made further advances. In the second half of the 19th century, the study of prehistory made rapid progress all over the World. During this period very important Paleolithic sites were discovered in France and Spain including La Madeleine, Le Mouster and also the cave painting at the famous sites of Altamira of Spain and Les Eyzies in France and also at Lascaux. In 1865 John Lubbock wrote his book 'Prehistoric Times' and in which he subdivided the stone age, which was suggested by C.J. Thomsen in 1936, into old stone age and new stone age and which was called as Paleolithic and Neolithic periods.

5.3 IMPORTANT ASPECTS OF EARLY ARCHAEOLOGY

In 1853 to 1942, an Englishman Sir Flinders Petrie did Yeoman Service to Egyptology as well as to the techniques of field Archaeology. He was hardworking good researcher and emphasized on four important aspects of Archaeology, they are,

1. Care of monuments
2. Care of excavation and collection and description of everything found
3. Accurate planning of excavations
4. Publication of the results

He also explained all these things with detail in this classic book titled as 'Methods of Aims in Archaeology'. He was one of the first few to appreciate the value of pottery for chronological purposes. Sir Flinders developed the technique known as 'sequence dating'. It is a form of seriation by which he could give relative dating for materials which were entirely undated.

According to Glyn Daniel, the last quarter of the 19th century 'Archaeology came to Age' and its essential techniques had taken shape. The foundations of modern scientific Archaeology were securely laid which were later developed and improved in the 20th century. The study of Archaeological works has developed into a well organized and systematized discipline with tremendous improvement in quality, quantity and methodology.

5.4 EARLY INFORMATION ABOUT INDIAN ARCHAEOLOGY

In India, as we all know and I have already discussed that the knowledge and development of Archaeology has taken place just because of British and their interest in Indian antiquities and structures. Though, there are thousands of Archaeological evidences are available in this country no Indian have done any serious attempt to know, study documentation or at least collecting them for their curiosity. It is difficult to find the answer for this question. Some of the written documents of the ancient times are considered as self-centered, because of the

kings and their own people documented the historical events to praise their kings and get some benefit out of that. But, in reality only one Indian has made an attempt to record the historical events properly by Kalhana in the 11th century A.D. This Kalhana from Kashmir made a sincere attempt to document properly about his contemporary history and he has been considered as historian. He collected some very important primary source material like coins, inscriptions and antiquities and proved that these essential materials are useful for writing the history. He has visited many ancient sties and also monuments to collect first hand information about the history and Archaeology of that place. His 'Raja Tharangini' is the result of his research in this field and was appreciated by everyone. But, when there was no proper written document available he also depended on folkloristic information to complete his book. Unfortunately after Kalhana till 18th century no Indian has made any attempt to make documentation of our own history.

5.5 DEVELOPMENT OF ARCHAEOLOGY DURING ISLAMIC RULE

Even after the entry of Islamic rulers to our country the same condition continued. Most of the good historians with best knowledge and historic sense were also failed to make the study of Indian Archaeology and they have not shown any interest in studying antiquities, structures, inscriptions and coins. The greatest Islamic historian Al-beruni also depended on literature of India for writing his books on Indian history and not depended or studied any antiquity for his writings. It indicates that Al-beruni also not interested in Indian antiquarianism. The Firoz Shah Thuglaq, the Islamic ruler in India has shown great interest in shifting Ashokan Monolithic pillars of Meerut and Thopra to Delhi but not with the interest of knowing antiquity to them. According to the historian Shamash-E-Siraajan, Firoz Sha have taken these monolithic pillars to Delhi as war victory Monuments and not for the study purpose out of many Islamic historians only Abul Fazal who wrote Iaan-E-Akbari has shown some interest in Indian monument and ancient sites and made some documentations.

5.6 DEVELOPMENT DURING BRITISH PERIOD

In European countries during Renaissance time the interest in the antiquarianism made them to study and record their own ancient culture in a proper way. Whereas this kind of interest was not there in Indian historians. Though there was plenty of antiquities and structures in India, there was no interest in the minds of Indian historians: Only at the end of 18th century A.D., after the invasion of Europeans in India, a kind of simulative instinction has started in the country. From the time of Macropolo many foreign ambassadors and historians visited India and documented large number of Indian antiquities and monuments. It attracted good number of foreign travelers and historians to this country. Nicholo Konti in 1416 to 1444 wrote on the glorious history of Vijayanagar dynasty, Nickithin in 1468, Vartham in 1503 to 1508, Doearth Boarbosa and others also wrote about Indian history and Archaeology. But Raalfapitch and Tavarniyar worte about the glorious history of Bijapur. Similarly Mithington, Tom Koryath in 1612 to 1617 wrote and beautifully explained about Delhi and Agra. Many of the rock cut architecture were not noticed by any of the historians for many years. But Thavanaat wrote about Ellora Rock cut architecture, Neebar Freyar and Hemilton also wrote about Fliphanta caves. Similarly many others also traveled all over the country and wrote about many cities, forts, temples, sculptures and other important historical structures and also prepared ground plans and made sketches.

5.6.1 Sir William Jones

In the last quarter of the 18th century, the officers of the British East India Company began to take interest in the antiquarian wealth of India. In 1784 under the initiative and guidance of Sir Willian Jones, a Judge of the Supreme Court and a great linguistic genius the Asiatic Society was started in Calcutta for ‘enquiring into history, the antiquities, arts, science and literatures of Asia’. Jones found in Charles Wilkins (1749-1836) a Kindred soul who had a good knowledge of Sanskrit and passion for Indian classics. Both of them had the blessings of the Governor General of Calcutta, the Warren Hastings. The establishment of ‘Asiatic Society’ and the publication of its journal ‘Asiatic Researchers’ in 1788 gave a

fillip to Indological studies. Sir William Jones and Wilkins Jointly translated several Indian classics like the Bhagavad Gita, Hitopadesa and Sakuntala into English. In the beginning their interests were mainly on literature. These translations served as the first steps in revealing India's past to the outer World. Archaeological works was indeed limited to the preparation of notes on monuments which were rather unscientific. But the Charles Wilkin's work proved important and provided the key to the decipherment of Gupta script. H.H. Wilson have done explorations Francis Buchanan in Bengal, Mysore and Afghanistan brought to light many interesting finds like temples, coins, etc, Many surveyors of East India Company brought reports on temples, caves and inscriptions.

5.6.2 James Fergusson and James Prinsep

Another important person in British India is Mr. James Fergusson who conducted an extensive survey for more than eighteen years from 1829 to 1847. He surveyed architectural important structures in India, inscriptions and visited some caves and systematically classified these monuments. It was a remarkable development which remains even today as classical example. Another important and interesting development had taken place in 1838 James Prinsep, a gifted amateur deciphered the Brahmi script in which Ashokan edicts were written. This became very important Archaeological discovery and helped for the historical and epigraphical studies in India and provided a sheet anchor for anchor for Indian chronology. H.J. Wells, in his book "An outline of Indian history", says, this decipherment of Brahmi helped us to know more about real Ashoka, which was not known to historians of the World for many years.

5.6.3 Alexander Cunningham (1861)

Alexander Cunningham was an army engineer who worked in his spare time with James Prinsep in the decipherment of Brahmi script. He took up keen interest in the study of ancient monuments and sites of India. He has been called as the father of Indian Archaeology. The works of Cunningham has impressed the Governor General, the Lord Canning and explained about the systematic

exploration of Indian Archaeology. Accordingly, Lord Canning, in 1861 established the Archaeological survey of India with Cunningham as the Archaeological surveyor. He took up the work with single minded devotion and abiding interest and surveyed an extensive area in north and eastern India. He followed the accounts of the foreign travelers like Fa-Hien and Hiuen Tsang tried to identify the ancient routes and places. He and his surveyors visited many monuments and remains and published reports with photographs and drawings. He identified many cities and sacred places of ancient India such as the city Taxila, fortress of Sangala, Sankisa, Sravasti, Kausambi, all intimately connected with Buddha, the Great stupa of Barhut, the inscription of Ashoka and the new rock edicts in Bactrian characters. His publications and bulletins stand as testimony to his untiring efforts, dedication and respect, for Indian cultural heritage. Accordingly to Prof. A.L. Basham "after Sir William Jones, Indology owes more to General Sir Alexander Cunningham than any other worker in the field".

5.6.4 J.F. Fleet and Hultzsch

Both have done good work and because of their hard work and important contribution they have been called as pioneers. In 1883 John Faithful Fleet was appointed as Government Epigraphist. He worked in South India published many inscriptions and Ballades. Hultzsch se rved as the Epigraphist for South Indian inscription. He was well versed in Sanskrit, Pali and Dravidian languages. Both of them did remarkable job in bringing to light valuable inscriptions and publishing them with their proper scholarly notes.

5.6.5 Meadows Taylor

Meadows Taylor was an administrator and was in service of the Nizam of Hyderabad. He was known for adopting scientific methods in his Archaeological work and he was also known by his famous work, 'The Confessions of a Thug'. He excavated a number of megalithic burials of Central and Southern India and also Maha Chaitya at Amaravathi with meticulous care for details which he recorded and published in the journal of the Bombay Branch of Royal Asiatic Society in

1951 and Antiquities in 1862. Sir Mortimer Wheeler has rightly said 'Meadows Taylor was the first man, so far as I know, has the true quality of an excavator and recorder. His works show an acuteness of perception and technical competence for advance of the time. His achievements stand out as a land mark in the annals of Archaeology'.

5.6.6 Robert Bruce Foote

Robert Bruce Foote served in the Geological survey of India from 1858 to 1891 and spent a good part of his service in the Madras Presidency working with William King and after retirement worked in Baroda and in Mysore state. He did a remarkable pioneering work in Prehistoric Archaeology and Proto-historic Archaeology of India. He is known as 'Father of Indian Prehistory'. He made very good contributions to the study of geology of peninsular India and took keen interest in Archaeology and was looking for traces of early man. For the first time in Indian Archaeology he discovered Paleolithic hand-axe at Pallavaram near Madras in 1863. More than 43 years he explored different parts in South India and discovered hundreds of Paleolithic, Neolithic, Megalithic sites and thousands of antiquities have been deposited in the Madras Museum. He published two volumes on his collections in 1914. The Foote collections of 'Indian prehistoric and proto-historic Antiquities'. It is a remarkable publication continuing good number of photographs and drawings of the prehistoric tools, pottery, iron objects etc. with excellent descriptions. As a geologist, he had a good idea of stratigraphy and sequence of cultures.

5.6.7 James Burgess

James Bungess succeeded Alexander Cunningham in Archaeological Survey of India and made many important contributions. He started the publication of Indian Antiquary in 1872 and Epigraphia Indica Volumes. He published the results of his collaborate surveys in twenty monumental volumes entitled "Archaeological survey of India, New Imperial series". Even though he was not himself a trained

excavator, he insisted on professional control of excavation and took measures against indiscriminate digging in ancient Archaeological sites.

5.6.8 Lord Curzon

After the retirement of James Burgess, Archaeological research suffered a setback which was removed only after the arrival of Lord Curzon as the Viceroy of India from 1899 to 1905. Though, he was a tough officer, he had sympathetic attitude for the preservation of ancient cultural relics and Archaeological researches in India. He had a comprehensive view of the Archaeologists work. In his famous address to the Asiatic Society of Bengal in 1990, he observed, "It is equally our duty to dig and discover, to classify, reproduce and describe, to copy and decipher and cherish and Conserve". In other word, his programme includes explorations, excavations, research, epigraphy, publication and preservation of monuments. During his period, the Archaeological survey of India was reorganized and enlarged. A young Archaeologist, John Marshall, was appointed as the Director General of Archaeological Survey of India at the age of 26 years in 1902.

5.6.9 Sir John Marshall

He was appointed as youngest Director General of Archaeological Survey of India in 1902 and continued till 1928. During his service Archaeology was placed in permanent footing with defined policies to guide it. He declared and protected hundreds of monuments and sites and brought them under the newly enacted Ancient Monuments Preservation Act, 1904. Several new circle offices and branch offices were found, to look after the monuments. He gave much more importance to excavations and during his period, several Buddhist and other historical sites were excavated. They are Saranath, Rajgir, Sanchi, Sravasti, Kushinagar, Nalanda, Pataliputra and Taila. Remains of the Mauryan palace were discovered at Pataliputra and a fine town planning system under Indo-Parthians at Taxila. The important and extensive development in the Indian Archaeology is the discovery of the Indus-valley civilization at Harappa in Punjab state and Mohenja-Daro in Sind. The earlier works were done in these sites by Daya Ram Sahini and R.D. Banerjee

in 1921 and 1922 respectively. But these sites were extensively excavated by John Marshall, assisted by Hargreavs, K.N. Dikshit and M.S. Vats. The results of the excavations were published by him in three volumes, 'Mohenjo-Daro and the Indus civilization'. These discoveries are very important and created widespread interest in the field of Indian Archaeology and gave good encouragement to further work. Hargreaves extended the horizon of the Indus civilization into Sind, Baluchistan and sites like Chanchundro, Amri and Jhukar were excavated.

A distinguished British Archaeologist Sir Leonard Woolley was invited in 1939 to advice on the future policy on exploration and excavation. He criticized the excavation techniques as dated. He pointed out that the Indian Archaeologists had not kept in touch with the latest techniques adopted in Europe and America. According to him, there was very little attempt to establish sequence of cultures based on stratigraphy.

5.6.10 Sir Mortimer Wheeler

His full name is Robert Eric Mortimer Wheeler (REM Wheeler) and he was appointed as Director General of Archaeological Survey of India in 1944 and it was land mark in the history of Indian Archaeology. When he was in England, he developed a new scientific technique in Archaeological excavations which was practiced by Petrie and Pitt, Rivers and adopted new scientific Archaeological excavation techniques in Indian Archaeological excavations. That is why he has been called as 'Father of Indian Scientific Excavations'. He reorganized the Department of Archaeology and expanded its activities in several branches like excavations, Museums, Technical research etc. He trained team of young Archaeologists in modern methods of excavation and especially in conservation. For the first time in India he also invited the scholars from universities to participate in excavations. He conducted well planned scientific method of excavation at Taxila and Harappa in North West India and also at Arikamedu in Pondicherry and Chandravalli in Chitradurga district of Karnataka state. All these excavations produced good evidences and significant results and have been published in the form of reports which are models of precision and masterly interpretation. Another important achievement of Wheeler is the publication of

new series called as 'Ancient India' and 'Indian Archaeology' which continued to hold an important place among the Archaeological publications in India.

5.7 POINTS ON KARNATAKA ARCHAEOLOGY DEVELOPMENT

In the development of Indian Archaeology, Mysore State also holds a key part and it can be taken up for separate branch to know the growth and development of Mysore state Archaeological studies as well as the growth of state Archaeology department and the Museums. Very important contribution of B.L. Rice, M.H. Krishna, R. Narasimhachar and also Dr. Allchin for the growth of our state Archaeology before 1947 can be studied separately. So for whatever we have discussed here is useful to study and understand the growth and development of Indian Archaeology. Indian people may hate Britishers for so many reasons of their own. But for the introduction and development of the subject Archaeology and Archaeological survey of India, its early excavations, explorations, study of inscriptions, coins, monument, forts etc. have been systematically done by Britishers only. Their publications on excavation, reports writing and other things are the contribution of British scholars only. The growth and development of Archaeology in India is rightly divided into two that is from the beginning to 1947 and after 1947 onwards.

When we study the development of Archaeology from the beginning, the father of Indian prehistory, Robert Bruce Foote, the father of Indian Scientific excavation Robert Eric Mortimer Wheeler and Alexander Cunningham who took special interest in Archaelogy and with help of Lord Canning in 1st December, 1861 established Archaeological survey of India office. In February, 1871 he became first Director General of Archaeological Survey of India after coming back from England. He continued his survey and research as a Director General for 14 years and retired from the service in 1st October, 1885. His contribution for the growth and development for Indian Archaeology will be remembered for ever.

It is difficult to bring all the events happened in the development of Indian Archaeology from last 250 to 300 years period. Only important development and establishment of department of Archaeology and its branches is mentioned here. The establishment of department of Epigraphy, branches of chemical conservation and preservation and its Garden departments are actively working in the country for the better development of Archaeology. Students can refer the recommended books for their knowledge.

5.8 LET US SUM UP

This unit is very important to know the subject development of Indian Archaeology, its origin growth and development from the beginning till 1947. Some very important contribution from the Britishers to Indian Archaeology and Establishment of Archaeological Survey India by Alexander Cunningham (1861), the first Director General and the Lord Cunning, only few Indian scholars contributed for the development before 1947.

5.9 KEY WORDS

1. Egyptology – is the study of ancient Egyptian history, language, literature, religion. Etc.
2. Decipherment – is the analysis of documents written in ancient languages, where the language is unknown.

5.10 CHECK YOUR PROGRESS

1. Discuss the History of the Development of Indian Archaeology
2. Explain the contribution of Britishers for the development of Indian Archaeology
3. Trace the development Archaeology in Karnataka

5.11 ANSWERS TO CHECK YOUR PROGRESS

1. See Section (1) 5.2
2. See Section (2) 5.6
3. See Section (3) 5.6.1 to 5.6.10

5.12 SUGGESTED READINGS

1. Archaeology from the Earth, Sir Mortimer Wheeler, published by Munshiram Manoharlal Publishers Pvt. Ltd., New Delhi.
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UNIT-6 DEVELOPMENT OF ARCHAEOLOGY IN INDIA FROM 1947

Structure

6.0 OBJECTIVES

After studying this unit you will be able to

- Describe growth of Archaeology in 1940s.
- Understand contributions of Sir Mortimer Wheeler to Indian Archaeology.
- Understand development of Archaeology after Independence.
- Explain about different branches of Archaeological Survey of India.
- To understand the development of Archaeology in Indian Universities.
- To describe the development of Karnataka State Archaeology.

6.1 INTRODUCTION

The development of Archaeology in India is rightly divided into two units for the better understanding of the subject. In the Unit-5 from the origin of the subject Archaeology or from the beginning to the independent India and in the Unit-6 it is after the independence of this country. In the first part we have discussed about the contribution of Biritsher for the development of Archaeology in India. But in this unit we are going to discuss the maximum contribution from our own scholars and few British scholars.

6.2 GROWTH OF ARCHAEOLOGY IN 1940'S

This unit starts with the development of Archaeology from 1947. A few very important developments had taken place in the process of learning and the scientific way of understanding the subject. Archaeology had developed in its techniques and the method of research, publication. And other things in a decade long period. This kind of growth in the Archaeology helped to develop into a more scientific subject like any other scientific discipline of the country. But in India Archaeology is treated as one of the branch of social-science.

- **Sir Mortimer Wheeler**

The appointment of Robert Eric Mortimer Wheeler as the Director General of Archaeology survey of India in 1944 was great land mark in the development of

Indian Archaeology. In England Petrie and Pit Rivers, by this time have already started the scientific methods in the Archaeological excavations and explorations. Mortimer Wheeler brought the same scientific methods to Indian Archaeology for the excavations he conducted in India in this decade completely. Though the Wheeler was Director General for four years (1944 to 1948), but his contribution to the development of Archaeology in India is remarkable and because of this he has been called as 'Father of Indian Scientific Excavations'. Before coming to India he was a Brigadier in the British Army and was serving at North African Wars. When he was appointed as Director General of Archaeological Survey of India he brought the same discipline in the field of Archaeology.

- **Contributions of Mortimer Wheeler**

Before coming to India Wheeler had done very good scientific excavations at many ancient Roman sites and forts. Apart from this he worked as Director of Walls Museum and London Museum. With this rich experience and tenure of four years as a Director General, he planned his work properly and executed in a proper way.

Wheeler first completely reorganized the department of Archaeological Survey of India and expanded its activities in several branches like Excavations, Museums, Technical section, Research and Publication wing and other branches. His important contribution for the development of Archaeology in India was that he trained many young Archaeologists in modern methods of excavation and also in conservation. He also invited the scholars from Universities to participate in excavations.

- **Excavation of Wheeler**

He conducted well planned and problem oriented excavation at Taxila and Harappa in North West India, Brahmagiri and Chandravalli in Karnataka and Arikamedu in Pondicherry. All these excavation yielded significant results which he published in the form of excavation reports. These reports are models of precision and masterly interpretation. For the excavation branch he appointed experienced Archaeologists as prehistoric Archaeologists, Archaeological chemist,

Islamic inscriptions specialist, publication officer etc. In 1945 he started separate branch for Archaeological Museums in India.

- **Wheeler's Publications**

He published a new series called 'Ancient India' with international standard. Another annual journal 'Indian Archaeology-A Review'. He published all most all his excavation reports. He wrote a book called 'Archaeology from the Earth' and very good report on Indus-valley civilization. He started Taxila School of Archaeology and he is the founder of the Institute of Archaeology in London University. After Wheeler, the Archaeological survey of India is practically manned by Indian Archaeologists and many of them were trained by him only.

6.3 SCHOOL OF ARCHAEOLOGY IN INDIA

In 1960 department of Archaeological Survey of India established the 'School of Archaeology' in New Delhi. Wheeler stressed for a Central Institute of Archaeology for training and research on a National level. It is now performing and functioning as a Institute of archaeology to train and develop young Indian Archaeologists. The selection of conditions for this institute is through common entrance test. After the selection there will be rigorous training for the selected candidates.

6.4 WHEELER'S EXCAVATIONS IN SOUTH INDIA

After his research of Greek culture in North India Wheeler concentrated to work in South India. He selected literary sources to know history and Archaeology of South India, particularly 1st century A.D. traveler and unknown Greek authored book called 'the Periplus of the Erythraean Sea'. This voluminous book gives us an idea of the maritime activities of the ancient India and also it left us a record of its ports, harbors and merchandise, particularly in South India. He also examined the results of the excavations conducted at Pondicherry in 1944 by the French Archaeologists. He was happy to see some important Roman Potteries collected by the French peoples. In 1947 Wheeler decided to conduct excavations at Arikamedu

in Pondicherry. It was a first scientific excavation in India conducted by Wheeler. The results of the excavations became popular with discovery of Roman harbor in India and the Roman potteries.

- **Excavation in Karnataka**

Wheeler also conducted same type of scientific technical excavations at Chandravalli in Chitradurga district in 1947. Earlier to that he had also conducted excavation at Brahmagiri in the same district. He was happy to know the cultural sequence from Neolithic, Megalithic to Shatavahana culture with few examples of Roman antiquities. These are very important to know the Shatavahana culture in Karnataka. The results of the Arikamedu excavation have been published within few months and that is his greatness.

- **Wheeler's Retirement**

He retired from the post of Director General of Archaeological Survey of India on 30th April, 1948. His rich experience in the field of Archaeology, introducing scientific and military discipline in Indian Archaeological research and development and training a host of young Archaeologists in India to carry the same kind of methodic research in the field of Archaeology in India were his greatest contributions. Though he served as Director General only for four years in Archaeological survey of India, his rich experience in this field developed Indian Archaeology in to a special status on par with any International level.

Even after his retirement in 1950 he had taken scientific excavation at Mohenjo-Daro and brought out many important structures and antiquities.

6.5 DEVELOPMENT OF ARCHAEOLOGY AFTER INDEPENDENCE

After the development of Archaeology during the time of Mortimer Wheeler in India, many volumes of books have written. After independence many changes have taken place in the structures of the Archaeological survey of India. Many excavations and explorations have taken place. Even in the Archaeological studies

and research, scientific methods have been adopted. It has taken up Indian Archaeology into new heights. Most of the indigenous scholars and young researchers have taken up a series of excavations and contributed to the growth of Indian Archaeology.

6.5.1 Laws of Indian Archaeology

For the first time in the history of development of Indian Archaeology some strong laws have been adopted in 1947, when Wheeler was still working in the Archaeological survey of India. He made the law for controlling and restricting the movement of antiquities. It helped greatly to protect our own culture properly. According to this law anything which is artificially made by man and which is one hundred years old is declared as antiquity. Accordingly to this law without the permission of the government nobody was allowed to sale or transport any antiquity or art objects in the country.

Earlier, in 1904 there was a law existed to protect ancient monuments. But it was not properly executed. There were some restrictions. In 1958, the whole law of ancient monuments protection act was changed and modified. According to this new law, the ancient monuments of government and the private people have been declared as National monuments and rules and regulations were framed. It also made National Policy, for giving full power to Archaeological survey of India for giving license and permission for conducting scientific Archaeological excavations with certain conditions and no Foreign National is allowed to conduct any excavations without the permission of the government of India and so on. Apart from this the law became strong and all powers were given to Archaeological Survey of India for protecting sculptures paintings, art objects, Art and Architecture etc.

- **Treasure Trove Act**

In 1972 Treasure Trove act of India came into existence to protect immovable cultural property of the country. This law gave powers to Archaeological survey of India to protect and preserve antiquities art objects and

hidden treasure. The law has banned, sale of antiquities, and art objects and even banned carrying Indian antiquities to foreign countries.

The same law have been modified and rewritten in 1978 providing more powers to government of India. Particularly the lapses of 1972 law have been modified. This law became more powerfull in protecting Ancient Archaeological sites, monuments, antiquities, documents, inscriptions, art objects of ancient period. The art objects which is not considered as antiquity, also preserved in India. The present Government of India when Hon'ble Minister Sri. Veerappa Moily was law minister in February, 2011 the same law is modified to give more strength, to protect the ancient monuments, its surrounding area and also ancient cities.

6.6 DIFFERENT BRANCHES OF ARCHAEOLOGICAL SURVEY OF INDIA

In 1947, partition took place, and our country was devided into India and Pakistan, due to which important Ancient Archaeological sites like Harappa, Mohenjo-Daro, Taxila and other places were lost. Indian Archaeologists have started searching for new ancient Archaeological sites in independent India which is similar to Harappa and Mohenjo-Daro. To assist this process Archaeological survey of India has set up new branches and sub-branch offices in India.

In 1960, the main Archaeological survey of India and its Director Generals office were in New Delhi. Subsequently ten new circle offices were opened all over the country along with an Excavation Branch, Prehistoric Archaeology Branch, Epigraphy Branch and Archaeology Museum Branch. To-day circle offices have been increased all over the country. Now the post of Regional Directors also introduced. In Bangalore we have one Regional Directors office. In Dharwad, the circle office and in Mysore one excavation branch of Archaeological survey of India, have been set up.

- **Directorate of Epigraphy**

For the protection and for the study of inscriptions a separate Epigraphy branch headed by Director was setup in Ooty of Tamil Nadu state. Now this office has been shifted from Ooty to Mysore in Karnataka. This office concentrates only on discovering taking print, studying and publishing and also preserving of inscriptions.

- **Chemical Laboratory**

A chemical laboratory had been set up at Dehradoon at for the chemical cleaning, preserving and conserving the available Indian National Monuments, Antiquities, Inscriptions, Paintings, wall Paintings etc. This is very important branch of chemistry and also Archaeology and hence this branch is called as Archeo-chemical branch. It will be more useful for the study of Indian History and Archaeology.

- **Archaeology Garden Department**

Archaeological survey of India has got its own garden department. It maintains beautiful gardens and the greenery around the declared monuments. This will protect the ground water table and also helps for preserving and protecting the monuments.

6.7 DEVELOPMENT OF ARCHAEOLOGY IN STATE GOVERNMENTS

In India several State Governments have made some valuable contributions to the development and progress of Archaeology. Even prior to independence, the princely states of Mysore, Baroda, Jaipur, Gwalior, Cochin, Travancore, Pudukottai and Hyderabad had a department of Archaeology which did fairly good work especially in the fields Epigraphy, Numismatics and Museums. Small scale excavations were also conducted by them. In recent years all the state governments have developed their own separate department of Archaeology. These departments are concentrating more on studies of inscriptions, coins, conducting regular scientific Archaeological explorations and excavations, preserving, conserving and

protecting their own state Archaeological monuments and structures. In Rajasthan, Punjab, Haryana, Uttar Pradesh and in Gujarat regular excavations were conducted to identify the new Harappan Archaeological sites in independent India and they have succeeded in discovering many new Harappan sites.

- **Development of Archaeology in Indian Universities**

Many universities in India have developed their own ancient history and Archaeology, Ancient History and Epigraphy and History and Archaeology departments for conducting research, teach and train-up young scholars in the field of Archaeology and in all its branches and have made the valuable contributions for the development and progress of Archaeology. These universities offer post graduate degrees, post-graduate, diplomas and provided research facilities for Ph.D. degrees and also for post doctoral research.

A large number of young scholars are trained in different branches of Archaeology including exploration, excavation, epigraphy, numismatics, art and architecture, prehistory conservation and preservation etc, Important excavations were carried in places like Kausambi, Maheshwar, Atiranjikeda, Kanchi, T. Narasipura, Banavasi, Koppa, Talakad, Hunsagi, Takkulakotta and many other places. Research institutes like the Deccan College post-graduate and Research Institute at Poona, in Maharastra and Jayaswal Research Institute at Patna are doing good and valuable scientific research work.

- **Deccan College, Poona**

Most significant and scientific research work has been carried out in the field of prehistory, explorations, scientific excavations and in the Research Publications by this research institute under the able and dynamic leadership of the great Indian Archaeologist Prof. H.D. Sankalia and his colleagues like S.B. Deo, Dhavalikar, K. Paddayya, R.V. Joshi and host of others,. They conducted good number of excavations at Maharastra, Karnataka and Rajastan. The publications of prehistoric research conducted by Deccan College, Poona are most significant.

- **University of Mysore**

From 1950-51 Mysore University, Department of studies in Ancient History and Archaeology (Indology) have contributed its own part by conducting many excavations and explorations in Karnataka, and produced great Archaeologists like M. Sheshadri, A.V. Narasimha Murthy, M.S. Nagaraja Rao, A. Sundara, B.K. Gururaja Rao, S. Nagaraju, K.K. Subbayya, M.S. Krishna Murthy, N.S. Rangaraju and many others joined Archaeological survey of India and State Archaeology Department and also Epigraphy Department of Archaeological Survey of India.

- **Mysore University Excavations**

For the first time in 1965 to 1972 Dr. M. Shehsadri, A.V. Narasimha Murthy and others conducted scientific Archaeological excavations at T. Narasipura and published an International standard excavation report. M. Sheshadri and others also conducted excavations at Banavasi and reports have been published by A.V. Narasimha Murthy and others, Sheshadri also discovered another important Archaeological site in Tumkur district at Kibbanahalli.

A.V. Narasimha Murthy, K.K. Subbayya, B.K. Gururaja Rao and the department staff have conducted three times Archaeological excavations at Koppa in Mysore district, and Belagal in Bellary district. Similarly M.S. Krishna Murthy and others at Krishnapura and Rajaghatta, two seasons. Jointly with state Archaeology Department the same team along with N.S. Rangaraju conducted large scale excavations at Talakad. Recently in 2012 N.S. Rangaraju conducted scientific Archaeological excavation at Anuvanahalli. This is the first excavation in Chikkamagalur district. Allmost all the scholars of the department conducted many explorations and also published many research books.

- **Dharwad University**

The scholars from University of Dharwad also conducted good excavations and explorations in many parts of Karnataka by A. Sundara, Ravi Khori Setter, R.M. Shedakhsaraiah, S.V. Padigar and others. They also published many scholarly books of their research work. Srinivas Ritti also contributed in the field of epigraphy.

6.8 KARNATAKA STATE ARCHAEOLOGY

Earlier Mysore State have contributed maximum for the development and growth of archeology in India as well as in the state of Karnataka prior to independence in the princely state of Mysore. In the last quarter of the 17th century A.D. Chikkadevaraju Wodeyar of Mysore, Wodeyar's dynasty for the first time made an attempt to list and copy of some inscriptions. But after that, for many years no one has done any work for the development of Mysore State Archaeology and its branches.

- **Benjamin Lewis Rice**

For the first time in 1884 princely Mysore state appointed Benjamin Lewis Rice as a Director of Archaeology in addition to his educational duties. Because of this the state Archaeology department took its birth. Earlier to that he was carrying out some antiquarian research as his hobby. Primarily, he devoted himself for epigraphical work. He served for 22 years and collected more than 9000 inscriptions in eight districts and published in 12 volumes of "Epigraphia Carnatica", the name which have been given by him only. Based on this the Epigraphia Indica took its birth. He also brought out Mysore Archaeological report and published annual research work carried out in the state. Original text of the inscriptions and its transliteration and also translations to Kannada and English have been made for each inscription. This is the first attempt in the country to study the inscriptions.

- **R. Narasimhachar**

His full name is Mahamahopadhyaya Rao Bahadur Ramanujapuram Narasimhachar became next Director of Archaeology after B.L. Rice. He was one of the greatest scholars of India. His erudition, profound knowledge of all the Dravidian languages, extra-ordinary proficiency in Sanskrit acclaim and independent judgment on matters dealt with these reports and elsewhere, won him the admiration of eminent scholars all over the World. He has discovered more than 400 inscriptions and few copper plates have been studied and published in Epigraphia Carnitica volumes. He has published seventeen volumes of Annual

Reports of the Department of Archaeology in the Mysore State from 1906 to 1922. He has published three Monographs on Hoysala temples of Somanathapura, Belur and Halebid, two books on Talakad and Nandi Hills. Apart from this, two volumes of Supplementary to the Epigraphia carnatica series, Index to the Annual reports and one volume of General Index to the Epigraphia Carnatica volumes. He also conducted small excavation at Chandravalli and Brahmagiri of Chitradurga district in 1909

- **M.H. Krishna**

He was a professor of History and in 1928 was posted as in-charge of State Archaeology department. He also discovered thousands of inscriptions and made the detailed study of thousands of monuments, notes on coins and historical monuments appeared in his new series of Annual reports. In 1944 State Archaeology became a separate independent department and became a new full-fledged department with M.H. Krishna as its Director, In the year 1947 Krishna suddenly passed away.

Apart from these scholars Robert Bruce Foote did explorations in Karnataka from 1876 to 1916. Bridget and Raymond Allchin also conducted some excavations and Subbarao and M.S. Nagaraja Rao also contributed for the growth of State Archaeology.

- **C. Krishna Murthy**

C. Krishna Murthy was working in Archaeological survey of India and made the village to village survey for more than 20 years in 1960s and 1970s and published research papers. Krishna Murthy C. concentrated in Southern Karnataka particularly in Mysore, Bangalore, Kolar and Chamarajanagar districts and listed 250 sites on Prehistoric, Early Historic and Historic Archaeological sites. He also identified some sites on the banks of Cauvery River. He also said his work is a continuation of explorations conducted by Robert Bruce Foote in Southern Karnataka. He has conducted extensive explorations in T.Narasipura, Chamarajanagar, Yalandur, Kollegala, Gundalpet, Nanjanagud, Hunsur, Devanahalli, Bangarpet, Malur, Doddaballapura and in many other taluks.

- **B. Narasimhaiah**

Narasimhaiah B. is also from the same Archaeological survey of India and he also conducted extensive explorations in Northern Karnataka almost in the same time, when C.Krishna Murthy was doing explorations in Southern Karnataka. In Northern Karnataka researchers like H.D. Sankalia, K.Paddayya, R.V.Joshi and many others were also conducting regular explorations and excavations. But, Narasimhaiah has conducted only explorations at river banks like Tungabhadra, at Bellary and Raichur area. Dr A.Sundara also conducted explorations at Krishna River and its tributaries. Explorations were also continued at Bijapur and Raichur district by many other scholars also. The excavations at Sanganakallu (Subba Rao B.), Piklital (Allchin F.R), Maski (Thapar B.K.) Hunsiholi (Paddayya K) Tekkalokotta (Nagaraja Rao M.S. and Malothra) Hallur and in many other places revealed the rich Archaeological cultural sites in Karanataka. These recent Archaeological researches contributed for the study of Karnataka Archaeology.

6.8.6 Recent Researches in Karnataka

Many scholars in Karnataka continued the research work conducted by other seniors from the beginning. There is no gap in the development of Karnataka Archaeology. The process of development can be seen in Northern Karnataka and Southern Karnataka simultaneously. Northern Karnataka research is continued by the Archaeologists of Karnataka as well as the Deccan College, Poona and also Archaeologists from state and Central Government. Where as in Southern Karnataka excavations were conducted by scholars from Universities and also by Government Archaeology Departments. Major Research work is continued in Hampi, Aihole, Badami, Pattadakallu, Bijapura, Bidar, Gulbarga, Raichur, Chickamagalur, Chitradurga, Hassan, Mysore, Chamarajanagar, Mandya, Bangalore, Kolara and in other places. R.V. Joshi, K.Paddayya, Ravi Kori Shatter, Sadaksharaiah R.M., S.V.Padigar, A.V. Narasimha Murthy, M.S. Krishna Murthy, N.S. Rangaraju, Nagaraja Rao, N.S.Taranath, Rajaram Hegde, Venkateshiah, Shivatarak, C.Mahadeva, Lakshman Telgavi, Rajashekarappa, G.K. Aiyappa and host many others from Archaeological survey of India and Karnataka State Archaeology Department scholars are doing research in all the fields of Archaeology.

6.9 OTHER SCHOLARS OF INDIA

In India hundreds of many other scholars have done significant work for the development of Archaeology in the post-independent era like A. Ghosh, V.D. Krishna Swamy, B. Subba Rao, B.B. Lal., S.R. Rao, Bridget and Raymond Allchin, M.N. Deshpande, K.N. Dikshit, M.K. Dhavalikar, R.S. Pappu, G.S. Gai, K.V. Ramesh, Madhavan Katti, G.R. Sharma, I.K. Sharma, K.V. Raman, K.R. Srinivasan, B.K. Thapar, N.R. Banerjee, K.V. Soundararajan, H.R. Raghunath Bhat, T.V. Mahalingam, Z.A. Desai, R.C. Agarwal, K.V. Rao, Venkateshaiah, Narasimhan, Keshava, K.G. Krishnan and many others contributed in their respective fields of studies in branches of Archaeology. Their works have been reflected in the publication of their research works.

6.10 RECENT DEVELOPMENTS IN ARCHAEOLOGY

In recent years very interesting developments have been taken place in the studies of Archaeology out of which the environmental Archaeology and scientific dating methods like Radio Active Carbon-14 dating, Tree ring method, Pollen analysis and Thermoluminiscence, have assumed greater importance. In recent years more scientific approach has developed in the study of Archaeology to get the scientific results. Archaeo-Chemistry, Archaeo-Geology, Archaeo-Geography, Archaeo-Physics. Archaeo-Botany, Archaeo-zoology, Archaeo-Pollinology, Archaeo-Anthropology are the few branches which are helping Archaeological research in the country. With the help of these branches Archaeological studies have made notable progress in India since independence. These kind of necessary scientific facilities are available in our country to undertake research works connected with Archaeological excavations, Explorations. Conservation and preservation of Antiquities, Art Objects, Monuments, Museum works, environmental Archaeology, scientific dating etc. Almost every good and major museum has its own scientific unit to attend to the needs of conservation. Some beginnings have also been made in underwater Archaeology by creating an Archaeological wing in the institute of oceanography, Goa. It has under taken some preliminary work in the ancient port towns of Dwaraka and Kaveri-pattinam.

6.11 SOME NEW INSTITUTIONS

There are several institutions which have developed special infrastructure facilities for carrying out these investigations.

- The Tata Institute of Fundamental Research, Bombay.
- Physical Research Laboratory, Ahmedabad
- Birbal Sahini Institute of Paleo-Botany at Lucknow.
- National Research Laboratory Center at Mysore, for Chemical Conservation and preservation of Antiquities, Art objects and Monuments and also training center for scholars and also for others who are in the field.
- The Archaeological survey of India has also got its own conservation and scientific wings where facilities for chemical cleaning preservation methods are undertaken
- Other departments like those of the Anthropological Survey of India, Botanical Survey of India Zoological Survey of India and Geographical Survey of India under taking collaborative work with Archaeological scientific studies.

6.12 LET US SUM UP

All these departments are doing excellent work and helping the departments of Archaeology in getting their data scientifically analyzed besides publishing their own technical reports. In 1956 seeing this kind of development and progress of scientific Archaeological studies and research publications. Sir Mortimer Wheeler said "Today no part of the World is better served in Archaeological matters than, the republic of India" His statement is true because, today Indian Archaeology departments are ready to take-up or accept any kind of challenging work in India or abroad. They are ready and also well equipped for Archaeological research and other works.

6.13 KEY WORDS

1. Brahmagiri – is a mountain range in the Western Ghats of South India.
2. Indus valley civilization – was an ancient civilization located in what is Pakistan and North West India today.

6.14 CHECK YOUR PROGRESS

1. Discuss the development of Archaeology after independence?
2. Explain the different Branches of Archaeological survey of India?
3. Trace the contributions of Karnataka State Archaeology.

6.15 ANSWERS TO CHECK YOUR PROGRESS

1. 6.5
2. 6.6
3. 6.8

6.16 SUGGESTED READINGS

1. Recent Researchers in Karnataka Archaeology, Edited by Krishnappa M.V. and Gopal, R.
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3. Archaeology of Karnataka, edited by Narasimha Murthy A.V.
4. South Indian Studies edited by Nayak, H.M.
5. Principles and Methods of Archaeology by Raman K.V.
6. Archaeology from the Earth, by Sri. Martimer Wheeler
7. Purathathva Parichaya by Srinivas Padigar.

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BLOCK – 3: EXPLORATION

UNIT-7 EXPLORATION – MEANING AND AIMS – METHODS OF EXPLORATION (GROUND SURVEY: USE OF SOURCES – TOOLS AND EQUIPMENT –MAP READING – VILLAGE TO VILLAGE SURVEY – DOCUMENTATION)

Structure

7.0 OBJECTIVES

The main objective of this unit is to know about the

- Importance of Exploration.
- Methods of Exploration.
- Use of Sources in Exploration.
- Tools and Equipments used in Exploration.

7.1 INTRODUCTION

Exploration is nothing but locating or identifying ancient archaeological sites, antiquities, burials. Explorations in archaeological sites have brought out many interesting unbelievable evidences and information.

7.2 EXPLORATION – MEANING AND AIMS

Exploration is the act of searching for the purpose of discovery of information or resources. Exploration occurs in all non-sessile animal species, including humans. In human history, its most dramatic rise was during the Age of Discovery when European explores sailed and charted much of the rest of the world, largely in a pursuit of material wealth. Since then, major explorations after the Age of Discovery have occurred mostly at information discovery.

In scientific research, exploration is one of three purposes of empirical research (the other two being description and explanation).

Aims

A site survey can be undertaken for different aims depending upon the nature of the problem taken up by the explorer. The areas to be inspected, the land features to be observed, the nature of artefacts to be collected, and, in short, the strategy to be adopted in the field depends largely on the aims and objectives of survey. The aims and objectives of the survey may broadly be classified as follows:

- **Survey of Pre-Historic Sites**

An explorer may be a specialist in prehistory and would like to study the Palaeolithic, Microlithic and Neolithic sites of a region. Yale Cambridge expedition to the Sohan Valley was solely organised to study the Pleistocene archaeology. Prof. Zcuner's survey of the Teri sites of Tirunelveli (Tamilnadu) would also come under this category.

- **Survey of Proto Historic and Historical Sites**

As an example of the former, the survey of the Indus valley sites in Rajasthan, Gujarat etc. in the post-partition period can be cited. As an example of the latter, exploration of the sacred Buddhist sites of India may be cited. For historical sites, we have the literary and epigraphical references also to go by. For proto-historical period, we may or may not have these references. There is no literary references evidence available for the existence of the Indus Valley Civilization.

- **Survey for a Specific Problem**

A field survey is sometimes undertaken to get information on any specific problem, prehistoric or historic. Survey of the Megalithic monuments of South India undertaken by Y.D. Krishnaswami can be cited as an example of this. The main purpose of the survey was to study and classify different types of the Megalithic tombs found in South India. Archaeology of the Ramayana sites will also fall under this category since the exploration is limited to the sites mentioned in the epic. Exploration to find out a lost city mentioned in ancient literature or inscriptions would also come under this category. Other examples of problem oriented surveys are, archaeology of Roman sites in Britain and India. Monumental survey of any one style or period such as the survey of Pallava cave architecture of Tamil Nadu done by K.R. Srinivasan.

- **General Survey**

A site survey can also be undertaken to assess all types of antiquarian remains of an area in general. That is, it may include the pre-historic, proto-historical items cited above. Usually, when an archaeologist once goes to the field to undertake the site survey work, it is better to include as many items as possible

in its purview. In such a survey, all items like stone age sites, mounds, burials, habitation sites, forts, temples, sculptures, inscriptions etc. are all documented. In India, such a type of exploration is often referred to as "Village to Village Survey antiquarian remains" since there are thousands of villages having ancient landmarks of one kind or the other.

7.3 METHODS OF EXPLORATION

The methods, the strategy and, to a certain extent, even the personnel depend largely on the objectives of the survey. If it is purely pre-historic exploration, the explorer's concentration would be on the study of geological factors like the river terraces, gravel deposits, the nature of rocks and soils, fossil remains, stone artefacts and the like. He should be familiar with the past geological and climatological changes or cycles that have occurred in the area and the corresponding land forms and the human remains there in. The preliminary documentation for pre-historic sites would differ in some respects from the one required for historical sites. Whereas, literary epigraphical and traditional data would be available for the latter category, nothing of that kind would be available for the former. Nor will there be any local tradition or guidance available for the pre-historic sites.Only in some rare cases, local people would be able to point to some caves in the hills nearby without knowing their true significance. The explorer should visit such caves which could turn out to be pre-historic once. Except in such cases, pre-historic exploration is based on the study of the geology and palaentology of the area rather than local enquiries and traditions. With such differences between prehistoric and historic explorations kept in view, let us review the important requirements to be attended to for a successful archaeological prospecting.

7.3.1 Map Reading

There are many useful maps available in India which can be of great value to the explorer in our country. Apart from the State maps, there are the District, Taluk and village maps prepared by the Survey of India. Particularly useful are the "one

inch topo sheets" prepared by the Survey of India which are more detailed since the scale adopted in them is 1" = 4 miles. These maps provide us with important information on the cities, towns, villages, hamlets, major highways, minor roads, cart tracks, railway lines and stations. This would enable the explorer to plan his trip and cover the area by jeep or foot. Rest houses or Travellers Bungalows or old Chatrams (Dharmasalas) are also marked which would provide useful resting place or night halts. Similarly, temples, mosques, churches are also marked.

Maps are also very useful for the explorer as they provide details regarding the physical features of the area - like the hills, rivers, lakes, springs and forests. Since the human settlements owe their position in many cases to their surrounding water sources, it would be reasonable to expect vestiges of old human settlements on the banks of the rivers or lakes. Particularly, many ancient civilizations flourished on the river valleys such as the Nile and the Indus. Explorers of Palaeolithic sites have mainly to study the gravel beds and sections of the rivers to identify the tools and fossils.The maps give us the present day configuration of the rivers and older courses have to be searched located and studied in relation to their present bed.

Maps, one or more centuries old, may show features which are-today completely buried or unrecognisable in modern maps. We have cases in South India where, in the older maps, certain areas are marked as "archaeological poromboke" (the usual local name for the Magalithic sites) are now shown in the present day records as cultivable lands, a clear case of encroachment into the ancient site. So, the study of maps and village field records are extremely useful for the archaeologist from many points of view.

7.3.2 Study of Physical Features

Apart from the location of hills, plains, rivers, lakes, forests and the like, there are also other aspects of physical features which are important and worthy of note for an explorer. Maps may not provide that category of data such as the distribution of rocks, minerals, soils, the flora and the fauna. But geological maps or reports would provide this kind of data. The District Gazeteers and Imperial

Gazetteer of India prepared several decades ago and in many cases revised now, is an invaluable source of information. Here, we can list out some of the significant physical features that an archaeologist has to take note of.

- **Hills**

Often, the area surrounded by high hills would be an area of relative isolation and to a certain extent free from external impacts. On the high ranges, one could expect the tribals living in splendid isolation e.g. Pulaiyars of Anaimalai and Todas of Nilgiris, who might provide a good scope for ethno-archaeological studies.

Low rocky hills would often have natural rock shelters or caves which provided the abode for pre-historic people eg. Gudiam cave near Attirampakkam and Hoshangabad rock shelters. Castellated hills in the Deccan and parts of Lower Karnataka have been found to be associated with Neolithic settlements. Hills provided the source for the necessary raw material for the Neolithic folk.

- **Passes**

Passes served as corridors through which movement of people and ideas trickled through. The Bholan and the Khyber passes served as the passage for several foreigners to enter into the Indian sub-continent (like the Greeks, Persians, Scythians, Kushans, Hunas, Turki, Mangols etc.). The Palghat pass in the Western Ghats had acted as an active cultural link between the Kerala coast and Tamil Nadu. Similarly, a number of passes in Vindhyas provided a corridor between North India and the Deccan-With their help the ancient routes could be plotted.

- **Rivers**

Rivers provided the perennial life-giving water source and hence important for human settlement from prehistoric times. All major river basins of India were once inhabited by the pre-historic people. The explorer has to study the old river terraces and gravel beds to locate the Palaeolithic tools and fossils in relation to the geological deposit in which they are lying.

Rivers continued to be a major attraction for the people's settlement even in proto-historic and historical times. The Indus basin supported an impressive and far-flung chalcolithic cultures in the second millennium B.C. Several urban centers belonging to the 1st millennium B.C. have been located in the Indo Gangetic plains. Huge archaeological mounds which marked the ancient townships or settlements have been discovered such as those at Hastinapura, Kosambi, Ahichchatra etc, the ancient cities mentioned in the Mahabharata. Ancient and historical cities are to be found on the banks of all the major rivers of India.To mention only a few. Indraprasta on the Yamuna. Ujjain, the capital of Avanti on the river Sipra. Dhanyakataka (Dharanikotaand Amaravati) the capital of the Satavahanas and Vijayapurithe capital of Ikshvakus on the River Krishna. The city of Vijayanagar, on the banks of the river Tungabhadra. Uraiyur the capital of the Cholas on the River Kaveri, Madurai the Pandyan capital, on the River Vaigai and so on. From this selective list itself one can understand the importance of rivers and the valleys for the study of the ancient sites and human settlements.

River mouths often served as the ideal spots for the port towns such as the Chera port Muziri in the mouth of the river Periar on the west coast, Kaveripumpattinam, the Chola port at the mouth of the river Kaveri and Tamluk or ancient Tamralipti in the mouth of the river Ganga.

- **Lakes**

Lakes formed another important water source. Some of the lakes are very old and even belonged to the prehistoric period while some others belonged to later periods. Lake dwellings in the Switz lakes belonged to the Neolithic period. They have furnished very important evidence regarding the settlement pattern of the Neolithic folk of Europe. Microlithic sites known as the Ten' sites have been noticed on the banks of old lagoons in the coastal tip of Tamil Nadu. South India was well known for tank irrigation system and there are a number of lakes, many of which might go well back to the beginning of Iron Age. It has been noticed that the Megalithic sites and burials are found clustering around the ancient villages near about the lakes eg. Sanur near Madurantakam Lake and Kunrattur near Sembarambakkam Lake. According to some scholars, tank irrigation system was started by the Megalithic people in South India.

- **Rocks, Minerals and Metals**

Study of rocks is another important aspect of the physical features. The importance of rocks for the study of Stone Age sites can hardly be exaggerated. Rocks supplied the raw materials for making the pre-historic tools. Palaeolithic man preferred the quartzite stone for his tools and hence, he was sometimes referred to as the "Quazitzite Mao". So, the availability of quartzite stone in an area may serve as an indicator for locating the palaeolithic sites. Similarly, the Microliths were made on silicious materials and semi-precious stones like jasper, chalcedony, agate etc. The Neolithic folk of South India went after the black basaltic dyke rock to make their shapely axes and adzes. The Neolithic sites are found to proliferate in such areas where this kind of stone is found in plenty. For example, Deccan and Karnataka.

The architecture of megalithic monuments was largely determined by the kind of stone available in the area. The monuments of purely latertic zone like parts of Kerala differ from those of granitic zones. So, by studying the nature of rocks in an area, the explorer can almost anticipate the type of monument he could come across there. Similarly, knowledge of the nature of metal and minerals available in an area would be helpful to locate the bronze and Iron Age sites.

7.4 ETHNOGRAPHIC DATA

In undertaking exploration in pre-historic sites especially in areas where the hunter gatherer and simple agricultural groups still exist, an ethnographic study of the local inhabitants may be necessary. A study of their material equipment, social organisation will be useful to know their settlement patterns and their traditions, for comparative study.

7.5 USE OF SOURCES

7.5.1 Historical Literature

Before exploring an area or an ancient city, the explorer would do well to acquaint himself as fully as possible with all the available historical literature about

them. It may be in the form of ancient and medieval literature or inscriptional references to the places. This data is not required for purely pre-historic explorations since no literary reference would be found for the pre-historic sites, but it is very essential for the exploration of ancient historical sites. Familiarity with the Biblical literature becomes indispensable for the explorer of the Biblical sites even as familiarity with the Buddhist literature is essential for undertaking exploration in the Buddhist sites. In many cases, literature gives valuable details regarding the ancient names by which a city or a village was known, its layout like fortification walls or gateways, its architectural landmarks and the field archaeologist could explore the potential areas and select a site for excavation according to its importance. In some cases, the exact location of an ancient city would be in doubt since all memories of it would have been lost and it has to be established by correlating the literary data with the field data, The location of the famous site of Troy was a matter of dispute until Schlieman identified it in the light of Homer's Iliad and the Odyssey, local traditions and inscriptions and later confirmed by his excavations.

Often, the foreign travelers or ancient geographers' accounts help us identify ancient towns. The accounts of the Greeko-Roman writers like Pliny, Ptolemy and Strabo have furnished valuable data regarding the ancient ports and capitals of peninsular India in the early centuries of Christian era. Some of the places mentioned by them still await precise dentification while many others tally well with other local evidences available in the sites. Megasthenes' description of Pataliputra city has been remarkably confirmed by the excavations done there.

Similarly, the accounts of the Chinese travelers Fahien (4th Century A.D) and Yuan Chuang (7th Century A.D) are of great use for archaeology of the Buddhist sites of India. Cunningham identified many forgotten Buddhist sacred places with the help of these travel accounts. Not only the towns and cities but also within them some ancient landmarks like the stupas, chaityas, temples or palaces can be located with the help of literature for detailed excavation.

The explorer should also be familiar with the epigraphical data available in the area to be explored. Old inscriptions attest to the antiquity and historicity of a place or a

monument. The royal edicts like those of Asoka were often put up on the highways or junctions. With their help we could locate the ancient trade routes of the Mauryan times. Inscriptional data also helped in the identification of the Chola port-town of Kaveripattinam.

7.5.2 Previous Works

The explorer of an area or a site should also get to know about all the previous archaeological work done in the area either in the form of exploration or excavation. This would serve as a valuable guidance and help in avoiding duplication of work. This data would be available in the from of published works or unpublished notes or site cards prepared by the explorer. Casual finds are most likely to be found in the local state or district museums. A visit to the museum and examination of the antiquities found previously in the area would be of great help. An outstanding example of a published exploration report is Robert Bruce Foote's famous work Pre and Proto historic Antiquities of Madras Presidency. Such a meticulous description of the sites and their antiquities can hardly be seen anywhere during the second half of the 19th century. Bruce Foote had tracked a vast ground and visited even remote places in those times when there was no jeep or car. An explorer, especially in the prehistoric archaeology of SouthIndia, cannot omit to consult it. Robert Sewel's book “Antiquarian Remains of South India” is a useful work for the historical and field data it contains. Cunningham's notes on his exploration and discoveries are of great value for the explorer in North Indian sites, though the methodology or techniques available to him were not upto the mark and his enquiry was limited in scope.

The explorer would do well to consult the old Annual Reports of the Archaeological Survey of India and its successor Indian Archaeology- A Review which report all the explorations and discoveries made in India every year by various agencies. Before Independence, several princely states had their own small departments of archaeology which published their discoveries in their annual reports. For example Mysore, Travancore and Cochin states had their own archaeological reports. The publications by the State Government and the

University departments of archaeology on the work done by them should also be consulted.

7.5.3 Local Traditions

Local traditions have their own value in reconstructing regional or local history. They often preserve old memories of the long forgotten facts about cities or towns and even about some particular landmarks within the town. This memory may be preserved in the form of legends or folk songs which would mix up facts with fiction. Local people would often be able to point out certain spots as the places where the ancient place or temple stood or as the place where a battleplace and the like. This would often help the excavator to choose the spot of his excavation within a site.

Enquiries with the elders and the knowledgeable of the locality are found useful in many other ways also. They would be able to tell us about some chance discoveries of old structures, burials, treasure trove or coin hoards made in the locality some years back. All these have to be carefully recorded by the explorer as they would serve as good guidelines for further investigation. It has been the experience of the author that the villagers would point to certain localities now under cultivation as the place where the old village stood. Such places were usually called "Nattamedu" or "Nattakkollai"'. When we inspect the spot, we would invariably find vestiges of habitation like the postherds and coins. At the ancient site of Kaveripattinam, local people could show the spots where from they had dug and removed bricks (from the buried ancient structures) and re- used them in their present houses.

7.6 TOOLS AND EQUIPMENTS

No hard and fast rule can be laid down on the strength of the staff for exploration work. The team may consist of one, two or more archaeologists, one of them preferably a specialist in pre-history and geology, and one a specialist in historical archaeology who is familiar with the historical sources of the area

including literature, inscriptions, architecture etc. Though the explorer himself can do photography it is better to have a specialist photographer to document important mounds, river sections, monuments, sculptures, inscriptions etc. It is useful to take a few student trainees in the exploration work. They are found helpful in making local enquiries and also collecting antiquities from the sites. Besides, they can learn the methods of exploration from the experts. Persons knowing the local language should be included in the team.

7.6.1 Exploration Kit

The preliminary exploration kit should not be too heavy. It should consist of only the minimum, since the party would be moving from place to place. The following items may be found useful:

1) Knapsack with shoulder straps for carrying equipment.
2) Cloth bags for collecting specimens like stone tools or potteries.
3) Antiquity packets to collect smaller antiquities like beads,coins etc.
4) 100-foot cloth tape for taking measurements of sections or monuments.
5) A few excavation knives to scrap the exposed sections forfinding the stratification.
6) Small entrenching shovel and pick axe for any emergency small scale excavation or clearance work.
7) A few brushes for cleaning the objects before photography.
8) Pocket compass to know the direction.
9) Portable camera, exposure metre and film rolls.
10) Site notebook or site cards to record the field data for every site explored.
11) Sundry items like drawing sheets (to make rough plans and sketches), pencils, pens, geometry box etc.
12) Binoculars are found useful in surveying the objects or suspected monuments from a distance eg. Megaliths on hill slopes.
13) First aid box.
14) Jeep.

Though the survey work has to be done mostly on foot, a jeep may accompany the party wherever possible as it is often found useful in many ways. It can carry the heavier exploration materials and tools or lunch packets from distant places. From the camping place to the work spot and also making local contacts it can provide transport and avoid unnecessary walking. The antiquity collection may also swell as the exploration progresses and particularly the stone tool collections would be heavy and they can be carried in the jeep back to the camping place.

7.7 FIELD OBSERVATION AND CERAMIC SURVEY

Surface exploration needs training and experience. First, the sites have to be recognized and carefully examined. The explorer must walk over the area with his eyes and mind open to all the possibilities. This would give a preliminary idea of the nature, importance and the probable date of the site. An archaeological mound or site could yield the following objects, broken pottery, stone or bone implements, structures, tombs or burials, coins, beads and the like. There may be rain gullies or partial exposures of the mounds due to erosion by a river or a deliberate quarry of the earth by the villagers as a result of which a section of the mound would reveal the successive habitational strata of the mound. A trained eye can recognize the ancient potteries or other antiquities of known association and date the various strata and form a general idea of the antiquity of the mound and the cultural phases represented therein. The scientific study and classification of ancient pottery has assumed importance in archeological investigation as they serve as reliable clues and type fossils for various periods and also indicators of the diffusion of cultures. The pottery assemblage of the Indus Valley sites for instance has distinctive quality, type, colour and designs about them and an explorer who goes in search of Indus sites should be familiar with their pottery and other allied artefacts like their inscribed seals and sealings. Therefore, ceramic survey has become an important feature of archaeological exploration. It is important to note that the presence of Kiln-baked pottery presupposes a sedentary life. So, ceramic records of the explored sites should be prepared with care for future reference.

7.8 DOCUMENTATION

The field data thus collected and features observed on the site should be accurately and adequately recorded in a suitable way such as it would be available for consultation later on. The data can be recorded under classified sub-divisions. It should be supported by photographs, sketches or rough plans. The "site card or sheet" should normally contain the following items of information.

1) Site Name and Location

Any site including the open uncultivated one normally belongs to a nearby hamlet or village. The name of the main village should be given first and that of the hamlet next. The Taluk, the District and the state should be indicated. Usually, in India every field bears a revenue survey number. This should be mentioned. If the particular land or site belongs to any individual or institution, the owner's address is to be noted.

2) Approach to the Site

Here, the nearest Railway station or bus station and the direction to reach the exact spot should be given. Halting facilities if any may also be indicated.

3) Topographical Features

Features including elevation, any river side or hill slope, rocks and the nature of soil or vegetation as deemed relevant may be given. Whether the site is under cultivation or fallow may also be mentioned.

4) Archaeological Importance of the Site

Pre-historic or historic or medieval; habitation site or burial site; important surface finds like pottery types or coins, terracotta figures and their cultural importance should be briefly stated. Important observation regarding the stratigraphy and approximate date may be recorded. Selected illustration with photographs or sketches should be given. A list of significant artefacts collected on the surface may be given.

5) State of Preservation of the Site or Monument

Here, any river erosion, or quarry of earth or construction of buildings and such other disturbances in the site that have threatened the site or the monument may be recorded.

6) Reasons and Possibilities of Excavation

The explorer can give his assessment of the site and state why further investigation like excavation is necessary. Any potential area in the site for excavation can be suggested with reasons.

7) Owner of the Site

If the particular site belongs to an individual or an institution, the owner's address should be noted. This will facilitate getting his permission to excavate.

8) Published References

Reference to any account of the site in historical or archaeological publications should be given.

9) Date of visit and the name of the explorer should be recorded.

The explorer can record his name and day of his visit to the site.

10) Illustrations and Antiquity Register

The number of photographs taken on the site and their register number in the Photographic Register should be cited for any future reference. Small size positives can be pasted in the site card. Similarly, reference to the register of antiquity bags should be given.

7.9 LET US SUM UP

Thus, Exploration has a vital role to play in bringing to light the nature and the distribution of artefacts or cultures not only in a site but also over a wider region.

7.10 KEY WORDS

1. Exploration – is the act of searching for the purpose of discovery of information or resources.
2. Ethnographic – is the systematic study of people and cultures.

7.11 CHECK YOUR PROGRESS

1. Explain briefly the meaning and aims of Exploration.
2. Explain the methods of exploration with suitable examples.

7.12 ANSWERS TO CHECK YOUR PROGRESS

1. 7.2
2. 7.3

7.13 SUGGESTED READINGS

1. Raman K.V.: *Principles and Methods of Archaeology*, Madras, 1986.
2. Roy, Surindranath: The story of Indian Archaeology, New Delhi, 1961
3. Sankalia H.D.: *New Archaeology – Its Scope and Application to India*, Lucknow, 1956.

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UNIT-8 SCIENTIFIC METHODS IN EXPLORATION – RECONNAISSANCE – AIR PHOTOGRAPHY – REMOTE SENSING TECHNIQUES – ELECTRICAL RESISTIVITY – MAGNETIC SURVEY – CHEMICAL PROSPECTING

Structure

8.0 OBJECTIVES

The main objective of this unit is o know the scientific methods in exploration,

- Air photography
- Remote sensing techniques
- Elecrical resistivity
- Magnetic survey

8.1 INTRODUCTION

Apart from the physical methods of prospecting some scientific aids like the magnetic and electricity resistivity methods are also found extremely useful. They would register certain types of abnormal surface disturbances or anomalies indicating some features below the earth which cause them. They provide valuable clues to the archaeologist as to the presence of structures or metal objects below.

8.2 MAGNETIC SURVEY

The Proton-Magnetometer is a highly sensitive apparatus which has been found useful in detecting buried iron kiln sites and certain kinds of soil. It detects anomalies or differences between the general magnetic field of an area and the one above or near a buried iron object or kiln. The spots where the anomalies are registered can be taken up for excavation. One disadvantage in this instrument is that since it is highly sensitive it will register the anomaly even if there is any small iron object or rocks with large iron content near the area for example iron fence or electric post on the field. But used with caution, it can play an important role in archaeological exploration. Proton-magnetic survey of certain suspected areas covered with sand was done at Kaveripattinam and Madurai in South India but its use was rather limited in scope.

The use of the proton-magnetometere involves setting up of a line of electrodes a few inches into the ground at the intervals of 30cms. Anomalies

between the electrodes can then be plotted. A team of three people would normally suffice to cover several acres in a day.

8.3 THERMO-REMNANT MAGNETIC SURVEY

By this method, the existence of burnt clay artefacts, burnt brick structures and sites which experienced extensive conflagration could be detected. The objects cause magnetic disturbances which are recorded.

8.4 ELECTRICITY RESISTIVITY SURVEY

The resistivity meter is based on the fact that the ground can conduct electricity. Different soils or rocks conduct differently. Electrical conductivity of the soil depends on its nature viz. whether it is filled in pit, ditch or wall or a uniform deposit. They will show wide divergence in their resistivity which is clearly registered in the Instrument. This method was used by the geologists and civil Engineers to study the layer of the earth but first applied to detect buried archaeological structures by R.J.C. Atkinson in 1946. This kind of survey is especially suited for problems connected with the tracing of the extent of a wall or a road. Negative resistivity anomaly would show a ditch or pit and conversely, positive anomaly would indicate a structure of high resistance such as a wall, floor etc. By this method a Roman road of limestone rubble was traced at Crawley, oxon and a Neolithic ditch traced at Dorchester. The special instrument, the Megger Earth Tester, is used to record and plot the variations in resistivity in graph model. This can also be operated by a team of three people and the equipment is also easily obtainable. If the soil is very wet or dry, the electrical resistance may be uniform throughout the strata and in such cases, the results of the survey may not be satisfactory.

8.5 PROBE SURVEY

This is done with a simple apparatus of an iron bar with a tapered point and a T-handle and used as a probe across a suspected wall or pit at convenient

intervals. "When the probe penetrates any stratum different in texture from top soil this can both be felt as a difference in resistance and heard as a different sound. A single line of probing can therefore discover a buried feature and a series of parallel lines one meter apart can define its whole shape".

8.6 AUGUR SURVEY

Used by the geologists, the augur survey is adopted for archaeological sites. Hand augurs are used to take out samples every 3cms. The samples of soils and pottery pieces or other antiquities can be studied. The strata accumulation over the bedrock and their content can be known. Its use is rather limited in hard soil.

8.7 DRILLS

In oil prospecting and geological survey, power-driven augurs and drills are extensively used as they can penetrate to great depths and reveal the nature of the strata below. In archeological sites, this can be used with advantage as preliminary survey. They can be used especially to probe the strata lying buried below flood deposits and sand accumulation. This was used by the Archaeological Survey of India in 1968 in and around Cranganore in Kerala to find out if there were cultural strata below the huge sand accumulation deposited by the Periar River. This probe proved useful to assess the antiquity of the habitation in the area in relation to the deposits.

The drilling equipments are rather unweddly and expensive. They have to be hired from special organisations like the Geological Survey of India or the Oil and Natural Gass Commission.

8.8 EXPLORATION BY SOUND

Sometimes tapping the ground at various spots would emit differential sound. Depending upon the compactness of the soil or structure below, the sound from the natural or undisturbed soil would be different from that of the disturbed

one or artificially accumulated one. This method is not always assure guide but combined with other methods it will be found useful.

8.9 GEO-CHEMICAL METHOD

The soil of ancient settlements often contains high concentration of phosphates from organic refuse, thus, the soil near Cairo has long been taken by the local cultivators for use as fertilizer. Here in India also, earth from ancient sites and mounds serve as fertilizers. On the basis of this kind of soil analysis, archaeologists were successful in defining sites in Denmark, Italy and England. Near Copenhagen, the lost site of the village of Stockkerup was found in this way by taking 250 soil samples from a depth of 14 to 30cms over an area of 30 hectares and analyzing them in order to find the high phosphorus pentoxide content. "In regions where the vegetation and terrain are unhelpful to air photography the method can be used with advantage to sample wide areas".

8.10 AERIAL SURVEY AND PHOTOGRAPHY

As pointed out by Kathleen Kenyon, the value of air Photography is twofold; firstly, it enables us to have a bird's eye view of the ancient town or settlement as a whole which is impossible from the ground. This will give us a total view of the shape and the outline of the ancient city. Secondly, the aerial photography shows up certain features which are not visible to the naked eye.

One has only to see the beautiful aerial photographs of the ancient cities of Taxila (now in Pakistan). Sisupalgarh (Orissa) to realize the importance of aerial photographs. The whole lay out of the ancient cities, the criss-cross roads and streets, the alignment of houses, the Stupa and the Vihara complexes therein, have come out boldly giving us a vivid picture of the town planning in ancient India. The excavator can by close observation and correlation of the photograph with the site proper can pick and choose the important areas or part of the alignments, depending on his objectives. If it was fortified city, the outline of the fortification

or the defensive wall surrounding the city can be identified as well as the entrance gateways and such other landmarks.

8.11 SHADOW MARKS

Certain features in a site like the covered up ditches or low walls or low banks, obscured ancient roads or tracks may come out sharply in air photographs in different ways such as the shadows, crop marks or soil marks. Slight variations in levels and the mounds can be detected by the shadow marks found in the photographs taken obliquely.

8.12 CROP MARKS

Differences in vegetation and the consequent crop marks and colour contrasts are brought out clearly in photographs. Over the buried structures, the growth of crop will be less sparse than the surrounding areas. Similarly, over the filled-in ditch, the growth would be comparatively more if not luxuriant. Thus, the variations of the crop marks shown in the aerial photography serve as good indicators of the buried buildings or ditches.

The development of air photography was one of the blessings of the world wars. Initially developed for mapping military targets, it was applied to different purposes. It was used for archaeological purposes as early as 1915 by Leon Rey in Macedonia and Lt. Col. G.A. Beazeley in Iraq in 1919. The later and G.O.S. Crawford were chiefly responsible for using the method more systematically as can be seen in their respective publications viz, surveys in Mesopotamia and Air Survey and Archaeology. With the aid of air photographs, Crawford mapped out the ancient Celtic and Saxon remains in England. Air survey was done in the old bed of the River Ravi in the state of Jaipur, India. Father Poidebard made further technical improvements and surveyed the desert regions of Syria. He was able to plot the whole system of ancient roads and fortifications of the Syrian Desert. He used horizontal lighting as well as counter lighting methods to achieve excellent results. John Bradford, an army officer working with air photos in the Second

World War, has in his valuable work Ancient Landscapes discussed the contributions made by "air Archaeology" to the discoveries in the ancient cities of Rhodes, Carthage, Etruscan burial mounds, the ancient field systems in Greece. Italy etc. Hitherto unknown sites have been revealed by soil, shadow and crop marks using the techniques of pin point, vertical and oblique photography. The method of horizontal lighting of the morning or evening exaggerates the undulations aided by the variations in the colour of the field. This method was perfected in 1930s. The buried ruins of the frontier zone of the Roman Empire buried over a vast distance in Syrian Desert could be plotted by air photographs. From 1939, stereoscopic examination of large areas was developed. For indications on the ground which are revealed by the shadows, oblique photographs were preferred while vertical photographs were taken to get comprehensive plan of a site or to show up differential vegetation. In the stereoscopic technique, 'a series of vertical photographs of the area or the landmarks, each having an overlap of 60% in common with the next in the direction of flight are taken and portions common to both are placed under stereoscope and the twin views of the feature to be examined are arranged immediately beneath the lenses. After some practice, the two images should fuse optically into one in full relief.'

8.13 PHOTOGRAMMETRY

The technique of transforming aerial photography into a scaled plan in an important and fruitful development which helps us to get a graphic and enlarged view of the site. This process or technique is called Photogrammetry. This has enabled archaeologist to get rapid and accurate method of map-making. In the course of a single flight for a few hours, the plan of several ancient sites can be obtained. As observed by John Bradford. "Aerial mapping can telescope years of work on foot into span of weeks." Though aerial survey is expensive, it has come to play a vital role in archaeological reconnaissance all over the world. It has almost justified Crawford's claim in 1923 that "the invention of air camera is as valuable to archaeology as that of the telescope to astronomy."

8.14 LET US SUM UP

Thus, the above said scientific explorations like magnetic survey, electricity resistivity, geo-chemical method, aerial photography, helps and plays a vital role in archaeological exploration all over the world.

8.15 KEY WORDS

1. Magnetic – It is the Magnetic influence of electric currents and magnetic Materials.
2. Aerial survey – is a method of collection Geomatics or other imagery by using aeroplanes, helicopters, balloons or other aerial methods.

8.16 CHECK YOUR PROGRESS

1. Explain briefly the different scientific methods in exploration.

8.17 ANSWERS TO CHECK YOUR PROGRESS

1. 8.2 to 8.13

8.18 SUGGESTED READINGS

1. Raman K.V.: *Principles and Methods of Archaeology*, Madras, 1986.
2. Roy, Surindranath: *The story of Indian Archaeology*, New Delhi, 1961
3. Sankalia H.D.: *New Archaeology – Its Scope and Application to India*, Lucknow, 1956.

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BLOCK – 4: EXCAVATION

UNIT-9 EXCAVATION-MEANING-AIMS-TOOLS AND EQUIPMENTS-EXCAVATION CAMP

Structure

9.0 OBJECTIVES

The main objective of this unit is to know about the

- Meaning and aims of the excavation
- Equipments used in the excavation
- Camp equipments used in the excavation

9.1 INTRODUCTION

Excavation is an elaborate process involving time, money, lobour and equipment. The services of different technical persons are needed at different stages of excavation-selection of site, setting up of the camp, laying out of the trenches, excavation proper, documentation of the evidence, sorting out of the excavated objects and then preservation and transport of the materials back to the headquarters, and preparation of technical reports and publication of the results.

9.2 EXCAVATION-MEANING-AIMS

Excavation is digging of the earth and removing the buried soil and in its very nature, it is a destructive process. But, archaeological excavation differs from ordinary excavation done for digging a well or laying foundation for houses. In the latter cases, the digger is not interested to know if there were occupational layers or cultural deposits or human artefacts. The well digger is only interested to get to the water level at the quickest possible time. He simply throws out all the excavated earth till he reaches water level. But the archaeological excavator is interested to know every inch of the soil he digs below the earth to find out if it is part of an occupation layer, or if it contains any vestige of human activity. By its nature, archaeological excavation is a slow, systematic and planned digging to study the nature and the contents of the occupation layers in the reverse order in which they were laid down, gradually uncovering each successive stage in the history of the site. The main aim of an archaeological excavation are: (1) it is done with great care and planning so that every artifact-be it a building or a bead-is laid bare and preserved (2) its position in relation to the layers of deposits in which it is

found (stratification) and in relation to other objects (associated finds) is documented in records for verification at any time; (3) the data relating to the environmental factors like flora, fauna, soil are recorded and studied to know the ecological setting and (4) the record of the excavation is made known to the public through publication. Because of the methodical and scientific nature of the work involving special techniques and well tried principles, excavation should be undertaken only by the well trained and experienced archaeologists with a team of experts.

As already pointed out, excavation was for a long time considered merely as a method of collecting antiquities "a glorified treasure hunt". It was Pitt Rivers in Britain and Petrie in the Near East who first placed emphasis on the context in which they were found i.e. the layers in which they were found and their relation to the other layers in which they were found and their relation to the other layers and objects. Another factor that was neglected in the past is the chronology of the site as a whole. But today "no excavation can be considered satisfactory unless the excavator can make a reasonable assessment supported by evidence, of the period and circumstances of laying down of each deposit and the construction of each feature, and of their general correlation.

9.3.1 Excavation Equipment

The number and variety of tools and implements employed in an excavation is virtually limitless. The bare minimum tools required are listed here:

1) **Pick Axes** – small, medium and long sized for digging. The pointed edge is invariably used for better control and minimizes damage to antiquities. They are found very useful in Indian sites.
2) **Shovels** – long – handled to remove the excavated earth or thick deposit of sand.
3) **Short handled shovel mammatis** – very popular in South India.
4) **Bale or turf cutter** with 'T' handle for trimming and straightening the sections.
5) **Crow bars –** which are used in a limited way to dig very hard deposit or to make deep narrow holes to plant the pegs.

6) **Iron pans –** or baskets to remove the debris and the excavated earth and to carry the potsherds to the pottery yard. They are also useful during the washing and storage. So, a substantial number of them, say about 100 would be necessary.
7) **Trolley –** Small two wheeled trolley is found useful to transport earth away from the trench.
8) **Excavation knives –** for scraping the section and examining the layers and the earth for antiquities. It is an essential tool for the site supervisors. It is especially useful in marking layers and examining the deposits on the floorings, pits, burials etc.
9) **Angle measure –** with bubble level fixed on the two arms, each one meter long and divided into centimeters. This is an important item for three dimensional measurements of antiquities.
10) **Brushes** of various types and sizes – coir brushes to clean the surface paint brushes for removing the dust and cleaning the delicate objects and wire brushes for harder surfaces. They are essential during the preparation of the subjects for photographs. Brooms can also be used for sweeping the floors and pavements, walls and the trenches. Small camel hair brushes and tooth brushes are used for delicate cleaning.
11) **Scissors –** big sized scissors to cut the rootlets in the excavation trenches and small sized scissors for other uses.
12) **Pen knife**
13) **Tapes**
14) **Plumb bob**
15) **Labels** to mark the pottery bags and also the layers on the section.
16) **Cloth** mentioned antiquity envelops – to keep the small antiquities.
17) **Pottery cloth** bags to pack the selected potteries and some bigger antiquities.
18) **Wooden pegs to** demarcate the trenches. They are faceted so that names of the trenches can be marked on them. The bottom is pointed for easy planting in the earth.
19) **Nails of various sizes.**
20) Black and white paint and steel pens for painting the trench numbers on the pegs and for marking the potteries.

21) Plaster of Paris for making models.
22) Quick fix, wax etc for first aid to antiquities.
23) Essential chemicals as preservatives.
24) Tin foil and plastic covers for collecting soil samples and C-14 dating samples.
25) Antiquity Record Book with plain and graph sheets.
26) The hand bellows: They are useful in blowing off fine dust.
27) Small and big ladders: Helpful in going up and down the trench.
28) Seeve: to seeve the excavated earth to save the smaller antiquities that would be missed by the human eyes.

9.4 EXCAVATION CAMP EQUIPMENTS

Excavation being an elaborate process involving many technical personnel like the Surveyor, Draftsman, Photographer and the like, the tools and plants required by them are quite numerous. Usually, excavations are to be conducted in out-of-the way places in rural areas where amenities for stay may not be available. The excavation party has often to set up its own camp close to the site and this would require camp equipment.

9.4.1 Tents

Tents of different sizes may be necessary. Tents of smaller size where two persons can stay, besides two or three bigger tents can also be fixed up – one to serve as a camp office one to store the tools and plants and the camp materials and one for the excavated antiquities. Some time, a bigger tent can serve as a common dining hall for the staff. In India, the camp kitchen is usually made of thatched palm leaves which are quite inexpensive.

9.4.2 Tent Equipment

A variety of tools are necessary to pitch the tents like hammers, nails of various sizes, iron pegs, ropes etc. Coir mattings or Dharis for the floorings, two

or three cots can be accommodated in each tent for the staff members. Light furniture of a small foldable table and two chairs for each tent are found useful for the staff to do reading and writing notes.

Lighting: In many of the villages it is possible to get electric connection for the camp. Otherwise, gas or petromax lights and hurricane lights would be necessary for every tent as also in important places of the camp site.

9.4.3 Water facilities

Drinking water is to be provided in each tent preferably by keeping a small pot or jug with tumblers and tubs or buckets of water with a mug for washing purposes.

It is usual in India to have a common kitchen and a dining place in an excavation camp so that the field staff need not go outside for breakfast or food. It is needless to say that this requires the necessary vessels like plates, cups, pans etc facilities for supply and storage of drinking water should be taken proper care of.

Furniture like folding chairs and tables, camp boxes to keep books and records and at least one small sized steel almirah to keep cash and other valuables would be essential. A bell is necessary to keep timings and alert the staff at appointed hours.

9.4.4 Transport

Transport of camp material from Headquarters to the camping site and back is usually done in trucks or lorries. A jeep or station wagon is absolutely necessary at the camp for local trips and transport.

9.4.5 Draughtsman's Equipment

1) Tripod Stand

2) Plane table
3) Drawing board
4) Metallic tapes
5) Bubble level
6) Steel tape
7) Architectural scales
8) Folding scale
9) Parallel ruler
10) Protractors
11) Set squares
12) T.Sqaures
13) Drawing paper
14) Drawing pins
15) Drawing pencils
16) Paper clips
17) Strings
18) Iron pegs
19) Wooden pegs
20) Indian Ink and Pen
21) Survey Umbrella
22) Graph sheets
23) Nails

9.4.6 Surveyor's Equipment

All the items mentioned above for the draftsmen are also required by the Surveyor. In addition, the Surveyor needs the following items:

1) Theodolite
2) Dumpy level
3) Leveling staff
4) Prismatic campus
5) Survey levels
6) Survey chains
7) Small notebooks

9.4.7 Photographer's Equipment

1) Field Camera full size with camera stand.
2) Quarter size camera like Linhor is found very handy and effective.
3) A Camera of 120 size like Rollicard or Rolliflex.
4) A 35mm Camera for preparation of slides
5) Cut films
6) Film rolls
7) Lenses (normal, wide angle, close up and telephoto)
8) Filters (Green, yellow and red)
9) Scales of different sizes 50mm. 1 mm 2mm
10) Bubble level
11) Exposure metre
12) Plastocine to fix the small scales
13) Black velvet cloth to serve as background for taking photographs of the antiquities.
14) Record notebook.

9.5 LET US SUM UP

Thus the most important thing in conducting excavation at each and every stage tools and equipments and excavation camp plays an important stage. At the excavation site each and every stage taking photographs, measurements, drawing and making keynote on the spot. Critical analyses and for rewriting the final report.

9.6 KEY WORDS

1. Graph sheets – features squares of various sizes from 1 line per inch to 24 lines per inch.
2. Protractors – is a rectangular, square, triangle, circular or semicircular measuring instrument.

9.7 CHECK YOUR PROGRESS

1. Explain briefly the meaning and aims of Excavation.
2. Explain briefly the Excavation Camp Equipments.

9.8 ANSWERS TO CHECK YOUR PROGRESS

1. 9.2
2. 9.4

9.9 SUGGESTED READINGS

1. Raman K.V.: Principles and Methods of Archaeology, Madras, 1986.
2. Roy, Surindranath: The story of Indian Archaeology, New Delhi, 1961
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UNIT-10 METHODS OF EXCAVATION – VERTICAL – HORIZONTAL – HABITATION SITES – BURIALS – STUPAS – LAYING OUT OF TRENCHES

Structure

10.0 OBJECTIVES

The main objective of this study is to know about

- The different types of excavation in Field Archaeology.
- How to layout a trench.

10.1 INTRODUCTION

Excavation follows exploration. For a better understanding of a detailed history of a site on a sequential basis excavations can be undertaken to know (i) the vertical dimension of a site i.e. the total thickness of the cultural accumulation of a site from its earliest inception – from the virgin soil upwards (ii) the different periods or phases in its history – including the different occupation levels and building levels and (iii) the horizontal dimension: the material contents of each period like the lay-out of the town, the house patterns, nature of buildings and a host of human artefacts throwing valuable light on the material culture of the people.

10.2 METHODS OF EXCAVATION

10.2.1 Typological Method

In this method, artefacts are classified according to their form or shape and their relative antiquity assigned on the presumption that the main criterion-simple to elaborate, poorly preserved to well preserved, crude to refined-is correlated with age. In every artifact, we can have 'type series' indicating a particular form or shape and the date and further finds can be described simply by reference to the types already recognized. The distribution of the types in space and time would indicate the diffusion of a culture. This is a logical evolutionary arrangement constructed by the archaeologies and this is called Seriation. Independent dating of two or more stages in the series would help us date the series relatively. The typological method has come in for much criticism in recent years; but Atkinson and Clark have shown that, with corroboration from the evidence of associated

finds, the method can be verified. Wheeler also observes: "Their (typological classification) values are liable to be local rather than universal and must be established afresh and objectively for every first locality. With this provision that may be of great use." The typological classification when applied in corroboration with stratigraphic method serves as a very useful tool to understand the different forms and traditions in the manufacture of different classes of artefacts. It also serves to link artefacts of distant areas and gives scope for comparison and contrast. For example, the close similarity seen between the handaxes and cleavers found in South India and South Africa or the Neolithic shouldered axes of South East Asia and Eastern India would open up possibilities of ethnographic links and even pre-historic migrations.

10.2.2 Stratigraphical Method

This method was first used by William Smith also called "Strata Smith" in 1816 for geological stratification with the help of fossils. This was adapted for archaeological investigations also later on. This technique has now been universally adopted by excavators and extended to the exploration of cities and burial sites. One of the first tasks of an excavator is to understand the principle of stratigraphy. Wheeler has aptly compared the strata of a site to the pages of a book and each stratum is a link in the cultural sequence of a site.

This method implies the recognition of occupation or habitation layers as well as the layers formed naturally in an excavation so as to determine their sequence of formation. The law of superposition states that the upper layer must have accumulated later in time than the lower one which in turn should have formed later than the one below it. Archaeological layers are deposits of materials laid down by man. It can also be called as occupation layer or level and may consist of artefacts used and left by man such as pottery, charcoal, coins etc. stratigraphical excavation means excavation layer by layer, keeping all the artefacts from each deposit in separate groups. The excavation should "proceed in precisely the reverse order of deposition" ie. The last laid deposit must be removed first and the earlier ones successively until the natural soil is reached. This will give us a good idea of the earliest culture at the site and the later cultures that came

up successively until the latest represented by the uppermost layers. This is known as the sequence of cultures built on the principle of stratigraphy. Stratigraphic excavation ends at the layer where there is no longer any trace of human handiwork i.e. when bedrock or natural soil is met with.

Let us examine what is meant by layers or strata. Layers are deposits differentiated by variations in colour or texture or content. The change of the colour of the surface of the layer can often be detected as the digging proceeds. As the excavation knife runs on the vertical section, it can feel the differences in the texture as well as the contents. Different kinds of soil depending upon the cause of the deposition natural or human, like the layers of sand, clay, silt, gravel or lime (chalk) can be identified. Layers deposited by natural agencies like the wind, floods etc. may easily be recognized because they will be bereft of human artefacts, and usually called "sterile". The sterile layers would indicated discontinuity in the occupation of the site due to temporary desertion of the site.

Colour photography would also be helpful in this examination. The artefacts like pottery, coins etc. extracted from each layer should be kept separately with the layers marked on them so that their place in the cultural sequence or in the chronological and contextual frame work in preserved.
Stratigraphy not only provides us with the sequence of cultures or the order of succession of events in a site but also enables us to arrive at some probable dates at least in terms of centuries.

Two terms are often used in relation to a datable object in a stratum i.e., terminus post quem and terminus ante quem. Artefacts sealed beneath a floor gives a terminus post quem for that floor, since it could not have got there after the floor was laid. Similarly, datable objects found on the floor would give the terminus antequem since the floor should have come earlier than the artefacts found on it.

Disturbance to the Strata

Pits

There are many factors which cause disturbance to the strata and they have to be recognized by the excavators. Any pit dug at a time either as a refuse or storage pit or for a well or as a foundation trench for a structure causes disturbance to the layers that had already accumulated at the spot. The material in the pit would be coeval with the time when the pit was dug and not with the materials found in the layers it had cut through. The antiquities found in the pit-filling should be separated from those found in the layers.

Post-Hole and Robber Trench

Two other items which often cause intrusion into the strata are the post-holes and robber trenches. A robber trench is generally a trench for removal of stones from an ancient wall for re-use. Post holes are the small pits or depressions on which posts were planted to carry a roof or a fence.

Bench Level or Datum Line System

The value of the stratigraphical method of excavation can be appreciated better when it is contrasted with the earlier method that was practiced in the early decades of this century by some archaeologists in the sites of Egypt and Mesopotamia and also by Sir John Marshall in Mohenjodaro.

10.3 LAYOUT OF TRENCHES

The layout of the trench by peg marking is an important first step in the excavator. The excavator should first decide where the trench should be laid in the mound.

Different strategies and methods have to be adopted in the excavations depending upon the aims, the area and the time available for excavation. An accurately laid out trench system is essential for precise record because all artefacts and structures found in the excavations are described according to their position within the trenches and to the pegs that outline the areas. The different types of lay out are:

- **Trial Trenching System**

Trial trenches serve as preliminary sounding before regular, excavation and give us some glimpses of the nature, depth and contents of the archaeological deposits in a given site. They have to be considered as exploratory in nature and they are only a means to an end and not an end in themselves. The dimensions may be one meter in width for equal measure of depth. They should be laid out and oriented with the grid so that if they produce promising results the areas can be extended into a square excavation. Indiscriminate trail trenching should be avoided as it would affect the perspective that would be gained by a fuller area excavation. At any given place, it may serve to give a view of the culture sequence of a site in a short time; but it should be used with caution since the areas of the dig is small and hence its value limited. It is not a substitute for a more detailed excavation.

- **Rectangular Trenching System**

One of the popular methods of excavation lay-out is the rectangular trenching method. Wheeler calls it as "Substantive trenches" since they are not tentative cuttings but regular method with definitive objective. This is useful when the area of dig is small and the objective is more to know the vertical sequence of cultures than to have fuller picture of each and every phase. This method is also useful for cross trenching a line of fortification to correlate its stratigraphical sequence with that of the enclosure within. This method was adopted in Harappa to establish the stratigraphical relationship between two cemeteries far away from each other.

Generally, in this system a rectangular trench of say 10'x8' or 30'x20' may be laid out lined with two parallel rows of one metre. The pegs on one side may be numbered as O, I, II, III, IV and so on whereas the corresponding pegs on the other side as 01, I1, II1, III1, IV1. If in the course excavation it is felt necessary to extend the trench backward from Zero, the pegs of the extended sides can be marked A B C D on one side and A' B' C' D' on the other. The pegs should be diagonally planted with a central nail at the top which marks the correct measuring point. The actual excavation should be done about 50 cms. inside the peg line on all sides. In fact, the actual area to be excavated should be marked with the string

lines all around. Digging should not extend upto the peg line but should stop with the cutting line. This is done in order to keep the pegs and the peg line undisturbed throughout excavations. The pegline is also marked by a running string firmly nailed to the ground. The peg line serves as the datum line for all measurements.

Another important feature in this method is to leave a number of intermediary baulks at regular intervals – say after every 3 metres. This helps having proper control over the digging and correlating the sections besides facilitating access to different parts of the trench for the supervisors and labourers.

Recording the artefacts and other features in the excavations is done by what Wheeler calls as the three dimensional measurement. The three measurements serve to pinpoint the exact location of each object found in the trench and help record the stratigraphical position. Longitudinal measurement records the distance along the trench from the nearest peg. An angle measure is used in such a way that one arm is help along the datum string and the other goes at right angles inside and perpendicular to the object. The vertical or perpendicular line is obtained with the help of a plumbob suspended over the object. This provides the lateral or inward distance of the object from the datum string; and the third measurement records the depth of the object from the intersection of the inward arm and the vertical plumbob line.

The ultimate measurement recorded would have three dimensions – the longitudinal, the horizontal or lateral and the downward or depth. The measurement of each object can be recorded thus: V 1.2 X .50 x 2.5. The first unit represents the peg number and the other three represent the three measurements. The envelops into which the antiquities are kept or the label thereof should contain these measurements so that at any time their exact location and their stratigraphical position can be known without location or ambiguity. With the help of the measurements we can reconstruct the location of the objects according to the plan and according to the strata. The same method of measurement is applied to plot the structures and other features that are discovered in the excavation.

The trench system described above is suitable more for vertical excavation than horizontal excavation; one of the defects in this system is that it does not lend itself for lateral expansion. Secondly, the scope of getting a fuller of material culture of a phase is certainly limited. Its great advantage is that within a comparatively shorter time and with less labour and expense, the excavator can obtain the vertical sequence of culture and also a few glimpses of the material culture.

10.4 HORIZONTAL EXCAVATION

For horizontal or area excavations two ways of investigation or lay-out are followed-one by the grid system in which a series of squares of uniform size is laid out and the other is stripping complete area without the aid of square divisions or balks. The former method was popularized by the British archaeologists including Wheeler and Kenyon. But the later method-open stripping has gained popularity in recent years especially in the U.S.

The grid divides the area into a series of exact squares which are parallel to the site baseline (or latitude) and to the datum line (or true meridian longitude). The Surveyor lays out the metric grid parallel to the datum line. This orientation is necessary because it enables the archaeologist to describe accurately any point on the site in relation to the north-south axis. The size of the square boxes will depend on the depth to be excavated. Normally, 5 to 10 metres square will be reasonable. The squares are separated by the balks (unexcavated strips of partition) of uniform width of 50cms or 1mt depending on the nature of the soil. The balks are to be retained till the end of the excavation work because besides providing access to different boxes they preserve four vertical sections which establish relation between the layers and features. They help the excavator in the correlation of stratigraphy from the different parts of the sites. Ultimately, the balks have also to be removed if necessary as they should never be allowed to obscure or cover any structural features or other important details. Besides the primary balks, secondary balks, wherever necessary, to have a section across the structures within a square, can be had.

After the grid is laid out and the peg marking done accurately, they can be conveniently named by means of letters on one direction and by numbers in the other. This would enable us to designate and mark the square individually as A1, A2, A3 etc. or B1, B2, B3 and so on. The peg at the junction of four squares will have four different names for its four faces A1, A2, B1, B2.

- **Open Stripping**

Some excavators would resort to open stripping method after knowing the stratigraphy of the site. The square unit system and the balks that go with it are avoided. The total stripping is carried out in a single operation or in connected series. Each layer and feature is follows individually and cleared completely. This method is often employed when time is short or where there is a need for emergency excavations. It also helps to clear a large area and save considerable amount of time and effort.

- **Quadrant Method**

For excavating a circular mound such as a barrow, megalithic cairn circle or a stupa, the trenches can be laid out in the quadrant method. The mound or the burial is divided into four quarters, each of which is excavated sequentially. This method was introduced in India by Wheeler to excavate the megalithic burials at Brahmagiri and since followed in all the megalithic excavations. The mound is marked out into four quarters by two strings, laid preferably to the cardinal points of compass and strings, laid preferably to the cardinal points of compass and over the approximate centre. Opposite quarters are dug leaving a balk of about 50cms to 1 metre wide between the quadrants which provides a complete transverse section across the mound in both directions. Quadrants are numbered or named in the order they are excavated. A line of pegs at 50cms.Intervals is planted along the lines of the lay-out. They serve as the datum line for recording the artefacts or grave goods or other features in the burial. The balk sections would preserve the stratigraphy of the deposits and features such as the level at which the primary burial pit was cut and the nature of the filling over it. This could be drawn to scale for recording. After recording the stratigraphy revealed by the balk sections the balks can be removed so that the complete plan of the burial is exposed for drawing and photography.

10.5 EXCAVATION OF BURIALS

The method of the disposal of the dead is an important element of the culture of any society. It reflects the attitude towards many aspects such as belief in the life after death, the immortality of the soul, belief in the protective role of the spirits and so on. An analysis of the burial mode and the grave goods would give clues regarding many religious beliefs and ritual practices of a society. Therefore, excavation of an ancient town would be incomplete without the excavation of the burial site. The burials as an important source of historical information can indeed be appreciated when we see the rich and elaborately furnished royal tombs of Ur or the Pyramids of Egypt with a vast array of artefacts and inscriptions or the comparatively simpler but extremely significant burials with inscribed seals found at the Indus Valley sites. The megalithic burials of South India present their own interesting variety of architectural features, grave goods and the graffiti marks. It is very difficult to generalize the burial types since there are so many improvisations and adaptations. Nevertheless, the following types can be distinguished: simple inhumation burial in fully extended or flexed position, urn burials associated with cremation, jar burials, collective burrials, sarcophagus burials, monumental tombs like the pyramids of Egypt, barrows which are usually low mounds above the ground level as those of the Bronze Age barrows of England, chamber tombs, the megalithic dolmens, cairn circles and so on.

Whatever the type of the burials, the general features to be observed, recorded and interpreted are:

- The location of the burials visa-vis the village habitation. Was there any particular direction set apart for the burial place? The megalithic burrials are usually situated on the slopes of a hill in South India while the habitation was at the foot of the hill. In the Neolithic period the dead were often buried in the house itself.
- The position of the body-extended position or flexed or crouched; and also the orientation of the body.
- The nature of the burial-whether primary or secondary-the latter meaning re-burial of the bones after exposure to nature and removal of the flesh.

- The nature of the receptacle-urn, or sarcophagus or stone chamber, rock-cut caves and other architectural features.
- The stages into which the original burial pit was dug and the fillings made and sealed. This will also indirectly help reconstruct the ritual history. Stratigraphical method in the guardant or general grid has to be adopted for this.
- The nature of the grave goods-pots and pans, weapons and other artefacts interned with the body. They have to be recorded in detail and interpreted. Inscribed seals and pottery would often be very valuable.
- Skeletal Analysis

The excavator should carefully expose the skeletal remains in situ by gently removing and cleaning the dirt by soft brush and needle; do the photographic documentation and the drawing to record the exact position of the skeletal remains and the grave goods. The bones should be chemically strengthened before removal lest they should crumble. If the skeleton is too fragile, it is advisable to lift it along with the surrounding earth by under-cutting. The packing and transporting to the laboratory for conservation and study should be done carefully. The bones are referred to the physical anthropologist for identification and study. Various aspects like the age, sex, racial type etc. can be analysed.

Pathological study can also be done to extract information on the cause of death, nature of disease etc. For achieving the objectives set out above, the stratigraphical method of excavation and three dimensional and triangulation methods of recording the artefacts are the best means. For circular burials like the round barrows or megalithic cairn circles, the quadrant method, described earlier, is found suitable. Good example of the megalithic excavations in India are those of Brahmagiri (by Wheeler) Sanur (by N.R.Banerjee and K.V.SoundaraRajan), excavation of urn-burials at Porklam, Kerala (by B.K.Thapar) and rock-cut cave burials of Kerala (by Y.D.Sharma) described in detail in the volumes of Ancient India. For flat cemeteries like the urn burials without any stone appendage, the ordinary grid system with adequate sections across the burials would serve the purpose.

10.6 EXCAVATION OF STUPAS

Excavation of buried stupas is somewhat complex since it has many architectural features like the outer gateways, circumbulatory passage, the projecting platforms, the central dome besides the relics in the centre. Since it is also a circular structure on plan, the quadrant method of excavation may well be applied to expose the plan as well as the stages of its construction and nature of the fillings. The quadrant method is easier for isolated stupas; but when they are part of a bigger monastic complex full of subsidiary structures like the Chaityas, Viharas, Mandapas etc. it is better to excavate them as part of the usual grid system. The advantage is that a comprehensive plan of the lay-out of the complex will be obtained. This would be quite important for the study of Buddhist architecture and rituals. Good examples of the excavated Buddhist complexes are Taxila, Nalanda, Kapilavastu, Pauni and Nagarjunakonda. In the latter place, interesting plans of the stupa base like the Dharma Chakra and the Swastika have come to light besides the ayaka platforms and pillars peculiar, to the Andhra stupas.

10.7 LET US SUM UP

Thus there are different types of excavation in field archaeology like vertical, horizontal, burial, how to layout a trench etc. the most important thing is the scientific excavation conducted by an archaeologist. Without disturbing and without making any damage to hidden antiquities, structures even if it is a minute evidence, to get correct information right shape and right position of the artefacts or structures archaeologist will take at most care to dig in a scientific manner. This is very important to get historic evidence at the site.

10.8 KEY WORDS

1. Trench – is a type of exaction or depression in the ground that is generally deeper, than it is wide.
2. Stupa – is a mound-like or hemispherical structure containing Buddnist relics.

10. 9 CHECK YOUR PROGRESS

1. Explain the different methods of excavation in the field of Archaeology.
2. Explain how to layout a trench.

10.10 ANSWERS TO CHECK YOUR PROGRESS

1. 10.2
2. 10.2.4

10.11 SUGGESTED READINGS

1. Raman K.V.: *Principles and Methods of Archaeology*, Madras, 1986.
2. Roy, Surindranath: *The story of Indian Archaeology*, New Delhi, 1961
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UNIT-11 RECORDING-SURVEYING-STRATIGRAPHY - HARRIS MATRIX-THREE DIMENSIONAL RECORDING-DRAWING-PHOTOGRAPHY-VIDEOGRAPHY

Structure

11.0 OBJECTIVES

The main objective of this unit is to know about

- The process of excavation in archaeology.

After studying this unit you are able to learn the following:
Recording is main instrument in excavation. Records are mainly in the form of photographs, measured drawings, surveying, Harris Matrix is a tool used to depict the temporal succession of archaeological contexts. The Matrix reflects the relative position and stratigraphic contacts of observable stratigraphic units.

11.1 INTRODUCTION

As already observed, archaeological excavation is a "recorded destruction" and therefore it is but proper that we should explain the nature and importance of the records in an excavation. Records are mainly in the form of photographs, measured drawings of features and artefacts besides field notes and observations.

11.2 RECORDING OF POTTERY EVIDENCE

Pottery has rightly been called the alphabet of archaeology. Excavations in the habitation sites yield enormous amount of pottery belonging to different periods. Pots and pans are so essential and so constantly used by the rich and the poor that they form the bulk of the remains in any village or town site. Moreover, because of their brittle nature short and life, they were in constant demand and consequently continuous production and supply were also there. Hence, the enormous quantity of the potsherds found in the excavations. It is a good index of cultural continuity and change. Valuable objects like gold, silver or copper would have been more carefully used and preserved and even melted and re-used by generation after generation and hence they are comparatively scarce in the excavations. But not so the earthen vessels. Once they were broken, they were discarded and nobody took notice of them.

Potteries belonging even to the earliest period of their use, nearly 5000 years ago, have come down to us. Pottery of high and distinctive quality with beautiful designs has been found associated with the sites of the Indus Valley Civilisation of the 3rd millennium B.C. Similarly, very special kind of pottery known as the Painted Grey Ware has been identified with the Aryan settlers in the Indo-Gangetic plains. The Megalithic people of South India were invariably found using a distinctive was called the Black and Red Ware. Pottery pieces also have sometimes valuable inscriptions or potter's stamps, graffiti marks or paintings which have considerable historical significance. Hence, the study of pottery is very important for an archaeologist. It serves as a good indicator of the prevalence and spread of an associated culture in an area.

Pottery Yard

The first task of the excavator is to separate the pottery of each stratum as the digging proceeds. This is best done by setting up a pottery yard as an important adjunct to an excavation grid. So, the excavated potteries are sent to the pottery yard with the labels and the same are received by the pottery assistants in charge of the pottery yard and placed in the appropriate square according to their locus and stratum. The printed pottery label or tag should have the columns such as the name of the site, the Locus or the Square number the depth and stratum and the Supervisor's name.

Pottery Classification

There are various methods of classifying the excavated pottery on the basis of the periods and the strata; or manufacturing technique, typology, colour, fabric, function, designs etc. Period-wise classification based on the stratigraphical sequence already arrived at would be quite convenient since it would at the same time, give a chronological sequence of the pottery types in a given site. So, firstly, period wise grouping of the pottery can be done and among them, further classification on the basis of colour and type may also be done. For example: Red sherds, Black sherds, Black and Red sherds, Grey ware and so on can be separated and under each of these categories, representative types can be taken up for drawing. Pottery types like the bowls, lids, plates, jars, and urns can be identified and grouped.

11.3 SURVEYING

Surveyor who helps the Director in laying out the trenches and the area of excavation and fixing the pegs according to the chosen measurements. Pegs mark the basic datum line for all measurements and so should be accurately and firmly fixed by the Surveyor. The theodolite which is a versatile surveying instrument used for measuring angles is often employed for setting out the grids.

A map showing the exact location of the excavated site, the village or town in which it is situated along with the other land marks in the vicinity like the hills, rivers etc. has to be prepared by the Surveyor. This can be done on the basis of the I" Topo Sheets prepared by the Survey of India. The details of latitude and longitude are also shown in the map. Supposing the excavated site is within a vast fortified complex with fortification walls, moat etc. the Survey map should show all these details and the excavated trenches set in these surroundings. All these needs accurate Survey plan prepared by a competent Surveyor and by following methods like Chain Survey or Plane Table Survey or Level Surveying.

The site map may also incorporate the contour lines or levels of elevation of the landmarks. The relative heights of the features in a given site can be brought out by the contour plan for which the usual base line is the bench mark showing the mean sea level. The relative levels of the different portions of a city can be indicated as well as a number of other factors like the height of the hills or the gradient of an old dried up channel. Particularly in the prehistoric sites, the relative elevations of the old river terraces can be plotted in the contour map.

Plan drawing is another important constituent of the excavation records and it is indeed complementary to the section drawing. While the section gives the vertical profile, the plan provides the horizontal picture of the object from top. The successive strata and the features in them have to be plotted on plan to scale. This would provide the relative position of the features in a stratum and would help interpretation of the evidence. Features like room walls, flooring, hearth, soak age pits, doorways, streets and drainage found at a particular level, when plotted, would clearly show the overall orientation and their inter-relationship. Apart from

this, plan drawing of all the features has to be prepared to show their length and breadth. In a burial, the plan drawing will enable us to plot the shape of the pit or the receptacle, the skeletal remains and the grave goods as they were originally interned.

11.4 STRATIGRAPHY

1. Stratigraphy is one of the recording methods.
2. In archaeology, stratigraphy is very important to know the sequence of the cultures.
3. Stratigraphy is a scientific method that when we conduct vertical excavation we have to identify the cultural sequence.
4. Stratigraphy is also one of the chronology methods.
5. In 1816 William Smith for the first time he conducted this method for Geological study.
6. Hence stratigraphy is called Geological stratigraphy.
7. This has been adopted for the study of cultural sequence of an excavation site.
8. This stratigraphy is also useful for knowing the dates or chronology.
9. Stratigraphy is one of dating methods.
10. In Archaeology, Stratigraphy used as one of the recording method.
11. As we know that the cultural sequence of the ancient India and all in the world are same.
12. Stratigraphy is useful for documentation in Antiquities as in the cultural sequence.
13. This stratum means layer and each layer represent one culture.
14. In addition to each layer is very important and it has to be document properly by study the contents of the layers.
15. Each layer will be represented with different type of soil and antiquities.
16. It is a primary duty of an excavator to digging of particular site to identify the contents of soil and different antiquities.
17. It is not possible for one person to conduct excavation without helping at the other persons or a group of people to identify the different layers.
18. Stratigraphy of layers has to be documented properly.

11.5 HARRIS MATRIX

The Harris matrix is a tool used to depict the temporal succession of archaeological contexts and thus the sequence of deposition on a 'dry land' archaeological site. The matrix reflects the relative position and stratigraphic contacts of observable stratigraphic units, or contexts. The Matrix was developed in 1974 in Winchester, England, by Dr. Edward C. Harris.

The concept of creating seriation diagrams of archaeological strata based on the physical relationship between strata had had some currency in Winchester and other urban centres in England prior to Harris's formalisation. One of the results of Harris's work, however, was the realisation that sites had to be excavated stratigraphically, in the reverse order to that in which they were created, without the use of arbitrary measures of stratification such as spits or planums. In his Principles of archaeological stratigraphy Harris first proposed the need for each unit of stratification to have its own graphic representation, usually in the form of a measured plan. In articulating the laws of archaeological stratigraphy and developing a system in which to demonstrate simply and graphically the sequence of deposition or truncation on a site, Harris, it has been argued, has followed in the footsteps of the truly great stratigraphic archaeologists such as Mortimer Wheeler, without necessarily being a great excavator himself. Harris's work was a vital precursor to the development of single context planning by the Museum of London and also the development of land use diagrams, all facets of a suite of archaeological recording tools and techniques developed in the UK which allow in-depth analysis of complex archaeological data sets, usually from urban excavations.

Harris's Laws of Archaeological Stratigraphy

In a series of layers and interfacial features, as originally created, the upper units of stratification are younger and the lower are older, for each must have been deposited on, or created by the removal of, a pre-existing mass of archaeological stratification.

Law of original horizontal

Any archaeological layer deposited in an unconsolidated form will tend towards a horizontal disposition. Strata which are found with tilted surfaces were so originally deposited, or lie in conformity with the contours of a pre-existing basin of deposition.

Law of original continuity

Any archaeological deposit, as originally laid down, will be bounded by the edge of the basin of deposition, or will thin down to a feather edge. Therefore, if any edge of the deposit is exposed in a vertical plane view, a part of its original extent must have been removed by excavation or erosion: its continuity must be sought, or its absence explained.

Law of stratigraphic succession

Any given unit of archaeological stratification takes its place in the stratigraphic sequence of a site from its position between the undermost of all units which lie above it and the uppermost of all those units which lie below it and with which it has a physical contact, all other superpositional relationships being regarded as redundant.

These laws were published in 1979. A fifth law of archaeological stratigraphy has also been added following papers presented at the "Interpreting Stratigraphy a Review of the Art" conferences JT in the UK from 1992 to 2003.

In constructing a matrix, the latest contexts sit on top of the matrix and the earliest at the bottom with the lines that link them together representing direct stratigraphic contact (though note that though all stratigraphic relationships are physical, not all physical relationships are stratigraphic). The matrix thus demonstrates the temporal relationship between any two units of archaeological stratification. While excavating, it is best practice to compile the area and site stratigraphic matrices during the progress of an excavation through reference to both the drawn and written record. Regular daily checking of the record and the compilation of the matrix itself both help inform the individual archaeologist on the physical processes of site formation and highlight any areas where dubious

relationships such as H relationships or loops in the recorded sequence may occur. Loops are sequences in the matrix that produce temporal anomalies so that the earliest context in a sequence of context appears to be later than the latest context by virtue of errors in excavation or recording. Urban archaeological sites are complex affairs, often generating thousands of units of archaeological stratigraphy (contexts'). It is of even more vital importance when excavating such sites to compile the matrix as the excavation progresses. Such sites by definition produce multi-linear sequences of succession and to date the best way to get a handle of these sequences is to compile the matrix by hand, based on the drawings and the context sheets. This ensures an internally consistent record and that the complexity of the site is given due regard. Computer programmes do exist which can aid the production of a matrix, though at the moment these tend towards articulating linear sequences rather than multi-linear sequences.

The Harris matrix is a tool that aids the accurate and consistent excavation of a site and articulates complex sequences in a clear and understandable way. Harris matrices play an invaluable role in the articulation of sequence and provide the building blocks from which higher order units of stratigraphically related events can be constructed.

Example of the Harris matrix

This hypothetical section as an example of matrix formation. Here there are twelve contexts, numbered thus:

1. A horizontal layer
2. Masonry wall remnant
3. Backfill of the wall construction cut (sometimes called construction trench)
4. A horizontal layer, probably the same as 1
5. Construction cut for wall 2
6. A clay floor abutting wall 2
7. Fill of shallow cut 8
8. Shallow pit cut
9. A horizontal layer
10. A horizontal layer, probably the same as 9
11. Natural sterile ground formed before human occupation of the site

12. Trample in the base of cut 5 formed by workmen's boots constructing the structure wall 2 and floor 6 is associated with.

The order in which these events occurred and the reverse order they should have been excavated with would be demonstrated by the following Harris matrix.

Completed matrix

The later a context's formation is, the higher it is in the matrix, and conversely the earlier it is, the lower. Relationships between contexts are recorded in the sequence of formation, so even though wall 2 is physically higher than other contexts in section, its position in the matrix is immediately under backfill 3 and below floor 6. This is because the formation of the backfill and floor happened later. Also note the matrix splits into two parts below the construction cut 5. This is because the relationships across the section have been destroyed by the cutting of construction cut 5 and even if it is likely that layers 1 and 4 are probably the same deposit the information cannot be guaranteed if the only information we had was this section. However the position of cut 5 and natural layer 11 "ties" the matrix together above and below the split in the matrix.

Interpretation

Starting at the bottom, the order events occurred in this section is revealed by the matrix as follows. Natural ground formation 11 was followed by the laying down of layers 9 and 10 which "probably" occurred as the same event. Then a shallow pit 8 was cut and then back filled with 7. This pit feature in turn was "sealed" by the laying down of layer 1 which is probably the same event as layer 4. Following this a major change in land use occurs as construction cut 5 is dug and immediately followed by trample off the feet of people 12 working in the construction cut 5 who then build wall 2 after which they backfill excess space between the wall 2 and cut 5 with backfill 3. Finally clay floor 6 is laid down to the right of wall 2 over backfill 3 indicating a probable interior surface.

The nature of archaeological investigation and the subjective nature of all human experience mean that a degree of interpretive activity obviously occurs during the process of excavation. The Harris matrix itself however serves to

provide a check on observable quantifiable physical phenomena and relies on the excavator understanding which way in the sequence is 'up' and the ability of the excavator to excavate and record honestly, accurately and stratigraphically. The process of excavation destroys the context and requires the excavator to be able and willing to make informed (by experience and where necessary collaboration) decisions about which context(s) lay at the top of the sequence. As long as undercutting is not endemic, in practice onsite errors in judgment should become evident especially if temporary sections are kept for stratigraphic control in areas of a site that are hard to discern. However, archaeological sections, while being useful and valuable, only ever present a slice or caricature of a sequence, and often under represent its complexity. The use of archaeological sections when dealing with stratigraphic complexity is limited and their use should be context-sensitive rather than as a running arbiter of sequence.

Carver matrix

Professor Martin Carver of the University of York has also developed a seriation diagram, known as the Carver matrix (not to be confused with the military term also named CARVER matrix). This diagram, which is based on the Harris matrix, is designed to represent the time lapse in use of recognizable archaeological entities such as floors and pits. Like Edward Harris, he used contexts numbered and defined on site as the basic elements of the sequence, but he added higher order groupings to increase the interpretive power. Several other people, such as Norman Hammond, looked to develop similar systems in the 1980s and 1990s.

11.6 DRAWINGS

Graham Webster rightly observes “Structures and features with their stratigraphical relationships are best demonstrated by drawings. The section and plan are the basic forms in which the evidence is represented and the report should be built around them.” Neat and accurate section drawings and plans are the most important records which illustrate the sequence of cultural deposits, associated structures and disturbances to the stratification. It was already stated that as the digging proceeds and the layers are laid bare they are immediately identified and

labeled on the sections of the trench. The next task is to draw them to scale on the graph sheet or tracing cloth. This can be done at convenient intervals during the excavations. After the excavation is completed i.e. digging upto the natural soil is done, the entire trench is ready for a comprehensive drawing and recording. Already, the layers, pits, structures, foundation trenches and other features as and when they were encountered were marked first in plan and then marked in the section. Now, complete pictures of the section on all the four sides of a trench are drawn to scale. This would help the excavator to correlate all the sides of the trench and interpret the evidences in the proper stratigraphical perspective. It would provide a measured drawing and an overview of the complete vertical profile of the strata of the site including the inter-relationships of the soils, trench sections, balks and structural features done by competent draughtsmen.

11.7 PHOTOGRAPHY

Photography plays a key role in archaeological documentation. As pointed out earlier, photographic record is indispensable for all the three stages-pre-excavation field survey, excavation and post-excavation research and publication. Photography plays a pivotal role in recording the different stages in the excavation. It is complementary to the plan and section drawings but its visual impact is more direct, objective and convincing. Good photographs can speak for themselves and bring before our eyes the different aspects of an excavation. It provides a permanent it situ visual record of the strata, structures, artefacts and other features. It is a faithful and trustworthy record of what has happened during the excavations. Photographs, along with the field notes, plans and drawings help "to recreate a comprehensive picture of the excavation."

The photographer has to work in close collaboration with the Director of the excavations. It is the latter who instructs him as to the items to be photographed and also the angle of view; or against a particular section and so on. Since he known the interrelationship of the structures, artefacts and their associated finds, he can instruct the photographer what are to be included in the photograph and what are to be left out. He would also explain what are the items within a structure that need to be emphasised more. The photographer's job is to fulfill the requirements

of the excavator and devise an arrangement to bring out the details desired. He discusses with the Director and tries to understand the importance of the finds, takes good quality photographs, keeps a register of them for ready reference and supply whenever required. The following are some of the items of photography in an excavation.

1. The site or the mound before excavation from different angles to show its natural shape, contours and dimension. In certain extensive sties, aerial photography would be necessary.
2. Strata sections of different trenches or squares with proper labels and scales.
3. Plan and section view of structures, floors, pits etc.
4. Artefacts in situ.
5. Photographs of different kinds of artefacts classified and arranged category-wise eg. Separate plates for coins terra-cottas, potteries etc. before and after chemical treatment.

11.8 VIDEOGRAPHY

Videography refers to the process of capturing moving images on electronic media (eg. Videotape, direct to disk recording, or solid state storage like a tapeless camcorder) even streaming media. The word combines "video" from Latin, meaning "I see" or "I apprehend" with the Greek terminal ending "graphy" meaning "to write".

The advent of digital imaging in the late 20th century began to blur the distinction between videography and cinematography. The arrival of computers and the internet created a global environment where videography covered many more fields than just shooting video with a camera. A videographer may be the actual camera operator. In social science videography also refers to a specific research method of video analysis.

Excavation process can be videographed at every stage of research work. Videograph is an authentic record, because every inch of excavation, daily progress report, the antiquities available during the excavation period. The

excavation project's director carefully designs and plans the research work and gives assent for shooting the research work. Videography plays an important record in the Archaeological excavation in India today. Each and every stage he will be taking videograph on the spot, which will help for the study, critical analyses and for rewriting the final report.

11.9 LET US SUM UP

Thus in archaeological excavation records are mainly in the form of photographs, measured drawings, surveying, stratigraphy, Harris Matrix tools implementation, photography and videography are important features in the excavation.

11.10 KEY WORDS

1. Harris Matrix – is a tool used to depict the temporal succession of archaeological contexts. The Matrix reflects the relative position.
2. Photography – is the Science art and practice of creating durable images by recording light.

11.11 CHECK YOUR PROGRESS

1. Explain the importance of recording in archaeological excavation.
2. Explain the importance of Harris Matrix tools.
3. Discuss the value of photography and videography of archaeological excavation.

11.12 ANSWERS TO CHECK YOUR PROGRESS

1. 11.2, 11.4
2. 11.5
3. 11.7, 11.8

11.11 SUGGESTED READINGS

1. Harris, Edward C, Brown, Marley, R and Brown Gregory, J (Ed) *Practices of Archaeological Stratigraphy*, London, 1993.

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BLOCK – 5: DATING METHODS, STUDY OF ANTIQUITIES AND INTERPRETATION

UNIT-12 DATING METHODS-RELATIVE DATING

Structure

12.0 OBJECTIVES

This unit will help the reader to understand

- Meaning and importance of dating methods used in Archaeology.
- Relative Dating
- Methods in Relative Dating
- Applications of Relative Dating methods in Archaeology.

12.1 INTRODUCTION

Absolute dating and Relative dating are the two broad dating systems or methods used presently in archaeology. In this unit we will understand more about relative dating system and techniques adopted. Next unit we will be focusing on the discussion of absolute dating and different methods in it.

The study of human past is to understand the human activity in a sequential order. The archaeological data has to be placed in chronological order to realize this sequential cultural process. For this, various dating methods are being used in the archaeological investigations. These dating methods are considered as the most important advancement made in this field. Its role in creating the sequential order of human activity and past has necessitated each archaeologist to be aware of the technique and its advancement made in the field. Some of the examples of dating techniques include radio carbon, magnetic, luminescence etc in absolute dating and flouring, nitrogen, historical in relative dating methods.

12.2 RELATIVE DATING

Relative dating is based on the simple principle of stratification, which states that if one layer lies upon another, then the lower layer must have been deposited before the upper. The interval between the depositions of two layers may be a century or a millennium. However, things are not usually that simple when discontinuous layers are occurred.

12.3 RELATIVE DATING TECHNIQUES

- **Historical Dating**
- **Typology**
- **Seriation**
- **Analysis**
- **Stratigraphy**
- **Geochronology**

12.3.1 Historical Dating

Until the development of the scientific dating, dating in archaeology depended entirely on historical methods. Different dating systems are followed in determining the dates of the historical records. The ancient literate societies recorded their written documents or records with certain methods.

Historical writing normally has a clear purpose, either to represent an event, individual or regime, or to use history to make a particular philosophical or religious point.

Thus, before we exploit any written information about the past for archaeology it is necessary to consider several factors:

1. The date and quality of surviving records.
2. The distance (in time and place) of the author from the events described
3. The author's record of accuracy if items can be checked independently
4. The quality of the sources available to the writer and any personal biases or motives that might have led the writer to present a particular version of events. Documents may be discovered in archaeological excavations, for example thousands of clay tablets with cuneiform inscriptions had been found in Mesopotamia. Inscriptions found carved on stone were particularly important in Egypt, the Greek and Roman world, and Mesoamerica.

In India, written documents can be found on different materials like stone inscriptions, copper plates, and seals etc. Generally, their content may range from terse building dedications giving the date and builder's name, to lengthy historical, religious or legal material. These all have the advantage of being primary

documents that have not been copied many times over the centuries by scribes who might introduce fresh errors at every stage. In India, different eras like Saka era, Kaliyuga era, Vikrama era and Kollam era have been used in the inscriptions, seals, copper plates etc. Epigraphist also gives the approximate date to the historical documents based on paleographical ground (styles of the script). The historical monuments like temples, mosques, churches, tanks and forts were given relative dating based on stylistic features. However, one needs to remember that the above mentioned and other dating methods are used based on the nature of the material available to the archaeologist. Archaeologist always tries to attain an absolute dating for the material. He prefers the relative dating when the absolute dating is not feasible.

12.3.2 Typology

The form of an artifact such as a Pot can be defined by its specific attributes of material, shape and decoration. Several pots with the same attributes constitute a pot type and typology groups artifacts into such types. Underlying the notion of relative dating through typology are ahving two further ideas.

- The first is that, the products of a given period and place have recognizable style through their distinctive shape and decoration, they are in some sense characteristic of the society that produced them. The archaeologist or anthropologist can often recognize and classify individual artifacts by their style and hence assign them to a particular place in a typological sequence.
- The second idea is that the change in style (shape and decoration) of artifacts is often quite gradual or evolutionary. Indeed, this idea came from the Darwinian theory of the evolution of species and was embraced by 19th Century archaeologists who realized that particular artifacts eg. Bronze daggers produced at almost same periods are often alike, whereas those produced several centuries apart will differ as a result of centuries change when a archaeologist is faced with a series of daggers of unknown date, it is logical to arrange them in a sequence in such a way that the most closely similar are located beside each other. This is then, likely to fall under chronological sequence.

Arguments were developed by many archaeologists who found that relative chronologies could be established for different classes of artifacts from different regions. The great master of the typological method was the 19th Century Swedish scholar Ocsar Montelius, who formulated local relative chronologies for many of the regions of Bronze Age Europe, drawing upon a whole series of bronze tool and weapon forms. These regional sequences could in many cases be confirmed in their outlines by stratigraphic excavations, where it was indeed found that the simpler forms were the earliest.

Montelius went on to use the same arguments also in spatial to show how the artifact types in one region influenced those in adjacent areas. In this way, making certain assumptions about the direction of influence he established relative chronology for tool and forms for the whole of Europe in Bronze Age weapons. For many purposes, it remains true that the best way to assign a relative date to an artifact is to match it with an artifact already recognized within a well-established typological system.

In Europe, this is true for Bronze Age Artifacts, but it applies very much more widely, at a world level. In the Paleolithic period, the approximate (relative) dating of a layer will often come from an examination of the stone tools found within it. In later periods, pottery typologies usually form the backbone of the chronological system. Like for example, detailed studies on the pottery of Greece in the Mycenaean period by Danish archaeologist Arne Furumark and his successors and the ceramic sequence established for the Pueblo Indians of the American Southwest. But nearly every area has its own well-established ceramic succession. If this is tied into a stratigraphic sequence of deposits that can be radiocarbon or other absolute means, then the artifacts in the typological sequence can themselves be assigned absolute dates in years. It is also worth noting that different types of artifact change in style (decoration and shape) at different rates, and therefore vary in the chronological distinctions that they indicate. Also by and large, with pottery, surface decoration changes more rapidly than shape and is therefore the most chronologically sensitive attribute to use for a typological sequence. Shape of a vessel or a container may in any case be most strongly influenced by a practical requirement such as water storage which need alter for

hundreds of years. Other artifacts, such as metal weapons or tools can change in style quite rapidly and so can be considered as useful chronological indicators. By contrast stone tools, such as hand axes, are often notoriously slow to change in form and therefore rarely make sensitive indicators of the passage of time.

12.3.3 Seriation

Seriation is a method of determining the age of the artifacts based on the style, type and technique. This technique of seriation allows assemblages of artifacts to be arranged in a succession, or serial order, which is then taken to indicate their ordering in time.

- Contextual Seriation
- Frequency Seriation

Contextual Seriation: It refers to a technique through which artifacts and attributes are ordered according to similarity in style, the duration of different artifact styles (shape and documentation) that governs the seriation. The pioneer of the method was Flinders Petrie. He worked at Despoils Parva in Upper Egypt at the end of 19th Century. He excavated several graves that could be neither stratigraphically linked to each other nor tied into the historical king-lists of the subsequent dynastic period. Petrie wanted to put the graves into chronological order, so he began by making an inventory of their contents. Each grave was allocated a separate slip of paper listing its artifact types. Petrie then placed the each separate slip parallel to other, one above the other in a column and kept rearranging their position up or down the column. He believed that the best arrangement would be the one where the greatest number of individual types had the shortest duration across the various slips. In this way he arrived at a sequence of assemblages, and thus arranged in what he thought was their relative chronological order, Subsequent work in Egypt has largely vindicated Petrie and shown that his serial ordering of the graves does in fact generally reflect their true chronological sequence. In India, for instance-dish on-stand, S-Shaped jar and perforated jar are some of the diagnostic styles available in Harappan sites. The availability of such diagnostic wares would help to determine the cultural phase.

Frequency seriation: The frequency seriation is more strictly oriented to chronological ordering of the artifacts, assessing the origin, popularity and disuse of the artifacts. The length of time and degree of popularity (frequency) would be assessed in the given archaeological context. For instance, The American archaeologists had no external chronological information while working at Maya sites in the Yucatan in the 1940s. Their material, however, consisted of ceramic collections which had been recovered without stratigraphic context. In this particular case, there was a need to place those ceramic assemblages in serial order so as to construct a relative chronology of the buildings and monuments with which they were associated. So they adopted frequency seriation, which relies principally on measuring changes in the proportional abundance or frequency of a ceramic style. These two basic assumptions were given by Wes Robinson and another by G.W. Brainerd, published in American Antiquity in 1951. First, they assumed that pottery styles gradually became more popular, reached the peak popularity and then fade. Secondly, they argued that at a given time period, a pot style popular at one site would similarly be popular at another. Thus if the style in question represented 18 percent of total pottery found at site A at a particular period, the pottery from site B for the same period would have a similar frequency of the style. Using these two assumptions, Robinson and Brainerd were able to put the assemblages a sequence so that those with the most similar percentages of certain pot styles were always together. The chronological validity of the method has been demonstrated by American archaeologists such as James A. Ford working in the American Southeast and Frank Hole in Iran. Both Ford and Hole studied ceramic assemblages mainly derived from stratigraphic excavations. They were therefore able to compare the sequences obtained using the method of frequency seriation with the true stratigraphic sequences they discovered in their excavations. In both instances there were no serious contradictions.

Nevertheless it should always be borne in mind that seriation by itself does not tell us which end of given sequence is first and which is last- the true chronology has to be determined by other means, for instance links with the excavated stratigraphic sequences mentioned. In India, for instance-Painted Grey ware, Northern Black Polished ware and Rouletted wares were noticed in a

particular time range only. Based on the quantity and frequency of the diagnostic ware, the date of the particular cultural phase is determined.

12.3.4 Analysis

All the following plants produce almost non-destructible grains called pollen. These were preserved in lake sediments that have allowed the pollen experts to reconstruct detailed sequences of past vegetation and climate. The earliest reported observations of pollen under a microscope are likely to have been in the 1640s but for Botanical researches, are the introduction of microscopes further improved in the studies of pollen analysis, which led the scientists to apply this method in other sciences.

Archaeological palynology examines human uses of plants in the past. This can help determine seasonality of site occupation, presence or absence of agricultural practices or products and 'plan-related activity areas' within an archaeological context. Bonfire Shelter is one such example of this application. The distribution of acritarchs, chitinozoans, dinoflagellate cysts, pollen and spores provide evidence of stratigraphical correlation through biostratigraphy and palaeoenvironmental reconstruction.

The best-known chronologically placed pollen sequences are those developed for the Holocene times of northern Europe. By studying the pollen samples from a particular site, one can safely place them in particular time-ranged pollen zones.

- **Sea-bed Deposits**

The most coherent record of climate changes on a worldwide bed is now provided by sea cores, drilled from the ocean. Cores, which are extracted from ocean-floor deposits reveal variations in oxygen isotopes in the shells and skeletal material of dead marine organisms known as Foraminifera, laid down on ocean floor through the slow continuous progress of sedimentation, which reflect fluctuations in global temperature and the volume of the ocean. Ice ages lock up enormous amounts of water in glaciers, and because of chemistry of water and ice-

formation, frozen water contains a greater number of 'lighter' oxygen isotopes (O^{16}) than sea water which has more (O^{18}). Thus, changes in the relative numbers of these isotopes (the oxygen isotope ratio) can be plotted together with temperature-sensitive species of marine fauna, to reveal the pattern of climatic variation which may be dated according to deviations in the Earth's orbit. A record of 116 marine isotope stages has been defined covering the last three million years. In addition, seabed sediments contain iron particles that show changes in Earth's magnetic field, including north-south reversals, which are also known from geological studies on land dated by K-Ar Potassium Aragon dating associated with suitable volcanic material. However, the major disadvantage is that isotopes tend to diffuse as time proceeds.

12.3.5 Stratigraphy

Stratigraphy is the study of stratification-the laying down or depositing of strata or layers (also called deposits) one above the other. The artifacts that are found in successive undisturbed cultural layers can be dated relatively based on the principles of stratigraphey.

The important principle is that, the underlying layer was deposited first and therefore earlier than the overlying layer. Thus, a succession of layers should provide a relative chronological sequence from earliest (bottom) to latest (top). Good stratigraphic excavation at an archaeological site is designed to obtain such a sequence that part of this work involves detecting whether there has been any human or natural disturbance of the layers since they were originally deposited. Some of these cultural and natural formation processes such as rubbish pits (dug down by later occupants of a site into earlier layers), animals burrowing holes, floods washing layers away and re depositing them elsewhere is a secondary context. Armed with carefully observed stratigraphic information, the archaeologist can hope to construct a reliable relative chronological sequence for the deposition of the different layers.

Of course, what we mostly want to date are not the layers or deposits themselves but, humanly generated materials within them-artifacts, structures,

organic remains which ultimately (when systematically studied) reveal past human activities in the site. When we say that two objects were found in association within the same archaeological deposit, we generally mean, that they got buried at the same time provide that the deposit is a sealed one without stratigraphic intrusions from another deposit. The associated objects can be said to be no later (no deposit more recent) than the sequence of sealed deposits thus giving a sequence and relative chronology-for the time of burial of the objects found associated in those deposits. This is a crucial concept to grasp because, if one of those objects can later be given an absolute date, say a piece of charcoal (that can be dated by radiocarbon in the laboratory) then it is possible to assign that absolute date not only to the charcoal but to the sealed deposit and the other objects associated with it as well. A series of such dates from different deposits will give an absolute chronology for the whole sequence. It is this interconnection of stratigraphic sequences with absolute methods that provides the most reliable basis for dating archaeological sites and their contents. As we have observed however, what we want ultimately is, to reconstruct and date the past human activities and behavior that those deposits and materials represent. If one of those deposits is a pit with pottery in it, the deposit itself is of interest as an example of human activity and the date for it will be the date of human use of the pit. This will also be the date of final burial of the pottery, but it will not be the date of human use of the pottery, which could have been in circulation tens or hundreds of years earlier, before being discarded, perhaps buried in another deposit and then dug up inadvertently with other objects to be thrown into the pit. Therefore it is always necessary to be clear about which activity one is trying to date, or can reliably date in the circumstances.

- **Bone Age**

A useful method of assessing whether several bones found in association in the same stratigraphic deposit are in fact of the same relative age is found out by chemical dating. Testing is done by studying nitrogen, fluorine and uranium content in the bone. Mostly in deposits, the bone's protein (mainly collagen) content is very gradually reduced by the processes of chemical decay. The most useful index for the amount of protein present in the bones is nitrogen content. The rate at which, the level of nitrogen declines depends on the temperature, water,

chemical, and bacteriological content of the environment in which the bone is buried. Even percolating ground water has significant affect on the composition of bone. Two elements fluorine and uranium present in the ground water are absorbed gradually by the bone. Thus the content of fluorine and uranium in buried bone gradually increases and can be measured in the laboratory. Like the rate of decrease in nitrogen, the rates of increase in fluorine and uranium depend strongly on local factors. The rates of change is thus too variable to form the basis of an absolute dating method and one can compare relative ages so derived at site with those at another site. But on an individual site chemical dating can distinguish bones of different age found in apparent stratigraphic association.

- **Ice Sheet cores**

A datable record of climatic change in relatively recent periods has been recovered from cores up to 3 km long extracted from the ice sheets of Greenland and elsewhere. Winter snowfall creates distinct annual layers that are visible for around 6,000 years in the upper parts of cores and may be counted reliably within around 50 years. Deeper layers are too compressed to be distinguishable by eye, but analysis of fluctuations in dust, acidity and the oxygen isotope ratio still reveals an annual record going back about 80,000 years. Thus long-term patterns of climatic variation can be correlated with marine cores, while short-term fluctuations allow more precise interpretation of rapid environmental changes like volcanoes known from historical records can be correlated with ice cores and provide support for their chronology by cross-dating.

Also, Cores extracted from the polar ice of the Arctic and Antartic yielded impressive sequences revealing climatic oscillations. The date for each layer of compacted ice from annual deposits for the last three thousand years has been determined. Thus, the archaeological material recovered from a particular layer is dated accordingly.

12.3.6 Geochronology

The dating of earth's by correlating archaeological events of different time and sequential geological events is called Geochronology.

- **Applications in Archaeology:**

The age of artifacts can sometimes be determined by their association with geological deposits or formations. The effects of long-term geological processes such as glacial advances and retreat or fluctuations in sea levels can sometimes be useful in dating archaeological material. The advance and retreat of glaciers during Pleistocene period (Ice Age) had a marked effect on the action of rivers and on sea level. River terrace or coastal bed formations are due to this ice age effect. The sequences of erosion or deposition have been worked for a number of river valleys. Geologists assessed the age of these geological formations through various dating methods. These dates allow archaeologists to assign approximate date to artifacts that are found with such deposits. This dating method is widely used for prehistoric materials. For instance, the age of Paleolithic tools found on the river terraces of the Soan valley in Punjab, is determined based on the geological deposits found.

12.4 LET US SUM UP

Relative dating is one of the methods used in Archaeology. It is based on the simple principle of stratification. Historical dating, typology, seriation, pollen analysis, sea-bed deposits, stratigraphy, geochronology are the techniques used in relative dating.

12.5 KEY WORDS

1. Pollen analysis – is a type of environmental archaeology in which microscopes are used to analyze the range of plant pollens present in archaeological layers.
2. Geochronology – is the Science of determining the age of rocks, fossils and sediments.

12.6 CHECK YOUR PROGRESS

1. Discuss the Relative dating methods.
2. Explain Historical dating? How it is useful in Archaeology?
3. Describe Stratigraphical dating?

12.7 ANSWER TO CHECK YOUR PROGRESS

1. Answer to Q. No. 1 can be found under section 12.3. (1,2,3,4,5,6,7,8)
2. Answer to Q.No 2 can be found under section 12.3.1
3. Answer to Q.No 3 can be found under section 12.3.6

12.8 SUGGESTED READINGS

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UNIT - 13 DATING METHODS - ABSOLUTE DATING

Structure

13.0 OBJECTIVES

This unit will help the reader to understand

- Meaning, importance and types of dating used in Archaeology
- Absolute Dating
- Methods in Absolute Dating
- Applications of Absolute Dating methods in Archaeology

13.1 INTRODUCTION

In order to address the drawbacks of the relative dating absolute dating methods were encouraged as they would provide most accurate date as well as can be assessed for comparatively longer time duration. This requirement was actually practically envisaged after 1950. This was actually become possible through the contribution of physical sciences. It contributed and developed a number of absolute dating techniques that had a revolutionary effect on archaeology as it helped archaeologists to date, relate and interpret various archaeological materials.
Let's look in to definition of absolute dating. According to Aitken, Absolute dating refers to the dating which is independent of any other chronology or dating technique, that it is based only on current measurable quantities.

After 1950, the physical sciences contributed a number of absolute dating techniques that had a revolutionary effect on archaeology, in helping archaeologists to date, relate and interpret from the various archaeological materials. There exist many Absolute dating methods as on date. They can broadly be classified on the basis of what they measure and how they measure. According to this classification dating techniques can be broadly listed into following types. They are,

- Radioactive Absolute Datings: This measures radioactive elements and processes released in the sample of testing. They include tests like Radiocarbon, Potassium-Argon, Uranium-Lead etc.
- Stratigraphy: Here we are not referring to stratigraphy of soil layers but absolute dating methods in biological and geological sciences. They mainly

constitute two methods namely Dendrochronology (tree rings analysis) and Varve Analysis, which are formed as a result of annual climatic variations.

- Chemical testing's: The samples are run through a sequence of chemical testing's called Obsidian Hydration.
- Palaeomagnetism: In this, magnetic properties of igneous material, baked clay, and sedimentary deposits are analyzed and their dating is fixed.

Before we go little in details to each of these dating methods let us be clear that these dating methods are independent once and their utility depends on the composition of the material being dated. For example it would not be possible to use Carbon dating method for dating a pottery. Therefore using appropriate test is very important and depends on the sample and objective of the study.

13.2 ABSOLUTE DATING

13.2.1 Radiometric (active) dating

It refers to the dating methods which depend on the radioactive minerals and the process of their radioactive decay, or half-lives in the sample tested for. The most common forms of radiometric dating are carbon-14, potassium-argon although some archaeologists will also make use of radium-strontium, lead-alpha age, and (spontaneous) fission-track radiometric dating. Radiometric dating techniques can be used on any object if the original amount of radioactive isotope, the current amount of radioactive isotope, and the rate of radioactive decay of the radioactive isotope is known.

Radioactive Decay

Radioactive decay is a process in which an isotope (the parent) loses particles from its nucleus to form an isotope of a new element (the daughter). The rate of decay is conveniently expressed in terms of an isotope's half-life, or the time it takes for half of the radioactive isotope in a sample to decay.

In 1905, the British physicist Lord Rutherford, after defining the structure of the atom made the first clear suggestion for using radioactivity as a tool for measuring geologic time directly. Shortly thereafter, in 1907, Professor B. B. Boltwood, radio chemist of Yale University, published a list of geologic ages based on radioactivity.

Today these radiometric dating methods are majorly used in Archaeological applications and in Geochronology. Radio carbon dating, Potassium-Argon dating and Uranium-Lead dating, Luminescence dating, Electron spin resonance dating etc, are widely used dating methods.

13.2.2 Radio Carbon Dating

Radiocarbon dating is a technique used to date Geological specimens, usually based on the concentration of a particular radioactive isotope contained within it. However one needs to consider that this dating is applicable to organic and in very rare cases to some inorganic materials (not applicable to metals). Archaeology and other human sciences use radiocarbon dating to prove or disprove theories. This is also called as Carbon 14 dating as the isotope assess is Carbon 14. Over the years, carbon 14 dating has also found applications in geology, hydrology, geophysics, atmospheric science, oceanography, pale climatology, and even biomedicine.

The credit of inventing this method of absolute dating which is widely used among all dating methods (as the number of organic materials are high than the inorganic) goes to American physical chemist Willard Libby. For the first time (in mid 1940) he realized that C14 decay may help to devise a method for dating organic matter and in 1948, he is credited to be the first scientist to suggest that the unstable carbon isotope called radiocarbon or carbon 14 might exist in living matter (organic materials). He led a team of scientists in the post World War II era to develop a method that measures radiocarbon activity. Mr. Libby and his team of scientists were able to publish a paper summarizing the first detection of radiocarbon in an organic sample. It was also Mr. Libby who first measured radiocarbon's rate of decay and established 5568 years that is 30 years as the half-

life. In 1960, Mr. Libby was awarded with Nobel Prize in Chemistry in recognition of his efforts to develop radiocarbon dating. Later the half life has been re corrected to 5730 years that is 40.

Let's look into the basic principles on which Carbon Dating works. Radiocarbon, or carbon 14, is a radioactive isotope of the element carbon and is unstable and weak as against to more stable isotopes of carbon namely carbon 12 and carbon 13.

Then the question is how Carbon 14 does enters a living beings body and how can that be assessed. To understand this, let me first answer where this carbon 14 isotope is formed? It is continually being formed in the upper atmosphere by the effect of cosmic ray neutrons reaction with nitrogen 14 atoms (nitrogen isotope N 14). When this interaction takes place N14 rapidly oxidized in air to form carbon 14 and enters into global carbon cycle. Let's halt and understand what global carbon cycle is. It is cyclical process where in each living being acquires carbon 14 into its body or system through breathing as well as through food chain (for example plants acquire it through photosynthesis and we humans acquire it as we consume vegetable, greens and fruits).

As C14 readily mixes with the Oxygen in the earth's atmosphere, together with C12, eventually enters into all living things as a part of normal exchange process. As long as the matter is living it continues to receive C 14 atoms in constant proportion. When they die, they stop exchanging carbon with the biosphere and the left Carbon-14 in the tissues of the organism begins to decay to become Nitrogen-14 and is not replenished by new C-14 at a rate determined by the law of radioactive decay. Thus the change in the Carbon-14 to Carbon-12 ratio is the basis for dating. It takes around 5730 years to become half of its quantity. Thus it is measured at the rate of one half every 5730 years.

Half life refers to the time taken for half of the radioactive atoms to decay. It may vary from seconds to millions of years, depending on different samples.

Half life (t 1/2) is measured by counting the number of beta radiations emitted per minute (cpm) per gram of material. Modern C 14 emits about 15 (cpm/g), whereas C 14 of 5700 years old should emit about 7.5 (cpm/g). In the disintegration the C 14 returns to N 14 emitting a beta particle in the process. Thus, C14=B±N 14 + Carbon-14 has a half-life of about 5730 years. After many half-lives, the parent daughter-ratio becomes too small for accurate measurement. This element should therefore not be used to age things that are older than about 50,000 years (i.e., 10 half-lives):

Half-Life	Years	Remaining C14
1	5,730	50.0%
2	11,460	25.0%
3	17,190	12.5%
4	22,920	6.3%
5	28,650	3.1%
6	34,380	1.6%
7	45,840	0.8%

Above table shows the approximate amount of carbon-14 that will remain years after a plant or animal is dead.

Radiocarbon dating is essentially a method designed to measure residual radioactivity. By knowing how much carbon 14 is left in a sample, the age of the organism when it died can be known. It must be noted though, that radiocarbon dating results indicate when the organism was alive but not when a material from that organism was used.

Radiocarbon Datable Materials

Not all materials can be radiocarbon dated. Most, if not all, organic compounds can be dated. Some inorganic matter, like a shell's aragonite component, can also be dated as long as the mineral's formation involved assimilation of carbon 14 in equilibrium with the atmosphere. Samples that have been dated through this method include charcoal, wood, twigs, seeds, bones, shells, leather, peat, lake mud, soil, hair, pottery, pollen, wall paintings, corals, blood

residues, fabrics, paper or parchment, resins, and water, among others. Physical and chemical pretreatments are done on these materials to remove possible contaminants before they are analyzed for their radiocarbon content.

Principal Methods of Measuring Radiocarbon

There are three principal techniques used to measure carbon 14 content of any given sample — Gas proportional counting, Liquid scintillation counting and Accelerator mass spectrometry.

- Gas proportional counting is a conventional radiometric dating technique that counts the beta particles emitted by a given sample. Beta particles are products of radiocarbon decay. In this method, the carbon sample is first converted to carbon dioxide gas before measurement in gas proportional counters takes place.
- Liquid scintillation counting is another radiocarbon dating technique that was popular in the 1960s. In this method, the sample is in liquid form and a scintillator is added. This scintillator produces a flash of light when it interacts with a beta particle. A vial with a sample is passed between two photomultipliers, and only when both devices register the flash of light that a count is made.

Accelerator Mass Spectrometry (AMS) is a modern radiocarbon dating method that is considered to be the most efficient way to measure radiocarbon content of a sample. In this method, the carbon 14 content is directly measured relative to the carbon 12 and carbon 13 present. The method does not count beta particles but the number of carbon atoms present in the sample and the proportion of the isotopes. For AMS, small sample size needed (as little as 20 mg) thus it is recommended for radiocarbon dating of blood particles, grains, seeds, small artifacts, or very expensive or rare materials.

Radiocarbon dating is very much used in dating the archaeological context, radio carbon dating provided a frame work for the Prehistory of the world, by testing its material culture, and many been dated in the historical context also.

13.2.3 Potassium-Argon Dating

Potassium is abundant throughout the earth's crust, it contains a small percentage of isotopes, and this potassium decays into calcium 40 and then to a gas called, Argon. This gas escapes while volcanic rocks are being formed, but once minerals have cooled and crystallized they trap the argon. Thus these collected crystallized particles containing gas can be released in the laboratory by heating process and it is measured. This quantity may be related to potassium 40 (k40) and calculated from its half life (1250 mi. yrs), since this half life is very much long in comparison with that of C14. Its potential was initially limited to geological dating, later it’s been used in archaeology.

History

L. T. Aldrich and Alfred O. Nier in 1948 demonstrated that argon is the product of the decay of potassium and also implied that age of items containing potassium can be determined according to amount of potassium turned into argon. F. Smiths and W. Gentner were first to publish results by this dating method.

Method

As radio carbon dating is based upon a decay process like other methods such as uranium series dating is based upon accumulation process. Thus, the recent samples of carbon contained high levels of radioactive isotope in it because they have not yet decayed. Recently formed geological deposits have very low levels of AR40 (argon 40) because there has been so little time for it to accumulate. As a result it is difficult to measure AR40 in samples less than 100,000 years old.

A revolution began in the 1970s with laser-fusion, which allows extraordinarily small samples even individual mineral grains to be measured rapidly. Further improvements in precision have extended K-Ar dating to relatively recent samples that overlap with the earliest part of the range of radiocarbon dating between 100,000 and 50,000 years ago.

Importance in Archaeology

Archaeological applications began only in the 1950s when the controversy over the date of fossil hominids from East Africa stimulated the demand for absolute dates beyond the range of radiocarbon. Potassium-argon is ideal for dating early hominid fossils in East Africa, for they occur in an area that was volcanically active when the fossils were deposited between one and five million years ago, pioneering results in the 1950s doubled previous estimates of their age (walter 1997 109-20). Layers containing bones and artefacts may be found sandwiched between volcanic deposits of ash or lava that provide excellent samples of newly formed minerals for measurement.

Very occasionally the association between human remains and volcanic deposits may be much more intimate, as in the case of hominid footprints around 3.6 million years old found on a layer of freshly deposited ash at Laetoli, Kenya. The laser-fusion method has been able to check and refine dates of geological stratification in Olduvai Gorge, while 'Lucy' one of the most famous hominid discoveries from Hadar in Ethiopia, is now precisely dated just less than 3,180,000 years. Thus K-AR dating is more efficient on dating much older materials.

Limitations

a. The major application of this method in archaeology would seem to be only at site which has witnessed volcanic activity has deposits of potassium rich minerals either just before or shortly after occupation by man.

b. K-AR dating is accurate from 4.3 billion yrs to 100,000 yrs, where only 0.0053% of potassium is decayed into argon. So below that result won't be much accurate.

Thus the future of K-AR dating lies in its versatility. It will be intriguing to see where how and in what form the next generation of this method will be applied.

13.2.4 Uranium-Series Dating

Uranium-Series dating is a radiometric dating method based on the decay of various uranium isotopes, which decay through a series of stages to a stable lead isotope.

Principles of the Method

Uranium-238 and uranium-235 elements are radioactive for long periods and decay in a series of stages to various elements with differing half lives. However, only some of these are useful for dating, particularly throium-230. Uranium is soluble in water while the elements products are non-soluble. This means that uranium present in water, it seeps into limestone caves, but its non-soluble daughter products do not. Because of this soluble nature uranium becomes part of the travertine of the caves whereas its elements isotopes present in the sample increase through time and this ratio is measured to provide an age estimate. Most commonly the ratio of uranium-238 to thorine-230 is measured.

Measurement

The alpha radiation of each element is measured and recognized by its characteristic frequency. For example a sample material, coral which forms newly in sea water will takes U234 dissolved in sea, but lacks Thorium (as it won't be dissolved in sea water). After the coral formation Th230 begins to accumulate in these newly formed materials at known rate relative to original amount of 234U and this measurement can used for dating early human activity in caves anywhere between a few hundred and 500,000 years ago. Large samples of up to 200 g are required unless mass spectrometry is available.

Human occupation levels sandwiched between layers of flowstone in a cave are ideal, for example successive levels associated with Neanderthals and modern humans at La Chaise de vouthon in Charente, France.

Archaeological Applications

- It is majorly useful to date Precambrian rocks by measuring proportions of Uranium to Lead. Uranium series dating is used at archaeological sites rich

in calcium carbonate and is often used to date cave sites with early human occupation. Artifacts are often found embedded in layers of calcium carbonate.

- Uranium-series dating can also be used on teeth as the dentine takes on soluble uranium post deposition

Limitations

- It provides less satisfactory results when carried out on porous material like bones or shells etc.
- Sequential deposition in caves can be complex, which can lead to ambiguous results if the geology of the area is not examined thoroughly, which allows the possibility of errors. Therefore testing of multiple samples is recommended.

13.2.5 Thermoluminiscence Dating

This method is based on the fact that the objects (with crystalline minerals) that have been subjected to strong heating in the past could be dated by their Thermo luminescent (glow) effect. In 1960 Kennedy and Knopff announced this potentially useful method of dating archaeological materials.

Method

Crystalline minerals have defects in their structures that they trap electrons displaced by radiation and also by the decay of radioactive isotopes in minerals contained either in the artifacts themselves or in soil in which they have been buried. Deep traps do not release these electrons until heated above 300 degrees. As soon as heating is over electrons begin to accumulate again. When electrons are released some recombine with a luminescence centre and emit light in proportion to their number. Thus, the basis of TL light dating is, measurement of light emitted when samples from artifacts such as potsherds or flints are reheated in laboratory to release electrons that have accumulated since they were originally fired or burned.

To calculate date of a sample, it is heated to 500 degrees c and then the amount of light released is measured and its glow curve is plotted on a graph. . This graphical representation is compared to an artificial glow curve derived from an identical sample (which is measured from the amount of radiation in the laboratory). The relationship between two curves provide information about the reliability of the sample, also reveals the amount of energy accumulated since it was last heated. Example Quartz grains from Australian sites have been dated to reveal the arrival of humans more than 50,000 yrs ago, which lies beyond the accurate range of carbon dating.

Applications in Archaeology

Thermoluminiscence dating is particularly valuable in situations where no suitable materials for radiocarbon dating have been found or if the age exceeds 40.000 years beyond which radiocarbon is of rapidly diminishing usefulness. It is also useful in areas where volcanic materials suitable for potassium- argon dating are absent. Fortunately, early pre historic caves or campsites normally produce many finds of stones and flint implements burnt in fires at a sufficiently high temperature to release their trapped electrons. Flints found in deposits with relatively low surrounding radio- activity may be datable up to 500,000 or even a million years.

Another method in Thermoluminiscence is Optical dating, which has proved to be particularly suitable for examining un-burnt sediments; this technique uses light, rather than heat, to release only those electrons stored in traps that are easily bleached, ensuring that only electrons stored since burial of the sediment are measured. Thermoluminiscence or optical dating of artifacts may not have the precision of radiocarbon, but it does not require calibration since it relies on constant rates of radioactive emissions. The span of time encompassed by the various luminescence techniques is remarkable from a few decades to approaching million years. Extension beyond the range of calibrated radio carbon dating is particularly to be noted.

13.2.6 Electron Spin Resonance (ESR) Method

ESR is a 'trapped charge dating method, but it is applied to different kinds of samples and the method of measurement is also different. ESR does not release trapped electrons, but subjects them to electromagnetic radiation in a magnetic field, which causes electrons to resonate and absorb electromagnetic power. The strength of resonance reflects the number of electrons that have become trapped since the crystals were formed. Same as with Thermoluminiscence, age is estimated by relating the amount of resonance to the radioactive content of samples, combined with any external radiation they have received, and calculating how long it would have taken for that amount of radiation to produce the level of resonance recorded.

History

In 1936, Gorter and colleagues delineated the basic principles of ESR spectroscopy, but early attempts were unsuccessful. In 1975 Ikeya successfully dated stalagmite from Akiyoshi cave, Japanusing ESR. Later it included many materials like molluscus, corals, enamel, quartz etc.

Importance in Archaeology

Tooth enamel is the best sample material, dentine of the core-like bone is porous, allowing new minerals to form after the death of the animal, which leads to an under estimate of true age, and making it possible for uranium to be transported into or out of it. Examples of ESR dates derived from samples of teeth from Canada, Germany and France. The dates were credible because they correlated well with the climatic stages to which the animal species belonged and with uranium-series dates. Future progress with ESR is likely to take place alongside uranium- series and other dating methods so that anomalies and errors may be detected and investigated. Shell offers some potential in addition to tooth enamel.

In contrast to potassium-argon dating, ESR is a direct method that dates teeth from animals and humans rather than the stratigraphic context in which they were found. This approach will overcome one of the main problems of the interpretation of dating results in palaeo-anthropological contexts, namely the precise relationship

between the samples that have been dated and the hominid specimen whose age is to be determined.

13.2.7 Fission Track Dating

Fission track dating involves counting microscopic tracks caused by fragments derived from fission of uranium-238 in glassy minerals, which can be of geological or of human manufacture. In practice the most useful samples come from zircon or obsidian, which used extensively for making tools.

History

First developed in mid 1960's, by 3 American physicists, who noticed that these tracks centered in minerals and glasses have minimal uranium. These tracks accumulate at a fine rate and can be dated, between 20000 yrs to few billion years.

Method

An obsidian artifact must have been subjected to heating if it is to provide a date for an archaeological context or event, heating removes earlier fission-tracks that had accumulated since the obsidian first solidified after its volcanic formation. Obsidian tools or waste flakes dropped into a hearth would make ideal samples. New tracks can be counted and related to the amount of radioactive U238 the artifacts contain to estimate how much time has elapsed since their last heating. Like potassium-argon dating, the fission track method has been invaluable for checking the age of volcanic deposits associated with early hominid remains in East Africa.

Fission track is also important in dating tephrochronology (a dating technique which uses layers of volcanic ash (tephra)) for checking the age material found on sites or in seabed cores that can be shown by its chemical characteristics to have come from a particular volcano. This has proved very useful in establishing the contemporaneity of the sites in Indian sub continent, where early stone artifacts have been found.

A limitation is that, fission tracks disappear if object is heated to very high temp of >2000 degrees and the data of the object that had been burnt gives the date of burning or firing, since prior fission tracks would have been disappeared.

13.3 GEOLOGICAL DATING

Geological dating refers to the use of chemical analysis techniques to find out dating of geological specimens. Earth's surface is continuously subject to change, all the processes by either Human or geological are recorded. Anything which is buried once may also be exposed again, like caves, once occupied and then abandoned whose living levels are now covered with different sediment layers. Later, all become archaeological material and presented to an archaeologist with the possibility that one may be able to determine a chronological placement of these recordings. These recordings can be dated with the help of geochronological dating methods that are discussed below.

13.3.1 Dendrochronology

It refers to an absolute chronometric dating technique that measures the time intervals, dating events and environmental changes of past by reading and dating the pattern (number, width and density) of annual rings formed in the trunks of trees.

History

The knowledge that trees grow rings each year was known since Leonardo da Vinci. However its philosophy was understood in 18th century by Schweingruber. Initially it was used by in 1913 by Dr. A. E. Douglass with an intention to determine a record of past climate as he was studying on fluctuations in solar radiation and its effect on climate by looking the variations in the tree ring thickness in Arizona from 1904. His new dating method was entered into archaeology in 1920s because of many timbers preserved in prehistoric Native American sites.

Tree ring dating

This method is based on the fact that rings are formed annually, where variations in widths of the rings reflect climatic conditions including several instances of extreme disturbances to natural growth. For example a series of exceptionally narrow rings indicate wet, cold weather conditions. Some rings show distinctive effects of forest fires, severe volcanic eruptions etc, these help in cross dating between trees in any region, as well as providing important environmental information.

On examining a cross section of tree trunk, one can see these annual increments preserved as a series of concentric rings, counting the rings gives the age of that tree. However, to get chronology suitable for dating archaeological material, it is necessary to match series of rings from various ages, with the help of cross dating. As the size of tree rings depends on the environmental conditions of a particular year, one can match similar rings from one tree to another. Not only width of the rings, measurements include density of the wood also. Collecting samples requires the use of a borer, when collecting dendrochronological samples, it is not the size of the sample that is important but the number of rings present within the sample.

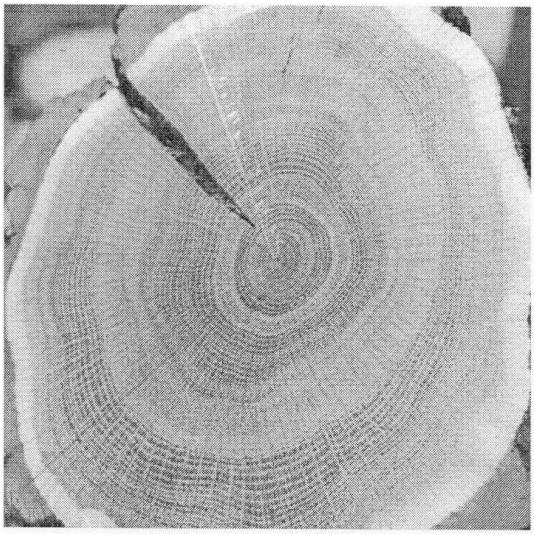

Fig (a) showing tree rings (thick, thin)

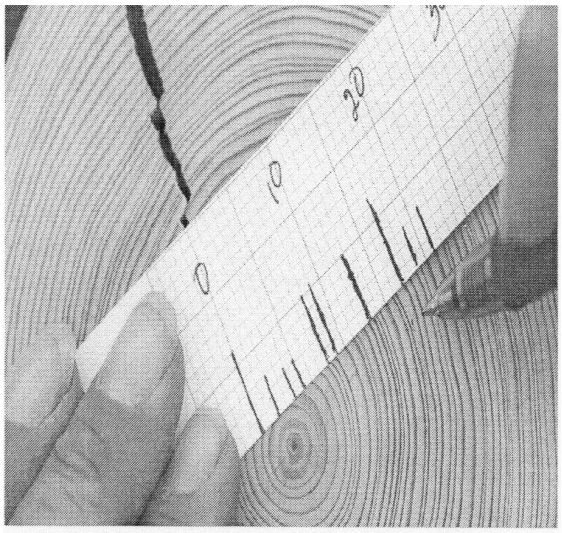

Fig (b) showing counting of the tree rings

Application of tree ring dating in Archaeology

This method of dating is used for dating wooden used in buildings as well as their modification and repair. This approach has been used in many different contexts and sites which are also integrated into historical accounts. For example, a site where a water logged timbers from a gate of Roman fort excavated at Alcester near Oxford in 2000 came from trees felled in autumn of AD 44, the year following the invasion of Britain. This dating is also used in dating of prehistoric materials and for prehistoric materials to make a tree-ring chronology, which is possible only when the following four conditions are met (as per Bannister and Smiley):

1. There must be trees that produce defined annual rings as a result of a definite growing season.
2 Tree growths must be principally dependent upon one controlling factor.
3. There must have been an indigenous prehistoric population that made extensive use of wood
4. The wood must be well enough preserved so that it still retains its cellular structure.

Limitations

Unfortunately there are many complications in the direct application of dendrochronological dating. Not all tree species are sufficiently sensitive to display distinctive variations in their ring characteristics particularly when growing in temperate climates wood survives only under exceptionally wet or dry. Wood is frequently reused several times in repairs or reconstructions of wooden buildings with foundations that decayed long before their roof. Reuse is a particular problem on arid sites where timbers do not decay. Despite these problems, tree rings are the only source of truly absolute dates.

13.3.2 Varve analysis

Varve analysis is an old dating technique for Geochronology. The melting of the glaciers every summer causes erosion by streams and rivers and the resulting sediments are eventually deposited on lakebeds. These sediments become sparser and finer as the year progresses and also the flow of water is reduced when

temperatures begin to fall and then winter freezing stops erosion until the next summer. Sections cut through lake beds in glacial region reveal a regular annual pattern of coarse and fine layers, known as varves. Variations in climate produces observable differences in the thickness of sediments, like the patterns of variation in tree rings; this allows matches to be made between deposits in separate lake beds.

History

Varves had been recognized and understood as early as the 1870s in Sweden. From 1905 onwards Baron de Geer carried out extensive fieldwork with the aim of establishing a continuous sequence from overlapping deposits preserved in beds of the hundreds of lakes that formed during the retreat of glaciers after the last Ice Age. De Geer lacked a secure fixed point at the end of his sequence. A set of 3,000 varves from a lake known to have been drained in AD 1796 gave an approximate pointer and he published a sequence covering around 12,000 years in 1912. This finally linked to the present with the help of modern deposits from river valleys in central Sweden.

Varves allowed the end of Ice age to be dated around 8750 BC and introduced the first calendar dates to European prehistory. They also made possible to date individual sites if their positions could be related to former lakes or seashores. Even more important, varves provided a means of dating the sequence of changes in vegetation known from pollen analysis that was vitally important before radiocarbon dating was introduced after 1950. Finally, ice cores and waves provide additional way of checking the reliability of radiocarbon dating in periods beyond the range of samples from precisely dated tree rings. The date of signs of abrupt climate change in ice cores and vanes around 8750 BC is underestimated by approximately 700 years by radiocarbon dating, underlining the need to convert the radiocarbon years to calendar years with the help of calibration curve. Varves also contribute to archaeomagnetic dating, as their iron rich clay particles contain a record of earth's magnetic field.

Application in archaeology

Well varve analysis can be used indirectly for archaeological dating. Sites are not often found in glacial lakes, but sediments in glacial lakes may be correlated with other geological features, such as beaches varying water levels. When the sea levels and hence their beaches can be dated by reference to varves and in turn to date archaeological material found in the beaches. The method lacks precision, however, because it is possible for archaeological materials to have been incorporated into beach deposits long after the beaches were formed.

13.4 CHEMICAL DATING

Obsidian-Hydration Dating

Obsidian or Volcanic glass is formed by rapid cooling of silica rich lava. Although its precise chemical composition varies from one out crop to another, it always contains >70% silica by weight. Humans often use it as a raw material while making chipped stone tools.

History

In 1948, two archaeologists, Irving Friedman and Robert Smith, began looking into obsidian potential as a time maker. They introduced the obsidian hydration dating method to the archaeology community in 1960.

It is used in two ways: as a relative dating method to determine if one artifact is older or younger than the other, or as an absolute dating method where a calendar date (BP) is produced. The decision to use it as a relative or absolute dating method depends upon the environmental conditions (e.g.: soil temperature and soil humidity) of the archaeological site.

Method

Obsidian hydration dating is based on the fact that a fresh surface is created on a piece of obsidian in the tool manufacturing or flint knapping process. Obsidian contains about 0.2 percentage of water. When a piece of obsidian is fractured, atmospheric water is attracted to the surface and begins to diffuse into glass. This results in the formation of water rich hydration rind (outer covering or

coat) that increases in depth with time. The hydration process continues until the fresh obsidian contains about 3.5 percentage of water. This is the saturation point. The thickness of the hydration rind can be identified in petrographic thin sections cut normal to the surface and observed under a microscope. A distinct diffusion front can be recognized by an abrupt change in refractive index at the inner edge of the hydration rind. These fronts or rinds of hydration are more dense than the un-hydrated inside and the un-hydrated zone has different optical properties. Friedman and smith reasoned that the degree of hydration observed on an obsidian artifact could tell archaeologists how long it had been since that surface was created by a flintknapper.

Applications in Archaeology

This method is used to date artifacts directly and not like carbon methods which dates context more. This technique is relatively cheap, easy to do, allowing archaeologists to obtain more number of dated samples.

13.5 MAGNETIC DATING

Archaeomagnetism (Palaeomagnetism)

In the 20 century, Geologists developed the paleomagnetic dating technique to measure the movements of the magnetic N pole over geologic time. Records of magnetic alignment have been made by scientists in Britain since 1600AD but began more recently. In mid 1960s, Dr. Robert Dubois introduced this new absolute dating technique as Archaeomagnetic dating to archaeology.

Magnetism

Magnetism occurs whenever electrically charged particles are in motion. Earth's molten core has electric currents flowing through it. As the earth rotates these electric currents produce a magnetic field that extends outward into space. The Earth's magnetic core is generally inclined at an 11 degree angle from the Earth's axis of rotation. Therefore, the magnetic north pole is at approximately at 11 degree angle from the geographic North Pole on the earth's surface, when you hold a compass the north pointed by needle is actually pointing to magnetic north.

The position of Earth's magnetic north wanders around the North Pole, changing its orientation and undergoing change in the magnetic field continuously. Generally from any reference point its position is measurable in two components, movements up or down (inclination) and from side to side (declination). The reference curve of this inclination and declination is made for dating. Any changes that occur in the magnetic field will occur all over the world, they can be used to correlate stratigraphic column in different locations. This correlation process is called magnetostratigraphy. Earth's magnetic field varies from region to region. Its intensity also varies over time.

Application in Archaeology

Magnetic dating may be applied to archaeological samples because fine grains of iron oxide with random magnetic alignment are present in most clays and soils. The alignment of grains containing iron is lost if they are heated above 6500 C, but they align with the Earth's magnetic field on cooling. This new thermoremanent magnetic alignment may be preserved for hundreds of thousands of years as long as heating has not been repeated. Magnetic alignment may also take place during the deposition of sediments, for instance in lake beds, where particles suspended in water may align with the prevailing magnetic field as they settle.

Dating according to the direction of the magnetic field is only possible on sites where solid day structures are found that have not moved since becoming magnetized kilns, hearths and burnt-day walls or floors are ideal. Small samples are selected and their positions are carefully recorded in relation to the present magnetic field before they are removed. Their modern alignment is duplicated in a laboratory, and the difference between the ancient and present alignment measured. The alignment of the ancient sample will be related record of past changes in the magnetic field in the same region as the site from which it was taken. Examination of the movement of magnetic north show that the line on the diagram crosses at many points, meaning that a sample could belong equally to more than one date. One particular date to be selected as most likely on archaeological or historical grounds. Although archaeomagnetic dating requires

samples that have not moved since they aligned with the Earth's magnetic field, portable fired objects such as bricks or pots that were fired in a horizontal position may be examined to determine the dip angle (inclination), although the declination will have been lost. This is of limited use but might be used to test whether objects were of the same date or indeed which wav up they were fired.

Limitations

Paleomagnetic dating can only date deposits that are millions of years old, useful when studying Fossil hominids, not for modern Homo sapiens.

Microscopic particles changes when settled through water into strata, causes realigning with earth's magnetic field at that time. Identification of such particulars is required if not leads to errors.

13.6 LET US SUM UP

This unit would have contributed to your understanding of what absolute dating mean and different kinds of Absolute dating techniques with their use and limitations that can be used in dating the past. Also understood how archaeologists will be able to incorporate or interpret the sedimentation, materialistic evidences into a framework of dates, major events and cultures.

13.7 KEY WORDS

1. Chemical dating – is a technique that Measures the Chemical composition of a specimen.
2. Archaeomagnetic dating – is the study and interpretation of the signatures of the Earth’s magnetic field at past times recorded in archaeological Materials.

13.8 CHECK YOUR PROGRESS

1. Briefly describe absolute dating and its importance in Archaeology?
2. What are the absolute dating methods available for an archaeologist?

3. What is Potassium-Argon dating? Explain its importance and applications in archaeology.
4. What is Dendrochronology? Its applications and limitations in Archaeology.
5. What is Obsidian - Hydration dating? Its application in Archaeology.
6. What is Archaeomagnetic dating? Applications in Archaeology.

13.6 ANSWER TO CHECK YOUR PROGRESS

1. Answer to Q. no. 1 can be found under section 13.2
2. Answer to Q. no. 2 can be found under section 13.2.1 (2, 3, 4, 5, 6, 7)
3. Answer to Q. no. 3 can be found under section 13.2.3
4. Answer to Q. no. 4 can be found under section 13.3.1
5. Answer to Q. no. 5 can be found under section 13.4
6. Answer to Q. no. 6 can be found under section 13.5

13.7 SUGGESTED READINGS

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UNIT-14 STUDY OF ANTIQUITIES - CONSERVATION OF ORGANIC OBJECTS – METAL OBJECTS AND OTHER OBJECTS

Structure

14.0 OBJECTIVES

The main objective of this unit is to know

- The conservation of Antiquities
- How antiquities are preserved after the excavation
- How organic and inorganic objects are preserved

14.1 INTRODUCTION

Objects buried in soil for centuries become fragile and undergo decay. The organic and chemical content of the soil affect the antiquities in varying degrees according to their strength and composition. The chemical and organic contents of the soil leave their indelible mark on the artefacts besides the physical pressure. For example, the organic materials from excavations like bone or wood are seen considerably weak and fragile having lost their original cohesion and strength. This is usually the result of biological decay caused by the insects and the fungus. Metal object like copper coins or iron knives and nails are corroded by the chemical content of the soil. Moreover, buried objects when excavated and exposed are affected by the sudden change in the atmosphere which is named as "micro-environment". Hence, extreme caution is necessary not only in excavating them out also in their transportation to the museum or the laboratory. First aid methods to strengthen the objects in situ, before their removal is necessary to reduce the possibility of deterioration. If the object is found in fragments they have to be repaired or put together with suitable adhesives and then come the question of cleaning the object to remove the incrustations so that the object can be restored to its original condition as far as possible.

14.2 CONSERVATION OF ARTEFACTS

The usual stages in the recovery and conservation of the antiquities are: consolidation in situ; lifting, packing and transporting to the museum; and treatment and protection.

For all these purposes, there should be provision for a small field laboratory in excavation camp under the charge of an archaeological chemist with the necessary equipments and chemicals apart from a well-equipped chemical laboratory in the departmental museum. Only the first aid treatment necessary for the safe removal of the object to the museum need be given in the field. Further processes of cleaning and preservation may be done conveniently at the museum laboratory at a later date. There are well known works on the subject like H.J. Plenderlieth and A.E.A. Werner's The Conservation of Antiquities and Works of Art and E.A. Dowman's Conservation in Field Archaeology which should be consulted for more details as they provide a comprehensive and excellent study of the problems and treatment. Here, only a few important guidelines are given to help the excavator to interact with the chemist in the care and preservation of the excavated objects. They can be broadly classified as organic and inorganic. Under the organic, we have the bones animal and human, wood, leather, textiles, shells etc. and under, the inorganic, we have materials like the ceramics, terracotta figures and objects, bricks, tiles and the metals. Under the metals would come the objects made of copper, iron, led, silver etc.let us take the more commonly available objects and study the kind of treatment they require.

14.3 ORGANIC OBJECTS

14.3.1 Bones and Ivory Objects

Apart from the burials where skeletal remains in different forms are encountered, we do get bone tools and other objects in the habitation sites also. They should first be lightly brushed clean and a coating of vinyl acetate diluted with methylated spirits or shellac or alcohol should be given to strengthen them. When bone is extremely fragile it is to be consolidated with polynyl acetate in acetone and when the solution has dried, the bone can be lifted. The same treatment is recommended for ivory objects also. Quickfix can be used to join the broken parts of the bones.

14.3.2 Shell

Delicate and flaking shell objects can be given a soaking in a thin celluloid solution. Shells taken from the wet soil are likely to disintegrate when they are dry. They should be taken to the museum in a container that will preserve their moisture, so that chemical treatment can follow. They are soaked in 5% solution of clear gelatin after which they are placed in a formal dehyde bath which helps in providing a protective coat.

14.3.3 Wood

Wooden specimen found in damp or in waterlogged condition should be kept in the wet state till it is taken up for treatment. Otherwise, it is liable to warp and split. It can be covered with a damp paper or cloth and wrapped in a polythene sheet. To maintain its humidity, it can also be embedded in a layer of saw dust. It should be slowly dried and treated with glycerine or vinyl acetate or shellac in alcohol.

14.3.4 Textiles

Textile specimens are very rare in excavations. When they are found, they are delicate and should be treated with great care. Ludermilk recommends a solution of clear rosin and acetone rather than celluloid as the latter tends to shrink the specimen upon drying. But samples for carbon-14 dating should be taken before the solution is applied as it would affect adversely the result of the dating. The textile samples can be wrapped (without folding) on the polythene sheets and a splint should be used to support it.

14.4 METAL OBJECTS

14.4.1 Copper and Bronze

Copper objects are often met with in the excavations eg. Copper tools in the Indus Valley and Chalcolithic sites. Historical sites usually yield plenty of copper

coins which are so valuable for dating purposes. In South India, bronze icons have been unearthed at many places. Copper and its alloys corrode easily when buried in the earth. Soil contains many salts which change the metal into various salts. The main corrosion products, the copper oxides carbonates, chlorides and sulphates which form the incrustation weaken the metal and make it friable. Even after the removal of the metal from the soil, the chloride causes decay. It is known as the "bronze disease" and it makes the surface of the metal green in patches. This bronze disease is due to the presence of the basin cupric chloride which results from the penetration of oxygen and moisture through the weaknesses in the corrosion product and their reactions. Thus, the corrosion of a bronze object is aggravated on exposure to oxygen.

Before any treatment is undertaken, the chemist has to ascertain whether the object has sufficiently strong metal core to withstand the cleaning. If it is too weak, it is better to avoid any treatment and leave it with a protective coating. But if the metal core is reasonably strong, it can be subjected to mechanical or chemical treatment. The coin can be immersed in water and gently brushed with a tooth brush. If this does not succeed, soak the coin in a solution of one part tartaric acid, one part caustic soda and 10 parts of water. This would remove the green incrustations. Then it is thoroughly washed in water and coated with polyvinyl acetate.

Another treatment described by Wheeler is: (1) Citric acid and pickling in 5 percent sulphuric acid to remove any red oxide (ii) neutralize with ammonia or any alkali after the acid treatment (iii) wash in distilled water (iv) carry out the silver nitrate test with the last wash water (v) dry in alcohol and (vi) coat with bedacryl or polyvinyl acetate.

Objects with strong metal more can be cleaned by the electrolytic method which consists of "suspension of the object on a copper wire attached to the negative pole of battery and immersing it in a 2½ percent caustic soda solution contained in a glass vessel in which is immersed a piece of graphite wire to the positive pole of the battery. The electric current passes through the object and the solution removes the impurities from the metal". After the treatment, the object is

thoroughly washed in distilled water and coated with bedacryl or polyvinyl acetate as protecting cover.

14.4.2 Iron Objects

Iron artefacts are frequently met with in the excavations and more so in the megalithic burials. Weapons of defense and offense, agricultural implements and household objects are commonly found. They are subjected to rust formation which may have gone deep into the metal. Treatment of the specimens depends on the extent of rusting. Chlorides present in the soil cause the rusting and they can be removed by electro-chemical reduction with zinc and caustic soda or by boiling the object in changes of a dilute solution of caustic soda in distilled water. Some have recommended the application of silver oxide to iron objects to neutralize the chlorides. Immersion of the objects in a dilute solution (2%) of sodium carbonate could add stability.

Iron objects in broken or crumbled condition can be temporarily preserved by covering them with paraffin wax or plaster-of-paris and mounted in wooden splints by means of cloth bandage.

14.4.3 Silver

Silver objects like coins recovered from historical sites are normally in a good state of preservation. Sometimes, black incrustation is found obscuring the inscriptions. They are affected by the mineralization caused by the silver chlorides and sulphides. Whenever silver was alloyed with copper, the copper corrosion is found on silver objects. Silver chlorides can be removed by immersion of the objects in dilute ammonia. Copper salts found on silver objects can be removed with formic acid, ammonia or alkaline glycerol in the same way as with bronzes.

14.5 MINIATURE MODELS

Miniature scale models of the interesting and more important structures found in the excavations may be prepared by the modeler for display. For example, the models of excavated structures like the Buddha stupas, viharas, chaityas and the secular buildings excavated at Nagarjunakonda are on display in the open museum there. A model of the famous Amaravatistupa is on display at the Amaravati museum. Models of even the megalithic burials can be prepared for display. Depending upon the space available in the museum, the size and the number of the models can be determined. Models give a three dimensional perspective and hence are more effective than the photographs or the drawings. The colour of the model should closely simulate the colour of the original structure to give a realistic effect.

14.6 SMALL FINDS

But there are some difficulties in the display of smaller antiquities like the beads, terracotta figurines and gamesmen high up in the vertical section since they may not be clearly visible. The best thing would be to combine the two types of show cases one showing the vertical sequence and the other placed in the table type show cases which bring the smaller objects closer to our eyes. Coins and coin moulds form an important item in the historical sites and hence a separate show case specially designed for the purpose can be set apart for each site. Inside the table show case, should be kept a slightly sloping tray covered with suitable light fabric on which the coins can be fixed. Coins may be arranged dynasty-wise or period-wise. Wherever we want to highlight some legends or figures in the coins which are too small to be seen, we can place reasonably sized photo enlargements of them by the side of the coin for easy reference. A note on the importance of the coin finds, their metal, age etc. should be kept in one corner of the show case or fixed on the side wall.

14.7 TERRACOTTA FIGURES

Terracotta figures form another important item in the excavations. If they are many, they deserve to be exhibited in a separate vertical show case at the eye level. They should be arranged in a special way. If there are horizontal glass divisions in the show case, small pedestals of various heights made of plaster-of-paris and suitably tinted in grey or cream colour with socked or depression at the top to accommodate the figure may be used. This arrangement would enable us to avoid exhibiting all of them at the same level. Within the vertical show case, we can have different levels to show the figurines. Another method is to avoid horizontal divisions in the vertical show case and fix the terracotta objects at the back wall of the show case at various levels with suitable background fabric. An explanatory note on the techniques, style and the significance of the objects may put up by the side of the show case. Other terracotta objects like the gamesmen, beads or moulds can be exhibited in the table showcases like the other small finds.

14.8 URNS AND VESSELS

Another category of the finds that requires special attention is the ceramic finds. Large burial urns or storage jars can be suitably fixed in specially divised wooden or iron pedestals for display. Smaller vessels with painted designs or graffiti marks or inscriptions may be displayed in vertical or table show cases Charts showing the graffiti marks and the inscriptions should be put up by the side with explanatory note.

14.9 GLASS

Ancient glass is frequently met with in excavations in the form of beads, bangles and vessel fragments. Moist or alkaline conditions affect the glass in many ways-leaching, discolouring and weakening of the structure. Further change in colour may occur when the excavated glass is exposed resulting in the evaporation of moisture and crystallization of salts on the surface. So, glass objects should be colour-photographed as soon as they are unearthed since they are

apt to change colour. Crackled and fragile glass should be gently cleaned before being consolidated with dilute coats of resin such as polyvinyl acetate or dilute soluble nylon. The same treatment holds good for the objects of faience.

14.10 POTTERY

Potteries with the exception of the pre-historic ones are normally strong enough and hardly need any intensive treatment. They should be washed in salt-free water and dried. Brushing can also be done if there are no paintings or designs. In some cases when the incrustation is thick, treatment with a 2% solution of hydrochloric acid is recommended. Low fired pottery or fragile pottery of the prehistoric times, need not be washed in water but cleaned by soft brush. Dilute solution of polyvenyle acetate can be sprayed. Wet clay tablets or seals after being carefully packed and transported to the museum can be baked carefully for preservation surrounding earth and the burial mode.

14.11 LET US SUM UP

Thus, in archaeological excavation the process of conservation of artefacts is very important. The organic and chemical content of the soil affect the antiquities. Extreme care should be taken to restore and conserve the historic items. Preservation of the excavated objects are divided into two i.e. organic and inorganic. Under organic, we have the bones animal and human, wood, leather, textiles, shells etc. and under inorganic, we have materials like ceramics, terracotta figures, objects like bricks, tiles and metals. Under the metals would come the objects made of copper, iron, led, silver, etc.

14.12 KEY WORDS

1. Artifact – is “Something made or given shape by man, such as a tool or a work of art.
2. Ivory – is used to describe any mammalian tooth or tusk.

14.3 CHECK YOUR PROGRESS

1. Explain briefly the conservation of organic objects of antiquities with examples.
2. Explain briefly the conservation of inorganic objects of antiquities with examples.

14.4 ANSWERS TO CHECK YOUR PROGRESS

1. 14.3
1. 14.4

14.4 SUGGESTED READINGS

1. Harris, Edward C, Brown, Marley, R and Brown Gregory, J (Ed) *Practices of Archaeological Stratigraphy*, London, 1993.
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UNIT-15 INTERPRETATION OF EVIDENCE

Structure

15.0 OBJECTIVES

The main objective of this unit is to know about how to interpret the excavation evidence.

After studying this unit you are able to learn and know the features to interpret the evidences, first title of the site, layout of the excavation, stratigraphy, chronology, potteries, artefacts and interpretation of evidence of the excavation.

15.1 INTRODUCTION

When the excavations are over and the documentation is completed the stage is set for the preparation of a detailed report on the results thereof. It is only through the publication of the report that an excavator can inform the specialists and the general public about the importance of his excavations. Pitt-Rivers emphasized this aspect in his famous statement, "A discovery dates only from the time of the record of it, and not from the time of its being found in the soil." Sir Mortimer Wheeler endorsed this opinion and put it more bluntly when he wrote: "Unrecorded excavation is the unforgivable destruction of evidence". The excavator in his report presents his findings in a systematic and integrated manner supported by photographic illustrations drawings and technical reports. The data he has collected during the excavations and the documented evidence he has so laboriously prepared form the basis for his report. He attempts to synthesise the various aspects the stratigraphical sequence, the soil samples, artefact analysis, the pottery evidence, the structural remains, the technical skill revealed by the artefacts and features, the environmental or historical factors and the like and tries to present a cogent history of the vicissitudes of the site. It should contain two important elements: (1) a-matter-of-fact presentation of the findings with the related data and illustrations and (2) interpretation of the data in a broader historical or conceptual framework. This would include the various technical reports given by the specialists to whom the findings were referred eg. The report on the skeletal remains by the physical anthropologist or a report on the metal objects given by the metallurgist. Here, the excavator's task is to integrate the evidence from different

sources and synthesise the results for a proper and meaningful interpretation. If the excavation of a site is undertaken as a long time project for a number of years, brief or interim reports should be published at the end of every season pending a full report on the completion of the work. Typical of the brief notices on the excavation and the reports published on the various excavation projects of India is the "Indian Archaeology – A Review" brought out annually by Archaeological Survey of India. There are a few other such professional journals including University journals or departmental bulletins in which interim reports can be published. The detailed report in usually brought out as a separate monograph etc. Sir John Marshall's Mohenjo-Daro and the Indus Civilization in three volumes.

15.2 THE SALIENT FEATURES OF AN EXCAVATION REPORT

15.2.1 Title

Usually, the title mentions the site name and the year of excavation. A shorter descriptive subtitle can also be attached if found suitable (eg. Arikamedu-an Indo-Roman trading Station in South India, 1945). This is followed by a list of contents and illustrations.

15.2.2 Abstract

A brief summary of the main results of the excavations can be highlighted in the abstract which may be given in one paragraph or two. It should focus attention on the new light thrown by the excavations and should help kindling the interest of the reader to study the report.

15.2.3 Introduction

A general description of the site, its exact location, approach, geological or topographical features should be provided. The location should be illustrated with a map and the topography with suitable photographs, plan drawings and contour map. Other environmental factors like weather conditions, rainfall, flora and

fauna, soil nature may be included. A note on the condition in which the site was found may be mentioned.

A brief historical background of the site including any previous exploration or excavation done in the site should be mentioned with all relevant references. Circumstances necessitating the present excavations and the main objectives of the excavations and how far they were achieved should be explained. Special problems, if any, faced by the excavator and the methods adopted to resolve them may be mentioned.

Acknowledgements to the team members, permission granted for excavations, collaborators and sponsors who have helped in the excavations in various ways may be included here appropriately. A note on the disposal of the finds may be added i.e. the department or the museum in which the artefacts and the records are deposited for any future reference.

15.2.4 Lay-out of the excavations

Here the grid system or the substantive trench system followed may be described and the sectors and the trenches excavated with their location and nomenclature may be explained with the help of a plan of the grid. The area of the cuttings, the differential depth encountered and unexcavated or left out areas may also be marked.

15.2.5 Stratigraphy and sequence of Cultures

The nature of the layers encountered right from the natural soil to the top humans may be explained with reference to their colour, composition and contents. This may be done according to their number, sequence of formation and inter-relationship. The disturbances in the strata like the pits and robber trenches should be also serially described and then related to the stratigraphical framework. Based on the stratigraphy and the associated antiquities, the sequence of cultures represented at the site may be outlined with sub-periods if any. Here, the

evidences like pottery, coins or such fairly datable artefacts play a crucial role and may be briefly cited relevant to the discussion. The description of the stratigraphy should be fully supported by the section drawings and the photographs. On the section drawing itself, the period divisions or cultural levels may even be indicated for convenience. For eg. Period I-Neolithic culture; Period II Megalithic culture; Period III- Early Historical Period; IV-Medieval. The distinctive cultural content of each period is indicated – habitat, tool types, food habits, potteries, economy, ornaments, burial practices and other rituals.

15.2.6 Chronology

Closely allied to the cultural levels and the period divisions is the chronology of a site. Their stratigraphic positions give them relative dating and based on that the chronological computation is done in terms of centuries by counting backwards from the known to the unknown periods. The broad chronological span for each period is indicated. But, for alter periods, for example, periods III and IV cited above, more precise datings can be given because of the datable objects like coins or inscribed materials that are usually met with. But, for the earlier periods, eg, Period I and II (pre and proto historic), the datings can be given only in the range of centuries. Here also, the results obtained for scientific dating methods like Carbon-14 or archaeo-magnetism etc. when available should be integrated and the chronology built up. For example at Kalibhangan site, carbon datings are available for the Pre-Harappan and Harappan cultures.

15.2.7 Structures and Other Features

This section is devoted to the description of the structural remains their stratigraphical association the mode of construction, architectural features, function etc. a comparison with similar structures found in other sites should also be made wherever called for. Other smaller but significant details of the brick sizes, the cementing materials, the nature of brick laying already recorded in the record book (see previous section) should be given. Based on this data, interpretation regarding the architectural history of the site in different periods of its history would be

fruitful. The text should be illustrated with drawings of plans, sections and elevation of the buildings and the photographs there of.

15.4.8 Potteries

Ceramic analysis forms a major section in a report for reasons already explained in section A of this chapter. Potteries used in each period should be described in terms of their colour, technique of manufacture and typology. Period-wise analysis of the pottery equipment would show the evolution of the industry, techniques and types. The impact of pottery traditions from other cultural zones, the improvement or decline in the quality of the ceramics can be analysed. The variety of the vessels would show the multifarious functions to which they were put. The paintings, the graffiti, the inscriptions, potter's marks or designs are to be described and analysed. Sometimes, the high quality of pottery would imply the social status of the person using it. The excavator has to mention when a particular ceramic type or technique originated in an area and proliferated and when it dwindled-a fair indication of its periods of peak and decline respectively. Normally, the pottery traditions are not confined only to a site or two. They are usually found in a wider area and in fairly compact time-range showing homogeneity of a culture and chronological link for eg. The Painted Grey Pottery found in the Ganga Yamuna Valley or the Russet Coated wares are found in South India in a fairly specific time range. In short, the technical, cultural and chronological implications of the potteries have to be fully discussed with the help of the elaborate pottery drawings and photographs prepared.

Among the technical points to be investigated and the results analysed, are the manufacturing techniques: the nature and preparation of clay as revealed by the pottery section; handmade or wheel made or partly handmade and partly wheel made; inverted firing technique (as in the megalithic black and red ware) salt glazing; the nature of slips applied, burnishing and polishing; russet coatings before firing; post firing markings, paintings and designs. The results of these analyses would bring out the distinguishing characteristics of each category of pottery and help in classifying the potteries on the basis of the techniques.

Under pottery types, we analyse the various types of vessels from which we can inter their possible uses. Among the chief types may be mentioned; jars, bowls, dishes, tumblers (lotas), goblets, cups, sprinklers and lids. Each one of these may again be sub-divided eg. Jars: high necked or wide mouthed, plain or handled and so on; bowls: shallow bowls, deep bowls, carinated bowls rimless bowls, etc. this type of analysis would throw light on the eating or drinking habits of the people besides other aspects of social life. For eg. Large storage jars would show how grains were stocked; tall and narrow perforated jars found in the Indus valley sites are considered to be associated with a ritual of special significance. This kind of close analysis of pottery of different periods of a site on the technical and typological bases is very important and useful for evolution of one of the most prolific artefacts of the past ages. These should be fully supported by the photographs and the drawings, as pointed out earlier. Colour photography would help illustrate the original colour of the pots.

Inscribed pot sherds should find a special place for description and analysis. The photographic illustrations are very important to provide clear view of the letters for palaeograpic study which often gives valuable clues for datings. Charts to explain the evolution of the script may also be useful. The technical reports on the analysis of clay, firing techniques, slip etc. should be given in the appendix.

15.2.9 Artefacts

The section on the antiquities forms another major element in a report. We have already discussed the various bases of classifying the artefacts. To cite only a few examples, antiquities like beads, bangles, coins, terracotta objects, metal objects, stone objects, bone objects etc. can undergo classification based on the material, shape and form. Examples are as follows:

i) Beads of

a) Glass, gold, terracotta, semi-precious stones etc.

b) discular, long barrel, collared, corrugated, biconical etc.

ii) Metal objects: These can be classified under silver, copper, lead, iron etc.

iii) Terracotta Objects: Seals and sealings; Human figures, animals figures and miscellaneous objects. Handmade or moulded; ritual or utilitarian objects and so on.

The value of these antiquities as a source of social and cultural achievements of the past can hardly be exaggerated. They often reveal the technical or technological progress of an age, besides its social customs and habits. For instance, the analysis of the copper or iron objects would show the manufacturing technique and the quality of the metal. At the same time, the tools like the axes, hoes, crowbars would throw light on the agricultural and other domestic practices. The weapons of offence would reveal the martial qualities of the people and the nature of warfare. Similar kinds of classification and analysis should be presented for each category of the artefacts and their social and cultural implications discussed. As has been aptly summed up by Martha Joukowsky, "The principle aim of the artefact analysis is to reconstruct cultural history by observing and analyzing its components in detail, so that a picture of daily life of the people as well as a definition of the site's pattern of culture emerges."

15.2.10 Technical Reports

Under this section the technical reports furnished by the scientists and other specialists are given: Scientific reports on carbon 14 or T.L.Dating; soil analysis; physical anthropologist's report on the skulls and bones zoologist's reports on the animal bone remains; metallurgist's reports on the metal analysis and so on. Similarly, reports of specialists like the numismatists (on coins) and epigraphists (on the inscriptions) should be given together with the relevant photographs, charts and drawings. Though the excavator has integrated the evidence from these specialists in the main body of his report, the technical reports have a much wider bearing on the technology of ancient objects and therefore, have much significance to the specialists in each field.

15.2.11 Interpretation

The foregoing sections presented largely a factual description of the findings, their analysis and the interferences. Here, in this section, an overall view of the socio-cultural changes that the site represents is given together with a comparative assessment of the evidence of the site with that of other sites and conceptualization of certain general patterns of material and cultural developments. Here, the excavator looks at the findings of the site in a larger context-the affinities with the neighbouring and far off cultural zones and identifies the links as well as the local adaptations. Questions like the interrelationships and migrations of communities and evolution or diffusion of social and cultural traditions and the processes of people's interaction with the environment are discussed.

The excavator can underline the special contributions of his excavations to the study of the problems taken up for investigation and also suggest future possibilities and lines of action. He can identify the inadequacies or deficiencies if any and ways of rectification. New sites or areas to be explored as a follow-up to the present study may also be indicated.

15.2.12 Appendices, Bibliography and Illustrations

Here, extracts from the original literary texts or inscriptions which are cited as evidence in the main body of the report can be given, if necessary, for further clarifications. Any other part or problems which is only indirectly connected to the subject but which may help further study by the interested can be elaborated in the appendices.

Bibliography should be comprehensive and should include the publications relating not only to primary sources but also secondary or published literature relevant to the report. The list of books is arranged author-wise alphabetically and the place and year of publication are given. Important articles from the periodicals may also be included, if necessary.

The major part of the photographic illustration can be given in the last if interleafing is not possible. They are given with serial Plate numbers with a short description below. A list of illustrations is given at the beginning, next to the list of contents. A more detailed description of the illustrated objects plate-wise and number-wise is also to be given at appropriate places. The plan and section drawing and such other illustrations are usually given along with the text with suitable designations.

15.3 LET US SUM UP

Thus, to write the Interpretation of Evidence in the Archaeological Excavation is an important aspect which is the final document of excavation report. Title of the excavation site, summary of the project, layout of the excavation, stratigraphy and sequence of culture, chronology, potteries, artefacts are important evidences for writing the interpretation of the excavation report.

15.4 KEY WORDS

1. Bibliography – is a systematic list of books and other works such as Journal articles.
2. Chronology – is the science of arranging events in their order of occurrence in time.

15.5 CHECK YOUR PROGRESS

1. Explain the main features of the excavation report.

15.6 ANSWERS TO CHECK YOUR PROGRESS

1. 15.2

15.7 SUGGESTED READINGS

1. Alexander John: *The Directing of Archaeological Excavation*, 1970.
2. Raman, K.V: *Principles and Methods of Archaeology*, Madras, 1986.
3. Roy, Surindranath: *The Story of Indian Archaeology*, New Delhi, 1961.

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UNIT- 16 EXCAVATION REPORT

Structure

16.27 Check Your Progress
16.28 Answers to Check Your Progress
16.29 Suggested Readings

16.0 OBJECTIVES

This unit will help the reader to understand the

- Excavation techniques used while conducting excavation
- Methods of digging
- Principles of excavation

16.1 INTRODUCTION

Sites are not dug only to find out what they contain. If this were true, quarrying would be a sufficient technique. M. Wheeler describes the excavation at a Roman town that "was dug like potatoes," and many similar examples could be quoted. Preferably, archeologists try to do two things in an excavation regardless of the size of the site, its type, or how large an excavation is planned. They want to discover the cultural sequence in the site, and to expose whole cultural levels separately. They do this to find out how the people lived during each cultural period. Their procedure is to find the vertical relation of one cultural level to another, and the horizontal relations of objects within each cultural level. These jobs depend on careful stratigraphic control. The purpose of the dig and the resources available to carry it out determine how large an area will be dug and the techniques what will be used. There is no general rule that will apply to all situations.

16.2 EXCAVATION TECHNIQUES

The aim of excavation is to identify, define, uncover, date and interpret each archaeological context of a site by understanding the transformation process in a given environmental condition. The reconstruction of the site usually goes in reverse order.

There are two processes of excavation, one is the arbitrary and another is the stratigraphic. Arbitrary excavation is the summary removal of soil by any possible means. Treasure hunters still employ the arbitrary method. Stratigraphic excavation

is the removal of archaeological deposits in reverse sequence to that in which they are laid down. To understand this reverse sequence, archaeologists evolved certain methods and strategies. Pitt – Rivers invented the section strategy in which a trench was cut through the deposit and completely excavated up to the natural soil. A. E. van Giffen invented the quadrant method. A few years later Mortimer Wheeler excavated the sites following with strip method (to excavate barrows) and grid method. In the grid method, a baulk is maintained between the trenches. Some archaeologists felt that baulk hindered in understanding the site in tato. They started removing the baulk what they call it open – area method. The open – area method is virtually followed the grid system but the baulk is generally absent.

16.3 EXCAVATION TYPES

All excavation methods can be placed under two heads namely horizontal excavation and vertical excavation. The horizontal excavation is further subdivided into area excavation and open – area excavation. The vertical excavation is subdivided into sondages or test pits, trench cutting, tunnel cutting and step – trench cutting.

- **Horizontal / Area excavation**

  Horizontal excavation (also area or block excavation) is a type of clearing exaction composed of large squares to reveal the horizontal extent of the site while preserving a stratiprahic record in the baulks left between trenches.

- **Open – area excavation**

  It is a type of clearing excavation composed of large squares to reveal the horizontal extent of the site without maintaining the baulk. In horizontal excavation, the site grid is maintained. The site grid is a set of regularly spaced intersecting north – south and east – west lines, usually marked by stakes (pegs), providing the basic reference for recording horizontal coordinates within a site. This is the method widely followed in India.

- **Vertical excavation**

  Vertical excavation is primarily to reveal the vertical and temporal dimensions within archaeological deposits, the depth, the sequence and composition of

burial data. In other words, vertical excavation is the one used to reveal the total cultural deposit of a site.

Irrespective of the method, there are certain essential things like fixing datum point and laying a grid to be followed in all excavations.

16.4 SELECTION OF THE DATUM POINT

Once the site is selected for excavation it is essential to relate the excavation area and grid to permanent features in the landscape. It serves as a control point in all future excavations. Generally, excavations are being carried out in two or more seasons. At the end of each season, the grid is removed. In the subsequent season, the grid has to be laid exactly as laid in the previous excavations. The datum point or points serve as a permanent control points to re – locate or re – lay the excavated area. In the era of vast urbanization and industrialization, it is becoming increasingly difficult to retrace the landmarks (control points). In these circumstances, the excavator may be disoriented when he goes for next time. Therefore, the field director must take utmost take utmost care in recording the landmarks, possibly as much number as possible. The Datum point is to be placed away from the immediate vicinity of the excavation so that it will not be destroyed by the subsequent excavation operations. The position of the site datum point, the datum line, and the baseline are all related to one another.

16.5 THE SITE GRID

Mortimer Wheeler designed the grid system of excavation to obtain information both horizontally and vertically. The spatial information about events is attained in the former, and a sequence of those events in the latter. Although it has severe methodological problems, it has certain advantages over other. In this system, the site is laid with a grid of squares with strips of undug area (baulk) between them.

The excavation grid or trench areas must be established in checkerboard fashion. A grid usually serves must be established in checkerboard fashion. A grid

usually serves as a prelude for starting a large area excavation. As noted above, for laying a grid one has to establish the datum line and base line with terminal pegs at each end. These lines would fall at right angles. The terminal pegs should be established outside the excavation area so that these reference pegs would not be disturbed with the expansion. The overall site grid is divided into smaller grids which are parallel to the site base line (east – west line/ latitude line) and the datum line (north – south line / longitude / true meridian) and each subsidiary pegs fall at right angles to each other. This way a grid system in the horizontal plane can be established.

Once the areas of excavation and the size and orientation of the grid or trenches have been decided, the surveyor will set stakes/pegs at the corners of the each grid/trenches and is sequentially numbered. These pegs must be positioned in such a way that it is projected at least 10 cm above the ground level. As these pegs serve as reference points or control points, it has to be driven adequately firmly into the ground so that it cannot be disturbed. These pegs serve as the point of intersection of the grid and as the outline of the trench. Therefore, each peg/stakes have to be constantly checked otherwise measurements taken from them will be inaccurate. The grids are formed in proportional division. The grid squares should be of identical size, and baulks of identical width throughout the grid. For instance, 4 m squares, separated by earth portions of I m wide, will make a grid of 5 m. It enables the archaeologist to describe accurately any point on the site in relation to its orientation – its north – south axis. As noted above the grid consists of squares to be excavated, which are separated by baulks (earth portions) of minimum of 20 cm in width. The baulk width depends on soil condition. These baulks must have the capacity to withstand the traffic of staff members, labourers and equipments. These are left out like a standing wall as long as they serve a purpose in the excavation. Another important purpose of the baulk is to provide stratigraphical results. The various layers of soil removed from each square can be seen in profile on the side of the baulk. The vertical relationship of levels (stratigraphy) can be constructed.

The naming of the grid by choice of the quadrant system is outlined in the following figure. It is always advisable to use letters (in east – west axis) and

number (in north – south axis) so that it is easily recognized by any staff members. If the site is a habitation mound, the field director divides the site grid into four parts or quadrant and naming them as A, X, Y and Z quadrants. He decides to start marking or numbering the trenches from the centre point of the mound. Sometimes this serves as control square or pilot trench. In the plan (see figure), the trench A1 serves as a pilot trench. If the site has a fortified wall, then one has to go according to the fortification system. This gives an idea about the nature of the deposit. If the site has multiple cultural deposits and having a great depth of deposit then the field director may choose different sequence of excavation. Trenching has been used to obtain cross sections of sites and is particularly important in strigraphic interpretation because it provides a single, long vertical profile. These control trenches helps to some extent to understand the potentiality of the site.

In all methods, an accurately laid – out grid or trench system is essential for precise records and proper identification. The field director, therefore, must educate or train the staff members so that each supervisor realizes his role and responsibility.

16.6 THE DUMP

Once the excavation is started, the earth removed from the trench starts accumulating. It is important to choose a place to put the excavated earth (the dump). The general rule is that, firstly, it should be placed in an area that will never be excavated. Secondly, it should not interfere with the access to the site. Thirdly, it should be way from the datum point/line so that it does not interfere with the on – site measurements. Finally, it should not obstruct the photo documentation. If the site is to be re – filled then the dump should be placed in a reasonable distance but outside the planned area so that it can be re – used easily for re – filling the trenches. Different methods are being followed to remove the topsoil. Among them, stripping is the common one.

The site should be excavated totally and as large area as possible. If the site has already been excavated, then the excavation plan should be based on the earlier discoveries.

16.7 STRIPPING

Stripping involves the removal of top soil accumulations. It is carried out after a series of trail excavations that had taken place in various parts of the site and usually begins with the edge of the site. After the stratigraphy is shown through control or trail trenches, some field directors incorporate a method known as stripping in the excavation plans. This method is often employed in contract archaeological work when the time factor is short. It is carefully carried out with the use of the bulldozer and other power equipment. But this method has to be employed with caution or else the valuable information may be lost.

16.8 THE QUADRANT METHOD

The quadrant method is the modified version of the grid system. It is one of the efficient ways to investigate small round mounds such as carin circles and stupas. Small mound or circular burials have successfully excavated by this method. The quadrant method involves of dividing the mound into four segments and leaving standing baulks between them. The baulk becomes a triangular wedge – shaped strip of earth and is left standing until the last possible moment. The baulk also provides access to all parts of the mound, as well helping orderly traffic pattern. Excavation of each quadrant proceeds systematically and alternately, and the coordinate baulks preserve the contour and stratification of the deposit.

16.9 TRAIL TRENCHES (SONDAGES)

The trail trenches are placed as an exploratory effort to assist the archaeologists in achieving information regarding the site. The objective of test pits is to gain a limited cross – sectional view of the site's depositional history. The trail trench should be wide enough to get meaningful information of the site particularly the stratigraphy. Particular caution must be exercised in using trail trenching on a multi – layered site because the trench often cuts through the most vital points of the site. It provides a cursory view of the site but not complete picture of the site. Two types of trail trenches were used in excavation: one is

carried out before the excavation to give information on the nature and size of the cultural deposit and the rest is carried out during the excavation to evaluate and elucidate the exposed structures or building foundations.

Anyone who excavated multiple trenches will know that digging a single trench can be grossly misleading. Many layers or floors are discontinuous and appearing even on one side of the section. The old archaeological presumption, that 'all will come on single section' is simply not true. Therefore, archaeologists should always try to go for a total or near – total exposure of the site, which would give substantial evidence. The trail trench may be carried out for sheer practical reason where the horizontal excavation is not feasible, for instance the area between two buildings. In developing countries like India, the resources are very limited, so the excavator should take maximum care to get the optimum results. The limited fund sometimes forces the excavator to take painful decisions. This decision will have to be made between what will be sacrificed and at what cost.

16.10 OPEN – AREA EXCAVATION

The principle behind open – area excavation (also known as Horizontal / Area / block excavation) is to clear the whole cultural deposit of a site. It is recording and removing each archaeological deposit in broadly the reverse order of their deposition. The sequence or stratigraphy of the site is carefully recorded through continuous recording of surfaces of deposits. The size and shape of the area excavated is in no way predetermined by the archaeologists. It will entirely depend on the size and shape of the site. This method allows the archaeologists to obtain a larger and a more meaningful number of artifacts, architectural features, industrial activities, site structure, and all other human activities at the site. This method is being followed in most of the excavations throughout the world.

16.11 DIGGING METHODS

The process of actual digging at the site varies with the character and content of the site. The method applied depends on the objectives of the excavator. There

are a number of digging systems that are being followed in archaeological excavations. A few of them are explained below:

16.11.1 Vertical – face method

In this method, a unit (trench) or a contiguous series of units (trenches) is dug entirely as a single vertical face. The section scarping of an exposed area caused due to river actions also falls in this category. The widely used level – stripping is a variation of vertical – face method. It consists of excavation in a staggered series of vertical faces, 50 cm to one meter in height at successive depths. It looks like a flight of steps. Due to this presentation, this method is also called step – trenching. This method is useful to understand the construction method followed in banks or fortification.

16.11.2 Unit – level Method

This is one of the widely and commonly used methods in India. Here, the technique is to dig each pit, defined by the lines of grid system, vertically as distinctive unit, always completing one before beginning another. The digging is done in a succession of separate arbitrary levels, each 5, 10, 15 or 20 cm deep. The thickness depends on the research design and character of the soil. Unless, there are unavoidable circumstances, the level thickness should be consistent across the site. The digging of each level is completed before the next began. The deposits of each unit level are screened to recover cultural materials. This method is best employed to get chronology or cultural history of a particular site.

Every archaeologist agrees with relying upon visible stratification as it gives the accurate and meaningful recovery of the archaeological data. However, recently scholars started in objecting the use of this metrical straigraphy method in all the places where the stratigraphy is not visible at all. For instance, in deserts, flooding areas, cave deposits, ash mounds and other non – stratified single cultural deposits. In this situation, the scholars started looking for natural stratigraphy against the metrical stratigraphy.

16.12 NATURAL STRATIGRAPHIC LEVEL METHOD

In natural stratigraphic level method, the excavation proceeds with removal of the visible strata in a site deposit. This method is so useful where a site had a very thin deposit but containing one or two different cultural phases. In this method, the cultural deposit is not removed like a cake – slicing, instead the deposits are removed as they are found in a site.

Whether the excavator uses the arbitrary or natural method or both, the find spot of the cultural signatures should be recorded carefully in relation to their stratigraphy. Stratigraphy alone can give better understanding of the site.

16.13 STRATIGRAPHY

Accumulations of remains of human activities leave sequential layered deposits known as strata (singular stratum). Each stratum may differ below or above it in texture (the size of the soil particles), a composition (types of organic or inorganic matter), or texture and composition, as well as colour, thickness, and cultural features. Stratigraphy, therefore, is the study of strata or the different layers and levels of occupation on an archaeological site and their relation to each other, and the determination of the archaeological sequence or order in which they were laid down. In summary, stratigraphy is the study and interpretation of the sequential deposit of site. Archaeologists distinguish between stratification and stratigraphy. Stratification is the existence of superimposed layers and stratigraphy is the study of stratified deposits. So stratigraphy is the archaeological evaluation of the significance of stratification to determine the temporal sequence of data within stratified deposits by using both laws of superposition and context evaluations.

Some sites have a long history of occupation and have been built up over a long period of time. This may have many strata, the earlier represented by the lowermost level of the occupation and the latest represented by the topmost level of the occupation. The general rule is that the upper one is later than the lower one.

Therefore, the upper stratum will contain the artifacts or later manufacture than the lower one. The archaeologist, however, must not be too hasty in equating sequential deposits with the sequential age of the materials. The context of the artifacts and their comparisons must be carefully evaluated before any conclusion can be drawn.

A stratum is dated by the latest artifacts found in the deposit. A coin or well – dated inscribed potsherd/seals are found in a particular undisturbed layer would give definite date for the layer or level. When objects of material culture are found, they cannot be dated to a specific year. Instead, archaeologists assign a time span during which they must have in use. The time span may cover one or more centuries like 3rd Century BC to 1st century BC. The difference between the terminus ante quem (Latin word meaning limit before which – in this case 3rd c. BC) and terminus post quem (limit after which) would therefore indicate the life span of the level. These terms are used in relation to undisturbed layers. If a stratum is disturbed by layer of intrusion such as portholes, foundations, pits (storage, silo, rubbish, clay and other pits) or robber trenches (areas from which the stones or bricks of an earlier structure have been removed or robbed to be re – used in a new construction) and human or animal or natural agencies like rat hole and ditches then sealing layer of these activities are considered for dating. Therefore, archaeologists must be careful in identifying the material, formed out of primary activity or secondary activity. The erosion, earthquakes and other such activities sometimes totally reverse the cultural sequence. Therefore, stratigraphy can be understood upon prolonged observation and inference. The filed director, artifact analyst, supervisor, draftsman, pottery yard analyst and other fellow members should interact frequently to identify the layers.

Stratigraphy is an index to the history of the site and used as a primary source of interpretation. It provides a perspective of the chronology; the geological, faunal and floral histories of the site along with the varied human activities like contemporary industries, architectural edifices and their cultural changes. Therefore careful observation and recording of stratigraphical evidence is absolutely essential for any interpretation of a site. The principles that stand behind this stratigraphy are dealt separately in the following chapters.

16.14 PRINCIPLES OF EXCAVATION

The general rule in excavation is to give due regard to all observable features as equally significant items. No manual can possibly describe all the problems relevant to excavation and all the methods used to deal with these problems. One has to rely on his academic and filed experience. The feelings and sensations can only be learned on the site. However, there is a minimum common rule to be followed in excavations. The field director may alter the rule from time to time in the course of excavation based on his observation made on the nature of the site.

The following are some of the common rules complied in the excavation:

a. Check the limit of the digging area.
b. All excavations have to be proceeded horizontally.
c. Ever – watchful changes in soil textures.
d. Move from one trench to another horizontally in the same level until architectural features are encountered.
e. Always loosen a small amount of soil with a trowel/pickaxe or other appropriate tool.
f. If roots or weeds are present, cut them with root clippers – do not pull at them.
g. Break up lumps with wooden hammer or hoe until earth is spread evenly.
h. The pickaxe must be always used cautiously.
i. Take out the earth evenly throughout the square.
j. Use soft hair – bristle brushes for cleaning the surface and use paint brushes to clean cavities.
k. Clear higher surface first and lower surface second.
l. Avoid walking on the surface frequently.
m. When a change in soil texture, colour, pottery type and architectural feature are identified, stop the excavation. Clean the area again and record the new layer.
n. Maintain t he baulk and the section sharply.
o. Always scrap the section from top to bottom.
p. Never under – cut a baulk even if a valuable artifact is found. Consult field director for advice.

q. If you found any potsherd/stone or any other artifact projecting out of the section – don't pull them.
r. All the earth removed from the trench should be carried to the screen/ sieve.
s. Do not trust your memory; write everything down on the field note book.
t. Establish the position of every object.
u. Each pick of the earth, soil sample, potsherd or any other object has to be properly recorded, documented and labeled. Potsherd has to be sent to the pottery yard with proper label where the pottery yard with proper label where the pottery analyst takes care of the potsherds.
v. All the potsherds have to be cleaned properly to observe the paintings, graffiti marks, scripts and also for mending the broken ones.
w. Baulks may be removed when it requires to get complete picture of the architectural feature or any other industrial activities.
x. Carry the excavation till natural soil is identified. Do not stop the excavation with sterile layer. There may be some cultural deposits below sterile layer.
y. Every feature has to be photographed.

16.15 EXCAVATION OF STRUCTURAL REMAINS (ARCHITECTURAL FEATURE)

When an architectural feature is uncovered, the excavator has to expose the features like the wall, floor, postholes, hearths, foundation, etc carefully. If any object is found, a good rule is to leave it in situ until the area is completely exposed. Particular attention should be paid during the clearing of the floor levels. Often sizable fragments of the walls or roofs fall to the floor and are preserved by one or another agency. Once the floor is identified, the excavator must remove the over – burden within a few centimeters of the floor. The artefats found on the floor levels have to be recorded carefully as it could give valuable evidence of the nature of the settlement. In order to maintain its stability of the cultural material, it should be covered with its own earth so that its micro – environment will be maintained. All the features have to be measured in three dimensions (depth and horizontal measurements from two given points) and mapped on the horizontal square plan and the vertical section. It is important to remember that once the artifacts are

exposed, the physical structure of the objects has to make a tremendous change to adapt to the environment to which they are suddenly exposed. Some objects, such as low – fired objects and fragile pottery, will probably crumble if prematurely removed from the earth. This type of object should be allowed to dry thoroughly before it is touched. Before the find is removed, its square (trench No.), level, locus number, sequential number and other pertinent data should be written on the bag with an indelible ink and reduplicated on the tie – on label also. A special report also may be prepared in addition to the field note record. Subsequently, the cataloger/artifact analyst also maintains the record while cleaning the objects. When a feature is exposed a temporary baulk running between the feature and the section may be formed to establish its relation with the stratigraphy.

When a stone is uncovered, carefully expose it by excavating around it. Do not move it or remove it until you ascertain whether there are other associated stones.

When artifacts are found, do not move it but cover it until the stratum is cleared, then clean around it with care. If the artifact is in a state of fairly advanced decomposition, it may have to be treated while in situ because any unnecessary movement will hasten its collapse. If the object is so delicate, it is always better to call the laboratory technician.

16.16 INTRUSIONS

Weathering, soil erosion and snakes and rodents often carry objects from one stratum to another stratum. When the artifacts are collected from these intrusions, it has to be labeled separately and kept as intrusion objects.

16.17 NUMBERING ARCHITECTURAL FEATURES

All architectural members like walls, floors, hearths, pits and robber trenches should be serially numbered. A label marked with (feature) serial number can be placed near the feature.

16.18 PITS, POSTHOLES AND ROBBER TRENCHES

The common things that are being encountered in all archaeological excavation are pits, potsherds and robber trenches. There are certain methods to identify them. Postholes are usually larger than the diameter of the post. They are to found in the border or centre of the house plan. If the subsoil is soft, it is usually packed with small pebbles particularly at the bottom. The posts inserted into them may be removed or decomposed and replaced by the soil. Dust and silt will accumulate at the top. So, postholes always had different filling pattern from the bottom to top. These postholes normally differentiated from the surrounding area by colour or texture or both. Based on the plan, size and orientation of the postholes one could easily reconstruct the plan and superstructure of the structure. The usual way of excavating postholes is to half –section it. This is best done when all the postholes from an individual structure are made visible on the surface.

Pits, postholes and robber trenches (robber trench is a stone wall from which stones have removed, in ancient times, for reuse) can be detected by colour contrast between them and surrounding soil. As soon as they are uncovered, they should be measured, plotted and recorded. They used to cut into the earlier layer for laying foundation/place rubbish. So the sealing layer of the pit/posthole serves as their working layer or one can say these features are belonged to that particular cultural level.

To establish sequence, pits are often half-sectioned. The top edge of the pit is carefully defined and then divided into two halves with string and nails. One must also keep in mind that there may be a single-time-fill of the pit or sometimes the pit itself contains some stratified layers due to prolong use. The study of the fill sometimes may give the functional value of the pit. The edges and bottom of the pit should be treated with extra care. Generally the pit would give good carbonized organic material. Through flotation technique, one may recover good amount of floral remains. Sometimes earlier pits are cut through later pits. In such cases, the latest pit must be cleared first and the material received from each pit has to be treated separately.

A safer way to date postholes or pit is to attempt to the date the surface from which they were dug. Again the surface from which they were dug will provide only a terminus post quem although the layer above the surface will provide a terminus ante quem.

Like pits and postholes, ditches are dug for variety or reasons and in different shapes and sizes. Big ditches like moat could defend towns from flooding or enemy attack and small ditches around the living area would protect them from vulnerable creatures and also fro water seepages. These linear features at one spot may be different from another spot. A single right-angled cross- section will give only the dimension of the ditch, its sequence of filling at a particular point and it may be different a meter away. Therefore a series of cross-cutting is essential to get full dimension of the ditch.

16.19 STRUCTURES

One of the important things to remember when excavating a structure is that people rarely lived on walls, ditches or in pits and yet these features often dominate excavations. People lived on surfaces (floors) and much of what they did on surfaces will leave only the lightest trace or sometimes none at all. Further, identification of living surfaces is made more difficult by post depositional transformation processes. Some surfaces may find with low concentration of artefacts, and structural features.

In the process of understanding our excavated structures and their surroundings we must not only able to recognize and explain structural features such as floors, post-holes, hearths, fences and the rest, but we must also attempt to understand the derivation of every layer that we encounter. This very thin occupational layer had undergone a change since the last occupation. So, one must learn to recognize all the changes also that have occurred on the sites. The term occupational layers also had different meaning. For instance, whether a floor level indicates the occupation of a human or cattle has to be decided on the material evidence that found on the floor surface. The physical and chemical examination of the soil collected from the layer would throw valuable light on the nature of the

formation. The former one helps to identify the building material and later helps to identify the existence of industrial processes or animal extracts.

16.20 FLOOR LEVELS

Floor levels are often hard packed and generally associated with some sort of wall or ledge or potholes. It is important to interpret their composition as well their dimensions. Generally these floor levels sometimes are detected by the feel of the tool or hardness or colour or texture.

16.21 WALLS

Unlike the excavation of pits, postholes and ditches, which involve a cut and fill, walls present their own problems, walls are generally represented either by foundations or merely by trenches left out by stone robbers (robber trenches). It is rare for masonry structures to be built directly on the ground surface, except in the case of simple low-walled buildings. So Archaeologists must first recognize the foundation. Foundation trenches can be made in two ways. Either a trench is dug to a full width and filled with footings or trench is dug wider than the footings. Then the footings are built inside the trench leaving the gap on both sides. This gap is back-filled. For dating purpose, every effort should be made to identify the surface from which the foundation trench was dug. Sequences of construction of wall footings can sometimes be determined by looking at points where bits of wall meet. A straight join – where one wall butts against another – usually suggests different periods. This can be often confirmed by differences in building material and relative depth of the foundations.

If the wall has been robbed completely it may be possible to trace former walls only by the pattern of robber trenches. When excavating a robber trench, great care should be taken to determine its extent in relation to the original foundation trench. The robber trench is likely to be more or less the actual width of the wall.

Wall is extremely important in archaeological excavation. The beginner is often tempted to excavate along the side of a wall. Such excavation would destroy the successive floor levels that join with the walls. Therefore, once the top level of the wall is discovered, the site supervisor has to plan the further exposure in consultation with the field director who is having wider experience in such jobs. First one has to determine the life and use of the wall. Generally one side of the wall is used as room and another side may be the exterior surface till one reaches a floor level across the wall by placing a small trench. This trench also will expose all the features of the wall such as method of construction, the association of stones, floor, masonry pattern, binding material and so on. Once the first floor is exposed and recorded, excavation may continue to identify second/third floor levels, if any. If there is only one level, it can be established its associated cultural level with ease. In the case of multi floor levels, one has to take outmost case in screening the objects that recovered from each floor levels.

16.22 SECTION

Vertical sections must have been cleaned from the top downwards with the help of trowel or with specially made section trimmer. Avoid section trimmers in loose soils. The protruding stones or tiles should be not removed which may cause small hole in the section, instead they may cleaned around and left in the surface as it is. In horizontal excavations cumulative sections may be obtained. The excavator may leave the baulk of one north-south and east baulk that falls in a particular datum line or base line, this would help a complete sectional drawing of the entire area. This cumulative section may be prepared at the end of the excavation.

16.23 SITES WITHOUT FEATURES

Sites, particularly prehistoric sites, may survive only as spread of artefacts and ecofacts representing activity areas. The recovery of artefacts, ecofacts and associated environmental data are essential for the understanding of a site. Artefacts may be important in their own right, for example as art objects; their importance generally lies in their association and their context on the site. They

can provide information like when, where and what happened on the site. Activity areas without features can be investigated through open-area excavation only. The exact location of individual pieces of struck flint, for example, could indicate where on-site flint knapping took place. The close observation on various waste material would indicate whether prehistoric man carried out the knapping by standing, sitting or crouching. Each knapping position could produce a distinct pattern of waste production. Negative areas within a site with no lithic waste may be equally important, indicating sitting areas or routes through the site. This sort of evidence will only, however, be retrievable when a site has been undisturbed since deposition. Great care should be taken to identify whether the lithic are really in situ or not. Lithic deposited in flowing water, for example, have a single orientation in relation to the water flow, while all patterns may be lost through, ploughing. Lithic with sharp edges would move lesser distance than the one with rounded edges, so, the observation on the nature of deposit would give invaluable information on the depositional process of the site.

16.24 SOIL SAMPLES

It is not preferable to collect bags of the soil samples and sending them to the soil-scientist with a list questions with the expectation that soil-scientist will solve the entire problem. It is important that soil-scientist and archaeologist should speak the same language. The ‘natural soil’ and ‘silt’ has different meaning for the soil-scientist. So archaeologist must use the term standardized by the soil-scientists. The colour and texture, two chief characteristics of soils, must be described by using a Munsell Soil Colour Chart.

The above are some of the procedures to be followed at the time of excavation. However, the field director has the final word on the nature of procedure to be followed during the excavation. Field director takes his final decisions based on his academic and field experience.

16.25 LET US SUM UP

Excavations were conducted technically sometimes many sites in an area are worth digging and the problem of selecting one becomes difficult. The knowledge that a particular site exists is not in itself sufficient reason to excavate it. No site should be dug unless new information can be learned from it. The clever use of modern techniques for excavation and analysis is wasted if it is not directed toward and designed for the solution of a particular problem. Throughout this brief and general history of recording on excavations, it was assumed that to all concerned, as section was a section and a plan, a plan. As Mortimer Wheeler noted, 'it is axiomatic, that an untidy excavation is bad one'.

16.26 KEY WORDS

1. Quadrant – A sector equal to one quarter of a circle, or half a semicircle.
2. Stratigraphy – is a branch of Geology which studies rock layers (strata) and layering (stratification)

16.27 CHECK YOUR PROGRESS

1. Discuss the types followed during Excavations
2. Elucidate the principles of Excavation

16.28 ANSWERS TO CHECK YOUR PROGRESS

1. Section 16.2
2. Section 16.13

16.29 SUGGESTED READINGS

1. Principles and Methods of Archaeology- Raman K.V.

Text Compiled By:
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UNIT- 17 EXCAVATIONS AT HUNASAGI BY K.PADDAYYA

Structure

17.0 OBJECTIVES

The main objective is to know the result of excavation at Hunasagi. After reading this unit you will get to know the Acheulian Culture of Hunasagi.

17.1 INTRODUCTION

The Hunasagi basin is located in the south western part of Sholapur Taluk of Gulbarga district, Karnataka. It is situated about 15km, away from the left bank river Krishna. The author seek to place a short account of the resulting the Acheulian Culture of the Hunasagi. In particular attention will be drawn to the discovery of a quarry site at Isampur in the Hunasagi Valley.

17.2 EXCAVATION REPORT OF HUNASAGI

The excavation revealed the valley measuring about 250 sq. km. in extent is an amphitheatre like basin of erosional origin and dates back to the Tertiary period. They are separated from each other by a narrow east west running plateau strip. The total covered by the two basins measures 30km. north south and 17km.east west. The total floor of the basin is occupied by the Archaean granite-gneiss formation with a mantle of black soil about 50 cm. thick. The eastern margin of the basin is defined by low. Dissected hills of granite-gneiss with heights above the ground ranging from 20 to 40 m. the other three sides are defined by shale-limestone plateau (some places with a capping of the Deccan Trap) formed of the Bhima series; these tablelands rise up to heights of 20 to 60 meters above the valley floor. The two basins from the headwater zone of the Hunsginullah, which is a minor left-bank tributary of the river Krishna. The Hunsginullah is fed by number of small, seasonal streams which originate on the plateau surfaces and flow across the valley floor. Notwithstanding the seasonal character of these streams, the two basins have perennial water pools at several spots; these are fed by seep springs originating at junction of sedimentary rocks with granite. The occurrence of thick and extensive travertine deposits proves that these springs were active in the past too.

The basin floor slopes gently from west to east and has several linear-shaped, shallow depressions separated from each other by tongue-shaped sweeps of land. These constitute respectively represent the fluves and interfluves. Resulting from the long drawn-out process of erosion that led to the formation of the two valleys.

The field investigations in the region from 1974 to 1989, comprising intensive foot-survey as well as excavations at the sights of Hunsgi and Yediyapur, brought to light over 120 Acheulian sites. Based upon dates obtained by the uranium-thorium series technique on enamel samples of animal teeth found along with other fossil fauna and cultural material, these sites are securely dated to the time range of one to three and a half lakh years. While from the Middle palaeolithic cultural phase onwards sites begin to occur on the plateau surface also surrounding the valley, the Acheulian sites are confined to the valley floor. The vast majority of these are found on the downslope surfaces of the ancient interfluves making the valley floor and close to or at short distance from the beds of ephemeral streams draining these surfaces.

Pooling together the field data pertaining to distribution of sites on the valley floor and seasonal character of water sources and animal and plant foods, as extrapolated from the present environment of the Acheulian community consisted of two strategies geared to the seasonality of climate. That is, in the wet season the Acheulian population aggregate split into small groups which spread over the valley floor, since water, plant foods and small fauna would be available freely everywhere. As against this, in the dry season the population groups aggregated near permanent water sources and adopted large game hunting as the main mode of subsistence. The Hunsgi-Devapur stretch of the Hunsgi nullah and the Fatehpur-Yediyapur stretch of the Fatehpurnullah in Baichbal Association with brown silt which occupies a fairly extensive area and supports rich dry farming. An oval – shaped patch of farmland covering 8 to 10 hectares had been acquired by the Irrigation Department to procure soil for raising the embankment of the main canal. This created a large depression from which the brown silt was quarried up to a depth of 2 to 3 m. The wall sections of this dugout area revealed the following stratigraphy. Overlying bedrock was a 25 cm. thick kankar conglomerate made up

of angular limestone blocks with a thick carbonate encrustation. This was followed by brown sticky silt measuring up to one metre and a half in thickness. This was in turn followed by a metre thick black soil. The Acheulian cultural material was found on the surface of or in association with remnant patches of brown silt in the dug – out area. It was therefore inferred that the Acheulian occupation took place during the terminal part of the formation of this sediment or when it was already a stable land surface. The black soil cover was formed subsequent to human occupation.

During the present field study careful inspection was made of the whole locality and its immediate vicinity for obtaining a clearer understanding of the sedimentary relationship between the brown silt and the black soil and for ascertaining the stratigraphical position of the Acheulian horizon.

During our inspection an important additional archaeological feature of the site was identified. This concerns an Acheulian quarry lying immediately to the west of the locality from where soil was quarried by the Irrigation Department. This area forms part of the farmland and is covered with half a metre thick black soil. The brown silt exposed in the quarry created by the Irrigation Department is absent here. In the stretch adjoining the original locality the black soil cover has been partly eroded away by a field stream descending from the plateau. This stripping has exposed kankar conglomerate which rests on limestone; this sediment is an extension of the conglomerate occurring below brown silt in the Irrigation Department's quarry. It consists of carbonate – encrusted limestone block measuring up to half a metre across in size. These still preserve angular edges and fresh surfaces, thereby proving that the deposit is of localized origin / derivation. The ground is partly covered with grass and black soil 20 cm. thick. The limestone blocks comprising the conglomerate served as ideal blanks for tool making purposes. Over 40 specimens, all of limestone, were counted in a patch of 30 m. X 20m. which is relatively free from grass and soil cover. It is probable that the litchi cluster covers a much larger area.

Further work including excavation and detailed plotting have been planned by the authors at this site. The account provided here is a preliminary one. The

assemblage basically consists of large and massive flakes measuring from 10 to 25 cm. in length and handaxes and cleavers of the unfinished nature and measuring up to 30 cm. in length. This assemblages from other Acheulian localities discovered in the area. First, it is found at the very source of raw material, as constituted by the knkar conglomerate. Secondly, the flaking seen on the artifacts clearly belongs to the preliminary stage of the reduction sequence. It appears that the efforts are directed not at the manufacture of finished tools as such but at initial working of raw material blocks into pieces which could be transformed later into finished specimens. In other words, we are probably dealing with a situation where the locally available raw material blocks were shaped into roughouts, which were taken to occupation sites for being worked into finished tools. The adjacent locality on the brown silt at the site could be one such place. The rough – outs could have been transported to other localities also in the valley. The importance of this locality is that it adds to the functional variety of sites known in the Acheulian culture of the Hunsgi and Baichbal valleys.

Since the authors intend to take up this site for detailed study, only a few specimens were collected during the present visit to the site. Once of these specimens is illustrated here. It is a massive block out probably meant for handaxe preparation. It consists of an elongated limestone block with flat surfaces and has been subjected to primary flaking, which has left behind large, deep negative flake scars on the surfaces.

17.3 ACHEULIAN SITE ON ARIKERA PLATEAU

All the Acheulian sites discovered so far in the Hunsgi and Baichbal basins are valley – floor sites. It is only from the succeeding Middle Palaeolithic phase onwards that archeological sites begin to occur on the plateau surfaces in a regular way. The senior author had earlier made the observation that although the plateau surfaces do not contain Acheulian sites, it is still possible that the hominids exploited these highlands for food resources. This was held most likely in view of the low heights of the tablelands in relation to valley floor and their flat nature, both features permitting easy access and free hominid mobility. This inference is

now borne out empirically by the discovery of a small Acheulian site on the Arikera plateau.

This site, lying about two kilometers south of the village of Arikera, is located on the elongated plateau strip separating the Hunsgi valley from the Baichbl valley. It is located about 150m. east of the Hunsgi – Kembhavi road. It is on the 520 m. contour level and lies about 40 m. above the valley floor. The geological stratigraphy observed here is similar to that of the Kariangigudda hill in the Hunsgi valley, lying 10 km. further southeast. The sedimentary rocks of the Bhima series (shales and limestones) are overlain by the Deccan Trap. At this site a whitish, kaolin – like deposit 1.5 to 2 m. thick was found below the Trap formation. Its stratigraphical position and sedimentary character seem to be similar to that of the pre – Trappean bed noticed by Mahadevan on the Karianigudda.

This kaolin – like sediment forms a distinct ledge – like feature, running for a distance of about 200 m. and having a width of about 10 to 15 m. It was on the surface of this ledge – like feature that stone artifacts were found along with a limited quantity of faunal material. The stone artifacts were found over a distance of 50 to 60 m. along the ledge; the fossil fauna was found in a smaller patch of 10 to 15 m. within the area of the lithic cluster.

The assemblage consists of 20 specimens. Of these, 12 are limestone, 5 of basalt and the remaining three of quartzite. In size, two flakes measure 8 and 9 cm. long respectively. The remaining specimens range from 10 to 22 cm. in length, from 6 to 12 cm. in breadth and from 4 to 8 cm. in thickness. All of them exhibit very rough and incomplete flaking on the surfaces and edges. None of the specimens could be regarded as a fully finished example. The following general types are present in the assemblage:

1. Rough cleaver – flakes
2. Chopping tools with unifacial flaking
3. Large knives, with a thick natural back
4. Large flake – scrapers with edge – retouch / secondary working
5. Large pick – like artifact
6. Unused flakes

The following specimens are illustrated:

1. Basalt nodule worked unifacially into a chopping tool.
2. Large discoidal flake of basalt steeply worked all round the periphery from under surface.
3. Triangular – shaped limestone block fashioned into a chopping tool by flaking one of the sides unifacially.
4. Elongated limestone block flaked to form a pick – like implement.
5. Limes stone block with a steep (natural) back on the left edge and the right edge showing unifacial flaking, probably to form a knife – like implement.
6. Elongated flake of quartzite with a borer – like projection on right margin and left margin chipped to form a thick scraping / cutting edge.

Two or three features of this assemblage are very striking. First, it is of a non – descriptive type and forms part of the Acheulian culture in a general way. Secondly, whatever raw material was available in the immediate vicinity was used for flaking purposes; the employment of three rock types (limestone, basalt, and quartzite) in a small assemblage like this certainly betrays a sense of expediency on the part of the maker / user. Thirdly, this notion of expediency is brought into a bolder relief by the fact that the assemblage lacks in well finished specimens and basically consists of heavy – duty implements which show minimal amount of flaking. The artifacts exhibit a minimum of effort in flaking and appear to have been devised for coming to grips with a specific and immediate need. In this respect the association of fossil fauna assumes a measure of significance. The collection consists of five teeth wild cattle (Bos/Bubalus); all specimens are mineralized and are encrusted with carbonate. The stone artifacts were in all likelihood connected with butchering and related operations for dealing with a portion or full carcass of wild cattle, procured either by regular hunting or scavenged from a carnivore kill. IN this connection it is important to recall that animal food – processing sites similar to the present one are already known from a few other places in the two valleys, e.g. Teggihalli, Yediyapur and Hebbal Buzurg.

17.4 LET US SUM UP

One author's prolonged research in the area from 1947 to 1989 brought to light a wealth of data pertaining to the Acheulian culture. This work not only confirms the original findings made by Robert Bruce Foote but actually makes this area into one of the richest concentrations of the Acheulian Cultural record of the old world. The excavation indicate the importance of lateral approach which the senior author has been advocating in Stone Age research in India for the last two decades that is shifting the focus of attention from large rivers to interior areas where the Stone Age sites are less likely to be disturbed by high order fluvial activity and then undertaking intensive filed studies geared to the discovery of small and large sites.

17.5 KEY WORDS

1. Limestone – is a sedimentary rock compose largely of the minerals calcite and aragonite which are different crystal forms of calcium carbonate.
2. Acheulian – relating to a stage of tool culture of the Lower Paleolithic.

17.6 CHECK YOUR PROGRESS

1. Discuss the excavation report conducted at Hunasagi.
2. Describe the Acheulian on Arikera Plateau.

17.7 ANSWERS TO CHECK YOUR PROGRESS

1. Section 17.2
2. Section 17.3

17.8 SUGGESTED READINGS

1. Paddayya, K: The Acheulian Culture of the Hunasagi i.e. Peninsular India: A Settlement System Perspective. Pune: Deccan College

2. Paddayya, K: The Acheulian Culture of the Hunasagi – Baichbal Valleys, Peninsular India: A Processual Study.
Paddayya, K. and Michael D. Patraglia: Formation Processes of Acheulian Localities in the Hunsgi and Baichbal Valleys.

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UNIT- 18 EXCAVATIONS AT INAMGAON BY H.D.SANKALIA AND M.K. DHAVALIKAR

Structure

18.0 OBJECTIVES

After reading this unit you will be able to understand

- the excavations at Inamgaon brought to light an extensive chalcolithic settlement
- the cultural sequence which revealed a sequence of three cultures, the Malva, Early Jorwe and late Jorwe
- the ecology system of the region

18.1 INTRODUCTION

It is a post-Harappan agrarian village and archaeological site located in Maharashtra, western India. Situated along the right bank of the Ghod River, it is considered to be the "regional centre" of the Bhima Valley. The village is located approximately 89 kilometres 55 m to the east of the city of Pune. The region, situated within the lower reaches of the Ghod, is characterized by Cretaceous-Eocene Deccan Trap basalt. The ancient site, measuring approximately 550 metres-1,800 ft by 430 metres -1,410 ft, is located about 3 kilometres -1.9 m from Inamgaon and has been studied for its archaeological finds The Chalcolithic settlement was excavated in order to better understand the early and later Jorwe culture. The excavation was a landmark in Indian's archaeology history due to its extensive and systematic process. The excavations revealed multiple cultural phases including Late Jorwe Culture, Early Jorwe Culture, and Malwa Culture.

The excavations at Inamgaon, District Pune, Maharashtra have brought to light an extensive chalcolthic settlement which began in 1600 B.C and came to an end around 700 B.C. The ancient site is situated on the right bank of the river Ghod, a tributary of the Bhima, which, in its turn, belongs to the Krishna system. The ancient site is spread over an area of five hectares and is thus probably one of the largest chalcolithic sites so far discovered in Maharashtra. The semi – arid climate of the region in which the site is situated has, to a considerable extent, been responsible for the survival of the evidence, more particularly of the mud houses of

the people, The aim in excavating the site for thirteen seasons from 1968 to 1983 was to recover the house plans and expose, as far as possible, the ancient settlement. The excavation albeit circumscribed by time and money has been amply rewarded. More than hundred and twenty houses of different periods have been exposed with the result that it is now possible to study the ancient settlement pattern at the site.

18.2 CULTURE SEQUENCE

The excavation revealed a sequence of three cultures the Malwa (Period I), the Early Jorwe (Period II) and the Late Jorwe (Period III). The first settlers at the site were the people from Malwa who occupied the site about 1600 B.C. Their occupation came to an end around 1400 B.C. when a new culture, termed as the Early Jorwe Culture, appeared on the site. Both these cultures remained overlapped for some time. It may, however, be stated that elsewhere in Maharashtra the Jorwe Culture begins around 1300 B.C., it appears to have come into being at Inamgaon earlier by a century or more as indicated by radiocarbon dates (Dhavalikar 1973).

The Early Jorwe Period (circa 1400 – 1000 B.C.) ushered in an era of prosperity. The Jorwe culture, which has been found in different parts of Maharashtra, actually represents the Early Jorwe phase. At Inamgaon, besides the early phase, tangible evidence for a Late phase of the Jorwe Culture has also been found. So far only a few Late Jorwe sites have been discovered in the Bhima valley. Elsewhere in Maharashtra, the Jorwe habitation comes to an abrupt end around 1000 B.C. the reason for which may possibly be the marked deterioration in the climate which become more arid. The climatic change is represented stratigraphically in the weathered layer at Nevasa. Aothough the Jorwe farmers deserted their habitations in the Tapti and the Pravara – Godavari valleys about 1000 B.C. they continued to survive in the Bhima valley where the climatic change may not have been very drastic. None the less they too were affected by these environmental changes and had to face poverty which is so well reflected in their cultural equipment at Inamgaon. On the basis of stratigraphical evidence the Late Jorwe phase can be dated to circa 1000 – 700 B.C.

18.3 ECOLOGY

Geologically, the region around Inamgaon forms part of the Deccan trap and the outcrop of the columnar basalt is to be seen on the other bank of the river opposite the ancient habitation. The region consists of stony uplands and rugged valleys, but towards its river boundaries slope into more open plains. The uplands have, in some cases, rich tracts of black cotton soil which is very productive even with a scanty rainfall. The area along the river upto this confluence with Bhima has a fair share of rich black soil but for which the soil cover is very thin. Consequently the region is throughout sparsely wooded, and the vegetation cover is xerophytic. It was, however, more wooded some fifty years ago, wild boar and deer roamed here. But in recent time a serious depletion of vegetal cover has taken place as a result of felling trees and clearing land for agriculture and overgrazing which, in its turn, has affected the fauna. The region is now classed as semi – arid because of scanty rainfall which averages 40 – 42 cm a year. The picture, however, is now changed because of the construction of a dam on the Ghod some 20 km upstream at Chinchani which irrigates large tracts of land on either bank of the river at Inamgaon the surrounding region. The principle crop today are Jowar (Sorhum uulgare, Pers), Bajra (Pennisetum typhoides, Stapf. & Hubbard), pules like Kulith (Dolichos biflorus, Linn) and oil seeds such as til (sesame), Kardi (safflower) and alshi (linseed) while wheat and very rarely rice is also grown in small carefully tended plots which are irrigated.

18.4 SETTLEMENT PATTERN

As already observed, the ancient site at Inamgaon is one of the most extensive chalcolithic sites in Maharashtra and is also the only site of its kind where excavations have been carried out on such a large scale. In the course of thirteen seasons' work we have been able to lay bare 137 houses of different periods. Of these a majority (72) belong to the final phase (III) of occupation whereas a few ones (33) are of the Early Jorwe (II) and (32) Malwa Period (I). In all likelihood the pioneering farmers came from Malwa in different waves from circa 1600 B.C. onwards. They seem to have been attracted by large tracts of black

soil and the perennial source of water in the Ghod. Another important factor is the large pool of water in the river where the massive columnar basalt on the left bank at the site form a sort of barrier to the flow of the river. Even now when the region is in the grip of famine as a result of scanty rainfall the water in the pool at the site is always sufficient for the surrounding villages.

There does not appear to be any proper planning in the Malwa (I) settlement for the houses. Though large and spacious, the houses were situated close to each other and even dwelling pits were dug by the side of mud houses. The pit houses, however, disappear in the succeeding period (II). The Early Jorwe houses were large rectangular structures and there appears to be some modicum of planning of the settlement during this period. The houses were situated about a metre and half each other, the intervening space forming a sort of road or lane as at present. The Early Jorwe settlement was very extensive; it was spread over almost the whole of the site. The alignment of the houses suggests that it was probably a linear settlement which is also corroborated by the rectangular shape of all the mounds. The increase in population must have crossed one thousand marks during Period II (Early Jorwe). The size of the settlement shrunk during the Late Jorwe period (III) possibly owing to the adverse conditions caused by a gradual decrease in the rainfall pattern. The house plan now undergoes a drastic change; the large rectangular houses of the preceding period are no more to be seen; they are replaced by small round huts. The Late Jorwe habitation was a nucleated settlement with clusters of round houses and the entire habitation from above would have looked like a veritable beehive. The huts were tightly spaced units, almost nestling with each other, and the open space in between the two huts was hardly a metre. Considering the fact that in a traditional Indian house the most important part is not the house but the courtyard where most of the family's life if lived, it is surprising that only a few Late Jorwe houses have a courtyard. It therefore seems highly likely that each cluster of huts had a common courtyard which was used for private as well as community purpose.

18.5 EMBANKMENT

A huge diversionary embankment wall (240 m long and 2.25 m wide) was constructed during Early Jorwe Period. A channel 4 m wide and 3.50 m deep was dug almost parallel to it. The wall was constructed of rubble set in mud mortar at the base, whereas the upper part may have been earthen for which the earth dug from the channel may have been used. The channel in its southern end almost joins the large feeder stream of the right bank of the river so that flood water from the river would be easily siphoned through the channel. In all probability, the water from the channel was used for irrigating the low lying fields nearby or else it could have been drained through another stream near the southern end of the channel.

18.6 SOCIAL STRATIFICATION

A distinguishing feature of the pattern of the chalcolithic settlement is the location of the craftsmen's quarter on the periphery of the habitation. The excavations have been confined mostly to the western periphery and to a part of the central area of the main mound. They they have brought to light a number of houses, which, on the basis of their contents, can be identified as those of craftsmen. The houses of the following craftsmen have been identified: Period I (Malwa period), (i) Potter, (ii) lvory carver, Period II (Early Jorwe), (i) Potter, (ii) Copper – smith; and Period III (Late Jorwe), (i) Goldsmith, (ii) Lime – maker, (iii) Wine distiller, (iv) Potter, (v) Coppersmith.

It is clear that right from the beginning (Period I) the craftsmen's houses were situated on the western periphery of the main habitation area just to the left of the entrance to the settlement and the same pattern continued in the subsequent periods. It is interesting to note that the same patterm prevails even today in the villages in central Maharasthra. Tradition dies hard, more so in a country like India.

A unique feature of the houses uncovered in the craftsmen's quarter is that a majority of them have pit silos which have not been found in the house in other

parts of the habitation. The pits silos were found to have been dug into the house – floor. They had perfectly vertical sides and flat bottom and were plastered with lime which obviously served as an insecticide. The pit – silos first appear in Period I and continue in Period II, but their number decreases in Period III. An average pit – silo is a matre and a half deep and has a diameter of one metre. In one of the pit – silos the base was covered with grass. Some of the pit – silos of the Later Jorwe period contained a huge storage jar which was handmade and have a bulging belly and a wide outcurved mouth.

The occurrence of pit – silos in the houses in craftsmen's quarter is indeed interesting and is suggestive of their need to store grain which was perhaps greater than their fellowmen living in other parts of the settlement. This must have been a full time job for the craftsmen and the community must have paid them in exchange for their services in kind. They naturally must have been paid in the form of grain once or twice a year' and hence the need to store in properly.

It reminds us of the Baluta system which was in vogue til recently in some parts of central. Maharashtra and according to which the craftsmen such as the potter, cobbler, blacksmith, carpenter and other were paid inkind at the harvest time for their services. Traditionally there are twelve such Balutedars. The chalcolithic craftsmen in all probability received coarse grain such as barley and kulith which they stored in silos. The absence of mud platforms/storage bins save in the potter's house of Period I shows that they usually did not consume wheat.

18.7 GRANARY

A unique structure was encountered close to the craftsmen's quarter, not far from the elite area which is located in the centre of the principal mound (INM I). It is a squarish structure (10.50 X 9.15 m), partitioned into two rooms by a reed screen which, however, appears to have been removed later to make room for storage bins. The structure had low – mud – walls, may be not more than 30 cm high, over which was the mud plastered bamboo screen. The structure contained a number of pit – silos (6) and round mud platforms (7) for storage bins of various sizes, all disposed in a very orderly fashion for storing different kinds of grains. In

some cases the sides and the bottoms of the pits were lined with lime whereas in case of others, the bottom was full of sand. No remains of grains, however, were found idn the pits. The structure is open on south and partly on east where only post – holes are to be seen.

In the southern half of the structure there were two large fire pits, one (42 cm X 77 cm, 2.18 deep) near the southern edge and the other (130 cm X 72 cm, 35 deep) near the eastern periphery where there was no wall. Both the pits were of much larger dimension the ordinary chulas which have been found in several houses at the site. In the centre of the bottom of both of them there was a large flat round clay lump possibly for keeping a receptacle which, however, was missing. But a similar fire pit unearthed in the Malwa levels had the broken base of a huge storage jar well embedded in the centre of the pit. The slides and bottom of both the pits were completely burnt hard indicating that they were in use over a long period. It may be noted that such fire – pits are dug today for community cooking when the whole village is to be fed.

The identification of the structure is not as easy as it appears to be, it is pertinent to note in this connection that very little pottery and other articles of domestic use were recovered from within the structure, thus suggesting that it was not used for residential purpose. We are therefore inclined to indentify it as a public building. The existence of a number of pit – silos and mud platforms for bins suggests that the structure could have been a granary, for there is very little or no living space inside. The people must have paid taxes in the firm of grain which was stored in the silos and bins. House of the Ruling Chief: Just to north of the granary and almost adjoining it was found a large house consisting of five rooms of which one was a kitchen and the other a store-room. The house had a well plastered floor and it covered an area of 25×10 m. in the courtyard of the house was found a symbolic burial consisting of one full and the other half four-legged unbaked ums which contain a Jorwe Ware painted jar covered with a lid. In the same area was found a similar four-legged urn containing a human skeleton which belonged to the end of the Early Jorwe Period. Hence the one in question can be identified as a symbolic burial since it did not contain multi-roomed house can be identified as that the ruling chief since all other houses so far discovered are single

room units. Moreover, its proximity to the granary also indicates that the collected the taxes from the members of the community in the form of grains and stored it in the granary by the side of his house.

Population: It is not an easy task to compute population of an ancient settlement fairly accurately purely on the basis of the size of its area. However, attempts have been made in recent times to calculate population of a given site. One such satisfactory estimate which was developed for south-east Asia is of a population of 200 person per hectare while the other by Fairservis in 1967 computes the population of Mohenjo-Daro to 800 sq. feet per person or 133 persons per hectare. Hole in 1968 has arrived at a figure of 60 to 80 persons per acre or 150 to 200 persons per hectare. Each of these estimates has accounted for open spaces, roads, public architecture and other non-habitational areas. We may, therefore, not be far off the mark if we calculate the population of Inamgaon basis of 200 persons per hectare. The size of the habitation at Inamgaon during the Malwa, the Early Jorwe and the Late Jorwe Periods was respectively five, and two hectares and the population, therefore, can be taken to be 1000 during the Malwa and the Early Jorwe Periods and 400 in the Late Jorwe Period. It is not unlikely that our computation for the final phase of occupation at the site is not very near the truth. This is, in the main due to the fact the size of the house, as will be seen later, becomes smaller reflecting the general decline in the standard of living. But all the same, the number of houses might not have been less than that in the Early Jorwe phase, a large number of houses could have been squeezed in a much smaller area and consequently the population would have been less. It is therefore reasonable to assume that the population of Inamgaon would have been in the neighborhood of a thousand souls figure which qualified it as a considerably large settlement of the Jorwe Culture.

Domestic Architecture: the earliest inhabitants of the Inamgaon lived in large rectangular houses which had thin dwarf mud walls over which the framework was of split bamboo, plastered over with clay and cowdung. One complete house of the Malwa period measures 6.64 m long and 4.42 m wide; its dwarf walls were flimsy and extremely thin (13 cm thick) and their extant height is 60 cm. there were a number of postholes outside the walls and some inside the

walls also. The house was divided into two compartments by a dwarf wall over which probably rested the reed screen. In the north eastern corner of the house was a circular mud platform 1.9 cm. such circular mud platform are still constructed in the houses in the surrounding region fir supporting a large cylindrical storage bin made of wickerwork. The mud platform contains thorny branches and sand in order to prevent rodents from destroying grain in the bin. It should be noted that the mud platform from the Malwa house also contained sand.

In the northern corner of the house was a chulah which was rectangular in shape and had a disc-shaped clay stem in the centre, in which was also embedded a flat rectangular stone. This was covered with mud in order to support the cooking vessel. In one case a clay pan was found plastered to the central clay disc obviously for baking the dough the rectangular chulah in each case was full of ash, charcoal and lumps of burnt earth. The central clay support recalls to the mind those in West Asia which, however, were circular.

Some people also lived in pit-houses. It is noteworthy that pit-houses occur only in Period I and not in later periods. But even in the early levels they are quite few in number. One such pit-house lay to the south and adjacent to the Malwa house described above. It was roughly circular on plan (maximum dia. 3m) and its side were perfectly vertical, and since the pit was considerably deep (1.23m), a step was provided on the southern side for descending into it. The floor and the sides were plastered with lime. There were several potholes along the periphery at the top for supporting the roof and on the east the ground was provided with a gradual slope for draining out rain water, thus preventing it from getting into the dwelling pit. On the north-east was found a double chulah which belonged to the occupants of the pit. Thus indicating that cooking was done outside in the open. Two more pit-houses, which were considerably shallow and may therefore be described as sunken floors, were also found. They were smaller (dia. About 1.50 m) than the preceding one. The discovery of a twin urn burial in one of them shows that they were used for dwelling purpose for at Inamgaon burials have always been found under the house floor. It is worthy of note that even today such sunken floors and pit-houses are constructed in and around Inamgaon. This is obviously due to

the short lengths of babhul (Acacia Arabica) posts and in order to obtain sufficient height for the structure the pit houses are dug into the ground.

The Jorwe people adopted the house plan of their predecessors at the site but their houses are slightly of smaller dimensions, about 5 m × 3 m. one of the house (No. 38) had a channel dug outside in the courtyard for draining out water from the roof. The floor was made with due care and plastered with mud and lime. The houses in the centre of the locality had no pit-silos and the grain was stored on the floor. Terracotta lamps have found inside the houses and experiments show that the boat-shaped lamps, if filled with oil, can burn the whole night Men of means probably had squarish lamps with pedestalled bases; they could accommodate four wicks at a time. Oil for the lamp might have been of Karadi (Safflower) charred gains of which have been found in the excavation. Pit-house were not in use during the Early Jorwe phase, but round houses begin to occur in the last phase of the Early Jorwe period.

There is striking change in the house plan in the Late Jorwe phase, instead of large rectangular houses there are small round huts of modest dimension. The overall economic degeneration is visible in every field of human activity. The houses are small, built close to each other in a haphazard manner, giving the appearance of a slum. They have dwarf wall with bamboo screen which were plastered over with mud and cowdung; the roof was probably conical and was supported on wooden post. Every house had a set of four flat stones for supporting a four-legged storage jar. The floors were well made and even the outside area around the hut was in some cases rammed with murum and plastered with mud. Their diameter varies from 2.50 to 4.25 m. the floor of the house was no doubt re-laid at regular intervals, may be every alternate years as in done now; the maximum number of re-laid floors counted in the section at one place was fourteen, the average number being between five to eight. This would show that a house was occupied from 15 to 25 years or for a generation or so. The largest house of this period was found in the central part f the mound about forty houses of this period have so far been exposed.

18.8 SUBSISTENCE

The mixed economy of the chalcolithic farmers of Inamgaon was based on farming and hunting-fishing. They raised a number of crops such as wheat, barley, rice and pulses and lentil and also collected fruits like Indian jujube (Ziziphus) charred seeds of which have been found. A number of perforated stones from all the three cultural periods show that they were used for hafting on digging sticks. Estimates for population and the food requirements lead to believe that the farmers of Inamgaon must have cultivated the black cotton soil which abounds in the region. The most important cereal was barley which was cultivated right from the beginning of the occupation. It is a crop of short duration and can be easily raised in a semi –arid environment. It is, however, not grown today but enquiries revealed that it was cultivated on a large scale some fifty years before.

The next important crop was wheat which however begins to be cultivated only from the Early Jorwe period and it is conspicuously absent in the Malwa levels. It is indeed surprising that the people of the Malwa culture should not have grown wheat at Inamgao. But wheat is rabi crop which requires winter rains. The region around Inamgaon lies in the rain shadow zone, and it has consequently become a semi-arid region which does not receive even its normal quota of the monsoon, let alone the winter rains. Wheat is presently grown in the area which has an assumed supply of water from wells or the regular canal irrigation. The Early Jorwe farmers must have faced tremendous difficulties in growing wheat. In all probability cultivation of wheat became possible because of the supply of water diverted by the embankment which also was built only during Early Jorwe Period. Rice was cultivated possibly in small carefully tended plots as is done now.

18.9 CRAFT SPECIALIZATION

As already stated, a number of house belonging to craftsmen have been laid bare Among these potter occupies as important position A potter's house (Period I) and two potter's kilns, one each of Period II and III have been found in the excavation, while the identification of the potter's house in the earliest levels is

based on circumstantial evidence, potter's kilns of the subsequent period have been uncovered. The kiln of period II is like a huge through made of clay and embedded in the ground on stone foundation. It appears to have been built in situ. Its maximum diameter is 1.75 m. and at a depth of 60 cm from the top were found clay cushions in the kiln placed over the fire chamber down below. These cushions are oval in shape and have a hole in the Centre and groove on the middle of each side; the holes in the center served as outlets for the hot gas. In the base of the kiln were flues or air ducts radiating from the Centre. To the north-east of the kiln was the fire passage lined with stones and reaching below the bottom of the kiln where an andiron or firedog of clay was placed. It is rectangular in shape with projecting comers and corners and curved upper sides for supporting firewood. At the time of baking pottery the firewood on the andiron was lit and the resulting hot gas would be passed above through the flues and holes and grooves in the clay cushions. It is thus a unique kiln which has so far no parallel within the country or even beyond. But in principle it is akin to those from Indus cities which were brick built and were provided with several holes for hot gas.

The clay and iron from the kiln, however, ha parallels in West Asia where they have been dated to circa 2700-2000 BC. Another kiln, belonging to the Late Jorwe Period, was also found. It was an open type of kiln consisting of a shallow pit dug in the ground. The pit, when exposed was found to be full of potsherds and ash.

18.10 IVORY CARVING

Another house of period I which unfortunately was in much disturbed condition yielded a piece of an elephant tusk buried carefully in a small pit in the house floor. We do not know whether this was done with a view to preserve the piece of ivory one end of the ivory is nicely cut flat, thus indicating that the owner may have been an ivory carver. Disc beads of ivory have been found at the site in all that they were manufactured at the site. It may also be stated that a bone fragment from the site has been identified tentatively as that of elephant (Elephusindicus) Ivory could also have been obtained from southern Karnatak which even today supplies ivory to the country.

18.11 GOLDSMITH

Gold ornaments were found only in the shape of beads (long barrel, circular), and they too were confined to the Late Jorwe (III). It is significant that the gold-smith's crucible and a pair of tongs of copper were also recovered in the Craftsmen's quarter from the Late Jorwe levels. The only Craftsmen's quarter from the Late Jorwe levels. The only source of gold was the Karnatak region and there is clear evidence of cultural contact with south, for the black-and-red ware occurs only in the Late Jorwe levels.

18.12 LIME-MAKING

Lumps of finely made lime, in the shape of balls, have been found carefully stored in pots whereas in one of the Late Jorwe houses a large number of lime balls were found. All this clearly shows that some people were actively engaged in the manufacture of lime, the house of lime maker was exposed in the upper levels of period III. A number of lime balls were recovered from this house whereas in his courtyard was what appears to be a lime kiln. It consisted of a number of stones rammed in circular fashion (maximum dia. 60 cm) over which was placed a large flat stone. It is significant that a heap of shells was noticed near the house but not far from the kiln. This would suggest that lime was made by burning shells just as they do today in Tamilnadu and Keral. But Kankar (calcified grit), which is available around the site abundantly, may also have been used for preparing lime as is done today.

Lime must have been required in large quantities by the chalcolithic inhabitants of Inamgaon for frequently plastering the pit-silos and walls and floors of their houses, Lime making may have therefore became a specialist's job. Small balls of lime which have been recovered from many houses appear to have been so kept for serving as an insecticide. Lime is also sometimes applied to soil for correcting acidity and a source of calcium but we do not know whether the early farmer at Inamgoan used lime for this purpose.

18.13 DISTILLATION

From the Late Jorwe house, which unfortunately was much disturbed, was recovered a tall cylindrical vessel with flat base and slightly outcurved rim. Near the mouth it had three holes, obviously for suspension. The vessel was found to have been carefully kept in a deep, narrow pit; only the mouth of the vessel was seen jutting out of the pit. It is obviously unsafe to keep a vessel of such height above ground as it could tumble any moment and hence it was kept in the pit. It was probably tied with string at the mouth through the holes in order to facilitate lifting it out pit as and when required for pouring out the liquid that it must have contained. It could have contained either oil or wine, but no trace of oil have been found in it and there was no need to store oil in such a manner below ground. In all probability, therefore, it must have contained wine which may have been some sort of beer made out of barley which is reported from all the levels. The jar appears to be too large to be in the house of a common man and the house can therefore be plausibly identified as of a wine merchant who obviously must have been the distiller also. Incidentally, it may be stated that two graceful jars with narrow tubular neck like that of a wine flagon were found in a Late Jorwe burial; they must have been wine jars which formed part of the burial goods.

The huge wine vessel from Inamgaon is the only of its kind in India, but is paralleled at Mundigak in Afghanistan where it comes from Period III which is dated to mid-third millennium B.C.

18.14 LET US SUM UP

The foregoing account of the excavations at Inamgaon shows how the large-scale horizontal excavation helps us in the understanding of the settlement archaeology of a chalcolithic community. What the efforts have tried to make out is not the settlement pattern in the accepted sense of the term, but rather the community pattern. The concentration of the houses of the craftsmen along the western periphery of the settlement and the location of the houses of men of means in the central part demonstrate that it was a class structured society.

The excavated evidence also throws light, to some extent, on the administration during the chalcolithic period. The discovery of the multi-roomed house with a symbolic burial in the courtyard and the granary adjoining it is indeed significant. The identification of this house as that of the ruling chief of the settlements is no doubt supported by the evidence. To this should be added the evidence of the diversionary embankment and the channel for draining out water which could have been used for irrigating fields. It implies the control exercised by a central authority that would see to the quotable distribution of water the periodical silt clearance of the channel and its normal repairs. All this is bound to remain hypothetical. Howsoever plausible it may be.

18.15 KEY WORDS

1. Granary – is a store house in a barn for threshed grain or animal feed
2. Distillation – is a process of separating the component substances from a liquid mixture by selective evaporation and condensation.

18.16 CHECK YOUR PROGRESS

1. Explain the Ecological and Settlement pattern at Inamgaon.

18.17 ANSWERS TO CHECK YOUR PROGRESS

1. Section 18.3 and 18.4

18.18 SUGGESTED READINGS

1. New Archaeology- Its Scope and Application to India- Sankalia H.D.

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UNIT – 19 EXCAVATIONS AT T. NARASIPURA BY M.SHESHADRI

Structure

19.0 OBJECTIVES

After reading this unit you will be able to understand the

- history of T. Narasipur
- chronology of the Site
- objects unearthed during excavations

19.1 INTRODUCTION

T. Narsipur is situated about 20 miles, South-East of Mysore at the confluence of the rivers Cauvery and Kabbini at 12°13′ N latitude and 76″58′ longitude. T. Narasipur is presently a town of moderate size. It is the head quarters of a taluk of the same name in the Mysore District. Tirumakudlu is a hamlet of Narasipur situated at the tip of the land between the two rivers. There are a few temples dedicated to (a) Agasty esvara, (b) Gunja Narasimhavami and (c) Anandesvara apart from a dilapidated temple in the vicinity of the site itself. The temple of Anandesvara is situated right on top of the site on the left on the left bank of the river.

The site is situated in the Upper Cauvery Valley, now confined within the Mysore, Mandya and Hassan Districts of Mysore breadth of the Cauvery in Mysore ranges between 300 to 400 yards, but from the point of its confluence with the Kabbini to the falls of Sivasamudram it swells into a broader stream.

This region watered by the perennial Cauvery and its tributaries is one of the most fertile areas in the present Mysore State and appears to have encouraged human habitation right from the earliest times, as evidenced by a number of ancient sites, strewn all over the Cauvery basin.

19.2 THE SITE

The Ancient site is located just opposite Narasipur Town, on the left bank of the river Cauvery. Every year during the high floods in the river, considerable

portion of its left bank is eroded. This destroys the overlying habitation deposits and also due to the under cutting and consequent collapse of the upper portion much of the site is gone. All along the length of the site the bank rises straight up as a cliff from the edge of water

During summer the river is easily fordable from many points:

This is the easiest approach from T. Narasipur. The people of Kendanakoppal, a village situated a little north of the ancient site; usually take this route only for their journey to and from T. Narasipur. Otherwise, the site could be approached from T. Narasipur on the Bangalore road. Just at the northern end of the Cauvery Bridge, a mud path leads east wards from the main road, running along the bank of the river. This leads directly to the site itself after a distance of a furlong and a half.

What remains of the site, after the devastating action of the river year after year could be considered as impressive, from all standards compared to the other known ancient sites in the area. The extent of the site is somewhat easy to mark on due to the recognizable difference between the natural soil and the habitation deposit on the river bank. Further the ancient site proper rises a bit higher than the surrounding ground.

At the western most point of the site there is the temple of Anandesvara, which may have been built somewhere in the 17th Century A.D. Probably the temple itself stands on the toe of the site. Here, however, a few pieces of ancient pottery could be collected and the site is much disturbed due to small ravines running from the neighborhood of the wet fields towards the river cutting through the site. Similarly there is another cutting through the site just to the west of the Bhiksheshwara Temple.

The Bhiksheshwara, as it stands to-day, is a poor structure of no architectural importance. It is built of granite and consists of a sanctum with a square hall in front divided into a nave and an aisle on either side, by two small pillars raised in the centre of the hall along the alignment of the side-walls of the sanctum. It has a small door way in front looking towards the river and the

Agastyesvara temple at Tirumukudlu further on. There is a plain low pyramidal tower of brick and mortar above the sanctum and from the stylistic point of view the temple cannot be pushed to a date earlier than the 18th or the 19th Century A.D. However, a few large stones used for the basement of the temple consist of illegible inscriptions in Kannada characters of the 14th Century A.D.

19.3 PERIODS AND CHRONOLOGY

The Period is classified into four periods,

- Neolithic
- Transitional
- Megalithic
- Early Historical

19.3.1 Neolithic

The site of T. Narasipur appears to have been first occupied during the early centuries of the second millennium before Christ, as revealed by the carbon 14 days obtained for the charcoal from the lowest layed (6) of the site =1800 to 1700 B.C ± 110 years by the incipient peasant-cum-pastoralist communities. The daily life of these people was characterized by the use of burnished grey-ware, hand-modeled and roughly fired, polished-pointed-butt stone axes, etc. The evidence from the neighbouring sites indicates that their main occupation was pastoralism and a crude method of cultivation probably using the digging stick and hoe. The occurrence of stone objects which might have been used as weights for digging sticks, saddle and rotary querns for crushing the grain, etc., go some way to suggest the method of their cultivation and use of the harvested grain. The occurrence of polished-stone-axes gives us an idea of their tools and implements of their day-to-day work. The occurrence of the gold mining was practiced and gold was used for ornaments and trade by these Neolithic folk in South India. Thus the evidence of T. Narasipur provides for the first time a picture of the Neolithic folk and their activities in the upper Cauvery Valley, the southernmost site in South India subjected yet to excavations.

19.3.2 Transitional

During this period which might have come into existence towards the closing centuries of the 2nd and opening centuries of the 1st Millennia before Christ, we find the simple rustic way of the life of the Neolithic folk undergoing vast changes. These changes were partially motivated by local progressive developments and partly by influences and inspirations which seeped in from the adjoining regions to the north which possessed comparatively more advanced cultures namely the chalcolithic and later the Iron Age cultures.

The local development are the evidence for the gradual use of turn cable or slow-wheel for making the pots, production of pottery with finer fabric and firing, improved methods of cultivation as suggested by fully ground and highly polished axes and chisels. From the north came, towards the beginning of this period, traits native to the chalcolithic culture of Central and Western India such as the use of copper, though in scanty quantities, wheel-made-sturdy red-ware of fine fabric painted in linear designs in black, akin to the Jorwe ware, and fluted cores, though no blades proper, removed from those cores have been encountered from the site. But these intrusive chalcolithic features could not gain any prominence at the site as a more vigorous iron and black-and-red ware using megalithic culture followed in its wake and secured, mastery over both the earlier autochthonous Neolithic and the intrusive chalcolithic cultures within a short time. This important event must have occurred sometimes early in the first millennium B.C. as carbon 14 dates for the end of the Neolithic and chalcolithic indicate in the more northerly regions. Hence this phase has been called the overlap or transitional phase.

19.3.3 Megalithic

The third period in the site is represented by the well-known proto-historic culture in South India. viz, the Magalithic. This culture must have commenced sometime in the 2nd quarter of the first millennium B.C. if not earlier, for the reasons mentioned above, namely, the C14 dates for the end of the Neolithic-chalcolithic of the Deccan and overlapping of these culture., with the megalithic in

the region. Or at the most, if the earlier cultures survived for a slightly later, at any rate, not after the middle of the first millennium B.C. Unfortunately no burials of the megalithic type proper have been encountered at the site.

The pottery consisting of, besides, the black-and-red, the black-polished and the red-polished and comparatively well-fired. The Black-and-red ware in particular is finely produced and among the South Indian wares of the proto-historic period may well be called the 'table ware' or 'deluxe ware'. Iron came into general use for agricultural, defensive and offensive purpose during the period, though in the limited excavations of the site, only a few iron objects were encountered and even they were in a highly rusted state probably due to the nature of the soil. Beads of terracotta, semi-precious stones, and bangle pieces of glass are among the objects of ornamentation in normal use.

19.3.4 Early Historical

The deposits of this period were highly disturbed due to their nearness to the surface. The cultural pattern of this period continued to be similar to that of the period which it succeeded. viz the megalithic. The earlier black-and-red and associated wares continued to be the dominant types of the ceramic industries and the emergence of a new ware, the ill fired crude red ware is also witnessed during the period. This may, on the other hand, be even due to the gradual devolution of the earlier red-polished ware. The beginnings of this period may be assigned to the first century A.D. or slightly later as the imitated roulette ware occurs in this level. The true roulette ware was produced in 28 A.D. in Rome and was brought to South India by Roman traders from the second quarter of the century and in course of time; the rouletted ornamentation was imitated on local fabrics by the local potters. It is such crude imitations of the roulette designs on russet-coated ware which have been found in T. Narasipur.

19.4 BURIAL POTTERY

- **Globular Pot**

Pale burnished with traces of ochre wash. It has a short concave neck, everted, featureless rim, and Crude burnishing in seen on the outer-surface as also the neck portion of the interior. Black patches of firing is seen at the bottom and neck portion while smudged-smoky colour is also seen in other parts. The fabric is crude with particles of sand quartz seen all over.

- **Globular Vase**

Pale burnished ware with a thick ochre-coating on the upper part of the vessel and on the interior. Smudged black patches are seen on the bottom and the outer surface. It has a concave neck, wide mouth, flaring featureless rim. This is comparatively better burnished than the previous one but has a coarse fabric and sand grains are seen in the body of the pot.

19.5 STUDY OF THE OBJECTS

19.5.1 Pottery

Pottery is the most important and informative of the remains left behind by pre-literate societies for the archaeologist to reconstruct their material and economic life. Those people were, wholly in the premetal and to a considerable extent in the metal (Chalcolithic and Early Iron) ages dependant on the pottery vessels for cooking, storing and many other aspects of life. Some pots were also used for ceremonial purposes. Some of these had ornamental devices which were really utilitarian. These include lugged handles, spouts, elaborate rims, pedestals and legs. Some of these vessels which were used to fulfill daily needs were decorated with incised designs, grooves or simple finger tip or nail impressions while greater and painstaking efforts were put forth to prepare the surface to receive painted decorations.

In short, pottery for an archaeologist represents the source material which is durable and most widely used and hence easily available of the remains of pre and proto-historic peoples.

The culture-sequence as revealed by the ceramic evidence from the excavations at the site, from bottom upwards is as follows:-

- Neolithic,
- Intrusive Chalcolithic,
- Iron Age Megalithic and
- Early Historical

First taking pottery from the Neolithic and the intrusive chalcolithic levels, we have vivid and rich evidence of the potter's art from the site. The dominant ware of the period is a grey ware, mostly burnished often with a thin slip applied and occasionally given an ochre covering or decorated with incisions.

19.5.2 Graffiti on Pottery

The graffiti on pottery appears to be essentially post-firing scratches on all class of pottery associated with the megalithic folk. The site has yielded as many as 186 marks on pottery used for domestic purposes. Col. Hunt considers them as symbols related to the megalithic burials, hence it may be inferred that the marks may not have any special funerary significance as Hunt remarks. Further B.B. Lal has pointed out that a number of these marks from the megaliths have resemblance to the script found on the Harappan seals

19.5.3 Stone Implements

Stone implements have found in different shapes and sizes.

- **Blades and Flakes**
  Some flakes and flake implements have been collected from the surface of the site and its neighborhood. A single flake has been discovered from a pit

of the Neolithic phase. It is made of vein quartz. And because of the coarseness of the material the working is hardly recognizable. Dr. Scuba Rae points that these flakes are post palaeolithic and mainly pre-neolithic and may be considered as a "Macro-facies" of the microlithic blades"

- **Pecked and Ground-stone Industry**
  A good number of stone tools finished by pecking and grinding were found. Trap, granite and milky quartz are the raw materials used in the preparation of stone tools like cells and pounders.
  The tools found were classified as
  - Axes and chisel
  - Grinding implements
  - Hammer stones
  - Querns
  - Anvils

19.5.4 Metal Objects

Six metal objects were recovered from the site. Four of iron, two of copper and one of gold. The gold one was a spheroidal bead. Fragment of a wire nail, thin knife blade with one edge straight, Fragment of dagger head or knife are all iron objects.

19.5.5 Beads, Bangles

Thirty beads were found at T. Narasipur. Out of them, twenty four were of terracotta, three of glass, and one each of potstone, copper and gold. The beads were all of simple shapes mostly spheroidal except the postpone one. Neolithic strata yielded only one bead of gold. The terracotta beads are generally of crude-make, mostly buff or red in colour, without any slip or ornamentation. A few of these have smoother surface, possibly due to the pre-firing application of a thin solution of the smooth clay from which the beads were made. A few beads are grey in colour. This colour variation may be just due to some defect in firing.

Twenty three bangle pieces were recovered from the digging. The Stone-Age culture did not produce any: only one piece belonged to overlap phase, and the rest were associated with the strata of the Megalithic and the early historical cultures. Out of the twenty-three bangle pieces twenty one are of opaque black glass, one of transluscent blue, and the other of stratified glass of rectangular section with dull green body and oblique black streaks and a rope design.

The preponderance of black glass bangle pieces is a noteworthy feature of the Megalithic phase of T. Narasipur. Wheeler considered that there is no good evidence for the regular use of glass bangles in India prior to the first century A.D. The association of glass bangles with the Megalithic phase suggests two possibilities: the use of glass bangles had commenced even earlier than the first century A.D. or the Megalithic culture in the T. Narasipur area survived to a considerably late date.

19.5.6 Animal and Human Remains

Animal Remains: Dr. Bhola Nath of the Zoological Survey of India after examining the bones of animals states that the following animals were present:

i. Domestic humped Cattle
ii. Indian Buffalo
iii. Gour or Indian Bison
iv. Sambar Deer, corresponds to the Chalcolithic phase

Dr. K.R. Alur points that of the University of Agricultural Sciences, Dharwar, examined the animal bones sent to him. He says that 9 specimens such as shoulder blade, tooth and ribs of cattle. This group belongs to the Neolithic phase. This is significant as evidence for domestication of cattle by the Neolithic people on the site.

Human Remains: The study reveals that the skeletal belong to that of an adult female aged between 25 and 30 years. The individual exhibited medium stature, high vaulted head with a long face, high frontal bone with feeble super-orbital ridges, slight subnasal prognathism medium-sized dentition medium cranial

capacity. On the basis of the above characteristics, it has been concluded that the individual may belong to the "Mediterranean" type without any admixture of Proto-Austroloid or any other racial element.

The study of the skeletal from the Neolithic sites in the region shows that the Neolithic folk of the Deccan belonged to two main ethnic groups-the Proto-Austroloid and the Mediterranean groups and there was considerable amount of admixture between the two groups. Further it has also been noted that similar ethnic elements prevailed in other parts of contemporary India and probably continued in the Postneolithic times in the country and have continued to occur down to the present day.

19.6 LET US SUM UP

Though the excavations have revealed four cultural phases at the site, the most outstanding is the Neolithic. There was an overlapping of cultures. Nevertheless we have indications that the Neolithic phase started independently. As Dr. K.R. Alur, points that there is good reason to believe that the Neolithic folk on the left bank of the Cauvery were cattle keepers and knew domestication of cattle. Thus there is evidence for a pure Neolithic phase at the T. Narasipur site. The presence of a quartz blade flake with a good bulb of per cussion in the same Neolithic pit indicates the use of such implements in the Neolithic. Such implements were found on the surface also.

Perhaps at a later date, Chalcolithic influences arrived at the site from the Deccan and permeated the original Neolithic culture. Since this deposit is thin, it is possible that this mixed-culture, namely, Neolithic-Chalcolithic, was short-lived on the site.

19.7 KEY WORDS

1. Graffiti – is writing or drawings that have been scribbled, scratched on a wall, pottery or other surface.

2. Flakes – a small, flat, very thin piece of something 1 typically one which has broken away from a larger piece.

19.8 CHECK YOUR PROGRESS

1. Discuss the contents of T. Narasipura report.

19.9 ANSWERS TO CHECK YOUR PROGRESS

1. 19.2, 19.3, 19.4 and 19.5

19.10 SUGGESTED READINGS

1. *Techniques of Archaeological Excavation*, Baker P.
2. *Principles and Methods of Archaeology,* Raman K.V.

UNIT-20: EXCAVATIONS AT TALAKAD BY DEVARAJ D.V

Structure

20.0 OBJECTIVES

The objective of this unit is to discuss the contents of the Excavation Report of Talakadu. It also highlights the significance of the excavations conducted at Talakadu.

20.1 INTRODUCTION

Talakadu, a place of historical and religious importance, is situated in the T. Narasipura taluk of the Mysore district, about 60 km southeast of the city of Mysore. It is located on the left bank of the river Kaveri, in a scenic setting. The river takes a sharp bend at around this town. On the opposite bank is the village of Malangi, which has earned considerable fame owing to the curse of Alamelamma. The lofty hills of the Biligiriranga range are visible at a distance to the southeast. There is a group of five Shaiva (Pancha Linga) and one Vaishnava temples in and around Talakadu in addition to several small shrines, which have lent a serene and spiritual atmosphere to this place. PanchalingaDarshana is a famed pilgrim event that takes place at regular intervals. In addition to historical monuments, the formation of huge sand dunes, a rare geological phenomenon with no parallels in Karnataka, has added its own beauty to this place, Due to all these factors, Talakadu is today a well-known tourist destination.

20.2 A BRIEF HISTORY OF TALAKADU

Talakadu rose to political importance during the times of the Gangas, who chose this place as their capital sometime in 6th Century AD. Inscriptions of the Ganga rulers testify thatTalakadu was under their rule till the last part of 10th Century AD, up to the end of this dynasty. The temples of pataleshvara and Maraleshvara at Talakadu and Arkeshvara at Vijayapura (three of the panchalingas) are believed to have been constructed during the Ganga period. Thereafter, the region around Talakadu was conquered by the cholas. It remained under the chola control for over a century, until it was conquered back in 1117 AD, in a fierce battle, by the Hoysala king Vishnuvardhana who, in commemoration of

this victory, raised the Kirtinarayana temple at Talakadu. During the Hoysala rule, the prosperity of Talakadu multiplied significantly. Talakadu later became a part of the Vijayanagara Empire. The Vaidyeshvara temple at Talakadu was built during the early Vijayanagara period (14th AD). Around the same time, Madhava mantri, a native of Talakadu, caused the construction of a small dam across the Kaveri, upstream of Talakadu, in order to facilitate agricultural activities. There is an interesting folktale related to Srirangaraya, the local Governor of the Vijayanagara Empire at Srirangapattana in 17th Century AD. Srirangaraya was apparently suffering from some disease and on being informed about the healing powers of the god Vaidyeshvara of Talakadu, he came to Talakadu along with his wife Alamelamma, where he breathed his last. Enraged by the demands of Raja Wadeyar, the ruler of Mysore, for ornaments that she possessed, Alamelamma is said to have thrown the ornaments into the Kaveri, and before taking her own life by jumping into the river on the Malangi side, she pronounced the curse (in Kannada) – *Talakadu maralgali, Malangi maduvagali, Mysuru doregalige makkalagade hogali*- Let Talakadu be buried by sand, let Malangi be a deep whirlpool; let there be no issues to the kings of Mysore. The old town of Talakadu was abandoned after this event as sand particles began to accumulate in the town and the population shifted to the present town a little away from the bank. The historical temples too get buried under a huge sheet of sand in course of time. After the fall of the Vijayanagara rule, Talakadu was taken over by the Wadeyars Mysore.

20.3 EXCAVATIONS AT TALAKADU

Considering the historical occupation of Talakadu from the period of the Gangas up to the Wadeyars of Mysore, excavations were conducted here for two seasons, during 1992-93, by the Directorate of Archaeology and Museums, Mysore, in collaboration with the Department of Ancient History and Archaeology of the University of Mysore.

Three main objectives

- To investigate the antiquity of Talakadu

It was assumed that before being the capital of the Gangas, Talakadu could have been a place of some importance. To put it in the words of the excavators, "…dynasties selected their capital from among the places which had allinfrastructure in the ancient days. Seldom a place uninhabited and uncivilized was selected as a capital by any discerning dynasty. Thus one would have thought that Talakad also should have been a place of prosperity before becoming a capital. Hence it was aimed at understanding the antiquity and nature of culture that prevailed in the pre-Ganga period".

- To understand the pattern of life and building during the Ganga period much of our knowledge about the Ganga dynasty is confined to political history and 'some aspects of culture as can be reconstructed from epigraphs' Hardly any information was available about the material culture of this dynasty till then and hence, "it was planned to understand the pattern of structures and daily life during the Ganga period" through excavations.

- To know the significance and antiquity of sand dunes
  Since "the antiquity and formation of sand dunes was a subject of controversy among the scholars….it was thought that the archaeological excavations would provide a specific answer to the problem of Talakad sands".

The results of the excavations have been published in 1996 in a single volume. The first half of the Excavation report consists of textual matter of 318 pages while the second half of about 200 pages includes maps, plans of trench sections, drawings and photographs of both colour and black and white pottery and other antiquities.

20.3.1 Results of Excavations

- The excavation yielded information about the existence of the Megalithic and Early Historic culture at Talakadu-antiquity of this historic city was established through the excavation.

- For the first time, the excavation threw light on the material culture of the Ganga period.
- It settled the issue regarding the formation process and date of sand dunes
- Discovery of wind-breaker wall
- Discovery of the remains of Jaina temple added a new dimension to the history of Jainism under the Gangas.

20.4 CONTENTS OF THE EXCAVATION

- Sand-dunes- Their formation and Age
- Aim, Plan of work and Summary of the Findings
- Cuttings/Trenches
- Study and Description of Pottery
- Coins, Coin Mould and Seals
- Beads
- Bangles
- Graffiti on Megalithic Pottery

- **Sand Dunes**

Geoarchaeological investigations were conducted in the region by Dr. T.V. Shivarudrappa, an eminent geologist, with a view to understand how the sand dunes came to be formed at this place. He has identified the following geological factors that have contributed to this process-1. The Z-shaped meandering course of the river Kaveri around Talakadu, 2.The presence of Muduktore hillock which obstructed the flow of the river and caused it to take a bend, 3.Formation of sand bars at river bends (vast stretch of sand on the river banks at Talakadu), 4. Strong southwesterly winds blowing over the sand bars, which transported sand particles from time to time. The formation of dunes also owes a large share to the construction of Madhava-mantri dam in Century 1342 AD, because of which the sand on the banks at Talakadu got exposed due to shallow water levels in the river. The southwestern winds blowing over the sand bars carried fine particles of sands along with them and deposited them against the buildings at old Talakadu, which acted as barriers to the sand-laden blowing winds. Gradually layers of sand began

to accumulate in and around the old town of Talakadu. Eventually, the town was abandoned and people shifted to the new Talakadu town.

The excavators remark that "the nature has played and has been playing a fascinating drama, very rare and unique in her history and has made Talakad a charming place". The sand dunes are spread over an area of 10 sq km. They rise in height up to 7 mtr (about 20 ft). In establishing the date dune formation, the excavators have taken into account the legend of Alamelamma's curse as well as evidence from excavations. The story of Alamelamma is dated by them to Century 1610 A.D, considering that Raja Wadeyar ruled between 1578 and 1617 AD. Thus this "story fixes the date of the formation of the sand dunes around the beginning of the 17th or the last part of the 16th Century AD".

Another factor that strongly supports this date is the absence of sand layer beneath the temples at Talakadu. The Kirtinarayana (1117 AD) and Vaidyeshvera temples (early Vijayanagara period), for example, show no traces of sand underneath their foundation implying that they were built on a firm ground. Similarly, there is no evidence of sand beneath the gateway of the Kirtinarayana temple that was added in about 16th Century AD. It is told that in the early Vijayanagara period, there was a path connecting the Kirtinarayana temple with Vaidyeshvara temple, where many festivities used to take place. This too suggests that there was no sand formation in this area then. As the excavators observe, "these temples prove that sand dunes were formed later than the date of the construction of these temples".

In the trenches excavated, sandy layers were noticed in the upper layers of the trench, which belong to the late Vijayanagara period. Thus, different lines of evidence clearly show that sand accumulation started in Talakadu during the late Vijayanagara period, i.e. in the early part of 17th Century AD.

- **Foundry**

The early historical layers suggest 'a hectic activity'. Archaeological remains from these layers indicate that a foundry existed here during this period. An earthen kiln was found at this layer, surrounded by terracotta crucibles (for melting

ores), iron slag pieces, large amounts of charcoal, ash and burnt clay lumps, a terracotta sitting plank, pots and bowls, and most importantly, a terracotta Roman coin mould. All these evidence indicate that activities related to smelting and forging of metals was taking place here. As far the kiln is concerned, it is the first ever discovery of such a find in the early historic context in Karnataka. Excavators note that "most of these objects were lying in such a condition… to suggest that the work was abruptly stopped there. It appears thatthis foundry (was) abandoned all of a sudden due to unknown reasons".

- **Roman Coin**

The presence of one half of a Roman coin mould is significant in two ways- it has provided a relative date to this layer; in addition, it reinforces the metallurgical activity. The mould contains the impression of a lady sitting on a tall seat holding a scepter in her right hand and a branch of a tree in her left hand. The upper portion carries the legend Maxim Pontif. This motif is commonly found on the coins of Roman Emperors Augustus and Tiberius (1st Century BC- 1st Century AD). On the basis of this mould, excavators have dated this layer to 1st Century AD. It is possible that such coins were being duplicated in this foundry.

20.4.4 Ganga Period

The excavators infer during the Ganga period, this area was probably used as a burial ground. They note that the presence of a foundry in the preceding period is a likely indication that this area was outside the habitation limits, for metallurgical activities are seldom done within the residential premises. After the foundry was abandoned, this area was turned into a burial ground as it lay outside the habitation.

A few burial pits of the Ganga period were found in this trench. The pits contained pottery of different types some of which contained ash and bone pieces. Beads of semiprecious stones and glass, shell and glass bangles were also found inside the pits. According the excavators, these are post-cremation burials.

20.4.5 Vijayanagara Period

In the layers belonging to the Vijayanagara period, remains of a brick structure constructed over an artificial bedding of river silt were encountered. Trench was lad right in front of the Kirtinarayana temple, on the verge of the sand dunes. seven layers, spanning in age from Ganga to Vijayanagara periods, were noticed in this trench which was dug up to a depth of 3 m. Important findings from this trench were two terracotta ring wells, portion of a brick structure, copper coins of the Vijayanagara period and a cache of copper and bronze objects buried in a pit.

The two ring wells were identical in every respect and were found close to each other. Each terracotta ring measured 90 cm in diameter and was 14 cm in length. A paste of fine clay was used to seal the gaps between two rings. One of the wells contained as many as 21 rings. Both the wells were dug from layer 3. The coins of the Vijayanagara ruler Vira Narasimha (1506-1509 AD) in the upper two layers suggest that layer 3 is of 15th Century AD. Thus the ring wells were constructed during the Vijayanagara period.

The cache of copper objects contained a mango-shaped bowl, a big cup, a small bronze cup with stand and a copper damaru with chain. They were found buried in a pit inside the room of a large structure. The objects are also of the Vijayanagara period.

The remains of the brick structure found in this trench were once part of a residential building of the Vijayanagara period. The excavators opine that it was probably the pooja room as the cache of copper objects was found inside this room. The size of the bricks varied from 30-24 cm (L) x13-15 cm (B) x 5-6 cm (H).

20.4.6 Jaina Basadi

Excavations revealed the foundation of a ruined brick structure of the dimension 22x17 m. The brick structure, identified as Basadi, was raised on a thick base of riverine sand, in two phases. In the first phase, three sanctums with a

common porch in the front were constructed. The sanctums, arranged in a row, faced east. A square pillared hall was built in front of the porch, a little away from it. These structures were built of burnt bricks set in mud mortar. A thin coat of lime plaster was applied on the walls. The sanctums as well as the porch appear to have had a wooden roof supported by pillars. In the second phase, a thick masonry wall was constructed so as to enclose these structures. The entire structure appears to have been ruined in a fire accident as suggested by the presence of a thin layer of ash and charcoal at the floor level. At a later date, it was rebuilt and enlarged using stone slabs.

Kirtinarayana Temple

This trench was laid about 300 m south-west of the Kirtinarayana temple and about 200 m west of the Pataleshvera temple. Excavations at this site disclosed unique brick structures including the wind-breaker wall.

20.4.7 Pottery

Pottery of the megalithic period included Black and red ware, redware, black ware and brown ware. Some of the shreds showed incised designs on the outer surface.

The pottery of the Ganga period predominantly contained red ware, of which spouted globular pots are noteworthy. These pots were found mostly in burial pits. Besides redwere, bowls and pots of dull black ware also in use during this period. The use of red ware and black ware continued into the Vijayanagara period.

20.4.8 Coins and Seals

In all 16 coins were found in the excavations, 6 coins belong to of the Vijayanagara period, 2 coins belong to Mysore Wadeyars, 1 coin of Haider-Tipu, 3 coins of British period, 4 unidentified. The coins were especially helpful in dating the layers. The coins of the Vijayanagara period belong to Vira Narasimha and Devaraya II. Of the 6 seals discovered from the excavations, 3 seals are of soap stone and the rest are of terracotta. The purpose of these seals remains unidentified.

It is interesting to note that five of these seals were found from the area where the structures of the water supply system were discovered.

20.4.9 Beads and Bangles

Their variety, both in terms of raw material and shape, is impressive. They were found from all the cultural periods. The raw materials include-semi-precious as well as precious stones like agate, amethyst, amber, beryl, carnelian, chalcedony, crystal, quartzite, jasper, jade, ruby, limestone, lapis-lazuli, quartz, labrodorite, serpentine, soapstone and talk; glass, ivory and terracotta. Of these, glass beads dominate the assemblage. There is, however, no evidence of manufacturing at the site. Good numbers of bangle pieces were gathered from the excavation, from layers belonging to the early historic period up to modern times. Bangles made of shell, ivory and glass were common.

20.4.10 Fraffiti Marks

Graffiti marks observed on the pottery which belonged to the Megalithic period.

20.5 LET US SUM UP

Excavations were conducted at Talakadu, the capital of the Gangas, by the Directorate of Archaeology and Museums, Mysore, in collaboration with the Department of Ancient History and Archaeology of the University of Mysore, with the objectives of knowing the antiquity of Talakadu, material culture of the Gangas and the age and formation process of sand dunes. Excavations revealed a continuous cultural sequence from the Megalithic period up to the Vijayanagara period, and thereby pushed backed the antiquity of this place to the Megalithic times. It further helped in dating the dune formation to post-16th Century AD.

Remains of a structure, identified as that of a Basadi of the Ganga, period, were also encountered in the excavations. Brick structures representing a well-

planned water supply system, two terracotta ring wells, wind-breaker wall, coins, and cache of copper objects were the important discoveries pertaining to the Vijayanagara period. Excavations were resumed at Talakadu by the Directorate of Archaeology and Museums in the subsequent years. However, the results of the excavations have not been published.

20.6 KEY WORDS

1. Talakadu – is a desert – like town on the left bank of the Kaveri River 45 km from Mysore.
2. Sand dune – is a mount, hill or ridge of sand that lies behind. The part of the beach affected by tides.

20.7 CHECK YOUR PROGRESS

1. Discuss the aims and results of the Talakadu excavation.
2. Describe the contents of the excavation.

20.8 ANSWERS TO CHECK YOUR PROGRESS

1. 20.3
2. 20.4

20.9 SUGGESTED READINGS

1. *Excavations at Talakad*. 1996. D.V. Narasimha Murthy, M.S. Krishna Murthy, Sri Swamy. Mysore: Directorate of Archaeology and Museums in Karnataka.

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