



ALAGAPPA UNIVERSITY

[Accredited with 'A+' Grade by NAAC (CGPA:3.64) in the Third Cycle
and Graded as Category-I University by MHRD-UGC]

(A State University Established by the Government of Tamil Nadu)

KARAIKUDI – 630 003



Directorate of Distance Education

M.A. [History]

I - Semester

321 11 E1

PRINCIPLES AND METHODS OF ARCHAEOLOGY

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Phone: 0120-4078900 • Fax: 0120-4078999

Regd. Office: 7361, Ravindra Mansion, Ram Nagar, New Delhi 110 055

• Website: www.vikaspublishing.com • Email: helpline@vikaspublishing.com

Work Order No. AU/DDE/DE1-238/Preparation and Printing of Course Materials/2018 Dated 30.08.2018 Copies - 500

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INTRODUCTION

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Archaeology is the study of human activity through the recovery and analysis of material culture. The archaeological record consists of artifacts, architecture, biofacts or ecofacts and cultural landscapes. Archaeology can be considered both a social science and a branch of the humanities.

Archaeology is the means by which we relate material things to human behaviour, to the concepts underlying it, and to their changes over time. It can, but does not always, involve digging: the more accurate focus is on examining the means which the material world can be coaxed to answer a wide variety of questions, thoughtfully posed, about the shifting circumstances of human existence, whether in relation to social, physical, mental conditions of the past and present.

This book, *Principles and Methods of Archaeology*, is divided into fourteen units that follow the self-instruction mode with each unit beginning with an Introduction to the unit, followed by an outline of the Objectives. The detailed content is then presented in a simple but structured manner interspersed with Check Your Progress Questions to test the student's understanding of the topic. A Summary along with a list of Key Words and a set of Self-Assessment Questions and Exercises is also provided at the end of each unit for recapitulation.

BLOCK - I

THE IDEA OF ARCHAEOLOGY

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UNIT 1 AN INTRODUCTION TO ARCHAEOLOGY

Structure

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1.0 INTRODUCTION

Archaeology is the study of people and cultures of the past through objects they left behind. It is a subfield of Anthropology—the study of all human culture. Archaeology complements history and helps tell the story of people and societies of prehistoric periods, and, helps shed light on the lives of people who are less visible on historical record (like farmers and urban poor) within societies in historical periods. There are various branches of archaeology, each with several sub-branches.

1.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the meaning and origins of Archaeology
- Establish the relationship between History and Archaeology
- Describe prehistoric archaeology
- Analyse historical archaeology

1.2 MEANING AND ORIGINS OF ARCHAEOLOGY

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The word archaeology has its origin from two Ancient Greek words ‘arkhaios’, meaning ancient or old, and ‘logia’, which stand for learning or study. Archaeology is the study of the ancient and recent human past through the recovery and analysis of material remains. Many consider it to be a subfield of anthropology (the study of all human culture and evolution), along with many other subfields comprising biological, cultural and linguistic anthropology. Archaeology can be considered both a social science and a branch of the humanity (the study of humans and their society). However, it also uses other branches of learning such as biology, chemistry, geology, botany, geography and various other disciplines. By using all these disciplines, the archaeologists are able to understand human civilizations of the past and recreate main aspects of the environment in which these bygone societies lived.¹

Archaeology is the only method available for the study of human actions in the material world, when other evidences such as a variety of written materials and oral traditions narrating certain phenomenon fail. The survival of written documents is relatively limited and hence from the time that these documents become available, they provide additional tools to archaeology for its interpretation of past activities of man, on the basis of material remains. Archaeology, from this point of view, has to not only interpret material remains of human activity, but also throw light on the literary interpretations of the past phenomenon.² It helps us to appreciate and preserve our shared human heritage. It informs us about the past, helps us understand where we came from, and shows us how people lived, overcame challenges, and developed the societies we have today.³

The development of the field of archaeology has its roots in history and those who were interested in the past, such as kings who wanted to show past glories of their respective nations. In the 5th century BC, Herodotus, the Greek historian, was the first scholar to systematically study the past and perhaps the first to examine artifacts and test their accuracy. In the Song Empire (960–1279) of Imperial China, officials unearthed, studied, and catalogued ancient artifacts. In the 15th and 16th centuries, there was a rise of antiquarians in Renaissance Europe who were interested in the collection of artifacts. The antiquarian movement shifted into nationalism and personal collections were used to create national museums. It developed into a much more systematic discipline in the late 19th century and became a widely used

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- 1 Lian Slayford, 2016, “*Archaeology: An Introduction to Archaeology and Important Archaeological Sites*”, Amazon Digital Services LLC, Kindle Edition
 - 2 K.N Mehta, 1979, “*Medieval Archaeology*”, Ajanta Publications, Delhi, p.1
 - 3 <https://www.archaeological.org/pdfs/education/Arch101.2.pdf>

tool for historical and anthropological research in the 20th century. During this time there were also noteworthy advances in the technology used in the field.

The exact origins of archaeology as a discipline are uncertain. Excavations of ancient monuments and collection of antiquities have been taking place since times immemorial. In ancient times, the tombs of the Pharaohs of Egypt were looted by grave robbers who probably hoped for financial gains from selling their plunder. We can distinguish this with endeavors of the Italian Renaissance humanist historian, Flavio Biondo, who created a systematic and documented guide to the ruins and topography of ancient Rome in the early 15th century. He is seen as a candidate for consideration as an early founder of archaeology. He was inclined to treat the ruins and topography of ancient Rome with great respect.⁴

Tentative steps towards archaeology as a science took place during the Age of Enlightenment, also called as the Age of Reason, in Europe in the 17th and 18th centuries. King Charles of the Two Sicilies employed an antiquities expert, Marcello Venturi, in 1738 to excavate the ancient city of Herculaneum. This first supervised excavation of an archaeological site was likely the birth of modern archaeology. In America, Thomas Jefferson supervised the systematic excavation of a Native American burial mound on his land in Virginia in 1781. During the Egyptian campaign in 1801, Napoleon Bonaparte brought many scientists and specialists in the field of biology, chemistry and languages with the purpose of carrying out a full study of the Egyptian civilization. During these campaigns, some soldiers rebuilding a fort discovered an unusual stone on which ancient scripts were engraved. This stone was known as the Rosetta Stone. Many decades later, the work of Jean-Francois Champollion in deciphering the Rosetta Stone led to the discovery of the hidden meaning of hieroglyphics. This discovery proved to be the key to the study of Egyptology.⁵

However, it was only in the 19th century that the systematic study of the past through its physical remains began to be carried out in a manner recognizable to modern students of archaeology. Richard Colt-Hoare (1758-1838) recorded the past of the countryside near his estate at Stourhead in Wiltshire. In his investigations and excavations of such neolithic barrows as Silbury Hill, Colt-Hoare used a terminology that was later adopted by other archaeologists.⁶

In later years archaeology continued as an amateur pastime and was pursued by persons such as Augustus Pitt Rivers who collected many artifacts and developed a typology scheme for dating archaeological remains in his personal collection in the second half of the 19th century. William Flinders

4 Ashish Mishra, 2011, "*History of Archaeology*", Shakti Publishers & Distributors, Delhi, India, p.1

5 Ibid., p.2

6 Ibid., p.

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Petrie (1853-1942) was another personality who may rightly be called the Father of Archaeology. His work on the ancient Egyptian civilization developed the concept of seriation, which allowed accurate dating long before scientific methods were evolved to testify his chronologies.

Mortimer Wheeler was the next popular figure involved in the development of archaeology. His highly disciplined approach to excavation and systematic coverage of much of Great Britain in the 1920s and 1930s brought the science on swiftly. His method of excavation still forms the basis of excavation technique. The work of Sir Arthur Evans at Knossos in Crete in early 20th century had shed light on the Minoan Civilization. The archaeological findings from this site were catalogued and kept in a museum at Oxford.

Archaeology was increasingly becoming a professional activity. Although the major chunk of excavation's workforce consisted of volunteers, it was mostly led by a professional. Archaeology as a discipline was introduced in schools and universities, and by the end of the 20th century, nearly all professional archaeologists, at least in the developed countries, were graduates in the subject.

Check Your Progress

1. What is Rosetta Stone?
2. Who is known as the Father of Archaeology?

1.3 HISTORY AND ARCHAEOLOGY

Both history and archaeology research the human past. The difference between these two disciplines derives from the source materials. The historians use written sources while archaeologists concentrate on physical remains. Historical sources are committed to dates while archaeological material is basically connected to spatial origin. This basic difference explains why historians and archaeologists have difficulties in understanding each other.

Archeology is also related with history in a more particular manner. The history of the earliest literate societies such as those of Egypt, Mesopotamia, Greece and Rome depends largely on archaeology, which was in the first place responsible for the recovery of the written history documents through archaeological excavations.

Archaeology and history complement each other. The two disciplines together provide a more comprehensive record of the past. For example, some of archaeologically invisible activities may be described in historical documents. Also, sometimes history can be used to locate archaeological sites. The two disciplines are related with each other in terms of methodology

as they use the same method in the finding the past events, such as the use of observation to identify a certain place where particular events took place. Archaeology has contributed to the study of written history through the study of artifacts and structures of literate societies. This has led to the development of the new sub-discipline of historical archaeology.

Many physical remains of the past, such as clay tablets, Egyptian choreographic text on papyrus and inscriptions, are historical documents just as much as are the books published in the 17th century Europe. Many historical texts are discovered through archeological research. Archaeology also helps in reconstructing the history of particular events in chronological order.

However, history and archaeology also differ from each other in some aspects. History deals primarily with written accounts from the past whereas archaeology deals with the material remains of the past. These material remains are mute, and their meaning and significance depend entirely on the interpretation that an archaeologist can make. In contrast, historical records contain messages, although their meaning and significance are also subject to critical interpretation to discoverer.

Historical records lay more emphasis on literate and richest communities such as kings, queens, and high priests, as the prominence of these people could have influenced the storage of their records, while archaeology is less partial for the elite class as anyone can contribute to the archaeological record.

Another distinction is found in the scope of the two disciplines. Archaeology covers the period from the beginning of human civilization (2.5 million years ago) to the present, while history covers the period from the beginning of written records (3000 BC) to the present. History comprises the stories of what happened, how, where, who did it and what happened next. Archaeology is concerned with the place where a sample, such as the remains of a temple, or an artwork, or an artifact is found.

Check Your Progress

3. List two differences between history and archaeology
4. How do history and archaeology complement each other?

1.4 PREHISTORIC ARCHAEOLOGY

Prehistoric archaeology is a section of archaeology which studies past societies. It is the study of the past before historical records began. It is a field of research that looks at all the pre-urban societies of the world. It has different procedures for analyzing material remains so that archaeologists

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can reconstruct their ecological settings. The study of prehistoric archaeology reflects the cultural concerns of modern society by showing interpretations of time between economic growth and political stability. It is also very closely related with biology, biological anthropology, and geology. It is sometimes termed as anthropological archaeology because of its indirect traces with complex patterns.

1.4.1 Relationship between Prehistoric Archaeology and History

Prehistoric archaeology studies the past cultures based on their material remains. It is as much a part of history as it is a section of archaeology. In fact, for more than 99 per cent of past material, culture is the main source of information if one ignores physical anthropology, which emphasizes on biological (human evolution and variation) rather than man's works (socio-cultural aspects). Colin Renfrew and Paul Bahn opine that the conventional history sources begin only with the introduction of written records around 3000 B.C. in western Asia, and very much later in most other parts of the world. Then a pertinent question arises as to how is the history of illiterate or preliterate people or country known? What were its sources? A prehistoric archaeologist will be able to answer this question. Anything that tells us its past history i.e. language, place-names and study of the people's physical features, customs and manners, legends and traditions, their monuments, even a study of landforms, soils and vegetation, and the animals may help to demonstrate this story. Therefore, a commonly drawn distinction is that prehistoric archaeology deals with the period before written records and history deals with the study of the past using written documents. To put it in other words, prehistoric archaeology deals with the history of the illiterate or preliterate societies. In this way, it contributes substantially in the understanding of those periods and places where written records, inscriptions and other literary sources are non-existent. It is the responsibility of the prehistoric archaeologists to explore, excavate, examine and interpret the evidence.

Although prehistoric archaeology tells the history of preliterate people, it is distinct from history proper as the former does not depend on written documents or accounts. The artifacts or whatever explored or excavated do not reveal anything without proper analysis and interpretation. It is the prehistoric archaeologist who has to make sense of these finds. He works like a scientist in this respect. He follows a scientific method. He collects the evidences (data), conducts experiments or formulates hypothesis (a proposition to account for the data), tests hypothesis against more data, and, in conclusion, develops a model, a description that seems best to summarize the pattern observed in the data. He has to develop a picture of the past, just as a scientist has to develop a logical view of the natural world.

1.4.2 Scope of Prehistoric Archaeology

Prehistoric archaeology has become an institution nowadays, encompassing a number of different scholars forming sub-disciplines. Each scholar propagates new theories and follows different methods having different approaches. In the recent past, there has been a growing realization that prehistoric archaeology has contributed a lot not only to study the antiquities or relics of the past societies but also to study the modern people or contemporary societies with simple technology from the light of their practices set in prehistoric times. It can also help with specific archaeological studies when the ways of life of the modern society are very much similar to those of the past life. It has become a current focus of research. In one way or another we compare something from the past with an object in use today. For example, megalithism, or using megaliths to create monuments, is a dead cultural phenomenon in most parts of the world. But it is still practiced by different tribal communities in the same way or in some modified form in North-East India, especially in Nagaland, Manipur and Meghalaya. Megalithism is a living tradition among these tribal communities. Hence many specialists in the field of ethno-archaeology take keen interest to reconstruct the past life of the ancient people of these regions in the light of this living tradition.

1.4.3 Approaches in Prehistoric Archaeology

Let us analyse the different approaches in Prehistoric Archaeology.

Ethno-Archaeology: Ethno-archaeology has become a chief specialization in modern archaeology. One can understand the archaeological remains or records only if one understands its existence and the process of its formation in much greater detail. The processes of formation of sites are now a focus of intensive study. Ethno-archaeology is the study of living people and their material culture conducted with the aim of improving our understanding of the archaeological remains or records. For example, the study of butchery practices among the living hunter-gatherers, conducted by Lewis Binford among the Nunamiut Eskimo of Alaska, has given him many new ideas about the way archaeological remains or relics may have been formed, allowing him to re-examine the bone remains of animals eaten by very early humans elsewhere in the world. Archaeologists believe that the present-day hunter-gatherers such as the Australian Aborigine or the North American Eskimo, and the people who lived during the Neolithic period have a lot in common with each other's ways of life.

Environmental Archaeology: Environmental archaeology is another major specialization of prehistoric archaeology. It involves three sub-disciplines of archaeology, viz., *zooarchaeology* that deals with the study of ancient animal remains, *geoarchaeology* that deals with the study of soil, sediments, rocks, natural deposits, etc., and *archaeobotany* that studies ancient plant remains.

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Thus, it is an interdisciplinary approach where archaeologists and scientists study the human use of plants and animals and how societies adapted to the ever-changing environment. Environmental archaeology is a subfield of archaeology and is the science of reconstructing the relationships between past societies and the environments they lived in. It is now a well-developed field in its own right. It views humans as part of the natural world interacting with other species in the ecological system or ecosystem. The environment governs human life. Geographical features determine the vegetation which in turn determines animal life. And all these things collectively determine how and where humans have lived, or at least what they did until very recently. The task of environmental reconstruction is a fundamental one because if we have to understand how humans functioned, and the community of which they formed a part, we have to know first what their world was like. Environmental archaeology includes field studies along with laboratory experiments.

Marine Archaeology: Marine archaeology, or maritime archaeology, or underwater archaeology, is another field of specialization of prehistoric archaeology. It demands great courage as well as skill. There is a lot of danger involved when working at low depths and with little visibility. The use of robotic divers, armed with strong lights and cameras, helps greatly in the safety of underwater archaeology. It specifically studies human interaction with the sea, lakes and rivers through the study of associated physical remains like vessels, shore-side facilities, port-related structures, cargoes, human remains and submerged landscapes. A specialty within marine archaeology is nautical archaeology, which studies ship construction and use. It is generally considered to have been given its first major impetus during 1853-54, when a particularly low water level in the Swiss lakes laid bare enormous quantities of wooden posts, pottery and other artifacts. From the earliest investigation, using crude diving belts, it has developed into a valuable complement to work on land.

In the last five decades, it has become a highly scientific practice yielding time capsules from the past in the form of shipwrecks and other structures that shed new light on ancient life. The inventions of miniature submarines, other submersible craft and above all scuba diving gear in recent times have been of great value, enabling divers to stay under water much longer and to reach sites at previously impossible depths. Consequently, the pace and scale of discovery have greatly increased in the last few years.

Check Your Progress

5. Why is prehistoric archaeology considered a part of history?
6. What is environmental archaeology?

1.5 HISTORICAL ARCHAEOLOGY

Historical archaeology is a sub-discipline of archaeology concerned with studying places, things, and issues from the past using physical evidence in combination with other types of historical sources such as maps, documents, illustrations, photographs and oral history. In the strictest sense, historical archaeology is the archaeology of societies that left behind historical records. These records can both complement and conflict with the archaeological evidence found. It focuses on the objects used by people in the past and the places where they lived and worked. It can tell us about the way things were made and used and how people lived their daily lives.⁷

Historical archaeology emphasizes on literate, historical-period societies as opposed to non-literate, prehistoric societies. While they may not have produced the records, the lives of people for whom there was little need for written records, such as the working class, slaves, indentured labourers, and children, during the historical period can also be the subject of study. The sites are found on land and underwater.

Historical archaeologists use written records, but not all research that involves written records is classified as historical archaeology. For example, the writings of Meso-American cultures are studied by archaeologists, but their work is not generally considered to be historical archaeology. The same stands true for fields such as Egyptology and Classical (Greek and Roman) Archaeology.⁸ The term historical archaeology most commonly refers to a narrower aspect of archaeology, namely the archaeology of the modern period with a focus on colonial and post-colonial contexts influenced by European Imperialism.

Historical archaeology pays great attention to the everyday world of all people. It is a combination of history and anthropology. The historical archaeologist attempts to understand the cultural processes and human experiences that produced the world we live in today through examination of written records of information by past cultures. Writing in some form or another was known to have been used from times immemorial. However, historical archaeologists study only recent history. Using only written evidence as the foundation of their research, historical archaeologists often work in partnership with historians. This type of archaeology developed in North America and Britain, where it continues to thrive in academic centres. Researchers in this field are particularly interested in books, manuscripts, seals, engravings, paintings, drawings and the like. Historical archaeology

⁷ <https://www.environment.nsw.gov.au/resources/heritagebranch/heritage/revealinghistarch.pdf>

⁸ http://nmnh.typepad.com/rogers_archaeology_lab/2014/05/historicalarchaeology.html

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is, therefore, the study of the material remains of past societies that also left behind historical documentary evidence. An interesting subfield of archaeology, it studies the emergence, transformation and nature of our modern world.⁹

Check Your Progress

7. What is historical archaeology?
8. What is the focus of a historical archaeologist?

1.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. During his Egyptian campaign in 1801, Napoleon Bonaparte brought many experts to carry out a study of the Egyptian civilization. During these campaigns, some soldiers discovered an unusual stone on which ancient scripts were engraved. This stone was Rosetta Stone.
2. William Flinders Petrie (1853-1942) is called the Father of Archaeology.
3. History deals primarily with written accounts from the past whereas archaeology deals with the material remains of the past. Historical sources are committed to dates while archaeological material is basically connected to spatial origin.
4. History can be used to locate archaeological sites, and some archaeologically invisible activities may be described in historical documents. Also, many historical texts are discovered through archeological research, and physical remains of the past, such as clay tablets, Egyptian choreographic text on papyrus and inscriptions, are historical documents.
5. Conventional history sources begin only with the introduction of written records around 3000 BC in western Asia, and very much later in most other parts of the world. It's prehistoric archaeology that can tell us anything about the history of illiterate or preliterate people and societies.
6. Environmental archaeology is the science of reconstructing the relationships between past societies and the environments they lived in. It involves three sub-disciplines, viz., *zooarchaeology* that deals with the study of ancient animal remains, *geoarchaeology* that deals with the study of soil, sediments, rocks, natural deposits, etc., and *archaeobotany* that studies ancient plant remains.

9 <http://www.archaeologyexpert.co.uk/typesofarchaeology.html>

7. Historical archaeology is the archaeology of societies that left behind historical records such as maps, documents, illustrations, photographs and oral history.
8. A historical archaeology pays great attention to the everyday world of all people. It is a combination of history and anthropology. The historical archaeologist attempts to understand the cultural processes and human experiences that produced the world we live in today through examination of written records of information by past cultures.

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1.7 SUMMARY

- Archaeology is the study of the ancient and recent human past through the recovery and analysis of material remains.
- It can be considered both a social science and a branch of the humanity (the study of humans and their society). However, it also uses other branches of learning.
- Archaeology is the only method available for the study of human actions in the material world, when other evidences such as a variety of written materials, and oral traditions narrating certain phenomenon fail.
- It informs us about the past, helps us understand where we came from, and shows us how people lived, overcame challenges, and developed the societies we have today.
- The development of the field of archaeology has its roots in history and those who were interested in the past, such as kings who wanted to show past glories of their respective nations.
- The exact origins of archaeology as a discipline are uncertain. Excavations of ancient monuments and collection of antiquities have been taking place since times immemorial. There were a few rulers who showed their interest in exploring the past.
- Tentative steps towards archaeology as a science took place during the Age of Enlightenment, also called as the Age of Reason, in Europe in the 17th and 18th centuries.
- However, it was only in the 19th century that the systematic study of the past through its physical remains began to be carried out in a manner recognizable to modern students of archaeology.
- Both archaeology and history complement each other. The two disciplines together provide a more comprehensive record of the past.

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- Prehistoric archaeology is a section of archaeology which studies past societies. It is the study of the past before historical records began. It has a very wide scope.
- Ethno-archaeology, Environmental Archaeology and Marine Archaeology are the three major approaches in prehistoric archaeology.
- Historical archaeology is a sub-discipline of archaeology concerned with studying places, things, and issues from the past using physical evidence in combination with other types of historical sources such as maps, documents, illustrations, photographs and oral history. It is a combination of history and anthropology.

1.8 KEY WORDS

- **Anthropology:** It is the study of human beings, including their behaviour, biology, linguistics and social and cultural variations.
- **Antiquarian:** It is a term used to indicate a pre-20th-century collector of ancient artifacts before the development of scientific archaeology and the establishment of standards for excavating and preserving finds.
- **Artifact:** It is portable object manufactured, modified, or used by humans.
- **Hunter-gatherers:** It refers to a community or group that subsists primarily by hunting wild animals and gathering wild plant resources.
- **Neolithic:** It refers to the latter portion of the Stone Age, a time period beginning around 10,000 BCE., when many areas were developing agriculture, especially the Middle East.
- **Site:** It denotes any place where human material remains are found; an area of human activity represented by material culture.

1.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Who was the first scholar to systematically examine artifacts from the past?
2. What is ethno-archeology?
3. Give a brief description about nautical archeology and its rise to prominence.

Long Answer Questions

1. Discuss the growth of archaeology as a discipline and list five key people and their contribution for its development.
2. Compare and contrast history and archaeology with examples.
3. Analyse the major approaches in prehistoric archaeology and their scope.
4. Differentiate between historical archaeology and history.

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1.10 FURTHER READINGS

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UNIT 2 ARCHAEOLOGY: TYPES AND CONTEXTS

Structure

- 2.0 Introduction
- 2.1 Objectives
- 2.2 Kinds of Archaeology
 - 2.2.1 Archaeology on the Basis of Work
 - 2.2.2 On the basis of Historic Time Period
- 2.3 Exploration
- 2.4 Excavation
- 2.5 Cultural and Historical Context
- 2.6 Answers to Check Your Progress Questions
- 2.7 Summary
- 2.8 Key Words
- 2.9 Self Assessment Questions and Exercises
- 2.10 Further Readings

2.0 INTRODUCTION

Archaeology is a broad discipline that comprises different points of view regarding interpretation of history and also a number of specialisations. The sheer variety of archaeology is often underestimated. An archaeologist needs to be familiar with other disciplines of archaeology and should have a multidisciplinary approach, in which every small thing matters.

Various methods are employed to unravel the human past through the material remains. They include exploration and excavation. Exploration is the method by which the archaeologist attempts to detect unknown sites, and, in case of known sites, try to know their potentiality by applying different techniques. Excavation is the exposure, processing and recording of the material remains from archaeological sites.

On the basis of archaeological findings such as artefacts, features and eco-facts during the exploration or excavation of a particular site, archaeologists label the assemblage of such material remains as culture. By the systematic study of these material remains one can construct some details of the culture and history of a period.

2.1 OBJECTIVES

After going this unit, you will be able to:

- Identify the various kinds of archaeologies
- Discuss the different methods of exploration

- State the methods of excavation
- Analyse the cultural and historical context of archaeology

2.2 KINDS OF ARCHAEOLOGY

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One of the primary aims of archaeology is to unravel the human past through material remains. It is an interesting job of interpreting material culture in human terms. It requires hard work in field as well as formulating hypothesis in the laboratory. Therefore, an archaeologist should be familiar in other related disciplines such as history, anthropology, and other related social and general sciences. Thus, one should have a multidisciplinary approach while practicing archaeology.

Archaeology is of many kinds, and each type demands either specific or multiple specialisations. The different kinds of archaeologies have been classified into two broad categories on the basis of the nature of the work that is involved, and on the basis of historical time periods.

2.2.1 Archaeology on the Basis of Work

Archaeology has been classified into different types based on the nature of the work involved in the process of data collection and analysis. This depends largely on the place of excavation or exploration, and the point of view of the archaeologist who wants to interpret history.

Environmental Archaeology

Environmental archaeology is a sub-field of archaeology that deals with the study of interrelationship between the past societies and their natural environment. It is commonly divided into three sub-disciplines viz., *zooarchaeology* that deals with the study of ancient faunal remains, *geoarchaeology* that deals with the study of soil, sediments, rocks, natural deposits, etc., and their relationship to the archaeological record, and *archaeobotany* that studies ancient floral remains. Environmental archaeology answers questions relating to the type of natural habitat that the past societies were surrounded by, the flora and fauna living in that age, varieties of wild and cultivated crops, animals hunted and domesticated, species of plants and animals that are now extinct, climatic changes that took place over a period of time, and the effects of changes in natural environment on the lives of the people and on their subsequent disappearance. Environmental archaeology includes field studies along with laboratory experiments. Karl Butzer (1934-2016) was a pioneer in this field.

Ethno-archaeology

Ethno-archaeology is the science that deals with the study of past societies, focusing on material remains rather than culture. It is sometimes called anthropological archaeology as it involves extensive application of

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anthropological methods. By applying ethno-archaeological methods, archaeologists, in a way, try to link the past with the present. It can provide insight into how the ancient people in a given region may have lived. By the application of the principles of ethno-archaeology one can get valuable insight into ancient social structures, religious and cultural beliefs, technology, etc. However, the connection between modern and ancient societies is certainly still very confusing. This is because, even if two societies share some common characteristics, they may be distinct from each other in many aspects, which tend to change by default over a period of time. Nonetheless, studying advanced techniques of modern communities may help to a certain extent to provide an insight into the rudimentary techniques, which may have been used by the ancients. Lewis Binford (1931-2011) and Ian Hodder (born 1948) have conducted ethno-archaeological studies among the Inuit (Eskimos) in Canada and in several parts of Africa to make a better understanding of pre-historic hunter-gatherers.

Settlement archaeology and spatial analysis

Settlement archaeology is a branch of modern archaeology which was started by Bruce G Trigger (1937-2006). It is defined as the study of societal relationships using archaeological data. It investigates former settlement and abandoned areas, forms of housing and settlements, and the prehistoric settlements of entire regions. It is the study of spatial distribution of ancient human activities and occupation, ranging from the differential location of activities within a single room to the arrangement of sites in a region. The special model of archaeological features is analysed in order to reconstruct past decisions regarding use of environment, allocation of natural resources, ritual pattern, social relationships and other related matters. A report by Gordon Willey (1913-2002) on Prehistoric Settlement Pattern in the Viru Valley had made a first attempt to study the pre-historic settlement pattern.

Landscape Archaeology

Landscape archaeology is a broad division in archaeology that deals with the study of the ways in which past people constructed and used the environment around them. It is the study of the various changes occurring in different landscapes, both naturally as well as due to human intervention. For archaeological purposes, landscapes have been categorized into natural and cultural landscapes. The study of how landscapes and natural habitats are interconnected with human behaviour and cultural changes is extensive. There are a variety of changes that landscapes may undergo over a period of time. These comprise natural changes relating to climate, topography, soil, natural calamities such as landslides, floods, tsunamis, rivers changing their courses etc., and human-induced changes such as agriculture, industrial and

construction activities, clearing of forest areas, etc. Techniques in landscape archaeology are also used in order to analyse inequalities that may have prevailed in a social structure at a given period of time.

Household Archaeology

Household archaeology is a relatively recent development in archaeology that occurred between the late 1970s and early 1980s. It involves a small-scale excavation within a specified area on an archaeological site. It considers each household as a social unit that not only depicts the social, cultural, economic, and political responsiveness of the people of a particular household/family, but also throws light on the affiliation of the society in general. It is also helpful in studying features of secular art and architecture, food habits of the people, their religious beliefs, and so on. Gender classification in the social order is an interesting aspect that can be studied by this kind of archaeological method. Different kinds of evidences are taken into consideration in the study of household archaeology, which include floral and faunal remains, pottery, processes of site formation and so forth.

Contextual Archaeology

Contextual archaeology is an approach to archaeological interpretation proposed by Ian Hodder in the mid-1980s in which stress is laid on methods of identifying and studying contexts to facilitate understanding of its meaning. This includes two lines of enquiry. The first is to consider the environmental and behavioural context of action; understanding an object, for instance, by placing it in relation to the larger functioning whole from which it is drawn. Second, look at the networks of links that objects were placed within in the past and attempt to read meaning from such groupings as if the objects were words in a text.

Marxist Archaeology

Marxist archaeology is an archaeological theory that interprets archaeological information within the framework of Marxism. It is a move towards archaeological interpretation and explanation that is based on the work of Karl Marx and Friedrich Engels to explore materialist models of social change and the central questions of social relations. Although neither Marx nor Engels described how archaeology could be understood in a Marxist conception of history, it was developed by archaeologists in the Soviet Union during the early twentieth century. Knowledge of who has power and how that power is exercised are seen as important elements in explaining social change. Marxists regard each human society as defined and shaped by its 'mode of production', which includes both the 'forces of production' (i.e. science, technology, and all other human and natural resources), and

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the ‘relations of production’ (i.e. the ways in which people relate to one another in order to facilitate the production and distribution of goods). Social organisation and change are seen as conflicts between segments of society: for example, those based on class, sex, or age. Gordon Childe (1892-1957) was one of the first western archaeologists to draw heavily on Marxist theory. He laid emphasis on the forces of production as being fundamental influences on prehistoric economies, societies, and ideologies. In many of his early works, Childe effectively challenged the fascist German-based views of pre-history prevalent at the time.

Gender Archaeology

Gender archaeology is a method of studying past societies through their material culture by closely investigating the social construction of gender identities and relations. It is the study of the roles, activities, ideologies and identities of men and women, and the differences between them. It is believed that in archaeology, everything is perceived through the eyes of men (this is called androcentrism), understanding women only in biological roles such as mother and sexual partner, and describing the differences between men and women as polar opposites. Margaret Conkey (born 1943) and Janet D. Spector (1944-2011) are regarded as the pioneers in the Anglo-American field to examine the application of feminist approaches and insights to archaeological practice and theory. Gender archaeology was created to balance archaeological interest in men and women by directing as much attention to women’s activities as to men’s, to reveal that women are not the same in all cultures and their activities are of interest for comparative studies, and to help make archaeology into a discipline that concerns people, rather than merely artefacts. Sarah Pomeroy (born 1938), a classicist and art historian, is considered a leading authority on women in the ancient Mediterranean world.

Cognitive Archaeology

Cognitive archaeology is a theoretical point of view in archaeology which focuses on the ways ancient societies thought and the symbolic structures that can be perceived in past material culture. Collin Renfrew (born 1937) and Paul Bahn (born 1953) are the chief propagators of this theory. Cognitive archaeologists examine the role that ideology and differing organisational approaches would have had on ancient peoples. The way that these abstract ideas are visible through the remains that these peoples have left can be investigated and debated often by drawing inferences and using approaches developed in fields such as semiotics, psychology and the wider sciences. Cognitive archaeology is interested in the material expression of human ways of thinking about things, such as gender, class, status, and kinship.

Underwater Archaeology

Underwater archaeology is also known as marine archaeology or maritime archaeology. It is a discipline within archaeology as a whole that particularly studies man's interaction with the sea, lakes and river. It is concerned with the study of underwater evidences such as shipwrecks, water-buried cities, and other inundated archaeological sites. It is an expensive branch of archaeology and is much costlier than any terrestrial archaeological excavation. Archaeological remains in the sea or in other underwater environments are typically subject to different factors than artefacts on land. Underwater excavations require knowledge of specific techniques and methods that need to be adopted. Underwater archaeologists try to discover submerged evidences by diving into the deep waters along with sophisticated archaeological tools. Sometimes an underwater excavation may also turn out to be a little risky because one cannot guess what the conditions under the sea would be like. However, it makes an exciting profession for adventure lovers. Discovery and recovery of king Henry VIII's warship Mary Rose and Titanic are considered among the extraordinary achievements in the field of underwater archaeology.

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Aviation Archaeology

Aviation archaeology is concerned with discovering historical remains of aircraft, air-borne weaponry, abandoned air bases or runways. In brief, it deals with everything that has to do with the history of aviation. Sometimes, aircraft wrecks are found under the sea, which are ultimately recovered, recorded and studied. It is because of this reason that many people consider aviation archaeology as a branch of marine archaeology. However, this may only be true to a limited extent as there are also numerous aviation archaeological remains found on land, in which case, it becomes a separate branch in itself. Crash sites vary largely in magnitude and remains. The remains can be military remains or civil remnants. Instances of ancient air bases discovered by aviation archaeologists have also been recorded. In so far as the actual professional practice of aviation archaeology is concerned, there may be some legal limitations, which can be overcome through sufficient paperwork and permissions.

Aerial Archaeology

Aerial archaeology is the investigation of archaeological remains from the sky. This concept gained momentum after aerial survey and photography were considered to be important during the two World Wars. Archaeologists attempted to gain a bird's eye view of archaeological sites to get a better outlook. Early investigators used hot air balloons, scaffolds, and cameras tied to the kites. After the invention of airplane and the military significance placed

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on aerial photography during the World Wars, archaeologists were more effectively able to use the technique to discover and record archaeological sites.

Conducting aerial surveys aids archaeologists to discover new sites, which otherwise would have been difficult, as some things can be better captured in their entirety and within their landscape from a certain height. The sites that already exist can be recorded from a different perspective. Aerial archaeology does not require actual excavation. On the contrary, it involves thorough exploration from an altitude. Currently, the technique of satellite imagery also forms part of aerial archaeology.

Industrial Archaeology

Industrial archaeology is the methodical study of material evidence concerned with the industrial past. The evidence, collectively referred to as industrial heritage, comprise buildings, machinery, artefacts, sites, infrastructure, documents and other items related to production, manufacture, extraction, transport or construction of a product or range of products. The field of industrial archaeology encompasses a range of disciplines including archaeology, architecture, museology, technology and urban planning and other specialties, in order to piece together the history of industrial activities.

Experimental Archaeology

Experimental archaeology is a type of archaeology in which the archaeologists attempts to figure out how the archaeological deposits are formed. In the course of this search, they experiment with different processes that they believe people in the past have applied to manufacture all those things which make the archaeological deposit. It has been part of archaeology since the beginning of the discipline. As artefacts were identified and arranged into chronological sequences, so assumptions were made about their manufacture and use. Replication of prehistoric stone tools is an interesting activity practiced in experimental archaeology. Some of the most methodical experiments in pre-historic agriculture were conducted in Denmark in the first half of the twentieth century, but the concept became more formally recognised as an archaeological tool in the 1960s. The formal recognition of experimental archaeology culminated in two important books published in the 1970s, by John Coles and Robert Ascher.

Salvage or Rescue Archaeology

Salvage archaeology or rescue archaeology, is a technique of retrieving the data from threatened archaeological sites. Rescue excavation was a term coined in the 1960s when development and road building destroyed much of our archaeological heritage. Salvage archaeological operations are conducted on sites that are on the verge of being destroyed by new road constructions,

dams, buildings, or any other kind of infrastructure development. The duty of the archaeologist, then, is to locate maximum possible sites in an assigned area, explore them, and excavate them if deemed necessary, and ultimately record in detail all the finds that have been obtained. Generally, in the case of salvage archaeology, time is a constraint, and so detailed excavation is difficult to carry out. Therefore, archaeologists tend to record whatever is found on the surface at the time of exploration. But, if it is realized during the exploration that the site holds an important place in history, then detailed excavation can be carried out and can thus alter the construction plans in some way or the other.

Battlefield Archaeology

Battlefield archaeology, also called military archaeology, is one of the most exciting types of archaeologies. It is concerned with excavating battlefields of the past and recovering evidences associated with military activities, which may have been responsible for subsequent changes in the social, political and economic fields of the society. Archaeological evidences obtained from battlefields have the potential to change those historical viewpoints which have been widely accepted and acknowledged. Evidences on such sites comprise remains of war implements, skeletal remains, and various artefacts related to military history. These war sites give important evidences to events, which occurred not only during a given war, but also before and after it, because not only actual battlefields but even military camp sites provide valuable evidences. Additionally, just as all the other sites tell us about how and when people lived, war sites tell us how and when they died. On the whole, battlefield archaeology is an interesting case-study of how written historical accounts can undergo changes when actual material remains relating to the recorded events are recorded. Battlefield archaeology is not concerned with the causes of war but of the sites where the war actually happened, and of the archaeology of the event.

Commercial Archaeology

Commercial archaeology is a branch of archaeology that deals with everything that is associated with trade and commerce. This comprises evidences regarding the commodities that were traded and bartered, numismatic finds, ancient means of transportation that were used for commercial purposes, and others. The study of ancient trade routes and sea ports, harbours and marketplaces is also incorporated in commercial archaeology. This is a fascinating study, as it answers questions such as which countries had trade relations and in what commodities, what were the media of exchange between them, how the commodities were transported, who and what all was involved, how they coordinated, etc. Sometimes, at commercial sites, ancient inscriptions are found, which are valuable resources for reconstructing economic histories.

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Forensic Archaeology

Forensic archaeology is a recently developed branch of archaeology. It is concerned with the use of archaeological methods in finding evidences on crime scenes. Forensic archaeologists are generally engaged by the security services with the purpose of investigating crimes and catching the offenders. Forensic archaeologists collect evidences like human burials, artefacts, footprints, tool marks, etc., and attempt to understand the situation in which a particular crime might have happened; and to determine the influences on the remains of external factors that may have disturbed the crime scene. They also attempt to find whether all the remains are in situ, and if not, how and when they landed up where they currently lie. The discoveries of forensic archaeologists prove to be very valuable in the court of law, and help the police to a great extent in the investigation of the committed crime.

2.2.2 On the basis of Historic Time Period

The other broad categorization of archaeology is on the basis of historical time periods. This categorization is with the purpose of easing the process of giving peculiar characteristics to the discoveries of a particular era, a particular dynasty, or a particular region.

Prehistoric Archaeology

Prehistory is the study of past before the invention of writing. Since there are no written records or historical accounts from the prehistoric time, whatever we know about prehistory is purely on the basis of physical archaeological finds. It has very close links with biology, biological anthropology and geology. On the basis of the developments that took place over a period of time in the human lifestyles, prehistory has been classified into Palaeolithic, Mesolithic, Neolithic and Chalcolithic periods. Prehistory also comprise periods before the Stone Age, which preceded the human existence. Thus, prehistoric archaeology is a vast discipline, and there is a lot of scope for original research, as there are numerous prehistoric mysteries that are to be yet unravelled.

Proto-historic Archaeology

Proto-history is the period or stage of human development or of a particular culture immediately before the emergence of writing. It is the period that lies in between prehistory and history. Though this is a period that emerged after the invention of writing, many of the evidences have not yet been deciphered. Proto-history includes the Bronze Age and Iron Age, and sometimes even the copper age, but this vary from region to region. Determination of dates of this period is a difficult job for an archaeologist, as this again depends on regional

and cultural aspects. But we are aware from the available data that it was during the proto-historic period that great ancient civilizations of the world arose, and the world took its first and prominent steps towards urbanization. Therefore, it is an important transitional phase, and sites are full of surprising artefacts, which make proto-historic archaeology an interesting option.

Historical Archaeology

Historical archaeology is a form of archaeology which studies that period of the history of mankind from which we have ample written records and oral traditions. So, historical archaeology involves the study of not only the artefacts obtained from the archaeological sites but also of the documented evidences that have been left behind. A large number of sites associated with historical archaeology are spread across the world, and each of these helps reconstruct different kinds of aspects of human past, such as industries, trade, art and architecture, social and cultural history and military history. However, it should be kept in mind that historical records are not always accurate, and for this reason, it should be supplemented with other evidences.

Classical Archaeology

Classical archaeology is a sub-field of archaeology which is related only to Greece and Rome. It deals with an in-depth study of the ancient civilizations of Greece and Rome. The Grecian Empire, the Roman Empire and the transitional period between the two, the Greco-Roman Period, together permit an almost 2,000-years long era of classical history. The period between 500 BC and 300 BC was known as the Classical period or Golden age of Greece. These short years have given us the great monuments, philosophy, art, literature and architecture that are now the building blocks of western civilization. Classical archaeology not only studies these two civilizations independently, but also in relation to other contemporary civilizations of that period. It also examines the influences of other civilizations on the ancient Greeks and Romans, and vice versa. It is a very exciting field of study, but because it pertains to specific regions, is limited in scope.

Medieval and Modern Archaeology

Medieval archaeology is concerned with the study of material remains of human culture belonging to the middle ages. Likewise, modern archaeology pertains to the study of the colonial and post-colonial periods in history. Material remains of these periods, in most cases, help only to establish firmly the facts from the written records of these periods, which are available in large numbers.

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Check Your Progress

1. Name the subfield of archaeology that deals with the study of interrelationship between the past societies and their natural environment.
2. Name the discipline within archaeology as a whole that particularly studies man's interaction with the sea, lakes and river.
3. Which kind of archaeology is concerned with the use of archaeological methods in finding evidences on crime scenes?
4. Define classical archaeology.

2.3 EXPLORATION

Exploration is an interdisciplinary investigation, which endeavours to locate and understand the potentials of an archaeological site. An archaeological site is based on many factors. Generally, an archaeological site has a deposit formed as a result of cultural and natural processes. Different techniques are applied for the retrieval of archaeological materials from archaeological sites, such as exploration and excavation. Archaeological exploration implies non-destructive scientific survey and documentation of sites.

The important task of an archaeologist is the identification of a site. An archaeologist should have an eye to be able to locate the cultural and natural processes. So before going for exploration an archaeologist should have an overall idea of the region under investigation. Maps can be helpful for attaining this knowledge. Maps showing various geographical features with the help of symbols can be useful. Other maps include geological maps, vegetation maps, agricultural maps, rainfall maps, soil maps, maps depicting natural resources and maps that indicate isolated but specialized features. An archaeologist should have an ability to understand these maps.

The nature of an archaeological site changes according to the cultural periods. So, when one looks for an archaeological site, the parameters under consideration changes from areas to areas, and from cultural periods to cultural periods. The artificial mound found in an archaeological site is a relic of the original site and differs a lot from the natural mound. Artificial mound can be located in several ways. It can be located with the help of religious literature. Exploration of Buddhist antiquity sites conducted by Sir Alexander Cunningham is the best example of this kind of exploration. It was done by using Buddhist sacred literature, Tripitakas and accounts of Chinese travellers Fa Hsien and Hiuen Tsang. Another way to locate the mound would be to conduct village to village surveys and enquire with the local people about

visible potsherds there. Sometimes, the folklores and certain terms in local dialects are useful to locate archaeological sites.

Different methods are used for exploration of sites: desktop study, surface survey, field walking, aerial photography, magnetometer survey, electrical resistivity survey, probing, remote sensing, and also with the help of Geographical Information System (GIS) which are briefly explained as below:

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- (i) **Desktop Study:** It involves the review of existing records including the pioneer studies about the archaeological site if it exists and literary references on the site. It involves researching available maps and historical or archaeological documents with the purpose of making a clear plan of exploration.
- (ii) **Surface Survey:** It implies the collection of archaeological finds from sites in order to gather representative samples of artefacts from the surface. If the surface survey provides sufficient amount of material remains from a particular area of the archaeological sites, then the archaeologist normally lay down a 'Test pit', which is also called 'Sondage'. Test pits are generally placed to understand the archaeological viability of a site.
- (iii) **Field Survey:** Also called Pedestrian Survey it is one of the oldest and authentic site survey methods in archaeological explorations. In this, a team of archaeologists surveying an area simply walk over the surface of the site covering almost all parts, observes, and collects material remains. This method is advantageous in the way that the chances of missing out even a small activity area are less.
- (iv) **Aerial Photography:** It is the earliest and perhaps the most important remote sensing tool available to archaeologists looking for new archaeological sites. This survey uses airborne and space borne remote sensing tool. It has two components -- Data Collection, which comprise capturing photographs or image from aircraft or satellite, and Data Analysis, in which such photographs are analysed, interpreted and integrated with other evidences. This method allows an archaeologist to have a bird's eye view of the mound and gives the outline of any aspect. It plays a key role in distinguishing features which are otherwise invisible when looked from the ground level.
- (v) **Electrical Resistivity Survey:** This method was developed by Atkinson that helps the archaeologist to record the geophysical data. It is based on the fact that the ground can conduct electricity. The different soils or rocks of earth conduct electricity differently, offering varying amounts of resistance to the passage of current. The electrical conductivity of an archaeological mound differs from area to area. Negative resistivity anomaly would exhibit a ditch or pit and a positive anomaly show a structure of high resistivity like floor, wall, etc. The most useful

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instrument used for this type of survey is Martin-Clark Meter and twin-electron type like the Geoscan Research RM15. The method of exploration helps in tracing the structural activities.

- (vi) **Magnetometer Survey:** In this method an instrument known as proton-magnetometer is used to identify structures or features which show the property of thermo remnant magnetism (e.g. hearths, brick structures etc.). It detects variance between the general magnetic field of an area and the one above or near the buried features or structures. The use of proton-magnetometer is based on the electrodes fixed into the ground at regular intervals and the variance between the electrodes can then be plotted.
- (vii) **Probing:** In this type of survey, an apparatus consisting of an iron bar with a tapered point and a T-handle is used to probe an activity area. The texture of the soil of each stratum emits a different sound and the resistance is different.
- (viii) **Remote Sensing:** It is a modern technique used to obtain archaeological data with the help of aerial photography and satellite imageries. This method enables the archaeologists to uncover unique data that is unobtainable using traditional archaeological techniques and have an overall idea of the features on a given landform, which is otherwise difficult to view while standing on the field. A series of ground-based geophysical methods such as Ground Penetrating Radar (GPR) and Magnetometry are also used for archaeological imaging.
- (ix) **Geographical Information System (GIS):** GIS has been an important tool in archaeology since the early 1990s. By using this technique, one can capture, store, analyse, manage and present data that are connected to locations of archaeological importance. In simple words, it can be said as merging of the data derived from cartography, statistical analysis and database technology. After the site is located, its position is recorded by taking the latitude and longitude of a place either by using map or the Global Positioning System (GPS).

While exploring the site, all available features on the sites as well as the features of the surrounding locality need to be recorded. Well-conducted exploration helps in the understanding of a number of archaeological issues regarding the site and in raising relevant questions that can be answered through excavation. During exploration, an archaeologist should also try to look for the possible cultural and natural transformations through which the sites may have passed over many years. The following information is required to be recorded by the investigator while conducting exploration:

- (i) Date of exploration, name of the site, taluka, district, state, geocoordinates (latitude and longitude), how it is reachable and its distance from the nearby village or town.

- (ii) The topography, climate, vegetation and natural resources around the region. The occupations of people, regional history, population and social hierarchy in these villages.
- (iii) Nature of the archaeological site i.e. a camp, village, town, its condition and area.
- (iv) Details of movable antiquities, methods used for their collection, rough sketch of the site and classification of the finds.
- (v) Details of their packing, labelling and sketches etc.

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The archaeological explorer may use the exploration card given below while recording the sites. This would allow the investigator to record a site systematically, collect necessary information to ascertain chronology, to situate a site in regional cultural context, understand its potentials and raise relevant questions for further research.

Exploration Card	
1. Site name, its geo-co-ordinates	6. Antiquities found during exploration
2. Approach to the site	7. Ceramics recovered
3. Physical features: elevation, river system, natural resources.	8. Owner of the site
4. Antiquity of the area.	9. Date of exploration

Check Your Progress

- 5. What do you understand by the term 'archaeological exploration'?
- 6. What are the different methods used for exploration of sites?
- 7. Define remote sensing.

2.4 EXCAVATION

Besides explorations, archaeologists conduct excavations to gather information about the past. Excavation is the most systematic and scientific method of uncovering buried things of the past societies. Through this process the cultural remains are brought out with utmost care. Excavations mainly give evidences of: (1) human activities at a particular period in the past, and (2) changes in those activities from period to period. In general, we can

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say that contemporary activities occur horizontally in space; whereas the changes in those activities take place vertically through time. It implies that in an archaeological excavation pit the horizontal space always represent the contemporary period and the material evidences collected from the horizontal spaces belongs to a particular period. However, after the excavation when we observe all these horizontal evidences vertically, we can see the changes occurred in different period.

Excavation of Mounds

The archaeological mound is a site where continuous human occupations occurred in the past. Excavation methods are the different techniques used in archaeology to dig, uncover, identify, process, and record archaeological remains. Archaeological excavation involves the removal of soil, sediment, or rock that covers artefacts or other evidence of human activity. While excavating a site, archaeologists resort to two types of digging -- vertical and horizontal excavation.

Vertical Excavation

Vertical excavation, where the archaeologist excavates a significant depth of deposits, helps to delineate the total cultural profile of a site up to the natural soil. It reveals the total stratigraphy of the site. Vertical digging discloses the entire cultural deposit of a site. Vertical excavation generally starts from the present surface, which is known as surface humus layer, and ends at the natural layer, a sediment layer without human interaction.

Horizontal Excavation

The horizontal excavation aims at exposing the deposits horizontally. It is a method of excavation in which full horizontal extent of an archaeological site is cleared and large areas are open while preserving a stratigraphic record in the baulks between large squares. A gradual probe may then occur. Sir Mortimer Wheeler (1890-1976) was one of the chief proponents of this excavation method.

Open-Area Excavation

This type of excavation tries to expose a large area of the archaeological site without maintaining baulk. Philip Barker (1920-2001) was the chief proponent of this method. This may aid the archaeologist to realize the total cultural deposit of a site.

Grid Excavation

It is an excavation technique developed by Mortimer Wheeler. It is also known as Box-Grid System of excavation, to obtain information both horizontally and vertically. It involved the retaining of intact baulks of earth

between excavation grid squares so that different stratigraphic layers could be correlated across the site in the vertical profiles. This system has been used across the world in modern archaeology and, although less popular in Europe, it is still the simplest method to ensure a systematic approach.

Quartering

This is an excavation method which involves cutting archaeological sites in to four quadrants to obtain maximum vertical and horizontal information. It is generally applied to the excavation of small mounds.

Quadrant Method

Burial excavation enables us to understand various aspects of the human life in the past, including rituals and beliefs. The skeletal remains aid in identifying the racial affinities, family groups, age, sex, nutrition, paleodemography, paleo-diseases and other cultural information. Megaliths are the most important burials of South India that have archaeological significance. Megalithic burials are of different kinds like Umbrella stone, Cap stone, cist, dolmen, rock-cut sepulchres, stone circle, urns, sarcophagus, etc.

In quadrant method, the mound or burial is divided into four segments and each quadrant is removed systematically. After removing the soil of one quadrant, the archaeologist attempts to understand the actual position of the burial and then move on with the removal of remaining three quadrants. Even depth is needed to be maintained in the entire quadrant. For example, if one attempts to excavate an urn burial, he/she has to remove the four quadrants until the capstone is identified and then continue with removal of one or two quadrant simultaneously. Once the burial is bare, the entire burial goods have to be documented in situ. The documentation comprises drawing or illustration, photographs, mapping, etc. The samples, especially bones or fossils, charcoal, pottery, etc. have to be scientifically collected. After the documentation is completed, then the burial goods are sent to the museum.

Trench Excavation

It implies a small or sample excavation as opposed to an open area excavation. Even a large area excavation is only a sample of archaeological landscape and so is really a large trench. Trial trenches, or trial pits, or sondages, are also sampling excavation of the sites. They are often small square trenches (1m x 1m) with the purpose of recognizing the archaeological potentials of the site.

Sieving

Sieving is the most important part of excavation. This method, also known as screening or sifting, is used to recover quantifiable data from excavations. It is a technique of particle size analysis used for determining the size grades of pebble, gravel, sand, and coarse silt in sediment and soils of archaeological

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deposits. Before New Archaeology of the 1960s, sieving was not commonly practiced and usually was limited to the use of coarse mesh sieves for the recovery of small artefacts such as coins and beads. However, nowadays archaeologists collect and document all artefacts, whether it is small or big, from the archaeological sites.

Stripping

It involves the removal of topsoil accumulations. It is often conducted after a series of excavations that had occurred in various parts of the site. It is a method of excavation in which a large horizontal area is dug instead of a deep vertical one; clearing excavations in which large areas of overburden are removed to expose horizontal distributions of data without leaving baulks.

For example, in an urban context, this may involve removing the remains of recently demolished concrete building. This method is employed in contract archaeological work when the time factor is short.

Stratigraphy

Stratigraphy is the analysis and interpretation of depositional layers or strata in excavated area. It is a process by which layers of soil and debris are laid down on top of one another over time. It involves a careful consideration of the characteristics of individual soil layers with the purpose of understanding the relation of one layer with the other. The relation between the top most humus layer and natural layer in an archaeological site explains the continuity or break, and changes occurred in the site during the past. This topic is discussed in detail in Unit XI.

Mapping of Sites

Map is one of the important tools in archaeological exploration and excavation. It comprises topographic map, site map, aerial map, contour map, etc. Topographic map shows the topographical data in combination with representation of archaeological features. It aids an archaeologist to view the landforms through which he/she may be able to locate an archaeological mound before and during the exploration and excavation. The contour map represents the elevation or furrow of the landscape. Nowadays, satellite maps, Google Earth maps, etc. are also widely used to locate and document archaeological sites.

Excavation Reports

Excavation report is the final product of the excavation. It is generally divided into many parts which represents the evidence in a meaningful way and placed in logical sequence. The first part is related to the discovery of the site, proper identification of the site, previous researches, including rescue

operations, exploration and excavations, stratigraphical record of the site, and a detailed description of the site.

The second part contains a detailed report of trenches with description of archaeological layers, material remains, and an analysis of the trench supervisor. It reveals the location of the trench and its relation to other trenches in the same site, topographical characteristics of the site, the measurement of the trench and GPS position of the trench, and the ownership of the land where the trench is laid out. The report contains the report of all trenches laid out in the site.

The third part deals with detailed catalogue of artefacts. It comprises the list of artefacts and eco-facts collected from the site.

The last part of the report consists of the result of the samples collected during the time of excavation from various experts. It also gives a comprehensive conclusion of the excavation.

Check Your Progress

8. What is the main objective of the Open-Area Excavation?
9. What is sieving used for?

2.5 CULTURAL AND HISTORICAL CONTEXT

Cultural-historical context is an approach to archaeological interpretation which uses the method of the traditional historian, including stress on specific circumstances elaborated with rich detail, and processes of inductive reasoning. The notion of archaeological culture developed in the nineteenth century. Archaeologists often found material remains such as artefacts, features and eco-facts during the exploration or excavation of a particular site. They labelled the assemblage of such material remains as culture. Sir Edward Burnett Taylor's ideas typify the 19th century cultural evolutionism. In his work "*Primitive Culture*" (1871), Taylor defined culture as "the complex whole which includes knowledge, belief, art, morals, law, custom and other capabilities and habits acquired by man as a member of a society". However, in archaeology, culture implies the grouping of archaeological remains from a particular site and then labelling the site as a distinct culture like Harappan culture, Mohenjo-Daro culture, Lothal culture, Dholavira culture, Kalibangan culture, Ropar culture and so on. The assemblage of these cultures stands for 'Civilization'. For example, the grouping of the above said archaeological cultures are labelled as Indus Valley Civilization. The transfer of material culture from one culture to another is labelled as diffusion. The diffusion of iron technology is often quoted as a good example.

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Archaeologists and anthropologists generally use the term ‘cultural evolution’ to visualise the long-term trends in human history. It represents the evolution of human culture from hunting, food gathering to farming; from farming to the origins of civilization and the state; from agrarian civilizations to industrial and now post-industrial society. Therefore, such development has resulted in the increase of population, greater social complexity and inequality, and technologies that are more complex. Archaeologists believe that the culture is always moved from simple to complex or from one condition to another condition. For instance, the state is evolved from tribal society, while chiefdoms evolved into kingdoms.

The concept of cultural evolution has its origins in the 18th century Enlightenment period and it is basically influenced by the nineteenth century ideology of Karl Marx and Frederic Engels and heavily influenced by L.H. Morgan’s sequence from savagery to barbarism to civilization. Gordon Childe (1892-1957) in his works “*Man Makes Himself*,” “*What Happened in History*” and “*Social Evolution*” clearly showed the changes occurred in the human culture due to the changes occurring in the subsistence strategies. Childe considered the origins of agriculture (the Neolithic revolution) and the emergence of urban societies (the urban revolution) as major steps in the growth of human societies, because they represented improved adaptations of humans to their environments.

Check Your Progress

10. Who wrote the book *Primitive Culture*?
11. When did the notion of archaeological culture originate?

2.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Environmental archaeology is the subfield of archaeology that deals with the study of interrelationship between the past societies and their natural environment.
2. Underwater or Marine Archaeology is the discipline within archaeology as a whole that particularly studies man’s interaction with the sea, lakes and river.
3. Forensic archaeology is concerned with the use of archaeological methods in finding evidences on crime scenes.
4. Classical archaeology is a sub-field of archaeology which is related to the study of the ancient civilizations of only Greece and Rome.

5. Archaeological exploration implies non-destructive scientific survey and documentation of sites.
6. Different methods are used for exploration of sites: desktop study, surface survey, field walking, aerial photography, magnetometer survey, electrical resistivity survey, probing, remote sensing and others.
7. Remote sensing is a modern technique used to obtain archaeological data with the help of aerial photography and satellite imageries.
8. Open-Area Excavation tries to expose a large area of the archaeological site without maintaining baulk.
9. Sieving is the most important part of excavation. This method, also known as screening or sifting, is used to recover quantifiable data from excavations.
10. Sir Edward Burnett Taylor wrote the book *Primitive Culture*.
11. The notion of archaeological culture developed in the nineteenth century.

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2.7 SUMMARY

- One of the primary aims of archaeology is to unravel the human past through material remains. An archaeologist should be familiar with other disciplines which archaeology covers such as history, anthropology, and other related social and general sciences. Thus, one should have a multidisciplinary approach while practicing archaeology.
- There are different kinds of archaeologies and these have been classified into two broad categories---on the basis of the nature of the work that is involved, and on the basis of historical time periods.
- Kinds of archaeology based on the basis of work involved include environmental archaeology, ethno-archaeology, settlement archaeology, landscape archaeology, household archaeology, contextual archaeology, Marxist archaeology, gender archaeology, cognitive archaeology, underwater archaeology, aviation archaeology, aerial archaeology, industrial archaeology, experimental archaeology, salvage archaeology, battlefield archaeology, commercial archaeology and forensic archaeology.
- Kinds of archaeology based on historical time period include pre-historic archaeology, proto-historic archaeology, historical archaeology, classical archaeology, and medieval and modern archaeology.
- Exploration is an interdisciplinary investigation, which endeavours to locate and understand the potentials of an archaeological site. A variety of techniques are applied for the retrieval of archaeological

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materials from archaeological sites such as exploration and excavation. Archaeological exploration implies non-destructive scientific survey and documentation of sites.

- For the exploration of sites, methods like desktop survey, surface survey, field walking or survey, aerial photography, magnetometer survey, electrical resistivity survey, probing, remote sensing and GIS are employed.
- Besides explorations, the archaeologists conduct excavations to gather information about the past. Excavation is the most systematic and scientific method of uncovering the buried things of the past societies. It involves the removal of soil, sediment, or rock that covers artefacts or other evidence of human activity.
- Archaeologists resort to different kinds of excavations methods to get the material remains. These include vertical excavation, horizontal excavation, open area excavation, grid excavation, quartering, quadrant method, trench excavation, sieving, stripping, stratigraphy and mapping. Excavation report is the final product of excavation which is divided into many parts.
- Cultural-historical context is an approach to archaeological interpretation which uses the method of the traditional historian.
- Nineteenth century witnessed the development of the notion of archaeological culture. Archaeologists term the material remains discovered from sites as culture and try to reconstruct the history of a particular society and period.
- Archaeologists and anthropologists generally use term ‘cultural evolution’ to visualise the long-term trends in human history. It represents the evolution of human culture from the earliest to the present and from simple to complex.

2.8 KEY WORDS

- **Assemblage:** These are artefacts that are found together and most probably were used simultaneously or for similar or related tasks.
- **Baulks:** It refers to unexcavated walls which may be left between pits to provide stratigraphic control.
- **Contour line:** It is a line on a map connecting points of equal elevation.
- **Culture:** It refers to a set of learned beliefs, values and behaviours—the way of life—shared by the members of a society.

- **Forensic:** It relates to the application of science to decide questions arising from crime or litigation.
- **Grid:** It is a network of uniformly spaced squares that divides a site into units; used to measure and record an object's position in space.
- **In situ:** It refers to an article that has been found in its original context. Artefacts found in situ mean they have not been removed from the position they were in when discovered.
- **Paleo:** It is Greek word for old or ancient.
- **Sediment:** It refers to material that was suspended in water and that settles at the bottom of a body of water.
- **Test pit:** It is a small exploratory "dig" designed to determine a site's depth and contents prior to major excavation.

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2.9 SELF-ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write short notes on the following:
 - (a) Environmental Archaeology
 - (b) Ethno-archaeology
 - (c) Contextual Archaeology
2. Mention the important functions of an archaeologist.
3. What is the kind of information required to be recorded by the investigator while conducting exploration?
4. What is an archaeological mound?

Long Answer Questions

1. 'Household archaeology is a relatively recent development in archaeology that occurred between the late 1970s and early 1980s.' Analyse the statement.
2. Explain the categorization of archaeology on the basis of historic time period.
3. Discuss cultural-historical context is an approach to archaeological interpretation.

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2.10 FURTHER READINGS

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UNIT 3 DEVELOPMENT OF NEW ARCHAEOLOGY

*Development of
New Archaeology*

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Structure

- 3.0 Introduction
- 3.1 Objectives
- 3.2 Heinrich Schliemann
- 3.3 Gertrude Caton Thompson
- 3.4 Development of New Archaeology
- 3.5 Answers to Check Your Progress Questions
- 3.6 Summary
- 3.7 Key Words
- 3.8 Self Assessment Questions and Exercises
- 3.9 Further Readings

3.0 INTRODUCTION

An archaeologist is someone who studies the genesis, development, and behaviour of human beings, past and present. They investigate the cultures, languages, archaeological remains, and physical characteristics of people in different parts of the world. German businessman and archaeologist, Heinrich Schliemann established archeology as the science that we know today. He discovered Troy and what he thought was the Treasure of Priam. Despite his errors and wrong conclusions, the world continued to venerate Heinrich Schliemann as one of the most significant archeologists of all times. English archaeologist Gertrude Caton Thompson was another explorer and archaeologist of repute. Her excavations of Malta, Egypt and Zimbabwe opened the unknown world. She got into this profession at a time when participation of women in this field was very uncommon.

New Archaeology or Processual archaeology was an intellectual movement of the 1960s, which believed in logical positivism as a guiding research philosophy, based on the scientific method. The New Archaeology is not really a single concept, but a group of ideas which desired to make traditional archaeology more scientific. Therefore, the need to make hypotheses clear, the implementation of quantitative methods, the application of different modern technologies for characterizing materials and other features of the archaeological record, and the adoption of the idea of models for explanation of human behavior, all became part of the general sphere of New Archaeology.

In this unit, you will study about the life and works of German archaeologist Heinrich Schliemann and about Gertrude Caton Thompson. In addition to this, you will also study about the development of New Archaeology.

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3.1 OBJECTIVES

After going through this unit, you will be able to:

- Examine the life and works of Heinrich Schliemann as an archaeologist
- Analyze the contribution of Thompson as an archaeologist
- Discuss the development of New Archaeology

3.2 HEINRICH SCHLIEMANN

Heinrich Schliemann was a German businessman and a pioneer in the field of archaeology. He was born in Neubukow, Mecklenburg-Schwerin (part of the German Confederation), in 1822. His father, Ernst Schliemann, was the son of a poor pastor. In 1823, his family moved to Ankershagen.

Heinrich's mother died in 1831, when Heinrich was nine years old. After his mother's death, his father sent Heinrich to live with his uncle. When he was eleven years old, his father enrolled him in the Gymnasium (grammar school) at Neustrelitz. Heinrich's interest in history was primarily encouraged by his father, who had schooled him in the tales of the Iliad and the Odyssey and had given him a copy of Ludwig Jerrer's *Illustrated History of the World* for Christmas in 1829.

However, Heinrich had to move to the Realschule (vocational school) after his father was blamed for misappropriation of church funds and had to leave that institution in 1836. His family could not afford to give him university education, so it was Schliemann's early academic experiences that influenced the course of his education as an adult.

At the age of 14, after leaving Realschule, Heinrich was apprenticed to a grocer in Fürstenberg. He later revealed that his passion for Homer was born when he heard a drunkard reciting it at the grocer's. He laboured for five years, and then determined to emigrate. With this aim Schliemann moved to Hamburg in 1841 and became a cabin boy on a ship bound for Venezuela. Schliemann became a messenger, office attendant, and later, a bookkeeper in Amsterdam.

In 1844, he took a position with B. H. Schröder & Co., an import/export firm. In 1846, the firm sent him as an agent to St. Petersburg. In time, Schliemann represented a number of companies and learned a number of languages which was an important part of his career as a businessman in the importing trade. Schliemann went to California in 1851 and started a bank in Sacramento. In 1852, he sold his business and returned to Russia and married Ekaterina Lyschin. Schliemann made a fortune at the time of Crimean War (1854–1856) as a contractor. He retired from business

at the age of 36 and began to devote his time, energies and money to the study of pre-historic archaeology. To train himself, he travelled extensively in Greece, Italy, Scandinavia, Germany, and Syria and then went around the world, visiting India, China, and Japan. He also studied archaeology in Paris.

Schleimann's Contribution as an Archaeologist

Schleimann's primary interest of a classical nature appears to have been the location of Troy whose very existence at that time was disputed. Perhaps his attention was attracted by the first excavations at Santorini in 1862 by French geologist Ferdinand Fouque who found fresco-covered wall of houses and painted pottery under 26 feet of pumice, the consequence of great eruption that divided the original island into Thera and Therasis. On the other hand, he may have been inspired by an English archeologist, Frank Calvert, whom he met on his first visit to the Hisarlik site in 1868.

On the basis of Frank Calvert's work, who had been excavating the site in Turkey for over 20 years, Schliemann decided that Hisarlik was the site of Troy. In 1868, he took his large fortune to Greece and published his first archaeological book *Ithaka, der Peloponnesus und Troja* ('Ithaca, the Peloponnese, and Troy') in which he argued for Hisarlik and not Bunarbashi was the site of Troy.

He further asserted that the graves of the Greek commander Agamemnon and his wife, Clytemnestra, at Mycenae, which had been described by the Greek geographer Pausanias, were not the tholoi (vaulted tombs) outside the citadel walls but lay inside the citadel. Later on, he managed to prove both his theories by excavation. In 1868, Schliemann took over Calvert's excavations on the eastern half of the Hisarlik site, which was on Calvert's property. The Turkish government owned the western half. Calvert became Schliemann's collaborator and partner.

In 1871, Schliemann began work on Troy. His excavations commenced before archaeology had developed as a professional field. He believed that Homeric Troy must be in the lowest level, so he and his workers dug hastily through the upper levels, reaching fortifications that he took to be his target. In 1872, he and Calvert fell out over this method. Schliemann was angry when Calvert published an article stating that the Trojan War period was missing from the site's archaeological record.

In 1873, Schleimann discovered fortifications and remains of an ancient city and discovered gold jewellery which he smuggled out of Turkey. He believed that the city he discovered was Homeric Troy; however, later on it was identified as Priam. It was later discovered that Schliemann's claim to the treasure had been wrong all along. His findings did not amount to the treasure of Priam, but were rather a relic from an unknown culture, which had flourished many years before ancient Troy.

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When Schliemann proposed to resume work at Hisarlik in 1874, he was delayed by a court case that the Turkish government had brought against him about the division of his spoils, particularly the gold treasure, and it was not until 1876 that he attained permission to resume work.

In 1875, Schliemann published *Troja und seine Ruinen* ('Troy and Its Ruins') and in 1876 he began excavation at Mycenae. After discovering the Shaft Graves with their skeletons and more regal gold (including the so-called Mask of Agamemnon), he cabled the king of Greece and published his results in Mykenal in 1878. After an unsuccessful excavation in Ithaca designed to locate the site mentioned in the *Odyssey* in 1878, he resumed work at Hisarlik the same year. He conducted a third excavation at Troy in 1882–83 and a fourth from 1888 until his death. Émile Burnouf, a classical archaeologist, and Rudolf Virchow, the famous German pathologist, joined him there in 1879. In his last two seasons Schliemann had the expert assistance of Wilhelm Dörpfeld. He brought to Troy the new system and efficiency of the German classical archaeologists working in Greece, and he was able to expose the stratigraphy at Troy more clearly than before and to revolutionize Schliemann's techniques. In 1884, Schliemann, together with Dorpfeld, excavated Tiryns near Mycenae.

Criticism

Schliemann was a supporter of the historicity of Homeric sites mentioned in the works of Homer and an archaeological excavator of Hisarlik, now presumed to be the site of Troy. He believed that Homer's *Iliad* reflects historical events. Schliemann's excavation of nine levels of archaeological remains with dynamite has been condemned as destructive of important historical artifacts, including the level that is believed to be the historical Troy. His methods have been described as savage and brutal. He has been criticized for plowing through layers of soil without proper maintenance of records, no mapping of finds and few descriptions of discoveries.

At Troy, Heinrich Schliemann discovered a reserve of gold and other artifacts, which he subsequently named as 'the Treasure of Priam' in 1873. He smuggled the gold treasure out of the country and gave it to the German government to showcase. But the treasure got lost during the Second World War, only to later resurface in Russia, where it is now being kept at the Pushkin Museum.

Schliemann also commenced and funded the removal of medieval structures from the Acropolis of Athens in 1874. In spite of considerable opposition, including from King George I of Greece, Schliemann continued with the project which was later described as an act of vandalism. From 1874 to 1876 Schliemann conducted excavations at the Greek archeological site of Mycenae where he drew many wrong conclusions based on his work. Schliemann erroneously identified a golden mask as having belonged to the ancient Greek military leader Agamemnon.

In the last years of his life, Schliemann suffered greatly with ear trouble and travelled hoping for a cure but in vain. On 25 December 1890, while walking across a square in Naples, he collapsed and died the next day. Schliemann brought conviction, enthusiasm, dedication and a not inconsiderable fortune to the work. Schliemann was able to provide both funds and publication of results needed for excavations. As a result, he dominated the field of Mycenaean archaeology in his lifetime, and, despite his faults, still commands the loyalty of classical archaeologists.

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Check Your Progress

1. Who are archaeologists and what do they study?
2. On the basis of whose work, Schliemann decided that Hisarlik was the site of Troy?
3. When did Schliemann, together with Dorpfeld, excavated Tiryns near Mycenae?

3.3 GERTRUDE CATON THOMPSON

Gertrude Caton Thompson was an influential British archaeologist at a time when participation by women in the discipline was not common as it was dominated by men and by Victorian and Edwardian sensibilities. She was born in London on February 1, 1889 to William Caton Thompson and Ethel Page. She attended private schools in Paris and in Eastbourne. She attributed her interest in archaeology to her early encounters with antiquity- gained on holidays abroad. She went for a trip to Egypt with her mother in 1911, followed by a series of lectures on Ancient Greece given by Sarah Paterson at the British Museum. Indeed, a trip to Rome is where Gertrude recalled feeling ‘the first stirrings of interest in past civilizations’.

In 1912, she received an inheritance which helped ensure her financial independence and support her later excavations. In 1914, she joined the First World War effort as she worked for the British Ministry of Shipping. Thompson’s first experience in the field of archaeology came in 1915 while working as a bottle washer at a Palaeolithic site being excavated at Rochers Rouges in France. This made her decide that she wanted to make a serious study of prehistory. In 1921, she went for studies at University College London where she was taught by Margaret Murray, Flinders Petrie and Dorothea Bate, excavating in Upper Egypt during the winter of that year.

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Thompson's Contribution as an Archaeologist

1. Excavations in Malta

In 1921, along with Margaret Murray, Thompson contributed in the excavation of the Neolithic and/or Bronze Age temple at Borg-en-Nadur near St. George's Bay in Malta and a prehistoric cave at Ghar Dhalam. She was assigned with responsibilities of investigating the caves near the temple searching for Neanderthal skulls as evidence for a land bridge between Malta and the continent of Africa. However, she did not find evidence to support this theory. Nevertheless the excavation yielded other notable artifacts, such as Bronze Age pottery that closely paralleled Sicilian styles of the same period.

2. Work in Egypt

During the 1920s she worked as an archaeologist, mainly in Egypt for the British School of Archaeology Egypt, although she also carried on fieldwork in Malta. In Egypt she contributed in excavations at many sites including Abydos, Badari, and Qau-el-Kebir. She took active interest in all facets of prehistoric Egypt and was one of the first archaeologists to look at the full-time spectrum from the Palaeolithic through to pre-dynastic Egypt. She not only found numerous archaeological artifacts from Egypt but also organized their exhibition in the Egyptian Exhibition in England. A number of these findings are now housed in the British Museum's collection.

Thompson teamed with Egyptologist Guy Brunton to explore Neolithic settlement remains at Hemamieh while working in the Badari region during 1923–24. Her work at the site was distinguished by its meticulousness. She began her work by arranging the site into ten by thirty foot intervals. She watchfully excavated in arbitrary six-inch levels, and recorded the exact position of each artifact. Along with her excavation methods, Thompson was also the first to use air surveys to locate archaeological sites. These approaches to excavation were in many respects a generation ahead of her time and 'sets her apart from her contemporaries and the majority of her successors'. The results of this excavation was published in the classic, '*The Badarian Civilization and the Predynastic Remains near Badari*', were near revolutionary.¹

In 1925, Thompson and the geologist Elinor Wight Gardner, another woman, commenced the first archaeological and geological survey of the northern Fayum, where they wanted to link ancient lake levels with archaeological stratification. Thompson found the earliest farming civilization so far in the Fayum region of Egypt, estimated to about 4000 BC. They continued working in the Fayum over the next two years for the Royal

¹ Linda Ellis, 2003, "*Archaeological Method and Theory: An Encyclopaedia*" Routledge, p.89

Anthropological Institute where they discovered two unknown Neolithic cultures.

Thompson and Gardner also conducted excavations of the pre-historic sites at Kharga Oasis in 1930. Her publication of '*Kharga Oasis in Prehistory*' was the first publication of the new Athlone Press of the University of London. In addition to this, the flints she was allowed to bring back to London are permanently housed in the Institute of Archaeology in London. This led to research more broadly on the Paleolithic civilizations of North Africa. In 1928, she made her first visit to the Kharga Oasis during her expedition to the Zimbabwe excavations. She made three expeditions to the Kharga Oasis from 1930 to 1933. Gardner did the surveying for many of the excavations. Thompson had to excavate only for Paleolithic artifacts because there was such a variety of pre-historic civilizations at the Kharga Oasis including Neolithic artifacts. Thompson found that the Kharga Scarp contained water without rainfall, which helped to supply water to a Neolithic civilization. Since the Kharga Scarp contained many Paleolithic sites, she was able to excavate many implements used by those civilizations.

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3. Excavations in Zimbabwe

The ruins of Zimbabwe are considered to be the largest ancient stone construction south of the Sahara desert. When the British colonial rulers of the region discovered the site, they could not believe that the indigenous people of the region were proficient of constructing anything as impressive as Great Zimbabwe. In 1928, Thompson was invited by the British Association for the Advancement of Science to undertake a politically extremely sensitive assignment of investigating the origins of ruins in southeastern Zimbabwe near Lake Mutirikwe. The site consisted of three sets of structures which contained multiple buildings.

Great Zimbabwe had been earlier excavated by James Theodore Bent and David Randall-MacIver and controversy fumed as to whether the site was the work of Africans or of some other civilization. Finally, after years of dispute, Thompson arranged an archaeological team consisting only of women for the Zimbabwe excavations, which was the first of its kind. She used ceramics, which were similar to what modern villagers were using, and structures like terrace walls to know who built the structures from the site. Thompson along with Kathleen Kenyon conducted excavations that led her to the conclusion that Zimbabwe was the product of a 'native civilization'. The findings attracted considerable negative press attention and was received negatively by many within the archaeological community. Modern archaeologists now hold the view that the city was the outcome of a Shona-speaking African civilization.

Thompson retired from fieldwork after the Second World War. She went on to have her memoirs released as an autobiography entitled '*Mixed*

Memoirs in 1983. She breathed her last in 1985, in her 97th year at Broadway, Worcestershire.

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Check Your Progress

4. What was Thompson's first experience in the field of archaeology?
5. Why did Thompson teamed up with English Egyptologist Guy Brunton?
6. Who was the first archaeologist to use air surveys to locate archaeological sites?
7. Name the geologist with whom Thompson commenced the first archaeological and geological survey of the northern Fayum.

3.4 DEVELOPMENT OF NEW ARCHAEOLOGY

New Archaeology or Processual Archaeology is a form of archaeological theory that has its origins in 1958 with the work of Gordon Willey and Philip Phillips, '*Method and Theory in American Archaeology*' in which the authors stated that 'American archaeology is anthropology or it is nothing.' Proponents of this archaeology assert that with the rigorous use of the scientific method it was possible to cross the limits of the archaeological record and know something about how the people who used artifacts lived. It was an intellectual movement which believes in logical positivism as a guiding research philosophy, modelled on the scientific method—something that had never been applied to archaeology before.

Before the emergence of new archaeology in 1960, culture-history was a dominant point of view. In fact, the century before 1960 was the 'long sleep' of archaeological theory, in which very little explicit discussion of theory occurred. The inability of culture-history to answer the 'how' and 'why' of the past events was because of its mono-casual explanations and the descriptive level of this framework. Together these factors led to the emergence of new archaeology.²

The processualists discarded the cultural-historical belief that culture was a set of norms held by a group and communicated to other groups by diffusion and instead maintained that the archaeological remains of culture were the behavioural results of a population's adaptation to particular environmental conditions. Theory in the new archaeology attempts to explain change and recognise the process by which it came about. Thus, it represents an important movement from the main traditions of archeology, in which

² Asish Mishra, 2011, "History of Archaeology", Shakti Publishers and Distributors, Delhi, p.105

the description was considered to be more important than the explanation of change.³ It was time for a New Archaeology that would apply the scientific method to find and make apparent the laws of cultural growth in the way that societies responded to their environment. Archaeologists have generally recognised the works of Colin Renfrew, Kent V. Flannery, Ian Hodder and L.R Binford as indicative of the growth of processual school of archaeology.⁴

The New Archaeology laid emphasis on theory formation, model building, and hypothesis testing in the pursuit of general laws of human behavior. According to processualists cultural history cannot be repeated: it is futile to tell a story about a culture's change unless you are going to test its inferences. There is no scientific ground to determine as to whether a culture history one has built is correct. The processualists clearly wanted to go beyond the cultural-historical methods of the past (simply building a record of changes) to focus on the processes of culture (what kinds of things happened to make that culture). In processual archaeology, culture is considered basically as the adaptive mechanism that permits people to adjust with their environments.

The processualists had two tools to strike out in this new archaeology—Ethno-archaeology and the rapidly growing varieties of statistical techniques. Ethno-archaeology is the study of the social organization and other ethnological features of present-day societies based on their material culture, in order to draw conclusions about past societies from their material remains. It is the application of archaeological techniques on deserted villages, settlements, and sites of living people. Lewis Binford conducted the classic processual ethno-archaeological study by examining the archaeological remains left by mobile Inuit Upper Palaeolithic hunters-gatherers .

Since the processualists uses scientific method so there arose a need for examination of huge amounts of data. Processual archaeology came about during the quantitative revolution, which comprised an explosion of complicated statistical methods fueled by growing computing powers and growing access to them. Data collected by processualists (and still today) comprised both material culture characteristics (like artifact sizes and shapes and locations), and data from ethnographic studies about historically known population make ups and movements. This data was utilized to build and ultimately test a living group's adaptations under particular environmental conditions and thus to explain prehistoric cultural systems.⁵

Processualists were concerned with the dynamic relationships (causes and effects) that operate among the components of a system or between systematic components and the environment. The process was by definition

3 Ibid., p.104

4 Vijneshu Mohan, 1998, "*India: 50 Years of Independence (1947-97)-Status, Growth and Development*", B.R.Publishing Corporation, Delhi, p.51

5 <https://www.thoughtco.com/what-is-processual-archaeology-172242>

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repeated and repeatable: first, the archaeologist observed phenomena in the archaeological or ethno-archaeological record, then they employ those observations to form clear hypotheses about the connection of that data to the events or conditions in the past that might have caused those observations. Next, the archaeologist would decipher what kind of data might support or reject that hypothesis, and finally, the archaeologist would go out, collect more data, to test the validity of the hypotheses. If it was found to be valid for one site or circumstance, the hypothesis could be tested in another one.

Since there was a plenty of data and so much variability, the search for general laws rapidly became difficult. As a consequence the archaeologists found themselves in sub-disciplinary specializations to be able to manage: spatial archaeology dealt with spatial relationships at every level from artifacts to settlement patterns; regional archaeology required understanding trade and exchange within a region; inter-site archaeology sought to identify and report on socio-political organization and subsistence; and intra-site archaeology planned to understand human activity patterning.

Before processual archaeology, archaeology was not naturally seen as a science, because the conditions on one site or feature are never similar and so by definition not repeatable. Richard Gould states that one of the dictums of archaeology is that every site is unique. What the new archaeologists did was to make the scientific method practical within its limitations.

However, what processual archaeologists found was that the sites and cultures and circumstances varied too much to be simply a reaction to environmental conditions. It was a formal, Unitarian principle that archaeologist Alison Wylie called the 'paralysing demand for certainty'. There had to be other things going on, including human social behaviors that had nothing to do with environmental adaptations.

The weakness of processual archaeology appeared from the beginning of its approach. The archaeologists believe that it is difficult to dig up a social system, ideology, a kingship terminology and a philosophy. Apart from this it is very complicated to reconstruct the social organisation and ideology of a society. This is the most important reason for them to discard processual archaeology.⁶ The critical reaction to processualism born in the 1980s was called post-processualism, which is a different story but no less influential on archaeological science today.

The post-processual archaeology, which identifies itself as an interpretative perspective and is against processualism, stresses the subjectivity and historical particular; anti-science and objectivity; symbolism, ideology; relative position and highlights the plurality of events and individuality.

⁶ Asish Mishra, 2011, p.107

Check Your Progress

8. Who wrote the book '*Method and Theory in American Archaeology*'?
9. Whose works were recognised by whom as indicative of the growth of processual school of archaeology?
10. What is Ethno-archaeology?

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3.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Archaeologists are scientists who study the genesis, development and behaviour of human beings, past and present. They investigate the cultures, languages, archaeological remains and physical characteristics of people in different parts of the world.
2. On the basis of works by Frank Calvert, an English archeologist, Heinrich Schliemann decided that Hisarlik was the site of Troy.
3. In 1884, Heinrich Schliemann, together with Dorpfeld, excavated Tiryns near Mycenae.
4. In 1915, Thompson got her first experience in the field of archaeology while working as a bottle washer at a Palaeolithic site being excavated at Rochers Rouges in France.
5. Thompson teamed up with English Egyptologist Guy Brunton to explore Neolithic settlement remains at Hemamieh while working in the Badari region during 1923–24.
6. Gertrude Caton Thompson was the first archaeologist to use air surveys to locate archaeological sites.
7. Elinor Wight Gardner was the geologist with whom Thompson commenced the first archaeological and geological survey of the northern Fayum.
8. Gordon Willey and Philip Phillips wrote the book '*Method and Theory in American Archaeology*'.
9. Archaeologists have recognised the works of Colin Renfrew, Kent V. Flannery, Ian Hodder and L. R. Binford as indicative of the growth of processual school of archaeology.
10. Ethno-archaeology is the study of the social organisation and other ethnological features of present-day societies based on their material culture, in order to draw conclusions about past societies from their material remains.

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3.6 SUMMARY

- Heinrich Schliemann was a German businessman and a pioneer of field archaeology. He believed in historical reality of places mentioned in the works of Homer.
- Schliemann was an archaeological excavator of Hisarlik, now supposed to be the site of Troy, along with the Mycenaean sites-Mycenae and Tiryns.
- However, Schliemann's excavation of nine levels of archaeological remains with dynamite has been condemned as damaging to the important historical artifacts. Schliemann was amongst the pioneer in the study of Aegean civilization in the Bronze Age.
- In spite of his errors and wrong conclusions, the world continued to venerate Heinrich Schliemann as one of the most significant archeologists of all times.
- Gertrude Caton Thompson was great British archaeologist at a time when participation by women in this field was not common as it was dominated by men and by Victorian and Edwardian sensibilities. She attributed her interest in archaeology to her early encounters with antiquity- gained on holidays abroad.
- Although she did considerable archaeological work in Egypt, she also went on expeditions in countries like Malta, Zimbabwe and South Arabia. Many of her contributions to the field of archaeology comprise a technique for excavating archaeological sites and information on Paleolithic to Pre-dynastic civilizations in Zimbabwe and Egypt.
- Thompson was truly a remarkable woman, who helped in shaping the future of archaeology. She took the science of archaeology to the next level, and was well ahead of her times. Her excavation techniques were unique that showed concern for the natural environment around the sites she excavated. She was very meticulous in her findings and recordings of artifacts.
- She held many official positions in organizations such as the Prehistoric Society and the Royal Anthropological Institute. Even retirement couldn't stop her as she continued to perform research and visited the sites.
- New Archaeology or Processual Archaeology is a form of archaeological theory that has its origins in 1958 with the work of Gordon Willey and Philip Phillips, '*Method and Theory in American Archaeology*' in which the authors stated that 'American archaeology is anthropology or it is nothing.'

- Proponents of this archaeology emphasised that with the rigorous use of the scientific method it was possible to cross the limits of the archaeological record and know something about how the people who used artifacts lived.
- It was an intellectual movement which believed in logical positivism as a guiding research philosophy, modelled on the scientific method—something that had never been applied to archaeology before.
- Before the emergence of new archaeology in 1960, culture-history was a dominant point of view. The processualists discarded the cultural-historical belief.
- The New Archaeology laid emphasis on theory formation, model building, and hypothesis testing in the pursuit of general laws of human behaviour.
- The processualists clearly wanted to go beyond the cultural-historical methods of the past (simply building a record of changes) to focus on the processes of culture (what kinds of things happened to make that culture).
- Before processual archaeology, archaeology was not naturally seen as a science, because the conditions on one site or feature are never similar and so by definition not repeatable.
- However, what processual archaeologists found was that the sites and cultures and circumstances varied too much to be simply a reaction to environmental conditions.
- The weakness of processual archaeology appeared from the beginning of its approach. The archaeologists believe that it is difficult to dig up a social system, ideology, a kingship terminology and a philosophy.
- Apart from this it is very complicated to reconstruct the social organization and ideology of a society. This is the most important reason for them to discard processual archaeology.
- Post-processualism was a scientific movement in archaeological science that took place in 1980s. It was the critical reaction to processualism but no less influential on archaeological science today.

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3.7 KEY WORDS

- **Dictum:** It is a formal pronouncement from an authoritative source.
- **Ethnography:** It is the scientific description of peoples and cultures with their customs, habits, and mutual differences.
- **Oasis:** It is a place in a desert where there is a water and therefore plants and trees and sometimes a village or town.

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- **Pathologist:** It is a person who studies the causes and effects of diseases, especially one who check laboratory samples of body tissue for diagnostic or forensic purposes.
- **Spatial:** It is something relating to space.

3.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. What did Heinrich Schliemann discovered at Troy? What happened to the treasure and where it is kept at present?
2. Which work of Heinrich Schleimann was a subject of ample criticism?
3. Briefly discuss the contributions of Thompson as an Archaeologist.

Long Answer Questions

1. Discuss the early life and contribution of Heinrich Schliemann to archaeology.
2. Examine the early life and works of Gertrude Caton Thompson in the field of archaeology.
3. Elaborate Thompson's excavations in Egypt.
4. Define the term 'New Archaeology' or 'Processual Archaeology'. Discuss the origins and development of new archaeology.

3.9 FURTHER READINGS

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UNIT 4 ARCHAEOLOGY IN INDIA - I

NOTES

Structure

- 4.0 Introduction
- 4.1 Objectives
- 4.2 The Asiatic Society
 - 4.2.1 Contribution of Sir William Jones
 - 4.2.2 Contribution of James Prinsep
- 4.3 Answers to Check Your Progress Questions
- 4.4 Summary
- 4.5 Key Words
- 4.6 Self Assessment Questions and Exercises
- 4.7 Further Readings

4.0 INTRODUCTION

The urge for archaeological explorations took a very long time to germinate on the Indian soil. There are hardly any traces of archaeology in ancient India and medieval India too remained practically unaffected by it till the end. The earliest work on archaeology was done in the eleventh century by a historian, Kalhana, who perhaps seems to have understood, however imperfectly, the value of historical reconstruction of the material remains of past. He conducted a systematic study of coins and inscriptions, but also made it a point to visit ancient monuments and relics, and acquired in addition a thorough mastery of the topography of his land which enabled him to produce a masterpiece, the *Rajtarangini*, with a degree of objectivity never met with before in India.¹

Alberuni, who came to India during the invasions of Mahmud Ghaznavi in the eleventh century, was another historian who showed a scientific understanding and an objective approach through his book titled *Tehkik-e-Hind* or *Kitab-ul-Hind*. Later on Abul Fazl (in the sixteenth century) displayed a more scholarly approach to the national relics of the past and his *Ain-i-Akbari* exemplifies fairly accurate notices of a large number of historical monuments and sites.

Interest in archaeology in India began earlier than the establishment of the Asiatic Society. From the sixteenth century onwards, there are numerous references to Indian monuments in the writings of European travellers in the country. Travelogues thus form the first source material of archaeological writings on India. The tradition continued well into the eighteenth century,

¹ S. Roy, 1961, "The Story of Indian Archaeology", New Delhi, p.4.

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but from about the middle of that century there is clear evidence of the beginnings of systematic scholarly attention to archaeology.

However, a true antiquarian spirit in India ultimately came from the West only when the antiquarian wealth of India started attracting the attention of the officers of the English East India Company during the last quarter of the 18th century. It was Dr. Samuel Johnson, an English litterateur and his friend Sir William Jones, the then Supreme Court Judge, who were the first to recognize the supreme need for systematic investigations into the remains of India's past. In 1784, Sir William Jones founded the Asiatic Society at Calcutta for enquiring into the history, antiquities, arts, sciences and literature of Asia. The Society was intended to study the tradition and the history of the east and to conserve the remains of its ancient edifices and trace the vestiges of its ruined cities. However, the real impetus for archaeological research came from James Prinsep. His genius and labours helped archaeology to free itself from antiquarian and literary affiliations who assumed the direction of virtually the entire field of archaeological work in India.

In this unit, you will study about archeological exploration and development in India. Also, the unit deals with the foundation, objectives and members of the Asiatic Society of Bengal. In addition to this, you will also learn about the contribution of James Prinsep and Sir William Jones towards the Indian Archeology.

4.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the foundations, aims and objectives of the Asiatic Society of Bengal
- Analyse the contribution of Sir William Jones to the development of Indian Archaeology
- Examine the contribution of James Prinsep towards the Indian Archaeology

4.2 THE ASIATIC SOCIETY

The Asiatic Society was founded on 15 January 1784 by Sir William Jones in a meeting presided over by Sir Robert Chambers in the Grand Jury Room of the Supreme Court at the Fort William in Calcutta, then capital of the British, to enhance and further the cause of Oriental research. At the time of its foundation, this Society was named as 'Asiatick Society'. In 1825, the society dropped the antique *k* without any formal resolution and the Society was renamed as 'The Asiatic Society'. In 1832, the name was changed to

‘The Asiatic Society of Bengal’ and again in 1936 it was renamed as ‘The Royal Asiatic Society of Bengal.’ Finally, on 1 July 1951 the name of the society was changed to its present one. The main objectives of the Society were as follows:

- to organize, initiate and promote researches in Humanities and Science in Asia
- to establish, build, erect, construct, maintain and run research institutions, reading rooms, museums, auditoriums and lecture halls
- to organize lectures, seminars, symposia, discussions, meetings and award of medals, prizes and scholarships in furtherance of the objectives

On September 29, 1796 the Society decided to have its own building. J.H. Harrington, then Vice-President selected the corner of Park Street and Chowringhee Road Kolkata (present location) for the Society’s house and the site was granted to the Society. The original plan for the new building was prepared by Captain Thomas Preston and modified by the French architect, Jean-Jacques Pichou. The first quarterly meeting of the Society was held at its new building on 3 February 1808. The Society is housed in a building at Park Street in Kolkata (Calcutta). The Society moved into this building during 1808. In 1823, the Medical and Physical Society of Calcutta was formed and all the meetings of this society were held in the Asiatic Society.

Charles Wilkins and Alexander Hamilton were the distinguished early members of the Society. Initially, the Grand Jury Room of the Supreme Court was used for the meetings of the members, who were required to pay a quarterly fee of two *mohurs*. The members were elected by means of ballot-voting.

Initially, only the Europeans were elected members of the Society. However, at the initiative of Hoarse Hayman Wilson, a number of Indians were elected members in 1829, which included Dwarakanath Tagore, Sivchandra Das, Maharaja Baidyanath Roy, Maharaja Bunwari Govind Roy, Raja Kalikrishna Bahadur, Rajchunder Das, Ram Comul Sen and Prasanna Coomar Tagore. Ram Comul Sen was elected ‘Native Secretary’ on December 12, 1832. Later on, Rajendralal Mitra became the first Indian President of the Society in 1885. Both the orientalist, Brajendranath De, and one of his grandsons, the historian, Barun De, were for some time vice president of the Asiatic Society.

Collection of the old manuscripts was one of the main activities of the Asiatic Society. There was a vast collection of Sanskrit manuscripts with the society. At present, the library of the Asiatic Society has a collection of around 117,000 books and 79,000 journals printed in almost all the major languages of the world. It has also a collection of maps, microfilm, paintings, pamphlets and photographs. The earliest printed book preserved

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in this library is Juli Firmici's *Astronomicorum Libri* which was published in 1499. It also has a large number of books printed in India in the late 18th and early 19th centuries. The library also possesses many rare and scarcely available books. It has a rich collection of about 47,000 manuscripts in 26 scripts. The most noteworthy amongst them are an illustrated manuscript of the *Qur'an*, a manuscript of the *Gulistan* text, and a manuscript of *Padshah Nama* bearing the signature of Mughal Emperor Shahjahan. At present there are around 80,000 journals in the library.

The Society also proved to be a key centre of Oriental studies and research and extended its helping hand to the other two major centres of activity that paved the way to the Indian Renaissance, namely, the College at Fort William and the Serampore Mission of William Carey. A proposal came to the Asiatic Society from the Serampore Mission in 1805 to publish classical Sanskrit works with their English translations, and Ramayana was the first book chosen for this. The Society spent five thousand five hundred rupees from its fund for this purpose. From 1788 till its end in 1839 the journal *Asiatick Researches* ran into twenty volumes and was superseded by the *Journal of the Asiatic Society*, henceforth the official organ of the Society.²

The Library of the Asiatic Society is its most important asset and its importance lies not only in numerical strength of its holdings but also in its rich and unique contents.³ Contribution of the Society members enriched the library. Henry Richardson provided seven Persian manuscripts to the library on March 25, 1784. William Marsden gifted his book *The History of Sumatra* (1783) on November 10, 1784. Robert Home, the first Library-in-Charge (1804) donated his valuable collection of works on art. The first accession of importance was a gift from the Seringapatam Committee on February 3, 1808 consisting of a collection from the Palace Library of Tipu Sultan. Surveyor-General Colonel Mackenzie contributed to the library by donating his collection of manuscripts and drawings in December 1822.

Since 1849, the Society has printed *Bibliotheca Indica*, a collection of rare and unpublished works belonging to Oriental literature and containing original text-editions as well as translations into English, and also grammars, dictionaries, bibliographies, and studies.⁴ In the 20th century, valuable collection of books were donated by Dr. B.C. Law, Dr. G.W. Gurner, Rama Prasad Chanda, Dr. Pratul Chandra Gupta, Dr. Nirmal Kumar Bose, Dr. Pratap Chandra Chunder and several individuals.

The Asiatic Society announced its intention of establishing a Museum in 1796 and it was actually established in the beginning of 1814 under the superintendence of Dr. Nathaniel Wallich, a Danish botanist. The rapid

2 <http://www.indev.nic.in/asiatic/History/index.htm>

3 <http://www.asiaticsocietykolkata.org/library/history>

4 https://en.wikipedia.org/wiki/The_Asiatic_Society

growth of its collection is evident from the first catalogue, published in 1849 and other descriptive catalogues of different sections. In 1839, the Society proposed to the Government for setting up a public museum at Calcutta and the Indian Museum of Calcutta was established in 1866. The Society handed over its valuable collections to it. The Society however still maintains a museum of its own possession of Ashokan Rock Edict (250 BC), copper plates, coins, sculptures, manuscripts and archival records. Some works of genius, like Joshua Reynolds' *Cupid asleep on Cloud*, Guido Cagnacci's *Cleopatra*, Thomas Daniell's *A Ghat at Benares* and Peter Paul Rubens' *Infant Christ* are also in the possession of this museum.

Three historical factors explain the success of Asiatic Society. Firstly, it was evident that the early British role of the trader would be replaced by that of a territorial ruler, and the time was ripe for a systematic investigation of the country. Secondly, as Poliakov has shown, in their effort to free themselves from Judaeo-Christian thought, Western philosophical thinking turned to India for the origin of culture and religion. This approach is well reflected in the works of Voltaire, who was 'convinced that everything has come to us from the banks of the Ganges, astronomy, astrology, metempsychosis, etc.' This image of India considerably influenced German Romanticism. Thirdly, the closing years of the 18th century witnessed the growth of many literary and philosophic societies in Britain. By 1815 every important provincial town had its society, supported by both the local aristocracy and the local manufacturers who were equally aware of the social value of scientific discovery . . . The results of this activity were vast and valuable. The flora and fauna of Britain, the nature of its soils and rocks, were examined in detail, catalogued, and given a scientific order and arrangement. The foundation of the Asiatic Society in Calcutta was totally in keeping with the scientific spirit of late eighteenth century Britain. ⁵

4.2.1 Contribution of Sir William Jones

Sir William Jones was an English philologist and a student of ancient India, particularly known for his proposition of the existence of a relationship among Indo-European languages. He was born at Beaufort Buildings, Westminster, London on 28 September 1746. His father William Jones, F.R.S, an able mathematician, died in 1749 and William Jones was raised by his mother Marie Nix Jones. He was sent to Harrow School in September 1753 and then went on to Oxford University. He graduated there in 1768 and completed his post-graduate degree in 1773. ⁶

5 [http://adcaacs.in/pdf/pdf/Article-Pastoral%20Nomadism%20in%20the%20Archaeology%20of%20India%20and%20Pakistan1%20\(2\).pdf](http://adcaacs.in/pdf/pdf/Article-Pastoral%20Nomadism%20in%20the%20Archaeology%20of%20India%20and%20Pakistan1%20(2).pdf)

6 Sailendra Nath Sen, 2010, "An Advanced History of Modern India", MacMillan Publishers Pvt.Ltd, p.131

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He was a linguistic prodigy. Alongside his studies he learnt Greek, Latin, Persian, Arabic and the basics of Chinese items at an early age. He then embarked on a career as a tutor and translator. During this time at the request of King Christian VII of Denmark he published *Histoire de Nader Chah* (1770), a French translation of a work originally written in Persian by Mirza Mehdi Khan Astarabadi. At the young age of 24, he acquired a reputation as an orientalist. In 1770, he joined the Middle Temple and studied law which ultimately led to his appointment as puisne judge to the Supreme Court of Judicature at Fort William in Calcutta, Bengal in March 1783. He arrived in Calcutta on 25 September 1783.

As mentioned earlier, Sir William Jones established the Asiatic Society in January 1784. Governor-General Warren Hastings was its patron and William Jones was its founding president. Jones was a great philological scholar who was proficient in Arabic and Persian languages when he was appointed to India and he knew 28 languages by the end of his career there. He gradually developed interest in Sanskrit, translating significant pieces of Hindu literature and Hindu and Arabic/Muslim legal texts, which contributed to the establishment of a civil law code in India. His *Digest of Hindu and Muslim Laws* (completed by Henry Colebrooke) was his major contribution. The aims of Asiatic Society were to inquire into history, antiquities, arts, sciences, and literature of Asia, and from the beginning it was envisioned that the learned Indians would become its members. Between 1788 and 1839, the Society collected and published on oriental manuscripts, coins and antiquities in Society's journal *Asiatic Researches* which set the standard for oriental research of the day. In 1847, the Society started making a wide variety of oriental literature more broadly available in *Bibliotheca Indica* series. It served as a model for the foundation of the Royal Asiatic Societies in the West.

The foundation of the Asiatic Society in India was the consequence of European Enlightenment. It was the belief in the value and benefits of knowledge and science and in universal history. Biblical history and chronology was based on the belief that all humans were related and one of the major tasks of the Society in India was to prove it. William Jones believed that Indian's were descendents of Noah's son Ham and that Sanskrit was related to other ancient languages, such as Phoenician, Egyptian, and Celtic. He pointed out that Sanskrit was the fountain head of many languages: "The Sanskrit language whatever be its antiquity, is of a wonderful structure more perfect than the Greek, more copious than the Latin, and more exquisitely refined than either, yet bearing to both of them a stronger affinity, both in the roots of verbs and in the forms of grammar, than could possibly have been produced by accident."⁷

7 Ibid.,132

He further believed that for 3,500 years Sanskrit was the language of philosophy, religion, medicine, astronomy, mathematics, literature and of all branches of learning not only in India, but also in every other region influenced by the Indian culture until their conquest by Muslims and the use of Arabic by the new ruling class and religion. Through his knowledge of Sanskrit language, a mixture of many older Indo-Aryan dialects, and by comparing it with the history and developments of other languages, he created Indo-European linguistics.⁸

By associating Sanskrit to the European language family, William Jones integrated Hindu civilization to that of Europe. He had an indirect influence on the growth of the science of comparative philology. He collected evidences to prove that the game of chess was discovered in India. He supported the premise that Plato and Pythagoras borrowed their philosophical ideas from India. The two principles of non-duality of God (advaitavada) and the transmigration of the soul of Hinduism fascinated William Jones. He showed that India excelled in logic, geometry and arithmetic. In his last discourse to the Society he observed that Newton's theory and part of his philosophy may be found in the Vedas.⁹

By means of his works, William Jones changed the public opinion towards India. He showed that the Indians had a civilization when Europe did not. He and his co-workers at the Asiatic Society were evidence of a type of intellectual archaeology, of exploring and appreciating South Asia through the history of its culture. They believed in the great contribution of oriental civilization to world history and made it accessible to Europe and to India itself. The oriental studies became a respected discipline as a result of the efforts of Society's members.¹⁰ Indian archaeology is highly indebted to Sir William Jones. His discovery of the synchronism between Chandragupta Maurya and Alexander the Great provided Indian archaeology with its first positive date i.e., 326 BC. In 1788, Charles Wilkins, a close associate of William Jones, revealed the mysteries of the Gupta as well as the Kutila scripts and laid the foundation of epigraphical studies in India.

Thus, William Jones is one of the most interesting figures in the history of India. He was not only an erudite scholar who knew more than two dozen languages but made a number of great discoveries in Indian studies. He died in Calcutta on 27 April 1793 at the age of 47 and is buried in South Park Street Cemetery. The Asiatic Society survived William Jones's death and opened its doors to the members of the Bengali intelligentsia in 1829. Dwarkanath Tagore was among the first Indian members of the Society. By promoting Indian culture, William Jones gave India a weapon in their hands which

8 Tim Murray, 2007, "Milestones in Archaeology: A Chronological Encyclopedia", ABC-CLIO, p.115-16

9 Sailendra Nath Sen, p.132

10 Ibid., p.116

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could be used against the Europeans whenever they attempted to belittle the Indian civilization.

4.2.2 Contribution of James Prinsep

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James Prinsep was born on 20 August 1799 to John Prinsep and his wife, Sophia Elizabeth Auriol. John Prinsep went to India in 1771 and became a successful indigo planter. After earning good money he returned to England in 1787 and established himself as an East India merchant. He moved to Clifton in 1809 after incurring losses. He managed to find work for all his sons and several members of the Prinsep family rose to high positions in India. John Prinsep later became a Member of Parliament.

James Prinsep initially went to study in a school in Clifton. He showed a flair for detailed drawing and mechanical invention made him study architecture under the gifted but eccentric Augustus Pugin, an Anglo-French artist, architect and critic. However, due to some problem with his eyesight he was unable to take up architecture as a profession. His father knew of an opening in the assay department at the mint in India and sent him to train in chemistry in a hospital and later as apprentice to Mr Bingley, assay master at the Royal Mint in London (1818–19).

Prinsep found the job of an assay master at the Calcutta mint and reached Calcutta on 15 September 1819. A year later he was sent by his superior, the eminent orientalist Horace Hayman Wilson, to work as assay master at the Benares mint where he stayed till 1830. He then moved back to Calcutta as deputy assay master and when Wilson resigned in 1832, he was promoted as assay master. On his position as assay master he conducted many scientific studies. He also formed intimacy with Major Herbert, a scientific officer of the East India Company's army, who had started a periodical called *Gleanings in Science* with the proposed object to make known in India, the discoveries made in arts and sciences. Prinsep contributed several articles to this periodical. In 1831, Major Herbert was appointed astronomer to the king of Avadh and transferred the conduct of his periodical to Prinsep, who improved it to rival publications of the same nature in Europe. In 1833, he called for reforms to Indian weights and measures and advocated a uniform coinage based on the new silver rupee of the East India Company.

James Prinsep was a gifted artist and draftsman. He made meticulous sketches of ancient monuments, astronomy, instruments, fossils and other subjects. He continued to take an interest in architecture at Benares. After his eyesight was restored, he studied and demonstrated temple architecture, designed the new mint building at Benares in addition to church. In addition to his official duties, he improved the drainage of the city by constructing an arched tunnel. He helped renovate the dilapidating minarets of mosque built

by Aurangzeb. He conducted the city's first census, built a church there and prepared a balance of extraordinary precision to indicate the 3/1000th part of a grain. He also made a series of sketches related to Benares in pencil and ink drawings that were later reproduced as lithographs under the title of *Views and Illustrations of Benares*.¹¹

In 1832, Prinsep succeeded H. H. Wilson as secretary of the Asiatic Society of Bengal. By merging *Gleanings in Science* with the society he became the founding editor of *Journal of the Asiatic Society* and contributed articles on chemistry, mineralogy, numismatics and on the study of Indian antiquities. He was also very interested in meteorology and the tabulation of observations and the analysis of date from across the country.

Prinsep showed great interest in numismatics. He used bilingual Indo-Greek coins to decipher Kharoshti script. He interpreted coins from Bactria and Kushan as well as Indian series coins, including 'punch-marked' ones from the Gupta series. According to Prinsep there were three stages of development of coins--the punch-marked, the die-struck, and the cast coins. He initially held the view that ancient India had no native coinage but he later modified his view and suggested that old Indian coinage was restricted to those 'punch-marked' on silver and gold.

James Prinsep provided the real impetus for archaeological research in India. Both Alexander Cunningham and Falconer emphasized on his 'burning, irrepensible enthusiasm' which led him to complete the task of a dozen men. James Fergusson, a Scottish architectural historian, was of the opinion that if James Prinsep would have lived to continue for a few years longer, the researches which he commenced and continued with such success, probably would have succeeded in raising the veil which still shroud in obscurity the antiquities of India.¹²

The deciphering of the Indian scripts is a remarkable story. Its culmination was reached in Prinsep's deciphering of the Brahmi script in 1834, a discovery which can be compared with Henry Rawlinson's reading of the cuneiform Sumerian script in 1835. This was followed up by the decipherment of the Ashokan inscription and the establishment of its contemporaneity with the Greek rulers of the East who are mentioned in the inscriptions. Thus, for the first time Indian history was placed on a sound chronological basis. Later on, the second script used in the North-West of the Indian subcontinent, commonly known as the Kharoshthi script, was deciphered. James Prinsep was the man, whose genius and labours helped archaeology to free itself from antiquarian and literary affiliation and who

11 The Tribune, March 28, 2010, Spectrum

12 Ravi Prakash, *The Journey of Indian Archaeology: From Antiquarianism to Archaeology under British Rule*, SAJTH, January 2013, Vol. 6, No. 1, © South Asian Journal of Tourism and Heritage

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assumed the direction of virtually the entire field of archaeological work in India. He encouraged the antiquarian interests of his European contemporaries in India and appealed to them to undertake and report on field investigations as they travelled around.

He got an overwhelming response and was flooded with reports of archaeological findings, collections of coins and facsimiles of inscriptions for study and publication. He even got cooperation from unexpected quarters. For instance, Maharaja Ranjit Singh's French General Jean Baptiste Ventura who excavated Buddhist stupa at Manikyala, near Rawalpindi, sent his findings to James Prinsep. Likewise, Claude Auguste Court, another French officer in the Maharaja's army, sent coins and inscriptions from Punjab to the Asiatic Society.¹³

As we have seen that Prinsep was basically a man of science and he brought accuracy to his task and the scientist's mastery of factual details, which enabled him to make many discoveries. He not only discovered new things, but succeeded in subjecting existing discoveries to an interpretative analysis. His research and writings were not confined to India. He conducted the exploration of the stupas in Afghanistan, particularly the historical site of Begram, which brought to light for the first time the names of the Graeco-Bactrian and Indo-Scythian dynasties, of whom there were no previous historical records.

Prinsep also undertook the task of conservation of a stone pillar in Allahabad which had ancient inscriptions. It was under Prinsep that the task translating original material from the authentic records of ancient Hindu dynasties of the Southern Peninsula was completed and they were published.

Prinsep's incessant hard work resulted in an infection of the brain that led to his premature death in 1840 ending a glorious phase not only of Indological studies but also of the Asiatic Society. As mentioned by Lord Curzon in his speech at the meeting of the Asiatic Society in 1900: 'How these men labored is illustrated by the fact that Prinsep died of overwork at the age of 40.' Dr. Huger Falconer's obituary, published in the *Colonial Magazine*, said, 'Of his intellectual character, the most prominent feature was enthusiasm — one of the prime elements of genius; a burning, irrepressible enthusiasm, to which nothing could set bounds. His powers of perception were impressed with genius — they were clear, vigorous and instantaneous. The extent of his capacity was wonderful, and the number and variety of his acquirements no less remarkable.'¹⁴

13 Ibid

14 Ibid

Check Your Progress

1. Who founded the Asiatic Society and when?
2. Under whose leadership was the Museum of the Asiatic Society of Bengal established?
3. Who contributed to the library of the Asiatic Society by donating his collection of manuscripts and drawings in December 1822?
4. Who discovered the synchronism between Chandragupta Maurya and Alexander the Great and provided Indian archeology with its first positive date, i.e. 326 BC?
5. When did James Prinsep succeed H. H. Wilson as secretary of the Asiatic Society of Bengal?
6. 'How these men labored is illustrated by the fact that Prinsep died of overwork at the age of 40.' Who spoke this line for James Prinsep at a meeting of Asiatic Society in 1900?

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4.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Sir William Jones founded the Asiatic Society on 15 January 1784 in Calcutta.
2. The museum of the Asiatic Society of Bengal was established under the leadership of Dr. Nathaniel Wallich, a Danish botanist.
3. Surveyor-General Colonel Mackenzie contributed to the library by donating his collection of manuscripts and drawings in December 1822.
4. Sir William Jones discovered the synchronism between Chandragupta Maurya and Alexander the Great and provided Indian archeology with its first positive date, i.e., 326 BC.
5. In 1832, James Prinsep succeeded H. H. Wilson as secretary of the Asiatic Society of Bengal.
6. Lord Curzon said this statement for James Prinsep in his speech at the meeting of the Asiatic Society in 1900.

4.4 SUMMARY

- The urge for archaeological explorations took a very long time to germinate on the Indian soil.
- Interest in archaeology in India began earlier than the establishment of the Asiatic Society. From the sixteenth century onwards, there are

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numerous references to Indian monuments in the writings of European travellers in the country. Travelogues thus form the first source material of archaeological writings on India.

- However, a true antiquarian spirit in India ultimately came from the West only when the antiquarian wealth of India started attracting the attention of the officers of the English East India Company during the last quarter of the 18th century.
- Sir William Jones founded the Asiatic Society in 1784 at Calcutta for enquiring into the history, antiquities, arts, sciences and literatures of Asia.
- By associating Sanskrit to the European language family, William Jones integrated Hindu civilization to that of Europe.
- Through his researches, William Jones changed the public opinion towards India. He proved the superiority of Indian civilization to that of Europe.
- James Prinsep was another British scholar of repute. He was a gifted artist and draftsman. He made meticulous sketches of ancient monuments, astronomy, instruments, fossils and other subjects.
- He showed great interest in numismatics and epigraphy. He deciphered many scripts which provided deeper insights into Indian history. Prinsep's works provided the real impetus for archaeological research in India.
- To sum up we can say that the works of Sir William Jones and James Prinsep under the banner of Asiatic Society contributed immensely to the development of Indian Archaeology.

4.5 KEY WORDS

- **Cuneiform:** It is one of the earliest systems of writing, developed in ancient Mesopotamia, which used a reed to impress wedge-shaped marks onto the surface of clay tablets.
- **Manuscript:** It is a book, document or piece of music written by hand rather than typed or printed.
- **Mohur:** It is a gold coin that was formerly minted by several governments, including British India and some of the princely states.
- **Orientalist:** It refers to someone who is from the West and studies the language, culture, history, or customs of countries in eastern Asia.
- **Philologist:** Philologist is a person who deals with the structure, historical development and relationships of a language or languages.
- **Prodigy:** It refers to a young person with exceptional qualities or abilities.

- **Topography:** It is the arrangement of the natural and artificial physical features of an area.

4.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short Answer Questions

1. Write a short note on the beginning of archaeology in India.
2. Briefly discuss the role of Sir William Jones towards the establishment of Asiatic Society of Bengal and the development of Indian Archaeology.
3. What was the aim behind setting up the Asiatic Society?
4. Write short notes on the following:
 - (a) Library of the Asiatic Society
 - (b) Museum of the Asiatic Society

Long Answer Questions

1. Describe the foundations, aims, objectives and activities of the Asiatic Society of Bengal.
2. Explain the reasons for the success of Asiatic Society of Bengal.
3. Assess Sir William Jones as a philologist, polymath and orientalist.
4. Elaborate the contribution of James Prinsep in the development of Archaeological studies in India.

4.7 FURTHER READINGS

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BLOCK - II

THE GREAT ARCHAEOLOGISTS AND EXCAVATION

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UNIT 5 ARCHAEOLOGY IN INDIA - II

Structure

- 5.0 Introduction
- 5.1 Objectives
- 5.2 Colin Mackenzie
- 5.3 Alexander Cunningham
- 5.4 Ancient Monuments Preservation Act
- 5.5 Archaeological Survey of India
- 5.6 Answers to Check Your Progress Questions
- 5.7 Summary
- 5.8 Key Words
- 5.9 Self Assessment Questions and Exercises
- 5.10 Further Readings

5.0 INTRODUCTION

Archaeological and historical pursuits in India started with the efforts of Sir William Jones. The efforts put by Jones had a long backing, of enthusiasts and dilettantes like Tavernier, Finch and Bernier, Thevenot, Careri, Fryer, Ovington, Hamilton, Anquetil du Perron, Joseph Tieffenthaler, William Chamber, to name a few, who carried out survey of monuments in various parts of India, earlier. Colin Mackenzie and Alexander Cunningham, the two military officers of English East India Company in India due to their antiquarian interest also surveyed various parts of India and contributed to the development of archaeology in India. Their efforts led to the foundations of the Archaeological Survey of India in 1861 which was established with the objective of conducting archaeological explorations and excavations, maintenance, conservation and preservation of centrally protected monuments/sites and remains.

In 18 March 1904 the British government in India enacted and passed the Ancient Monuments Preservation Act, 1904, which was aimed to provide for the preservation of ancient monuments and objects of archaeological, historical or artistic interest and to prevent the excavation by unauthorized persons of sites of historic interest and value.

In this unit, you will study about the contribution of Colonel Colin Mackenzie and Alexander Cunningham in the development of Indian Archaeology. This unit will also deal with the enactment of the Ancient Monuments Preservation Act, 1904. In addition to this, you will also learn about the origins, development and functions of the Archaeological Survey of India (ASI).

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5.1 OBJECTIVES

After going through this unit, you will be able to:

- Assess the labors of Colin Mackenzie in the Indian Archaeology
- Recognise the contribution of Alexander Cunningham in laying the foundations of the Archaeological Survey of India
- Examine the Ancient Monuments Preservation Act, 1904
- Explain the origins and development of the Archaeological Survey of India

5.2 COLIN MACKENZIE

Colonel Colin Mackenzie was a Scottish army officer in the English East India Company who later became the first Surveyor General of India. He was born in Stornoway, Scotland in 1754. Not much is known of his early life but it is believed that he started his work as a Comptroller of the Customs at Stornoway from 1778 to 1783. In his youth he had keen interest in mathematics. Lord Kenneth Mackenzie (last Earl of Seaforth) and Francis (fifth Lord Napier) sought his help in preparing a biography of John Napier and his work on logarithms. Kenneth Mackenzie helped Colin to obtain commission with the English East India Company to join the Madras Army. He arrived in Madras on 2 September 1783. He joined as a Cadet in the Infantry division but was transferred in 1786 as a Cadet of Engineers.

When he arrived in India he first met Hester, the daughter of Lord Francis Napier, who was married to Samuel Johnston who worked as a civil servant at Madurai. Hester introduced Mackenzie to some Brahmins to obtain information on Hindu mathematical traditions as part of the biographical memoir on John Napier and the history of logarithms. However, the biography project was subsequently dropped but Mackenzie continued to take an interest in antiquities.

For more than a decade he was busy with military duties in India. In around 1783, he started military duties in Coimbatore and Dindigul followed by engineering duties in Madras, Nellore and Guntur and during the campaign against Mysore from 1790 to 1792. He saw the Siege of Pondicherry in

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1793. He prepared sketches on the eve of the Third Mysore War indicating the position of the British forces. They were highly appreciated by Lord Cornwallis, the Governor-General who conducted the war to success. He was posted as a commanding engineer to Ceylon and returned in 1796. He worked his way to become a Major and then a Colonel. He was able to follow his interest in antiquities after his return from Ceylon.

After the defeat of Tipu Sultan in the Fourth Anglo-Mysore War in 1799, Mackenzie was asked to survey Mysore territories as well as the Ceded districts which the Nizam of Hyderabad handed over to the British in 1800. This allowed Mackenzie to have a large team of interpreters, draftsmen and illustrators through whom he collected a lot of information on natural history, architecture, local history, geography, social customs and folk tales of Mysore and Rayalaseema regions.¹ Mackenzie had a vast collection of inscriptions, manuscripts, annals, drawings, maps and coins. His collections of historical documents related to India are considered to be the most extensive ever made by a single individual in Europe or in India.

Mackenzie was the first to reveal the rich architectural heritage of the Vijayanagara ruins at Hampi. He also visited Amravati near Guntur and made 85 sketches of the sculptures. He is also credited with the accurate measurement of the giant statue of Gomateshwara at Shravanabelagola. In 1811, Mackenzie was deputed to Java, where also he pursued his antiquarian interests. He spent two years (1811-13) in Java where he got married with Petronella Jacomina Bartels. His surveyed Java and submitted a report which included many watercolors illustrating life during the period.

In 1757, the East India Company under Lord Clive had appointed James Rennell as Surveyor General for Bengal. In 1810, Colin Mackenzie was appointed as the Surveyor General of Madras Presidency but later these posts were abolished. On 26 May 1815 Mackenzie was appointed as the Surveyor General of India with his headquarters at Fort William in Calcutta.² However, he was allowed to stay in Madras till 1818 to complete his survey of South India. Ultimately his antiquarian work received the appreciation of the Court of Directors of the East India Company in England and the military government was asked to 'present him with a sum of 9000 pagodas, as full remuneration for his past labours, and as a mark of our approbation of his work.'³ He was also awarded with a certificate acknowledging his collection of materials.³

1 <https://www.thehindu.com/society/history-and-culture/Col.-Colin-Mackenzie-Eagle-eye-of-a-manuscript-man/article16925797.ece>

2 D.K Chakrabarti, 1988, "A History of Indian Archaeology", New Delhi, p.29

3 SAJTH, January 2013, Vol. 6, No. 1© South Asian Journal of Tourism and Heritage, The Journey of Indian Archaeology: "From Antiquarianism to Archaeology under British Rule" RaviPrakash

R.H Phillimore commented thus, ‘Mackenzie has preserved for countless students of history an immense mass of interesting and valuable material, which otherwise would surely have perished. It is doubtful, however, whether his enthusiasm for collecting was tempered with sufficient discrimination, or whether he could have dealt with very much of it even had he lived to examine it more thoroughly himself.’

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Check Your Progress

1. Name the two military officers of English East India Company who largely contributed to the development of archaeology in India.
2. Whose collections of historical documents related to India are considered to be the most extensive ever made by a single individual in Europe or in India?

5.3 ALEXANDER CUNNINGHAM

Alexander Cunningham was born in London on 23 January 1814 to Allan Cunningham and his wife Jean née Walker. He received his early education at Christ’s Hospital, London. Through the influence of Sir Walter Scott, Alexander Cunningham obtained cadetship at the East India Company’s Addiscombe Seminary (1829–31), and received technical training subsequently at the Royal Engineers Estate at Chatham. At the age of 19, he joined the Bengal Engineers as a Second Lieutenant and spent the next 28 years in the service of British Government of India.

Cunningham arrived in India on 9 June 1833. Those were the days of Orientalism in India. He met James Prinsep and during 1837 and 1838, he was in daily communication with Prinsep. Soon, Cunningham became Prinsep’s intimate friend, confidant and pupil. Prinsep passed on to him his lifelong interest in Indian archaeology and antiquity.

He served as an aide-de-camp (ADC) to Lord Auckland, the then Governor-General of India, from 1836 to 1840. He paid his visit to Kashmir during this period. In 1841, Cunningham was made executive engineer to the king of Oudh. In 1842, he was called by the ruler of Jaipur to serve in the army for suppressing an uprising in Bundelkhand. He was then posted at Nowgong in Central India before he saw action at the Battle of Punniar in December 1843. Then he joined as an engineer at Gwalior and in 1844–45, he got constructed an arched stone bridge over the Morar River. In 1845–46, he was sent to Punjab where he helped construct two bridges of boats across the Beas river prior to the Battle of Sobraon. In 1846, he was appointed commissioner to demarcate boundaries. Letters were written to

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the Chinese and Tibetan officials by Lord Hardinge, but no officials joined. In 1847, a second commission was set up which was led by Cunningham to establish the Ladakh-Tibet boundary, which also included Henry Strachey and Thomas Thomson. The commission aimed at delimiting the northern boundaries of the Empire after the First Anglo-Sikh War, concluded with the Treaty of Amritsar, which ceded Kashmir as war indemnity expenses to the British. His work *Essay on the Aryan Order of Architecture* (1848) resulted from his visits to the temples in Kashmir and his travels in Ladakh during his tenure with the commission. He also explored the Buddhist monuments of Central India along with Lieutenant Maisey in 1851 which is mentioned in his account.

In 1856, he was assigned the duty of Chief Engineer in Burma, which had just been annexed by the British. But archaeology remained his obsession. He stayed there for two years and from 1858 served for three years on the same post in the North-Western Provinces. In both regions, he established public works departments. He was therefore absent from India during the Revolt of 1857. In 1860, he was appointed Colonel of the Royal Engineers and retired as Major General on 30 June 1861.

Alexander Cunningham's contribution towards Indian Archaeology

Cunningham had showed keen interest in antiquities early in his career. Excavations became a regular activity among British antiquarians after Jean-Baptiste Ventura, general of Ranjit Singh, who inspired by the French explorers in Egypt had excavated the bases of pillars to discover large stashes of Bactrian and Roman coins. In 1834, Cunningham wrote to the *Journal of the Asiatic Society of Bengal*, an appendix to James Prinsep's article on the relics in the Manikyala Tope. He had conducted excavations at Sarnath in 1837 and made careful drawings of the sculptures. In 1842, he excavated at Sankissa and at Sanchi in 1851. He published *The Bhilsa Topes* in 1854 in an attempt to establish the history of Buddhism based on architectural evidence.

The need for a methodical survey under government sponsorship was being increasingly felt by Cunningham and by 1851 he initiated communication with the East India Company on the value of an archaeological survey. He provided a justification that could earn the funding needed for the endeavour stating that:

...would be an undertaking of vast importance to the Indian Government politically, and to the British public religiously. To the first body it would show that India had generally been divided into numerous petty chiefships, which had invariably been the case upon every successful invasion; while, whenever she had been under one ruler, she had always repelled foreign conquest with determined resolution. To the other body it would show that Brahmanism, instead of being an unchanged and unchangeable religion which had subsisted for ages, was of comparatively modern origin, and had been constantly receiving additions and alterations; facts which prove that the establishment of the Christian religion

in India must ultimately succeed.⁴ In other words, he attempted to justify the systematic archaeological exploration of India on the grounds that politically it would help the British to rule India and lead to an easier acceptance of Christianity in the country.

After Cunningham's retirement from the military service, the Viceroy of India Lord Canning appointed him as an archaeological surveyor to the Government of India in 1861. He held this post from 1861 to 1865. Most antiquarians of the 19th century who took interest in identifying the major cities mentioned in ancient Indian texts did so by gathering clues found in classical Graeco-Roman records and the travelogues of travellers to India such as Fa-Hein and Hsuan-Tsang. Cunningham succeeded in identifying some of the places mentioned by Hsuan-Tsang and counted among his major achievements the identification of Aornos, Taxila, Sangala, Srughna, Ahichchhatra, Bairat, Sankisa, Shravasti, Kaushambi, Padmavati, Vaishali, and Nalanda.

Cunningham would also regularly corroborate his identifications through field surveys unlike his contemporaries. Particularly the identification of Taxila was made difficult partly due to miscalculation of the distances recorded by Pliny in his *Naturalis Historia* which pointed to a location somewhere on the Haro river, two days march from the Indus. Cunningham noticed that this position did not match with the route of Chinese pilgrims. His subsequent explorations in 1863-64 testified his hypothesis.

After his department was disbanded in 1865 due to lack of funds, Cunningham returned to England and wrote the first part of his *Ancient Geography of India* (1871), covering the Buddhist period; but failed to complete the second part, which covered the Muslim period. In 1870, Lord Mayo revived the Archaeological Survey of India, wherein Cunningham served as the Director-General from 1 January 1871. So he returned to India and made field explorations each winter, conducting excavations and surveys from Taxila to Gaur. He produced twenty-four reports, thirteen as author and the rest under his supervision by others. Other major works included the first volume of *Corpus inscriptionum Indicarum* (1877) which included copies of the edicts of Ashoka, *the Stupa of Bharhut* (1879) and *the Book of Indian Eras* (1883) which allowed the dating of Indian antiquities. No archaeologist in India, before or since, has had such a close personal familiarity with such an impressive stretch of territory. In his Memorandum of Instructions to his assistants written in 1871, Cunningham set a high ideal for archaeology:

'Archaeology is not limited to broken sculptures, old buildings and mounds of ruins, but includes everything that belonged to the world's history But our researches should be extended to all ancient remains whatever that will help to illustrate the manners and customs of former times'.

⁴ https://en.wikipedia.org/wiki/Alexander_Cunningham

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Cunningham collected a large number of coins, but much of that was lost when the steamship he was travelling in, the *Indus*, was wrecked off the coast of Sri Lanka in November 1884. However, the British Museum obtained most of the gold and silver coins. He had suggested to the British Museum that they should use the arch from the Sanchi Stupa to mark the entrance of a new section on Indian history. He also contributed numerous papers in the *Journal of the Asiatic Society* and the *Numismatic Chronicle*. He retired from the Archaeological Survey on September 30, 1885 and returned to London to continue his research and writing and wrote two books on numismatics. He was knighted in 1887. He died on 28 November 1893 in London.

Check Your Progress

3. Who felt the need for a methodical survey under government sponsorship for the first time in India?
4. When was the Archaeological Survey of India revived after it was disbanded in 1865 due to lack of funds, by whom?

5.4 ANCIENT MONUMENTS PRESERVATION ACT

‘The purpose of archaeology is to extract history from the monuments and artifacts of the past, to write history from the often inadequate relics that time has spared.’ However, Archaeology has greatly suffered in India because of appropriation by private persons of such antiquities as come to light from time to time. Sculptures, rings, coins, seals, gems and other remains were occasionally carried off by government officers for their friends and to present to distinguished visitors and tourists, or to decorate their houses and gardens. The demand and prices offered for such relics became so great that the natives were induced to search for them everywhere. Due to random fashion of making excavations, the sculptors got mixed up, and their history and meaning are lost. Dr. Burgess advised an amendment of the Treasure Trove Act of 1878, which could make it illegal to export the antiquities without an official permit. The government directed the local government to prepare a list of all the ancient monuments in their areas.

It was only in 1899, Lord Curzon, the Viceroy of India who saw the chaotic condition prevailing in the Archaeological Survey of India and the failure of the local government in looking after responsibility of the archaeological survey, once again decided to bring explorations, excavations, researches, epigraphs, publication and preservation of monuments under central government. In 1904, the central government enacted the Ancient Monuments Preservation Act for the first time, which was intended ‘to provide for the preservation of ancient monuments and objects of archaeological,

historical or artistic interest' and to prevent the excavation by unauthorized persons of sites of historic interest and value.

The Act was applicable to ancient monuments which had been declared as 'protected monuments' and invested the executive with sufficient legal authority in regard to the monuments in private ownership. The conservation program received great emphasis during the regime of the Governor-General Lord Curzon. A number of monuments and sites were declared, protected and brought under the purview of the Ancient Monument Preservation Act. In 1921, under the Government of India Act, 1919, the archaeology was made the central subject. The provinces were left merely with the power of declaring monuments and sites protected under the Ancient Monument Preservation Act. Even this power was transferred to the centre by the Government of India in 1935. In 1946, an important decision was taken to transfer the maintenance works of ancient monuments from the public works department to the Archaeological Survey of India.

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Check Your Progress

5. Under whose Viceroyalty was the Ancient Monuments Preservation Act, 1904 enacted in India for the first time?
6. What was the important decision taken in 1946 regarding the maintenance works of ancient monuments?

5.5 ARCHAEOLOGICAL SURVEY OF INDIA

A survey of archaeological remains throughout India is indispensable to the study of history. For the period when writing was unknown, we have to rely only on archaeological remains to trace the history. Moreover, ancient records have perished with the passage of time. The first systematic research into the subcontinent's history was conducted by the Asiatic Society, which was founded by William Jones on January 15, 1784.

Prominent among the early members of the society was Charles Wilkins who published the first English translation of the *Bhagavad Gita* in 1785 under the patronage of the then Governor-General of India, Warren Hastings. However, the most important of the society's achievements was the decipherment of the Brahmi script by James Prinsep. This successful decipherment inaugurated the study of Indian palaeography. Alexander Cunningham, a protégé of Prinsep, carried out a detailed survey of the Buddhist monuments. Inspired by early amateur archaeologists like the Italian military officer, Jean-Baptiste Ventura, Cunningham excavated many *stupas* of India. Cunningham funded many of his early excavations himself. However, he gradually realized the need for a permanent body to oversee

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archaeological excavations and the conservation of Indian monuments and used his stature and influence in India to lobby for an archaeological survey. Thus, the Archaeological Survey of India was eventually formed in 1861 by an act passed into law by Lord Canning with Cunningham as the first Archaeological Surveyor.

Between 1865 and 1871, the survey was abolished briefly due to the lack of funds but restored by Lord Lawrence, the then Viceroy of India. In 1871, the Survey was revived as a separate department and Cunningham was appointed as its first Director-General. Continuing until today, Alexander Cunningham is regarded as the 'Father of Indian Archaeology'.

In 1885, Cunningham was retired and was succeeded as Director-General by James Burgess. Burgess started a yearly journal *The Indian Antiquary* (1872) and an annual epigraphical publication *Epigraphia Indica* (1882) as a supplement to the *Indian Antiquary*. Under Burgess much attention had been devoted to the great monuments of Agra, Jaunpur, Delhi, Lahore etc. The post of Director General was permanently suspended in 1889 due to paucity of funds and was restored in 1902. During this period, conservation work in the different circles was carried out by the superintendents of the individual circles.

Lord Curzon restored the post of Director-General in 1902. Breaking with tradition, Curzon appointed John Marshall, a professor of classical studies at Cambridge University, to head the survey. Marshall served as Director-General from 1902 to 1928. He replenished and revived the survey whose activities were fast dwindling into insignificance. He modernized the approach to archaeology, introducing a program of cataloguing and conservation of ancient monuments and arte facts. He initiated the practice of allowing Indians to participate in excavations in their own country.

Marshall created the post of Government epigraphist and encouraged epigraphical studies. However, the most noteworthy event of his tenure was the discovery of the Indus Valley Civilization in 1921. The success and level of the discoveries ensured that the progress made in Marshall's tenure would remain unsurpassed. Harold Hargreaves succeeded Marshall in 1928. Hargreaves was succeeded by Daya Ram Sahni, supervisor of Marshall's excavation of Harappa in 1921, who in 1931 became the first Indian Director General of the Archaeological Survey of India.

Daya Ram Sahni was succeeded by J. F. Blakiston and K. N. Dikshit both of were involved in the excavations at Harappa and Mohenjodaro. In 1944, Mortimer Wheeler, a British archaeologist and army officer, took over as Director-General and served till 1948. During his tenure, Wheeler excavated the Iron Age site of Arikamedu and the Stone age sites of Brahmagiri, Chandravalli and Maski in South India. Wheeler established a new archaeological journal, *Ancient India* in 1946 and presided over

the partitioning of ASI's property during the Partition of India and helped establish an archaeological body for the newly-formed Pakistan.

Wheeler was succeeded by Niranjan Prasad Chakravarti in 1948. On 15 August 1949, the National Museum was inaugurated in New Delhi to house the artifacts displayed at the Indian Exhibition in the United Kingdom. Chakravarti was succeeded by Madho Sarup Vats and Amalananda Ghosh. Ghosh's tenure, which lasted until 1968, is renowned for the excavations of Indus Valley sites at Kalibangan, Lothal and Dholavira. In 1958, the *Ancient Monuments and Archaeological Sites and Remains Act* was passed which brought the archaeological survey under the aegis of the Ministry of Culture. A. Ghosh was succeeded by Brij Basi Lal who conducted archaeological excavations at Ayodhya to examine whether a Ram Temple preceded the Babri Masjid. During his tenure, the *Antiquities and Art Treasures Act* (1972) was passed advocating central protection for monuments considered to be 'of national importance'.

Lal was succeeded by Madhusudan Narhar Deshpande whose tenure lasts from 1972 to 1978 and Bal Krishan Thapar who served from 1978 to 1981. On Thapar's retirement in 1981, archaeologist Debala Mitra succeeded him and became the first woman Director-General of the Archaeological Survey of India. Mitra was succeeded by M. S. Nagaraja Rao. Archaeologists Jagat Pati Joshi and Munish Chandra Joshi succeeded Rao. When the Babri Masjid was demolished in 1992, Munish Chandra Joshi was the Director-General of ASI. The demolition generated Hindu-Muslim riots all over the India. As a result of the demolition, Joshi was terminated in 1993 and controversially replaced as Director-General by Indian Administrative Service (IAS) officer Achala Moulik, a step which initiated a tradition of appointing IAS bureaucrats in place of the appointment of archaeologists to head the survey. The tradition finally culminated in 2010 when Gautam Sengupta, an archaeologist, replaced K. M. Srivastava, an IAS officer, as Director-General. He was again succeeded by Pravin Srivastava, another IAS officer. Srivastava's successor Rakesh Tiwari was also a professional archaeologist. He was succeeded by another bureaucrat Usha Sharma who is the present Director General of Archaeological Survey of India.

The Archaeological Survey of India functions as an attached office of the Ministry of Culture. Till date, it has declared 3,686 monuments to be of national importance to the country. The major activities of ASI are-

1. Maintenance, conservation and preservation of centrally-protected monuments/sites and remains;
2. Conducting archaeological explorations and excavations;
3. Chemical preservation of monuments and antiquarian remains;
4. Architectural survey of monuments;

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5. Development of epigraphical research and publications;
6. Setting up and reorganization of site museums;
7. Training in different areas of Archaeology.

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Check Your Progress

7. Who is regarded as the 'Father of Indian Archaeology'?
8. Under whose tenure, as the Director General of the ASI, the discovery of Indus Valley Civilization took place in 1921?
9. Who was the first Indian Surveyor General of independent India?
10. Who is the present Director General of Archaeological Survey of India?

5.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Colin Mackenzie and Alexander Cunningham were the two military officers of English East India Company who prominently contributed to the development of archaeology in India.
2. Colonel Colin Mackenzie's collections of historical Indian documents are considered as the most extensive ever made by a single individual in Europe or in India.
3. For the first time in India, Alexander Cunningham felt the need for a methodical survey under government sponsorship.
4. In 1870, Lord Mayo revived the Archaeological Survey of India after it was disbanded in 1865 owing to the paucity of funds.
5. Lord Curzon was the Viceroy of India when the central government enacted the Ancient Monuments Preservation Act for the first time.
6. In 1946, an important decision took place under which the maintenance works of ancient monuments was transferred from the public works departments to the Archaeological Survey of India.
7. Alexander Cunningham is regarded as the 'Father of Indian Archaeology'.
8. The discovery of Indus Valley Civilization took place in 1921 under the tenure of John Marshall who was the then Director General of the ASI.
9. Niranjan Prasad Chakravarti was the first Indian Surveyor General of independent India.

10. Usha Sharma, a bureaucrat, is the present Director General of Archaeological Survey of India (ASI).

5.7 SUMMARY

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- The urge for archaeological explorations started with the efforts of Sir William Jones with the establishment of Asiatic Society of Bengal in 1784.
- Many European travellers who visited India surveyed monuments of various parts of India and wrote their memoirs.
- Two British military officers namely-Colin Mackenzie and Alexander Cunningham out of their antiquarian interests surveyed extensively during their postings in various parts of India.
- Colonel Colin Mackenzie, a Scottish army officer, had a vast collection of inscriptions, manuscripts, annals, drawings, maps and coins. His collections of historical documents related to India are considered to be the most extensive ever made by a single individual in Europe or in India.
- Colin Mackenzie's antiquarian work earned him appreciation from the Court of Directors of the East India Company in England and he was awarded for his contribution.
- Alexander Cunningham led a commission which was set up to establish the Ladakh-Tibet boundary. The commission aimed at delimiting the northern boundaries of the Empire after the First Anglo-Sikh War.
- Alexander Cunningham was another military officer who had great antiquarian interests and he was the first to prescribe the need for a methodical survey under government sponsorship and by 1851 he also initiated communication with the East India Company on the value of an archaeological survey.
- Cunningham founded the Archaeological Survey of India (ASI) in 1861 which was established with the objective of conducting archaeological explorations and excavations, maintenance, conservation and preservation of centrally protected monuments/sites and remains.
- Cunningham collected a large number of coins, but much of that was lost when the steamship he was travelling in, the *Indus*, was wrecked off the coast of Sri Lanka in November 1884. However, the British Museum obtained most of the gold and silver coins.
- Archaeology has greatly suffered in India because of appropriation by private persons of such antiquities as come to light from time to time.
- Sculptures, rings coins, seals, gems and other remains were occasionally carried off by government officers for their friends and to present to

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distinguished visitors and tourists, or to decorate their houses and gardens.

- In 1904, the central government enacted, for the first time, the Ancient Monuments Preservation Act to provide for the preservation of ancient monuments and objects of archaeological, historical or artistic interest and to prevent the excavation by unauthorized persons of sites of historic interest and value.
- Since its foundation, ASI had been headed by various Director Generals. Till date it has declared 3,686 monuments to be of national importance to the country.

5.8 KEY WORDS

- **Excavation:** It is the act or process of digging or removing earth carefully from an area in order to find buried remains.
- **Pagoda:** It is a unit of currency, a coin made of gold or half-gold minted by Indian dynasties as well as the British, the French and the Dutch.
- **Remuneration:** It is a payment for work that has been done or services that have been provided.
- **Hypothesis:** It is a proposed explanation made on the basis of limited evidence as a starting point for further investigation.
- **Numismatics:** It is the study or collection of coins, tokens, banknotes and medals.
- **Palaeography:** It is the study of ancient and historical handwriting.
- **Epigraphical:** It is the study of ancient inscriptions.
- **Decipherment:** It is the analysis of documents written in ancient languages, where the language is unknown, or knowledge of the language has been lost.

5.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Briefly explain the Ancient Monuments Preservation Act, 1904.
2. Who introduced Colin Mackenzie to some Brahmins and for what?
3. Write a short note on the relationship between Alexander Cunningham and James Prinsep.
4. Make a list of various Director Generals of the Archaeological Survey of India.

Long Answer Questions

1. Discuss in detail the contribution of Colin Mackenzie towards Indian Archaeology.
2. Describe the role of Alexander Cunningham in the foundation and development of Archaeological Survey of India.
3. Trace the evolution of the Archaeological Survey of India (ASI).
4. Discuss the functions of the Archaeological Survey of India (ASI).

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5.10 FURTHER READINGS

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UNIT 6 ARCHAEOLOGY IN INDIA-III

Structure

- 6.0 Introduction
- 6.1 Objectives
- 6.2 Sir John Marshall
- 6.3 Sir Mortimer Wheeler
- 6.4 Robert Bruce Foote
- 6.5 Harappa and Mohenjo-Daro Excavations
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- 6.7 Answers To Check Your Progress Questions
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6.0 INTRODUCTION

In India, archaeology has progressively transformed from antiquarian pursuit to rigorous science. Leading this transformation has been the Archaeological Survey of India (ASI). Since its establishment in 1861, it has been excavating the historical sites and deciphering and describing thousands of valuable inscriptions. Sir John Marshall who served as Director-General of ASI replenished and invigorated the survey whose activities were fast dwindling into insignificance. Sir Mortimer Wheeler, in his capacity as Director-General, excavated many sites in South India. Robert Bruce Foote was a geologist and archaeologist who conducted geological surveys of prehistoric locations in India for the Geological Survey of India.

In the 1920s, Daya Ram Sahni began excavations at Harappa, at almost the same time, R.D Banerjee commenced excavations at Mohenjo-Daro. These two sites are still considered to be the core of the vast spread of the Indus Valley Civilization. The development of aqua-lung and free-diving made it possible to view ancient remains. A new branch of submarine archaeology has opened new avenues of research. Marine archaeology has begun to provide useful information in the Indian context. The ancient port-city of Dwarka has been explored by the archaeologists from time to time.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain the contribution of Sir John Marshall in the development of Archaeological Survey of India
- Understand the role played by Sir Mortimer Wheeler in the growth of archaeology in India
- Examine the contribution of Robert Bruce Foote towards Indian archaeology
- Analyze the excavations conducted at the Indus Valley Civilization sites of Mohenjo-Daro and Harappa
- Examine the excavations conducted at Dwarka

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6.2 SIR JOHN MARSHALL

Sir John Hubert Marshall was the Director-General of the Archaeological Survey of India from 1902 to 1928. He was born on March 19, 1876 at Chester in England. He was educated at Dulwich College, London as well as King's College, Cambridge. In 1902, the Viceroy of India, Lord Curzon, hired John Marshall immediately after he finished his degree at Cambridge on the basis of his archaeological experience in Greece and Turkey. He was appointed as the Director-General of Archaeology within the British Indian administration. Marshall modernized the approach to archaeology introducing a program of cataloguing and conservation of ancient monuments and artefacts. He was at the forefront of the archaeology era in India becoming a prominent scholar who focused on the Indian archaeology scene. It was under the direct patronage of Lord Curzon that John Marshall began work. It was he who laid down the basic guidelines of this work:

It is in the exploration and study of purely Indian remains, in the probing of archaic mounds, in the excavation of old Indian cities, and in the copying and reading of ancient inscriptions, that a good deal of the exploratory work of the archaeologist in India will in future lie . . . It is in my judgment equally our duty to dig and discover, to classify, reproduce, and describe, to copy and decipher, and to cherish and conserve.”¹

Marshall initiated the practice of permitting Indians to participate in excavations in their own country. In 1913, he started the excavations at Taxila, which lasted for two decades. In 1918, he laid the foundation stone for the

1 Dilip K. Chakrabarti , 1982, “*The Development of Archaeology in the Indian Subcontinent*”, p.335-37 Author(s): Source: World Archaeology, Vol. 13, No. 3, Regional Traditions of Archaeological Research II (Feb., 1982), pp. 326-344 Published by: Taylor & Francis, Ltd. Stable URL: <http://www.jstor.org/stable/1243>

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Taxila Museum, which today hosts many artefacts. He then moved on to other sites, including the Buddhist centres of Sanchi and Sarnath.

Marshall's work gave evidence of the age of Indian civilization especially the Indus Valley Civilization and the Mauryan age. He started the excavation at Harappa with Daya Ram Sahni as the director and Harappa was discovered in 1921. In 1922, work began at Mohenjo-Daro with Rakhal Das Banerjee. The results of these excavations, which revealed a seeming ancient culture with its own writing system, were published in the *Illustrated London News* on September 20, 1924. Researchers linked the artefacts found at the two sites with the ancient civilization of Sumer in Mesopotamia. John Marshall announced the discovery of a new civilization in the Indus valley to the world. As S.N. Roy noted in *The Story of Indian Archaeology*, 'Marshall left India three thousand years older than he had found her.' This was because similar, till-then-unidentified seals were found at excavations at Mesopotamian sites. It was then that the world knew not only of a new civilization, but also of one contemporaneous with Mesopotamia. John Marshall also conducted excavations at the prehistoric site of Sohr Damb mound near Nal in Baluchistan. He is also known for his important role in the excavations at Knossos and many other sites on Crete between 1898 and 1901. Marshall was appointed a Companion of the Order of the Indian Empire (CIE) in June 1910 and knighted in January 1915.²

A new era of archaeology dawned with John Marshall. He reorganized the administrative structure of the Archaeological Survey of India and gave it a permanent footing for, 'the work of the archaeological officers is of a kind which cannot be discharged by any other existing agency and it can only cease if the government cease to admit their responsibility for the preservation of the ancient remains in the country.'³

Marshall directly shaped the course of Indian archaeology. Conservation of ancient monuments and objects was among his main concerns and the basic principles of conservation laid down by him in the Indian context are still pursued by the survey. The survey was reorganized and centrally consolidated. The whole of the Indian sub- continent was divided into a number of archaeological circles, each with its complement of officers and men.

Under John Marshall, the Archaeological Survey of India became the largest single organization of its kind in the history of archaeological research and witnessed its most magnificent period. The details of the discoveries and excavations conducted in India during this period by Marshall and his colleagues perhaps do not fit into the present survey of archaeological traditions, but a few significant points cannot be ignored. Firstly, the

2 [https://en.wikipedia.org/wiki/John_Marshall_\(archaeologist\)](https://en.wikipedia.org/wiki/John_Marshall_(archaeologist))

3 Vijai Shankar Śrivastava (edited), "*Cultural Contours of India: Dr. Satya Prakash Felicitation Volume*", Abhinav Publications, p.21

Annual Reports reveal that each and every part of India was given due attention. Secondly, a study of the number of memoirs published shows that specialized studies of monuments, sites and areas were not ignored. Thirdly, some of the discoveries and excavations revolutionized the study of Indian archaeology and ancient history-the discovery of the Indus Valley Civilization, explorations of Aurel Stein in Baluchistan and of N. G. Majumdar in Sind, and the excavations at Taxila and at some of the most important early historical sites of the Gangetic valley.

Fourthly, it was during this period that the people of the Indian subcontinent were appointed to superior positions in the Survey and associated with both excavations and discoveries. Many Indian scholars like Bhagawanlal Indraji, Ram Raj, and Rajendralal Mitra had shown their merit in the field of Indological studies in the nineteenth century and the help of the traditional Indian scholars was indispensable for the early decipherment of inscriptions. However, it was during this period that archaeology became a renowned part of Indian academic thinking.

Historical scholarship about India had already come of age when John Marshall was directing the Indian archaeological scene. Political history, religion, economy and culture of ancient India had been established on the basis of textual, inscriptional, numismatic, architectural, sculptural and other sources. Important sites associated with the course of ancient Indian history remained largely unexcavated so the historical image of ancient India was not clear. However, the excavations conducted by Marshall at the sites of Taxila, Bhita, Sravasti, Vaisali, Rajagriha, Sarnath and Nalanda unveiled the curtains. The work started by Marshall suddenly made the Buddhist period alive in the Indian cultural consciousness. In the field, Marshall was primarily concerned with the horizontal exposure of sites. This had not been earlier attempted in the Indian context. In fact, except the work of Bellasis at Brahminabad in Sind, no archaeologist had even thought about the total picture of the site.

Under Marshall's leadership, structures were separately described and their positions plotted in relation to the total plan of the site. Their history was determined on the basis of successive structural phases. Plans were drawn of the excavated settlement all together and the main cultural occupations were recreated both on the basis of structural remains and antiquities.

Marshall's excavation methods have been criticized on the ground that the depth of antiquities and 'strata' was interpreted in relation to a fixed bench-level on the top of the mound, in defiance of the principles of modern stratigraphic excavation. However, he achieved what he desired: a total picture of the site and its main historical-cultural periods. This point was later on accepted by Mortimer Wheeler who the strongest critic of Marshall's excavations.⁴ He retired in 1928 and passed away on August 17, 1958.

4 Dilip K.Chakravarti, 1982, op.cited

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6.3 SIR MORTIMER WHEELER

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Sir Robert Eric Mortimer Wheeler was a British archaeologist and officer in the British Army. He was born on September 10, 1890 in Glasgow to a middle class family. He was raised largely in Yorkshire before relocating to London in his teenage years. He studied the Classics at University College London (UCL) and started working professionally in archaeology, specializing in the Romano-British period. During the First World War he volunteered for service in the Royal Artillery. Later on, he obtained his doctorate from UCL before taking on a position at the National Museum of Wales. In 1926, he was appointed Keeper of the London Museum. In 1934, he established the Institute of Archaeology as part of the federal University of London, adopting the position of Honorary Director. During the Second World War, he re-joined the Armed Forces and rose to the rank of brigadier.

In 1944, he was appointed as the Director-General of the Archaeological Survey of India. From the beginning of his tenure, he sought to distance himself from previous Directors-General and their administrations by criticizing them and tried to introduce new staff who had no loyalty to his predecessors. He was assigned with a four-year contract (1944-48). He then toured the subcontinent, seeking to meet all of the Survey's staff members. He had drafted a prospectus containing research questions that he desired the Survey to lay emphasis on. These comprised understanding the period between the Indus Valley Civilization and the Achaemenid Empire, discerning the socio-cultural background to the Vedas, dating the Aryan invasion, and establishing a dating system for southern India before sixth century A.D. His tenure also witnessed a 25 per cent budget increase for the Archaeological Survey, and convinced the government to agree to the construction of a National Museum of Archaeology, to be built in New Delhi.

His work was exceptional in many respects. First, he took an overall view of archaeology beginning with the Palaeolithic Age and stressed the need for scientific analyses in archaeology. For example, the study of animal, human and crop remains at the Indus Valley cities of Mohenjo-Daro and Harappa, and the chemical analyses of metal samples from some sites. It was Wheeler who first argued the basic necessity of scientific aids in archaeology in India. Second, he emphasized the need for careful archaeological planning which was something new for India. Third, by conducting excavations at Taxila, Harappa and Arikamedu he not only demonstrated the importance of such planning by solving major problems associated with these sites but also introduced the modern concept of archaeological stratigraphy to India. He also introduced there for the first time the importance of the study of stratified ceramic material for determining the cultural succession at excavated sites and its importance in comparative study of material between different sites. Fourth, he gave field training in his methods to a large number of Indian

students who have kept his excavation techniques alive since then. He also wrote many articles on the excavation methods. Fifth, he realized that in such a large country like India it was not possible for Archaeological Survey alone to do the work. So he introduced effective participation by the universities and it was under his guidance and inspiration that several Indian universities started archaeological research.⁵

Among other innovations, he developed the use of a Cartesian coordinate system, or three-dimensional grid, with which the materials found in archaeological excavations, could be recorded. Wheeler's final contribution to the tradition of Indian archaeological research is something indescribable and can be cherished only by those who have felt it, directly or indirectly. He was at the helm of the Survey for only four years; despite this he infused an element of urgency into the Indian archaeological research. Archaeology in India became more exciting under him. He retired from the University of London in 1955 and died on July 22, 1976 in Leatherhead, near London.

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6.4 ROBERT BRUCE FOOTE

Robert Bruce Foote (September 22, 1834-December, 29 1912) was a British geologist and archaeologist who conducted geological surveys of prehistoric sites in India for the Geological Survey of India or GSI. Foote joined the GSI on December 29, 1858 as an Assistant under Dr. Charles Oldham. He was posted in the Madras Presidency, Hyderabad region and Bombay. In 1887, he became a Director of the GSI. He was one among many geologists in British India whose persistent enthusiasm, inexhaustible energy and relentless explorations reigned supreme. His integrated approach of geological and prehistoric expeditions in different regions of southern and western India brought forth significant evidence of prehistoric cultures.

Foote's explorations in south India was a turning point, from where branched off the twin-fields of prehistory and geology. There was a happy coincidence of Foote's early discoveries with the establishment of the Archaeological Survey of India (in 1861). It took nearly eight decades for the Survey to commence organized expeditions into the prehistory of India. In 1942, at the instance of the Archaeological Survey, the late Professor H.D. Sankalia began from where Foote had left Indian prehistory. With equal strength he attempted to fill the gaps observed by Foote and largely succeeded in placing Indian prehistory on a scientific footing.

He supported the cause of stratigraphic and economic geology, and prehistory of India. Mounted on a horseback he carried the torch of Indian prehistory and trekked through the hilly tracts of what is considered to be the hottest zone (the Rayalaseema) in the south. He travelled around 53,000

5 Dilip K.Chakravarti, 1982, op.cited, p.337

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km along with his friend for his findings, on horseback. In the end, he had accomplished an inimitable task and had lit many dark areas of India's past.

Though Foote had several forerunners in Indian prehistoric research, his innate search for the prehistoric age opened up an entirely new area of research. Within five years of joining the Geological Survey he had reached a milestone that ushered in an era of discoveries. He was the first to pick up a Palaeolithic find and his modesty prevented him making a sensation. Instead he brought this significant discovery to knowledge of his senior geologist, Dr. Oldham.

Foote's account of Palaeolithic finds was first published in 1866, in the *Madras Journal of Literature and Science*. This heralded the commencement of systematic documentation of prehistoric evidences in India. He not only described the geological perspective of stone tools but also endeavoured to fix their probable age in addition to contemporary climatic conditions.

He agreed with others that the chipped stone implements were made by the ancestors of the modern tribes in India and not by Aryans. Between 1863 and 1912, Foote discovered 459 prehistoric sites in various parts of southern India. He published comprehensive geological reports of several parts of the former Madras Presidency which represent a leading example of European dedication towards unravelling India's past in its entirety.

Between 1879 and 1880 he mapped the geological features along the east coast of India. These sites are being revisited by the present-day geo-archaeologists with the purpose of reconstruction of the procedures involved in the formation and preservation of stone tools in these deposits. In 1884, he also excavated caves at Billasurgam in Kurnool District of Andhra Pradesh. He also stayed in Bellary. The Bellary-Raichur-Kurnool area has come to be recognized as the centre of Neolithic culture in south India. After becoming the first geologist of the Mysore Geological Department, Foote traversed through the former Mysore State and published his field notes in the first memoir of this Department.

He laid strong foundation of Indian prehistoric studies over which present-day archaeologists have to a large extent succeeded in constructing the superstructure and have kept pace with the developments in method and theory taking place elsewhere in other parts of the world.

No stone was left unturned by Foote in fifty years of relentless endeavour-both geological and prehistoric. During his nearly six decades of stay in India, he lived his relentless geological tours with a missionary zeal, considerable intensity and passion for collecting prehistoric tools. He was a pioneer in the real sense of the term. He is truly regarded both the 'Father of Indian Prehistory' and 'Father of South Indian Geology.'

Check Your Progress

1. What were Sir John Marshall's main concerns with respect to Indian archaeology?
2. Who is regarded as the father of Indian prehistory?

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6.5 HARAPPA AND MOHENJO-DARO EXCAVATIONS

The two principle excavations in the Indus Valley Civilization are at Harappa and Mohenjo-Daro which are now in Pakistan. The Indus Civilization was put on the 'archaeological map' by the discovery of seal by Alexander Cunningham in 1873. In the early twenties of the 20th century Rai Bahadur Daya Ram Sahni began excavations at Harappa, at almost the same time Rakhhal Das Banerjee commenced excavations at Mohenjo-Daro. These two sites are still considered to be the core sites of the vast spread of Indus Valley Civilization. The civilization extended from northern Baluchistan and the Makran coast to the west to Uttar Pradesh in the east and from Manda in the north to Daimabad in the south. This vast area is continuously being explored and new sites come to light through novel explorations.⁶

Harappa Excavations

Harappa is situated in Sahiwal District of Pakistani Punjab on the banks of Ravi river. The ruins of Harappa were described by Charles Masson in 1842 in his *Narrative of Various Journeys in Balochistan, Afghanistan, and the Punjab*. However, the discovery of Charles Masson could not attract any archaeological interest for many years. In 1856, Alexander Cunningham visited the site of Harappa where the British engineers John and William Brunton were laying the railway line to connect the cities of Lahore and Multan. They needed strong bricks for it. They were told of an ancient ruined city near the lines, called Harappa. On visiting the city, they found it full of hard well-burnt bricks. However, it was badly destroyed by brick robbers. Alexander Cunningham noted that the amount of brick taken from the ancient site was enough to lay bricks for 'about 100 miles' of the railway line. Thus, many of the ancient structures at the site were damaged. In contrast, Mohenjo-Daro was far better preserved.

In 1872, Sir Alexander Cunningham published the first Harappan seal. About 50 years later, in 1912, more Harappan seals were discovered by John Faithfull Fleet which triggered the archaeological campaign under John Marshall, Rai Bahadur Daya Ram Sahni and Madho Sarup Vats who

⁶ Vijñeshu Mohan, 1998, "India: 50 Years of Independence (1947-97)-Status, Growth & Development-16: Archaeology" B.R Publication Corporation, Delhi, p.30

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began excavating Harappa in 1921, finding buildings and artefacts indicative of an ancient civilization.

Post-independence, excavations were conducted at Mehrgarh between 1974 and 1975. It provided the earliest evidence for settled life in the Indian Subcontinent going back to the seventh millennium BC, but also provided enough evidence for the steady and gradual emergence of the Harappan elements. The evidence from Mehrgarh laid to rest the earlier controversial theory of the Western world being responsible for the emergence of the Harappan Civilization. The excavations demonstrated seven different stages of development before the emergence of the Harappan culture in the last stage. Identification of the three phases of Harappan culture- Early Harappan (3300-2600 BC), Mature Harappan (2600-2000 BC) and Late Harappan (2000-1700 BC) demonstrate that there was a gradual cultural process of origin, development and decline.

Mohenjo-Daro Excavations

Mohenjo-Daro (Mound of the Dead) lies in the Larkana District in Sind (Pakistan), on the bank of river Indus. John Marshall tended to excavate the town along regular horizontal units, measured uniformly throughout the mound, ignoring the stratigraphy of the site. This meant that all the artefacts recovered from the same unit were grouped together, even if they were found at different stratigraphic layers. Thus, valuable information about the context of these finds was irretrievably lost. In 1944, Sir Mortimer Wheeler rectified this problem. He recognized that it was necessary to follow the stratigraphy of the mound rather than dig mechanically along uniform horizontal lines. Moreover, as an ex-army brigadier, he brought with him a military precision to the practice of archaeology.

Nine strata of buildings have been revealed at the site, all belonging to the Bronze Age. Perhaps the most unique feature of Indus Valley Civilization was the development of urban centres. The settlement is divided into two sections, one smaller but higher and the lower. Archaeologists designate these as the citadel and the lower town respectively. The citadel owes its height to the fact that buildings were constructed on mud brick platforms. It was walled, which meant that it was physically separated from the lower town. The lower town was also walled. A number of buildings were constructed on platforms, which served as foundations. The town was laid out with two roads which were 35 feet wide and cutting each other at right angles. The streets and lanes branched off these roads, also at right angles.

The houses were built, like modern oriental houses, round a courtyard. The courtyard was probably the centre of activities such as cooking and weaving. It is interesting that there was an apparent concern for privacy: there are no windows in the walls along the ground level. Besides, the main entrance does not give a direct view of the interior or the courtyard. Every

house had its own bathroom paved with bricks, with drains connected through the wall to the street drains. Staircases have also been found in some houses to reach a second storey or the roof. Many houses had wells, often in a room that could be reached from the outside and perhaps used by passers-by.

On the citadel we find evidences of structures that were probably used for special public purposes. These include the Great Bath and the warehouse. The Great Bath was an oblong bathing pool surrounded by a corridor on all four sides. There were two flights of steps on the north and south leading into the tank, which was made watertight by setting bricks on edge and using a mortar of gypsum. There were rooms on three sides, in one of which was a large well. Water from the tank flowed into a huge drain. Across a lane to the north lay a smaller building with eight bathrooms, four on each side of a corridor, with drains from each bathroom connecting to a drain that ran along the corridor. Like the tank of a Hindu temple, the Great Bath probably had a religious purpose.⁷

There no metals or stones in the alluvial plains of Mohenjo-Daro so these materials had to be imported. Large slabs, used for covering drains and similar heavy work, were quarried a hundred miles or farther up the river and brought down by boat. Small semi-precious stones with the metals reached Mohenjo-Daro from some other part of India, or from Afghanistan. Some of the small stone seals found at Mohenjo-Daro and Harappa show connection with seals discovered in Mesopotamia and Elam. Other connections with Mesopotamia and Elam can be observed in the fragments of steatite vases carved with a mat pattern, found in all three places and also the peculiarly etched carnelian beads which are known at Mohenjo-Daro and in Mesopotamia and Russia. Cotton and not flax was used as the weaving material. The actual fibres of the cotton have been found preserved by being corroded on a silver vase; the threads which formed the fabric show its texture.

The whole civilization discovered at Mohenjo-Daro shows a trading town. Everything was severely practical-there was no attempt at art; and though religion was manifest, the great temples with their beautiful architecture, which are a feature of Egypt and of latter India, do not occur. Mohenjo-Daro existed for trade alone.

Since the 1980s, there has also been growing international interest in Harappan archaeology. Experts from the subcontinent and abroad have been jointly working at both Harappa and Mohenjo-Daro. They are using modern scientific techniques including surface exploration to recover traces of clay, stone, metal and plant and animal remains as well as to minutely analyze every bit of available evidence. These explorations promise to yield interesting results in the future.⁸

7 A.L Basham, 1982, "The Wonder that was India", Third Revised Edition, Sidwick and Jackson, London, p.18

8 <http://www.ncert.nic.in/ncerts/l/lehs101.pdf>

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6.6 DWARKA EXCAVATIONS

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Dwarka or Dwaraka is a coastal town situated in Jamnagar district of Gujarat. Significant ancient remains have been discovered at Dwarka, both on land as well as under water by the Underwater Archaeology Wing (UAW) of the Archaeological Survey of India. Traditionally, modern Dwarka is identified with Dvaraka, mentioned in the Mahabharata as Krishna's city. Dwarka was a port, and some scholars have identified it with the island of Barka mentioned in the *Periplus of Erythrean Sea*. Ancient Dwarka sank in sea and hence is an important archaeological site. The first clear historical record of Dwarka is dated 574 A.D. and occurs in the Palitana inscription of Samanta Simhaditya. This inscription refers to Dwaraka as the capital of the western coast of Saurashtra and still more important, states that Krishna lived here. It is one of the best studied underwater sites in India.

The first archaeological excavations at Dwaraka were conducted by the Deccan College, Pune and the Department of Archaeology, Government of Gujarat, in 1963 under the direction of H.D. Sankalia. It revealed artefacts which were many centuries old. The UAV of the ASI conducted a second round of excavations in 1979 under the supervision of Dr S. R. Rao. He was emeritus scientist at the marine archaeology unit of the National Institute of Oceanography. Rao has excavated many Harappan sites including the port city of Lothal in Gujarat. He observed a different kind of a pottery known as lustrous red ware, which could be more than 3,000 years old. In his book *The Lost City of Dwaraka*, published in 1999, Rao writes about his undersea findings: 'The discovery is an important landmark in the history of India. It has set to rest the doubts expressed by historians about the historicity of the Mahabharata and the very existence of the city of Dwaraka.' On the basis of the results of these excavations, the search for the sunken city in the Arabian Sea began in 1981. Scientists and archaeologists have incessantly worked on the site for many years.

Underwater exploration project was sanctioned in 1984, directly by the then Prime Minister of India for three years. Excavation under the sea is a tough job. The sea offers too much resistance. Excavation is feasible only between the months of November and February, during low tide. The sea has to be smooth and there should be bright sunshine. In order to make the best possible use of the time available, divers use echo sounder to get a fairly accurate idea of the location and the depth of the object under water. The side scan sonar offers a view of the sea floor. The sonar signals sent inside the water return the signals. Reading of the signals discloses the broad nature of the object under water. Underwater scooters, besides the usual diving equipment are also used. Conducting 12 expeditions between

1983 and 1990, S.R. Rao's team came across discoveries that confirmed the existence of a submerged city.

Another significant discovery by the divers was a conch seal that established the submerged township's connection with the Dwaraka of the Mahabharata. The seal substantiate the mention made in the ancient text, the *Harivamsa* that every citizen of Dwaraka had to carry such a seal for purposes of identification. It is believed that Lord Krishna had declared that only one who carried such a seal could enter the city. A similar seal has been found onshore.

Many underwater explorations were carried out between 1998 and 2001 which indicated a highly civilized city which must have existed at that site, which had great maritime links with many other countries and which must have been washed away by something like a tsunami or some such hurricane. Dwaraka was a large well- fortified city with an excellent drainage system, massive gates and a wall stretching about hundred eighty miles.⁹

In January 2007, the UAW initiated excavations at Dwaraka again. The Superintending Archaeologist of UAW, Alok Tripathi, said that the ancient underwater structures found in the Arabian Sea were yet to be identified. 'We have to find out what they are. They are fragments. I would not like to call them a wall or a temple. They are part of some structure,' said Dr. Tripathi, who is himself a trained diver. He further said that in order to study the antiquity of Dwarka in a holistic manner excavations are being conducted both on land and undersea at the same time to enable the co-relate and scientifically analyze the finds from both the places.

The purpose of the excavation was to be familiar with the antiquity of the site, on the basis of material evidence. In the offshore excavation, the ASI's trained underwater archaeologists and the divers of the Indian Navy investigated the sunken structural remains. The archaeological finds were studied, dated and documented. On land, the excavation was conducted in the forecourt of the Dwarakadhish temple. Students from Gwalior, Lucknow, Pune, Vadodara, Varanasi and Bikaner also joined in to help the archaeologists of the ASI.

Check Your Progress

3. When was the Indus Civilization put on the archaeological map?
4. Which organization discovered significant ancient remains at Dwarka?

⁹ <https://www.speakingtree.in/allslides/the-city-of-dwarka-had-existed-from-32-000-to-9-000-bc/dwarka-fortification>

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6.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Conservation of ancient monuments and objects was among Sir John Marshall's main concerns and the basic principles of conservation laid down by him in the Indian context are still pursued by the survey.
2. Robert Bruce Foote is regarded both the father of Indian prehistory and father of south Indian geology.
3. The Indus Civilization was put on the 'archaeological map' by the discovery of a seal by Alexander Cunningham in 1873.
4. Significant ancient remains have been discovered at Dwarka, both on land as well as under water by the Underwater Archaeology Wing (UAW) of the Archaeological Survey of India.

6.8 SUMMARY

- Since its establishment in India in 1861, the Archaeological Survey of India has been excavating the historical sites and deciphering and describing thousands of valuable inscriptions.
- In 1902, the Viceroy of India, Lord Curzon appointed John Marshall as the Director-General of ASI. He modernized the approach to archaeology introducing a program of cataloguing and conservation of ancient monuments and artefacts.
- Marshall initiated the practice of permitting Indians to participate in excavations in their own country. His work gave evidence of the age of Indian civilization especially Indus Valley Civilization and the Mauryan age. He directly shaped the course of Indian archaeology.
- In 1944, Mortimer Wheeler was appointed the Director-General of ASI. He first argued the basic necessity of scientific aids in archaeology in India. He emphasized the need of careful archaeological planning.
- Wheeler also introduced there for the first time the importance of the study of stratified ceramic material for determining the cultural succession at excavated sites and its importance in comparative study of material between different sites.
- He gave field training in his methods to a large number of Indian students and wrote many articles on the excavation methods. He introduced effective participation by the universities in archaeological research.

- He also developed the use of a Cartesian coordinate system, or three-dimensional grid, with which the materials found in archaeological excavations, could be recorded.
- Robert Bruce Foote was a British geologist and archaeologist who conducted geological surveys of prehistoric sites in India for the Geological Survey of India.
- Foote's explorations in south India was a turning point, from where branched off the twin-fields of prehistory and geology. Professor H.D. Sankalia began from where Foote had left Indian prehistory.
- The high point in the history of Archaeological Survey of India was the discovery of Indus Valley sites at Harappa by Rai Bahadur Daya Ram Sahni in 1921 and at Mohenjo-Daro by Rakhal Das Banerjee in 1922. These two sites are still considered to be the core sites of the vast spread of Indus Valley Civilization.
- Most of what we know about the Indus Valley Civilization comes to us from the excavation of city type sites. Many of the ancient structures at Harappa were damaged as there was a requirement of strong bricks by the railways. In contrast, Mohenjo-Daro was far better preserved.
- Many buildings and artefacts found at Harappa were indicative of an ancient civilization.
- John Marshall tended to excavate the town of Mohenjo-Daro along regular horizontal units, ignoring the stratigraphy of the site.
- Thus, valuable information about the context of these finds was irretrievably lost. However, Sir Mortimer Wheeler rectified this problem.
- Significant ancient remains have been discovered at Dwarka, both on land as well as under water by the Underwater Archaeology Wing (UAW) of the ASI.
- The first archaeological excavations at Dwaraka were conducted by the Deccan College, Pune and the Department of Archaeology, Government of Gujarat, in 1963 under the direction of H.D. Sankalia.
- It revealed artefacts which were many centuries old. The UAV of the ASI conducted a second round of excavations in 1979 under the supervision of Dr S. R. Rao.
- Many underwater explorations were carried out between 1998 and 2001 which indicated a highly civilized city which must have existed at that site, which had great maritime links with many other countries
- The purpose of the excavation was to be familiar with the antiquity of the site, on the basis of material evidence.

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6.9 KEY WORDS

- **Grid-System:** It is a system of rectangular excavation or sampling units laid over a site by strings and stakes.
- **Mound:** It is a mound is a heaped pile of earth, gravel, sand, rocks, or debris.
- **Palaeolithic:** It is something that relates to or denotes the early phase of the Stone Age, lasting about 2.5 million years, when primitive stone implements were used.
- **Seal:** It is a device for impressing characteristic marks into a soft surface, such as wet clay or wax, to indicate ownership or authenticity.
- **Sonar:** It is an acronym for Sound Navigation and Ranging. It is a system of detection of objects under water by emitting sound pulses and detecting or measuring their return after being reflected.
- **Steatite:** It refers to the mineral talc occurring in consolidated form, especially as soapstone.

6.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Who initiated the practice of permitting Indians to participate in archaeological excavations in their own country?
2. Who described the ruins of Harappa in 1842 in his *Narrative of Various Journeys in Balochistan, Afghanistan, and the Punjab*?
3. Write a short note on the first archaeological excavations at Dwaraka.
4. Briefly discuss the excavations conducted by the archaeologists at Harappa and Mohenjodaro.

Long Answer Questions

1. Elaborate the contribution of Sir John Marshall in the development of archaeology in India.
2. Discuss the role played by Sir Mortimer Wheeler towards the Indian archaeology,
3. Examine why Robert Bruce Foote is regarded as the Father of Indian Prehistory?
4. Discuss in detail the findings of the excavations conducted at Dwarka.

6.11 FURTHER READINGS

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UNIT 7 ARCHAEOLOGY IN TAMIL NADU-I

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Structure

- 7.0 Introduction
- 7.1 Objectives
- 7.2 Prehistoric Sites
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7.0 INTRODUCTION

The core region for the emergence of civilization in the South was the modern Tamil Nadu area. In the centuries preceding the Christian era, the Tamils composed the Sangam literature in which they refer to affluent towns and cities. However, the lack of proper exploration and excavation in this area leaves many gaps in our knowledge about the process of the emergence of the urban centres in this region. Excavations have been conducted in places like Urayur, Kaveripattinam and Korkai , Arikamedu, Adichanallur and others. Excavations and explorations in Tamil Nadu have been carried out both in the pre-and post-Independence days. The archaeologists have deciphered a number of facts about the socio-cultural life that prevailed in the bygone era. Relics found in these sites consolidate the fact that the people belonging to this region were highly adept in artistry whereas the architectural remains exhibit the blend of different architectural styles. This unit will deal with the archaeology of two important sites of Arikamedu and Adichanallur.

7.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the history of excavations, chronology, stratigraphy, locations of artefacts and structures of Arikamedu
- Describe the excavations conducted in two phases in Adichanallur

7.2 PREHISTORIC SITES

Let us discuss some of the prehistoric sites that have been excavated in the southern region of India.

7.2.1 Arikamedu

The site of Arikamedu is situated on the Coromandel Coast of India, 4 km south of Pondicherry, within the Union Territory of Pondicherry. The French astronomer Guillaume Le Gentil, who visited Pondicherry, makes the earliest mention of Arikamedu. He considered the ruins to be the remains of an ancient town or large village which, according to the local residents was known as Virampattinam. The historical importance of Arikamedu and its connection with the Roman Empire was first recognized by Jouveau-Dubreuil, who had started collecting artefacts from the surface of the mound and the river bank as early as 1937. His identification of the Arikamedu site with Poduke emporium mentioned in the *Periplus of Erythrean Sea* is accepted by historians; thus, the name Poduke, perhaps deriving from Tamil Puducheri, meaning new hamlet (the origin of the name Pondicherry), must have been in vogue at the time of the *Periplus*. Since the meaning of the Tamil word *puducheri* means a new settlement or, at least a change, it has been suggested that the name Puducheri was perhaps given when the settlement was transformed from a small village into a centre of commerce.

Many French and Indian scholars also visited the site of Arikamedu. Between 1941 and 1944, excavations were conducted by French scholars on a small-scale under the direction of L. Fauchaux and R. Sarleau. They plotted two grids, oriented north-south which are regarded as the most significant areas for excavations. Parts of the site were also declared protected by the French Government. These excavations were published later on.

However, the most outstanding excavations were carried out by Mortimer Wheeler, the Director General of Archaeological Survey of India, in 1945. His excavations at Arikamedu were the most widely known partly because of the methodology adopted by him, and partly because of the publicity given to the excavations by Wheeler himself in his numerous publications. Wheeler's important contribution at Arikamedu was the preparation of a contour map of the site and the surrounding area. J.M. Casal continued excavations here in 1947 and obtained extremely important data but unfortunately his work largely went unnoticed. After a comprehensive review of archaeological work at Arikamedu, Vimala Begley started fresh excavations between 1989 and 1992 which revealed many new types of artefacts and structures. All these discoveries proved that the site was first occupied during the second century BC. An underwater survey was also conducted by a team of archaeologists from the ASI in 2002. This survey

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found that impact of erosion on the site and the original extent of the site was beyond the present limits. Excavations at Arikamedu have brought to light the existence of small and large industries during the Pre- Roman period. Large number of shells, beads and pottery clearly indicated the existence of indigenous craft traditions before the arrival of Romans. Megalithic sites in the Gingee, Vaigai-Tamrapami and Kaveri valleys support the economic activity at Arikamedu.¹

Wheeler dated Arikamedu with the help of imported pottery viz., Arretine Ware and amphora from the Mediterranean. The use of amphora indicates that the Indians had developed a taste for foreign wine. He found that nearly all the excavated structures were constructed in the post of the Arretine ware period which showed that the site came to be occupied during the first two centuries AD. The presence of Celadon Ware and Chola coins of eleventh century AD indicated that the site was occupied for a long time. Excavations conducted later on brought to light evidence of trade with the Mediterranean between third to seventh century AD, as well as occupation during the Chola period and contact with Southeast Asia through trade. The evidence of Celadon Ware evidently supports the assumption that ships from India were engaged in trade with China. It is most likely that the site lost its importance due to the formation of sand bar at the mouth of Ariyankuppam River in the fourteenth century, which resulted in blockage of the entry of ships to the river, and this important port was abandoned.²

The entire site of Arikamedu was divided in two parts by Wheeler—the northern sector and southern sector. The nature and date of the structures discovered in these two sectors also showed variation. The structures discovered at Arikamedu were made of bricks. The northern sector had a warehouse which was built in 50 AD on the foreshore of the estuary on which apparently timber buildings had already stood. The debris of port penetrated into it. The brickwork with mud mortar had tough plaster outside to keep out water on this low-lying site which must have been vulnerable to flooding and was abandoned at an early date. The warehouse was used for working precious and semi-precious stones and exporting it to Rome.

The southern sector was occupied for about a century. The site continued to be occupied till 200 AD. Prominent structures built in the southern sector were two walled courtyards, with carefully built dyeing vat tanks supplied and drained by a series of brick culverts. Widespread use of drain, considerable pavements of large bricks and the absence of domestic features suggest its use for industrial purposes. Excavators speculated that these tanks and courtyards were used in the preparation of the muslin cloth. In addition to this, excavations carried out by French scholars and Wheeler revealed numerous other small and fragmentary structures. Some of these

1 http://shodhganga.inflibnet.ac.in/bitstream/10603/105014/8/08_chapter%201.pdf

2 Ibid

fragmentary structures were drains constructed by means of corbelled walls, floored and roofed with horizontal bricks, a number of fragmentary walls, patches of brick floor, a fragmentary square or oblong structure of uncertain purpose, blocks of brickworks and pavements, ring-well or soak-pit built of pottery rings.³

Stratigraphy in the southern and northern sectors also differs. Due to haphazard digging and extensive damage caused to it, the stratigraphic sequence is not clear. In the southern sector natural soil was found at 3m. above the sea level. It was out of reach of flood. Habitation started here later but continued after the abandonment of northern sector. The cultural deposits were divided into three main phases- Early Middle and Late which were further divided in sub-periods.

In spite of numerous excavations over the past many years there are no satisfactory answers to a number of questions regarding origin, development and extension of this town, chronology, ancient port, trade mechanism, etc. How and why Arikamedu became an important centre of commerce on the Coromandal Coast needs to be explained. The excavations were carried out in limited area with limited aims. Barring two structures, the other structures discovered were fragmentary in nature. Some of the areas excavated by Wheeler and Casal have suffered a great deal of damage. Additionally, how Arikamedu was related to inland interior settlements and what type of political or economic organization may have governed the location of the port needs to be explained.

Artefacts discovered from Arikamedu can be found in various museums and private collections across the world. Perhaps, no other site can claim the distinction of having its artefacts spread among a large number of individuals and institutions. Some of Jouveau-Dubreuil's collection are kept in the Government Museum at Egmore, Chennai. A few of the early finds by the French have been kept in the State Government museums in Bangalore and Hyderabad in South India and some were sent to the French Museum at Hanoi and Louvre Museum in Paris. Some of the materials from these excavations have been lost. A major chunk of the material from Wheeler's excavation is in the collection of the ASI at Purana Qila in New Delhi while others are in the collection of Institute of Archaeology, London and British Museum, London. The materials discovered during the excavations conducted V. Begley's team is with ASI, Chennai. A small collection of Arikamedu objects is in the Aurobindo Ashram Library at Pondicherry.⁴

The history of Arikamedu can be reconstructed by gathering information from archaeological and literary sources. The discovery of stone axes with pointed butts suggested a Neolithic settlement at the site. The use of such

3 Ibid

4 Ibid

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stone hand-axes was prevalent during later periods was also known in many other South Indian sites. Archaeological evidence suggests that the site was first occupied on a regular basis around the late third century or early second century BC. This period belongs to the Late Iron Age or Megalithic Age in South India. The earliest occupancy was in the Southern sector and not in the Northern sector. Fishing and bead-making were important occupations of this community.

Probably, trade with Mediterranean started around the second century BC. But trade was at its height from the mid-first century BC to mid-first century AD. During this period, the site may have been a part of the Sangam Chola Kingdom with its capital at Uraiyur. A square copper coin of this dynasty has been found during the excavations at Arikamedu. Alternatively, Arikamedu would have been a part of the territory of the *Malaiyaman* chieftain who controlled the regions close to Arikamedu with their capital at Tirukoilur. Or else, the *Velir* chieftains ruled the region. Perhaps, each of these dynasties controlled Arikamedu, one after the other.

During that period, both the Northern and Southern sectors were inhabited, probably by different ethnic communities. There was continuous interaction between the occupants of the two sectors. Gradually the site evolved into an urban industrial centre where different types of pottery, beads, ivory artefacts and textiles were manufactured. The industrial area extended over both the sectors. The Southern sector was also the main market place. However, the port was located in the northernmost part of the Northern sector. The settlement of Roman and other foreign traders and merchants was located in this sector.

The quantity of Mediterranean artefacts is much larger in northern than in the southern sector. Trade declined towards the end of the first century AD probably as a result of changes in the pattern of trade and trade routes. However, the settlement continued and new buildings were erected between the third and sixth centuries AD. Gradually, the power of the Sangam Cholas and *Malaiyamans* declined and Arikamedu would have been under the control of the Pallava dynasty that ruled this region with its capital at Kanchipuram. During the fourteenth and fifteenth centuries, Arikamedu was a part of the Chola Empire. From the Cholas, it may have passed on to the Vijayanagar Empire which emerged as a major power in South India from 1336 to 1565 AD. Chola coins, pottery and mud lamps have been frequently found at Arikamedu.

The site appears to have again emerged as an international trade centre during this period. The Chinese ceramics and coins discovered at the site indicate that the site had brisk trade with China. Arikamedu port has also been mentioned in a Medieval Chinese text. The occurrence of Persian blue glazed pottery in Arikmedu testifies its contact with Persia.

Perhaps, the site was deserted sometime in the sixteenth -seventeenth centuries. There are references to brick-robbing at the site. At the close of the 18th century, after the French conquest of the area, Arikamedu was reoccupied for a short period of time. Between 1771 and 1773, a seminary and residence was constructed for the Jesuit missionaries. The seminary, however, was abandoned in 1783. The locals mention the ruined seminary as the 'Mission House'. Many other buildings were constructed during this period.

The history of Arikamedu appears vaguer during the nineteenth and early twentieth century. Large portions of the site came to be used for agricultural purposes during this period. Coconut, Mango and Tapioca were cultivated. Cultivation never stopped even after the archaeological importance of the site was recognized and some portions of the site were declared as protected area. French rule in Pondicherry ended in 1954. The entire Pondicherry region including Arikamedu now joined the Republic of India. From that time onwards, Arikamedu has been a protected site of the Archaeological Survey of India.⁵

7.2.2 Adichanallur

Adichanallur is an archaeological site located in the Thoothukudi district in southern Tamil Nadu and is 15 km away from Korkai, the capital of the early Pandyan Kingdom. The town is locally known as *Aathichanallur*, and has been the site of numerous significant archaeological finds. It has been an active playground of archaeologists and anthropologists for more than 150 years. The urn-burial site was brought to light when a German explorer, Andreas Fedor Jagor, conducted a random excavation at the place in 1876. At that point of time, he unearthed number of bones, iron artefacts, burial urns, and copper objects. An Englishman called Alexander Rea, who was the Superintending Archaeologist, excavated the urn-burial site between 1889 and 1905. In his article titled 'Prehistoric antiquities in Tinnevely', published in the Archaeological Survey of India's annual report in 1902-03, Rea called the Adichanallur site 'the most extensive prehistoric site as yet discovered in southern if not in the whole of India.' A Frenchman called Louis Lapique had also conducted an excavation in 1904.

After a gap of 100 years T. Satyamurthy, the Director of Chennai Circle of the ASI, started the excavation of Adichanallur in February 2004. It was an extraordinarily large urn-burial site spread over 114 acres on a low, rocky hillock on the bank of River Tamiraparani. The first phase of excavation in 2004 was conducted between February 4 and July 5. In the six trenches that were dug then, the ASI ran into a range of spectacular finds. Each trench was a square, 10 metres by 10 metres.

5 Ibid

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Six trenches yielded a total of 157 burial urns, 57 of them undamaged and 15 with complete human skeletons inside. Many of the urns, particularly those that contained human skeletons, were covered with another urn, in what is called a 'twin-pot' system. They had been buried after cutting the rock in circular pits, into which the urns were lowered in a three-tier formation. The earliest burials formed the lowermost tier, which left enough space above to accommodate future burials.

Among the artefacts discovered at the burial site were a large number of red ware, black ware, black-and-red ware, copper bangles, copper earrings, iron spear-heads, terracotta lids with tiered knobs, terracotta vessels that could be used both as lids and as bowls, globular vessels and long-necked utensils. There were vases, pots with beautiful decorations, broken daggers and iron swords. There were also Neolithic celts, iron implements, urns with clan marks and urns with hooks inside.

The urns with skeletons had empty miniature vessels, rice, paddy and husk inside them. There were three types of miniature vessels: bowls, small vases and pots. They were made of polished blackware and were thought to have some religious significance. These small vessels invariably had their lids on. The painted lids were decorated with dotted, floral or geometrical designs. Some lids had tiered knobs that looked like chess pieces. One urn contained the skeletons of a mother and a child. Some skulls had disintegrated, the bones had become fragile. Some urns were broken, and were filled with earth, evidently the handiwork of treasure-hunters. Three copper bangles and some copper chisels were also discovered at the site.

Outside, around the urns, red ware bigger pots, iron implements, knives, daggers, spearheads and Neolithic celts used in farming were found. Some pots rested on ring stands of different shapes. The lids were differently shaped - conical, globular, and so on. More than a thousand undamaged pot-vessels were unearthed. A number of terracotta beads in conical shape and hop-scotches were found. Urns with clan or tribe marks were also discovered. The clan marks included three lines separating out from the top, with knobs, and garland-like designs. A few ornamented urns were also found.

Satyamurthy regarded the Adichanallur burial site as the earliest site in Tamil Nadu and was confident of its antiquity. He considered it to be as old as 1000 B.C. According to archaeologists, the Iron Age in South India extended between 1000 B.C. and 300 B.C. The Iron Age and the megalithic age were contemporaneous in South India. The Iron Age indicates the beginning of civilization.

The major attraction of these discoveries is the potsherd with dramatic motifs. It was found inside an urn which had a human skeleton. At the centre of the motifs is a tall, slender woman with prominent breasts and wearing a knee-length dress. Her hands are clinging to her sides and the palms seem

to be spread out. Next to her is a sheaf of standing paddy, a crane sitting on the paddy stalk, a deer with straight horns and so on. 6 Satyamurthy called the potsherd 'a unique find because no such motifs have been found so far in burial sites in Tamil Nadu. These motifs resemble pre-historic cave paintings found in central Tamil Nadu, including Erode and Dharmapuri districts.' There is a general consensus among the archaeologists that the depiction of the woman signifies the mother-goddess/fertility cult.

G. Thirumoorthy, Assistant Archaeologist of ASI, Chennai Circle said, 'Adichanallur shows the importance given to the dead in Tamil society. The excavation reveals the mode of burial practice, the disposal of the dead, the religious beliefs prevalent then, and the socio-economic conditions of the people who lived here at that time.' The people of Adichanallur used a creative method to bury their dead. Thirumoorthy pointed out that these megalithic people were intelligent and had foresight because they buried their dead in barren land and not in agricultural land. Apart from this, the urns were buried on a hillock, where they could not be flooded by the nearby river or the lake.

When the ASI started its excavation at Adichanallur, it had two intentions. First, to establish the date of the site and second, to locate the place where the people who used the burial site lived. Satyamurthy said, 'Our main aim is to study the site, excavate it thoroughly and give a scientific date to it, using the Carbon-14 dating method. We want to know the chronology or the sequence of the site and find out the nature of the culture that existed then. Another aim is to find out whether there was a habitational site nearby.'

The second phase of excavation, which started in February 2005, is presently under way on the north and north-western slopes of the urn-burial site. If the aim of this excavation was to locate the habitational site of the people whose bodies were buried a few hundred metres away, it has succeeded in that objective. ASI archaeologists Nambi Rajan, Aravazhi, Arun Malik, A. Anil Kumar and C.R. Gayathri are among those taking part in this excavation. So far six trenches have been excavated.

The excavation has revealed the town's fortification/rampart wall, which was composed of mud with stone layer in parts. Three potters' kilns with ash, charcoal and broken pots were discovered which established that this was a habitational site. Nambi Rajan said the trenches revealed a man-made floor paved with lime plaster. There were holes on the floor to hold posts. A few individual letters in Tamil-Brahmi (Tamizhi) script have been found on potsherds.

Some specialists believe that Adichanallur must have been a busy mining and industrial centre. The making of bronze figurines, iron implements such as swords, daggers and arrow-heads and big urns showed that it was a busy industrial township. M.D. Sampath, a retired Director, Epigraphy,

6 The Hindu, Sunday, April 3, 2005

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ASI, Mysore, said, 'The excavated objects at Adichanallur are valuable in the sense that a study of the finds will reveal a new vista to know the growth and culture of Tamil society, and how this society achieved literacy.'⁷

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Check Your Progress

1. Where is the site of Arikamedu located?
2. Name the French astronomer who made the earliest mention of Arikamedu.
3. Who started the excavation of Adichanallur in 2004?
4. What is the twin pot system?

7.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The site of Arikamedu is situated on the Coromandel Coast of India, 4 km south of Pondicherry, within the Union Territory of Pondicherry.
2. Guillaume Le Gentil was the French astronomer who made the earliest mention of Arikamedu.
3. After a gap of 100 years T. Satyamurthy, the Director of Chennai Circle of the ASI, started the excavation of Adichanallur in February 2004.
4. Many of the urns discovered at Adichanallur, particularly those that contained human skeletons, were covered with another urn and this was called a 'twin-pot' system.

7.4 SUMMARY

- Tamil Nadu was the core region for the emergence of civilization in the South. So far many sites have been excavated in Tamil Nadu before and after independence.
- The prehistoric site of Arikamedu in Pondicherry has been referred by Ptolemy in his 'Geography'. The historical importance of Arikamedu and its connection with the Roman Empire was first recognized by Jouveau-Dubreuil. However, Wheeler conducted the most extensive excavation of the site.
- The archaeological finds show that Arikamedu was once a considerable town with a warehouse, textile manufactory and several bead-making establishments.

⁷ Frontline, Volume 22 - Issue 13, Jun 18 - Jul 01, 2005

- A kind of red-glazed pottery presumably manufactured in Italy, Roman lamps and glasswares, the Mediterranean type amphorae are amongst the objects discovered which testifies that Arikamedu was an emporium of western trade.
- Archaeology confirms the evidence of literature. The discovery of 'Roman Factory' at Arikamedu confirms the correctness of the date suggested for the Sangam Age.
- Arikamedu has also yielded a small number of Chinese Celadon wares which confirms its brisk trade with China.
- Adichanallur is an archaeological site located in Thoothukudi district in southern Tamil Nadu. The town is locally known as *Aathichanallur*, and has been the site of numerous significant archaeological finds. It has been an active playground of archaeologists and anthropologists for more than 150 years.
- Four excavations in Adichanallur---by a German (Andreas Fedor), a Frenchmen (Louis Lapique), the British (Alexander Rea), and finally by Indians---have unearthed hundreds of burial urns, most of them several thousand years old, along with skeleton remains and thousands of iron and bronze artifacts, including weapons and gold jewellery.
- Adichanallur has attracted nationwide attention for three important findings: an inscription in a rudimentary Tamil-Brahmi (Tamizhi); a potsherd with dramatic motifs; and the remains of living quarters.

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7.5 KEY WORDS

- **Amphora:** It was a particular pottery used by the Romans for exporting wine.
- **Clan:** It means a group of people from many lineages who live in one place and have a common line of descent, usually under one chieftain.
- **Motif:** It refers to a decorative image or design, especially a repeated one forming a pattern.
- **Potsherds:** It can be defined as broken pieces of ceramic or pottery artefacts including storage and cooking vessels, building material and occasionally tools and furniture. They are common to nearly every digging site.
- **Terracotta:** It is a type of fired clay, typically of a brownish-red colour and unglazed, used as an ornamental building material and in modelling.
- **Trench:** It is a term used to refer to an excavation unit, especially when the length is longer than the width.

7.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short Answer Questions

1. Briefly explain the chronology and structures discovered at Arikamedu.
2. Discuss the stratigraphy and location of artefacts of Arikamedu.
3. Describe the artefacts discovered from Adichanallur.

Long Answer Questions

1. Discuss the excavations conducted at Arikamedu by different archaeologists.
2. Discuss the history of archaeological excavations conducted at the site of Adichanallur.

7.7 FURTHER READINGS

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UNIT 8 ARCHAEOLOGY IN TAMIL NADU-II

NOTES

Structure

- 8.0 Introduction
- 8.1 Objectives
- 8.2 Prehistoric Sites
 - 8.2.1 Uraiyur
 - 8.2.2 Kaveripattinam
- 8.3 Answers to Check Your Progress Questions
- 8.4 Summary
- 8.5 Key Words
- 8.6 Self Assessment Questions and Exercises
- 8.7 Further Readings

8.0 INTRODUCTION

Five ancient cities in composite Tiruchi district—Alagarai, Tirukkampuliyur, Woraiyur (Uraiyur), Karur (Kaveripattinam) and Gangaikondacholapuram—were excavated in the past. While the first three were excavated by the Department of Ancient History and Archaeology, University of Madras and the last two by the State Department of Archaeology. The Sangam texts mention the dual centres of Chola power—Uraiyur and Kaveripattinam—which were located in the Kaveri valley. Uraiyur, at present is a part of Tiruchirapalli town and was the ancient Chola capital. Descriptions in the texts indicate that it was a very well-defended city, however, no such structures have been recovered. Kaveripattinam, located near the mouth of river Kaveri and identified with Puhar was a port town and commercial capital of the Cholas. Excavations do not reveal relics of the level of magnitude and splendour mentioned in the texts. However, certain finds are of significance. The excavation of these two sites is discussed in the unit.

8.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the archaeological importance of Uraiyur
- Describe the significance of Kaveripattinam in archaeology

8.2 PREHISTORIC SITES

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Let us begin this unit by discussing the prehistoric site of Uraiyur.

8.2.1 Uraiyur

Uraiyur is located in Tiruchirappalli in the south Indian state of Tamil Nadu. It was the capital of the early Chola Empire. It has a history dating back to before 2nd century BC. There is definite mention of the Cholas and their capital in Ashokan inscriptions in Orissa pushing back the antiquity of the Cholas as well as Uraiyur to 272–232 BC. Inscriptions and rock edicts of Ashoka and the Satavahanas describe Uraiyur as ‘the citadel and centre of the Cholas’. Uraiyur was ruled by Karikala Chola.

The *Periplus of the Erythrean Sea* mentions Uraiyur as a trading centre. This text uses the term ‘Aragaru’ which is a Greco-Roman name for Uraiyur. It was a port at which all the pearls from the pearl fisheries of Korkai in Tutukudi were gathered.¹ Ptolemy speaks of ‘Orthura Regiasornati’, which is identified as Uraiyur. The account of the foreigners also corroborates that Uraiyur was a prosperous city in the ancient time and its importance contributed Tiruchirappalli developed gradually into a big town later. The local Purana or history mentions a story of the destruction of Uraiyur by a shower of sand. Now, Uraiyur is a suburb of Tiruchirappalli, which is a very important town in Tamil Nadu.

Even though it appears that Uraiyur was a very big city with large palaces and a thriving population, there is negligible archaeological evidence to support this hypothesis. Epigraphy and numismatics from this period are completely missing, which leaves us with only the vivid imagination of ancient poets to rely on. But the questions arises why haven’t we found any remnants of a rich kingdom at Uraiyur. The Archaeological Survey of India was busy with decoding hundreds of inscriptions across many temples in Tamil Nadu, and Uraiyur simply fell to the bottom of the list. The archaeologists reached Uraiyur in 1965, by which time it was a densely populated suburb of Tiruchirappalli. A few open fields and school playgrounds were the only places to excavate for artefacts, but even those limited excavations were successful. Among the items discovered were pottery, terracotta human figurines, and small jewellery. Most amusingly, the remains of a brick dyeing vat were discovered, confirmed Uraiyur’s status as an ancient textile capital. Unfortunately, the survey was not very extensive because every available piece of land was built upon, probably burying all vestiges of an advanced ancient civilization.

1 Vijaya Ramaswamy, 2017, “*Historical Dictionary of the Tamils*”, Rowman & Littlefield, p.58

Uraiyur was the unsung capital of the early Cholas which never got the same recognition as the later capital, Thanjavur. Historians have placed the early Chola period roughly between 200 BC and 300 AD. The precise chronology of the early Chola period is vague because all information is based solely on literature and poetry. However, it is very apparent that Uraiyur was a booming trade centre on the banks of the river Kaveri and was frequently visited by Greeks and Romans. A number of Chola kings ruled from this city but Karikala stands out prominent. He is described in a poem as the descendent of a king who compelled the wind to serve his purposes when he sailed his ships on the wide ocean—possibly a reference to the early maritime enterprise of the Cholas.²

When Karikala's father Ilamchetchenni died, there was a war of succession as there were many who staked their claim to the throne. Someone plotted to kill Karikala by locking him in a room and setting it on fire. However, according to the legend, the young prince escaped with a charred leg and went on to become the king. Thus, Karikala means 'the man with a charred leg'. Other explanations for the name were invented later on and it had also been taken to be a compound word in Sanskrit meaning either 'death to Kali' or 'death to (enemy) elephants'. Although he started ruling at a very young age, he took complete control over the justice department, and he was the sole decision maker of all criminal cases. He gave a fair hearing, and used to announce an instant judgment, greatly speeding up the trial process. According to the legend he used to wear a white wig to make him look more mature (and hence more capable) in front of his ministers when he presided over such criminal trials.

During those times poetry was one of the most cultured amusements of the upper classes. The poets were men and women from all classes of the society. They composed verses to suit the immediate occasion and were often rewarded generously. Karikala is said to have given 1,600,000 gold pieces to the author of *Pattinappalai*. His generosity spread and many poets settled in Uraiyur with the hopes of making quick money. A number of them succeeded, and this is reflected in the ancient literature, where several poets are addressed with the prefix 'Uraiyur'.

Karikala maintained a powerful navy. He actively extended his empire using his navy by annexing Sri Lanka from where he brought nearly 12000 prisoners of war whom he used to construct a huge embankment of 160 km called Kallanai (literal translation- stone dam), a brilliant water regulation system that transformed Thanjavur into an agricultural hub. Many inscriptions have been discovered in northern Sri Lanka that supports the Chola inhabitation of the area. Although Raja Raja Chola, the most famous Chola

2 K.A Nilakanta Sastri, 1976, "A History of South India: From Prehistoric Times to the Fall of Vijaynagar", Fourth Edition, Madras, Oxford University Press, p.124

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King (985-1014 AD), gets all the credit for expanding the empire to South-East Asia, the achievements of Karikala are unfortunately often overlooked.

After Karikala, the Chola Empire faced confusion and chaos. The successors were quite weak and family members fought for power and position. Kopperunjolan was another renowned Chola king who also ruled from Uraiyur. It is said that there was a serious quarrel between Kopperunjolan and his two sons and the king ultimately committed suicide, along with his friend and poet Andai.

The strategic location of Uraiyur's near the Kaveri River made it an international trade centre that was frequently visited by Greeks and Romans. The river provided an ideal means of transportation. Small boats carried merchandise out of Uraiyur to the legendary port city of Kaveripattinam on the Bay of Bengal, where the long-distance international ships were stationed. Textiles fabrics from the Chola kingdom were in great demand in different countries. Uraiyur's muslin cloth (called Argaritic by the Greeks) was considered to be the finest in the world, and was the preferred fabric of the Greek upper class. The muslin was made very cheaply from the cotton that grew around present-day Karur, and then sold at very high rates to foreign traders, thereby generating a lot of revenue for the Chola Empire. Apart from muslin, spices and incense were the other items sold. The extensive international trade further paved the way for Uraiyur to become a flourishing city of early Indian history.

Under the Cholas, Uraiyur remained as the major seat of textile industry and remained so even after the transfer of capital to Kaveripattinam. Spinning and weaving of cotton and perhaps also of silk had attained a high degree of perfection. The weaving of complex patterns on cloth and silk are often mentioned in literature. According to *Periplus*, Uraiyur was a great centre of the cotton trade.³ The muslin manufactured at Uraiyur was specially praised by the Roman writers. Excavations conducted at Uraiyur brought to light a brick built dyeing vat used for dyeing cotton textiles. As mentioned earlier Uraiyur, the suburb of Tiruchirappalli was known from the ancient past as a trade metropolis, where traders and merchants from different parts of the country and even beyond had assembled and collected products both for inland trade and for external distribution. The rich surroundings and availability of exportable surplus of cotton materials, and handicraft items encouraged foreign trade through the famous seaport at Kaveripattinam.

8.2.2 Kaveripattinam

Kaveripattinam (also called as Pampuhar or Puhar) was a major Chola port in the ancient times. According to the legends, it had to face the wrath of the sea. The contemporary Chola king who was anguished by the death of

3 Ibid, p.142

his son, had forgotten to celebrate the annual festival of Lord Indra. This infuriated the Gods and caused the destruction of the city by the sea in 300 BC as described in the famous epic *Manimekalai* by Chithalai Chatanar. However, excavations in the region indicate that there might have been a major natural calamity such as periodic sediment erosion or deadly tsunamis that had led to the destruction of the city. Though the remains of the city have been discovered in the archaeological excavations we have to rely on written accounts to understand the life of the people of that region.

Old texts refer to Kaveripattinam as Khabaris or Camara. Its details have been read in the Brahmi-inscription dating back to the second century BC in 'Barkuth' of north India. It has been described in *Periplus of the Erythraean Sea*, a travelogue by an anonymous merchant written during the first century AD. It has provided a brief on the Chola kingdom and its towns, ports and trading centres. The famous Greek geographer, Ptolemy in his work *Geographia* describes Kaveripattinam as a well-planned city. An entire Sangam text named *Pattinappalai* has described Kaveripattinam. There is a description of its two bustling markets laid out between the two sectors of the city, protected by officers of the king, and to its inhabitants who spoke different languages. Kaveripumpattinam has been identified with Kaveripattinam which is a small fishing village on the Coromandel Coast (East coast), located at the point where the Kaveri flows into the Bay of Bengal. The author of epic *Silappadikaram* refers to Kaveripattinam as a Mahanagaram, a great city and a busy port where horses were brought by the ships; bags of pepper were brought by carts; gemstones and gold was imported from the northern mountains; pearls were brought from the southern seas and wheat from the Gangetic region.

The historical details of Kaveripattinam have also been found in the inscriptions of Sayavanam Temple located at Kaveripattinam. The ancient kings like Musugundam, Sembian, Manuneethi Chola and Karikal Chola who carried myths with them, added to the glory of the town of Kaveripattinam. It grew into a great city during the reign of Karikal Chola. Even after Sangam Chola's period Kaveripattinam occupied a significant place during the regime of Kalabras. In the 6th century AD, it came under the Pallava rulers and during that time the Pallavaneeswaran temple was built by them. With the rise of later Cholas in 850 AD the city regained its past glory. It is mentioned as "Rajathiraja Valanaattu Nangoor Naattu Kaveripoompattinam" in the Sayavanam temple inscription of Vikrama Cholan in the same temple, calls the town 'Puhar Nagaram'. Later Kopperunchingan also contributed to the grandeur of the place. After the Sangam Chola period the Bay of Bengal swallowed a major part of Poompuhar town. Though Poompuhar became a prey of times, still a few small villages remain a silent witness to the cruelty of times. Thirusaikadu (Sayavanam), Pallavaneeswaram, Melapperumpallam, Keelaperumpallam, Keezaiyur and Vanagiri are mortal remains of ancient Poompuhar.

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Since 1910, excavations and explorations were carried out in Kaveripattinam along the coast of Tamil Nadu and certain areas in and around Karur. The archaeological department has discovered many ring-wells near the seashore. Puhar known to Ptolemy and Pliny was a planned city built over 2000 years ago. Excavations show an extent of planning that would make most modern planners envious. Remains of various buildings were found during the excavations. A wharf belonging to the 3rd century BC was excavated at Kaveripattinam in 1962-63 and a similar wharf was discovered in the subsequent excavation during 1997. Different types of brick figures and copper coins were also found. The structural resemblance and their functional viability are studied. The existence of such wharves corroborates the plan of ancient Kaveripattinam, which is very well explained by the Pattinappalai. The study emphasizes the need for further extensive excavations along the course of the palaeo-channel to open up new outlook in the technology of marine structures of ancient Kaveripattinam. The National Institute of Oceanography, Goa and the Department of Archaeology of Tamil Nadu Government have carried out offshore exploration at the site and they have contributed a museum.

Excavations conducted at Kaveripattinam reconstructed the history from the 3rd century BC to the 12th century AD, and recognized the growth of the settlement from a small village port with a simple dockyard made of wood and poles to a large and remarkable port city. Onshore excavations at the mouth of river Kaveri have resulted in the discovery of stone structures, large fragments of pottery belonging to the fourth and fifth century AD and terracotta ring wells. Ancient remains have been found in many nearby villages also. A semi-circular brick structure of an artificial channel that drew water from the Kaveri into a reservoir for the purpose of irrigation has been unearthed at Vanagiri. At Kilayur, archaeological exploration by a team led by K.V Sondurajan from 1971 to 1974 yielded copper coins with the tiger emblem. This was the royal crest of the early Cholas. Apart from this a T-shaped brick wharf was also discovered. The Tamil epic *Manimekalai* describes the Buddhist monasteries and monks living in the area during the Pallava times. A 3rd century Buddhist temple and monastery have been found in the adjoining village of Pallavanesvaram. Numerous early medieval Chola coins found at Kaveripattinam indicates that it continued to be an important port in the later times as well.⁴ Deposits of Black-and-Red ware and Rouletted ware have been found at Manigramam in addition to terracotta figurines and Chola coins. The name Manigramam indicates the presence of a merchant quarter, bearing important implications for this coastal town that has been elaborately described in the texts.

4 Upinder Singh, 2008, “*A History of Ancient and Early Medieval India: From the Stone Age to the 12th Century*” Pearson Education India, p.402

In 1981, a joint team of the Department of Archaeology, Tamil Nadu and NIO, Goa carried out an underwater excavation offshore survey of Tranquebar. A shipwreck at a depth of 19m has been found at a place 5 km south of Kaveripattinam which is the first of its kind reported along the east coast of India. A thorough survey by using a metal detector indicated that the ship might have been 50m long and 15m wide. Later on airlift operations were conducted and it was found that the ship was made of wood. Large number of lead ingots dating back to 1791 and 1792 were discovered from the shipwreck.

The explorations at Kaveripattinam comprised both visual (diving) and geophysical surveys. Diving aids in ascertaining the distribution of sites, condition of artefacts, their probable age and origin. It is only by diving that underwater documentation such as photography, videography and drawings are possible. These discoveries have aided the oceanographers to reconstruct the history of the Indian coastline. The NIO further intend to study the development of boat building and navigational technology by digging the underwater ports and sunken cities.⁵

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Check Your Progress

1. Which text uses the term 'Aragaru' which is a Greco-Roman name for Uraiyyur?
2. What was Uraiyyur's muslin cloth called by the Greeks?
3. What was the fate of Uraiyyur after the Cholas transferred their capital to Kaveripattinam?

8.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. *Periplus of Erythrean Sea* uses the term 'Aragaru' which is a Greco-Roman name for Uraiyyur.
2. Uraiyyur's muslin cloth was called Argaritic by the Greeks.
3. Under the Cholas, Uraiyyur remained as the major seat of textile industry and remained so even after the transfer of capital to Kaveripattinam.

8.4 SUMMARY

- Even though it appears that Uraiyyur was a very big city with large palaces and a thriving population, there is negligible archaeological evidence to support this hypothesis.

5 <https://www.gounesco.com/explorations-at-kaveripattinam/>

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- The archaeologists were late to reach Uraiyur by which time it was a densely populated suburb of Tiruchirappalli. A few open fields and school playgrounds were the only places to excavate for artifacts, but even those limited excavations were successful.
- Among the items discovered were pottery, terracotta human figurines, and small jewellery. Most amusingly, the remains of a brick dyeing vat were discovered, confirmed Uraiyur's status as an ancient textile capital.
- Unfortunately, the survey was not very extensive because every available piece of land was built upon, probably burying all vestiges of an advanced ancient civilization.
- The strategic location of Uraiyur's near the Kaveri River made it an international trade centre that was frequently visited by Greeks and Romans.
- Under the Cholas, Uraiyur remained as the major seat of textile industry and remained so even after the transfer of capital to Kaveripattinam. Spinning and weaving of cotton and perhaps also of silk had attained a high degree of perfection.
- Kaveripattinam is a town in the Nagapattinam district in the southern Indian state of Tamil Nadu. It was once a flourishing ancient port city known as Kaveri poompattinam, which for some time was the capital of the early Chola kings in Tamilakam.
- Puhar is located near the end point of river Kaveri, aside the sea coast. It is mentioned in the *Periplus of the Erythraean Sea*.
- Marine archaeological research (conducted by the National institute of marine archaeology, Goa) has established that much of the town was washed away by progressive erosion and floods.
- In the 1960s and 70s archaeological researches were conducted under the leadership of the noted archaeologist Dr. K. V. Soundararajan.
- Long submerged wharves of pier walls excavated in recent times have corroborated the literary references to Kaveripattinam. It was rebuilt several times after that. Ancient pottery dating back to the 4th century BC has been discovered by marine archaeologists east of this town.

8.5 KEY WORDS

- **Vat Dyeing:** It is a process that refers to dyeing that occurs in a bucket or vat. Almost any dye can be used in a vat dye. Cotton, wool, leather and other fibres can be all dyed with vat dyes.

- **Epigraphy:** It refers to the study and interpretation of ancient inscriptions.
- **Metropolis:** It means a very large and busy city.
- **Numismatics:** It is the study or collection of currency, including coins, tokens, paper money, and related objects.

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8.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Briefly discuss how the Greeks described Uraiyur.
2. What is the story behind Karikala's name?

Long Answer Questions

1. Explain the significance of Uraiyur in an Archaeological sense.
2. Describe the archaeological excavations conducted at Kaveripattinam.

8.7 FURTHER READINGS

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BLOCK - III
NEW EXCAVATION FIELDS

NOTES

UNIT 9 ARCHAEOLOGY IN
TAMIL NADU-III

Structure

- 9.0 Introduction
- 9.1 Objectives
- 9.2 Prehistoric Sites
 - 9.2.1 Karur
 - 9.2.2 Pallavaram
 - 9.2.3 Kodumanal
 - 9.2.4 Keezhdi
- 9.3 Answers to Check Your Progress Questions
- 9.4 Summary
- 9.5 Key Words
- 9.6 Self Assessment Questions and Exercises
- 9.7 Further Readings

9.0 INTRODUCTION

As you may have learnt through our discussion in the previous units, the history of Tamil Nadu can be traced from the pre-historic period to the historic period. Archaeological sites in Tamil Nadu include those places which have observed the growth and decline of ancient civilizations and houses the remnants of the same. The Archaeological Survey of India has conducted extensive excavations in these regions and deciphered a number of facts about the socio-cultural life that existed in the past. Remains found in these sites consolidate the fact that the people of this region were highly skilled in artistry whereas the architectural remains demonstrate the blend of different architectural styles. These sites serve the dual purpose of presenting a number of evidences to decipher the varied aspects of Indian history and popularizing the place as inviting tourist destinations. In this unit, we will be discussing the archaeological sites of Karur, Pallavaram, Kodumanal and Keezhdi, all of which are relatively new excavation fields.

9.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the archaeological importance of Karur
- Analyse the archaeological excavations conducted at Pallavaram

- Describe the archaeological findings at Kodumanal
- Discuss the significance of Keezhdi in archaeological sense

9.2 PREHISTORIC SITES

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Let us first begin with a discussion on the archaeological site of Karur.

9.2.1 Karur

Karur is the first ever excavated site in Amaravathi river valley. It is closely located to the town of Mohanur in the Namakkal district. Karur has been identified with Vanchi and Karuvur in which the cultural sequence dates from the 2nd century BC to the 14th century AD. The early Sangam texts Purananuru, Ahananuru, Kurunthogai, Narrinai and Pathirrupathu refer to Karur and Chera kings. The occurrence of several silver coins of the Cheras with portraits and various symbols suggests that this could have been a mint centre. The literary references to Karur as a centre of jewel making are borne out by the finds of rings with intaglios. In addition to the usual ceramic finds of this period, Roman amphorae have been discovered indicative of overseas trade. No structures have been found in excavations excepting a house-site with brick flooring and a drain joining to a brick structure.

It is located at the confluence of the river Amaravathi with Kaveri. In order to ascertain the validity of the literary references and other archaeological, epigraphical and numismatic evidences, a systematic spade work was conducted in the years 1973-74, 1977 and 1979. Six trenches laid within the town area yielded important evidences like Tamil-Brahmi inscribed potsherds, graffiti marks, Chera coins, Roman artefacts like coins, amphorae and brick structures, all indicative of urban nature. The pottery assemblage of this period comprised of black-and-red ware, red slipped ware and matt designed sherds. The stratified occurrence of a square copper coin with an elephant on the obverse and bow and arrow on the reverse is worth mentioning. The coin with such symbols indicating the royal insignia of the Cheras was the first of its type to occur at Karur in a stratified context.

Perhaps the most amazing discoveries have been the 1,000-odd Roman coins dating back to the first century A.D. These include Aure II (a denomination) bearing the heads of Marcus Aurelius and Augustus Claudius, and Denr II (a denomination) of Augustus Tiberius. Others bear the insignia of several other great Roman emperors. A highly corroded silver Roman coin found in the upper levels perhaps point to the survival of external trade activities. The occurrence of imported pottery, inscribed shreds and coins on the whole has been dated to 1st to 2nd century AD.¹

1 http://shodhganga.inflibnet.ac.in/bitstream/10603/5254/11/11_chapter%204.pdf

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Regardless of its importance, either Karur or the entire valley did not receive proper attention of archaeologists. The region was again excavated after 28 years in 2008. The site Nedungur located 15 km west of Karur was excavated. Four trenches in the habitation and one transected grave opened at the site provided limited information on the nature of the site. These two sites, excavated in the upper Amaravathi river valley, offered a good picture on the stratigraphical positions of Iron Age and Early Historic cultures. Both the sites were dated on the basis of archaeological stratigraphy. In the basin area of the river, the site Porunthal was excavated for two seasons in the years 2009 and 2010. Three trenches and four graves opened respectively in habitation mound and grave yard gave some interesting evidences on glass bead making and the rituals performed in the graves. The river valley could not give a complete picture of any site due to very limited nature of material evidence. Nevertheless, the excavations provided a good picture on the potentiality of the region. Future excavations may throw much light on various features of the society and may strengthen the existing knowledge.

However, this enormous archaeological wealth is under dire threat of being lost to historians and researchers forever. With at least half a dozen goldsmiths in Karur buying old coins and other valuable artefacts to sell to outsiders, a lot of rare material has passed into private hands.²

9.2.2 Pallavaram

Tamil Nadu has a total of 160 megalithic sites dating between 2nd century BC and 2nd century AD. Urn burials, stone mounds and stone coffins are supposed to be beneath the sites. Pallavaram is considered to be one of the oldest inhabited places in South India. One hundred and fifty years ago, on May 30, 1863, a young geologist Robert Bruce Foote bent down and picked up a stone implement from the debris thrown out of a small gravel pit at Pallavaram. It proved to be an epochal discovery. Foote's discovery revolutionized the study of India's pre-history. Since then, a number of Stone Age artefacts have been uncovered. Most of these artefacts have been preserved in the Egmore museum, popularly known as the Government Museum in Chennai.

This incredible discovery in the field of prehistoric archaeology pushed back the antiquity of man in Tamil Nadu to more than half a million years ago and placed this region on the world map of pre historic culture. The stone implement discovered by Foote was a hand-axe made of a hard rock called quartzite. The Stone Age man had crafted it to dig out tubers and roots from the soil, slaughter the hunted animals and take out the meat, and so on. As Foote, then an Assistant Geologist in the Geological Survey of India (GSI),

² <https://www.indiatoday.in/magazine/heritage/story/19910430-valuable-artefacts-unearthed-plundered-in-karur-in-tamil-nadu-814369-1991-04-30>

cradled the hand-axe and looked at it as fascinating, he identified it to be of Palaeolithic Age.

At one stroke, Foote's discovery changed the antiquity of humankind who lived in the Indian subcontinent. Recent research has established that such type of tools used by man in Palaeolithic Age could be dated back to 1.5 million years. Just a few months after this discovery, Foote and his colleague in the GSI, William King, made another significant discovery. They found many stone implements, including hand-axes, cleavers and flake tools, at Attirampakkam, near the river Kortallayar, in Tiruvallur district near Chennai. The prehistoric man had used them to hunt animals gathering around waterholes and exploit plant and aquatic resources. Sometime later, Foote discovered some more stone tools at Pallavaram and was thus convinced that a Palaeolithic population had lived in India.

It was not that Foote only discovered the stone tools rather he also classified, catalogued and described them scientifically. He made efforts to understand the technology that went into their making. He analysed whether the tool was made of quartzite, agate, chalcedony or chert. He also tried to ascertain whether it belonged to the Palaeolithic, Neolithic or the Iron Age., the stratigraphy and the sedimentary context in which he found it and the geography of the location of its discovery.³

Recently the ASI has discovered a 2,300 year old sarcophagus from Pallavaram. It was covered with red ware lid and was damaged by boulders which might have rolled down the hillock due to soil erosion. The artefact is 5.6 feet long and 1.5 feet wide; it has a depth of 1.64 feet. Two rows of six legs, which are supporting the sarcophagus, are hollow type which measures 16 cm in height and 8 cm in diameter. It has three holes at the bottom besides the legs which might have been used to tie ropes to facilitate the easy carriage of the sarcophagus. The sarcophagi are of different sizes depending upon the height of the deceased. It has the shape of a crescent indicating the belief among the people in those days that dead person would remain eternal as long as the existence of moon and so the things used by the person were kept in the burial with the belief that the person will use the things even after the death.⁴

Nearly 140 years ago, a British archaeologist Alexander Rea, had unearthed a similar sarcophagus from the hillocks of Pallavaram. It was 6 feet long, one foot eight inches deep and 1.5 feet wide with ten legs. Many utensils such as cups, pots, bowls and iron nails were also found during the excavations. This established the existence of a megalithic culture in Pallavaram. This discovery has brought to light that the area was inhabited

3 <https://www.thehindu.com/news/national/a-discovery-that-changed-the-antiquity-of-humankind-who-lived-in-indian-subcontinent/article4753744.ece>

4 <https://timesofindia.indiatimes.com/city/chennai/asi-unearths-2300-year-old-terracotta-coffin-at-pallavaram/articleshow/64754538.cms>

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by the people who were not nomads. They possessed a technology to create sarcophagus standing on 12 legs during the 3rd century BC.

9.2.3 Kodumanal

The prehistoric site of Kodumanal, in Perundurai taluk in the Erode district of Tamil Nadu, is located on the north bank of river Noyyal. It was the site of booming ancient trade and finds its mention in Patittrupathu of Sangam texts. This ancient city of Chera dynasty was the home of skilled craftsmen who had expertise in making high-quality iron and beads. Layers of megalithic-cum-early tombs of historic period have been excavated in Kodumanal. Megalithic communities that inhabited in this region belonged to 2nd century BC.

The significance of Kodumanal (identified with Kodumanam) is for being a bead manufacturing centre. The literary descriptions are matched by the occurrence of beads in different stages of manufacture. Iron was the other major industry, as confirmed by a range of iron weapons, spindles, and the earliest foundry for melting iron ore. Many coins of the Chera rulers have been discovered from the river beds, while the greatest concentration of Roman coins in South India has been found from the near vicinity of the site. Therefore, its significance as a commercial centre is undoubted. Pottery with Tamil-Brahmi script and graffiti marks complement this. Kodumanal is one of the few centres where connections between the Megalithic burial and habitation sites can be clearly established.

The antiquity of Kodumanal was first noticed in 1961 by an archaeologist of the ASI, V.N Srinivasa Desikan. Later on, a trail excavation was conducted by the State Archaeology Department of Tamil Nadu whose findings, however, have been report only briefly by the Director of the Department, R. Nagaswamy. The real archaeological potential of the site was first brought out by Pulavar S. Raju, who was formerly Professor of Epigraphy in Tamil University. He paid frequent visits at the site.

Digging at Kodumanal was conducted in seven seasons during the years 1985, 1986, 1989, 1990, 1997, 2012 and 2013. A total of 63 trenches and 16 graves were excavated in 15 hectares of the habitation mound and 40 hectares of the associated graveyard. The ongoing excavations have revolutionized our understanding of the cultural transformation which comprises the beginning of the early historical period in South India. This, in turn, will necessitate reworking our paradigm for understanding the arrival of the early historic phase for the Indian subcontinent as a whole.

There is a general belief that South India got into the historical phase around the 3rd century BC. This is because of the mention of kingdoms of the deep South in the inscriptions of Emperor Ashoka of the Maurya dynasty. Since those epigraphs are found in the adjoining regions of Karnataka and Andhra, it has been argued that writing too was introduced into South India

during his reign. The epigraphs of Ashoka are found in the Brahmi script which was one of the two earliest writing systems of ancient India.

However, Kodumanal's diggings have rendered that understanding as completely invalid. The site have given five AMS (Accelerator Mass Spectrometry) dates of 200 BC, 275 BC, 300 BC, 330 BC and 408 BC for the samples collected from well stratified layers respectively at the depth of 15 cm, 60 cm, 65 cm, 80 cm and 120 cm. These are obtained from layers which have yielded a significant number of potsherds which bear inscriptions in the Tamil-Brahmi script. More than 600 Tamil-Brahmi inscribed sherds have been found during the excavations. In many cases, the names of these potsherds have connections with names from the North. A couple of NBPW sherds associated with the first phase of the early historical period in North and Central India have also been discovered in the excavations.

Many silver punch marked coins in association with NBP have been found. There are ample evidences to prove that this commercial centre had well established trade and cultural contacts with the middle gangetic plains in the 5th century BC. By the way there is still a 65 cm thick cultural deposit contained inscribed potsherds below the level that has provided the above mentioned dates. Hence, there is every possibility that the beginning of the early historic period may be pushed back further.

Another important discovery at the site was the gemstone industry. Beads, discarded chips, raw material blocks, a grooved stone slab was unearthed from the habitation mound. Various kinds of stone such as sapphire, beryl, agate, carnelian, amethyst, lapis lazuli, jasper, garnet and soapstone were also unearthed from the habitation. A crucible furnace used for manufacturing steel, iron furnace and copper smelting furnace were also discovered from the site. There are evidences of shell industry and textile production also. The presence of various industries and trade items in Kodumanal evidently advocates that it was a flourishing trade and industrial centre in South India during the ancient times.

The excavations conducted at Kodumanal revealed two cultural periods---Megalithic Period and the Early Historic Period. Black and red ware, black slipped ware, russet coated ware and red slipped ware were discovered in the excavation. Additionally, beads made of quartz and clay, inscribed potsherds and graffiti potsherds were unearthed.

A megalithic cairn circle was also excavated from the site. The grave goods such as lids, dishes, bowls, ring stands and four legged jars were found placed outside the primary cist. An urn was discovered at the south-eastern side of this primary cist which surprisingly yielded 782 beads of carnelian. At the eastern side of the main cist, an iron sword measuring 169cm in length was also discovered at the eastern side of the main cist. Apart from this, four iron swords, a copper toddy filter with lotus and peacock designs, small daggers, stirrup like object and double edged axe were also excavated.

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In totality, the radiometric dates from Kodumanal make it quite evident that the beginning of the early history in South India is two centuries earlier than it was thought. The beginning of historical period has hardly any connection with Ashoka.

9.2.4 Keezhdi

Keezhdi also known as Keeladi, is a small village near Silaiman on the border between Madurai and Sivaganga districts in Tamil Nadu. This is the biggest ancient excavation site in South India. It is considered as the parallel of Mohenjo-Daro. For several years, experts had guessed that the archaeological site at Keezhdi in Sivaganga district of Tamil Nadu dates back to the Sangam Age.

In 2013-14, the ASI conducted explorations in 293 sites along river Vaigai in the districts of Theni, Dindigul, Madurai, Sivaganga and Ramanathapuram. Keezhdi in Sivaganga district was selected for digging and artefacts were discovered by the ASI in the second phase of the excavation. Carbon dating of charcoal found at the site has confirmed that the settlement there belonged to 200 BC. These excavations thus proved that urban civilization had existed in Tamil Nadu in the Sangam Age.

The diggings at Keezhdi were conducted at two localities. Both the places have yielded different things and one can guess that they represent a social hierarchy. The bigger of the two places with more number of trenches has been identified as the settlement of the educated rich people, as many precious objects like jewellery, semi-precious stones, fine game stones and 74 Tamil-Brahmi inscriptions have been discovered. Occurrence of beads of agate, quartz and Carnelian testifies that they had trade contacts with Rome and other countries. The Tamil-Brahmi letters were inscribed on the pottery which suggests that the common man was literate because inscriptions commissioned by kings are found in stones and walls of temples. There were poetic Tamil names such as Iyanan, Uthiran, Vendhan, Santhanavathi and Saathan, on those inscriptions, some of which can be found in the Sangam literature.

The other locality has more of graffiti on pottery, bone tools and iron weapons, the fish symbol which was both an art and as a sign representing a clan, was also found. Red-and-Black pottery, groove tiles used for laying roofs and typical flat brick measuring 38 cm are the other signs that the city discovered belongs to the Sangam Age.⁵

More than 5600 antiquities and artefacts have been unearthed in Keezhdi in the diggings conducted by the State Archaeology Department of Tamil Nadu. Hitherto, 102 trenches have been excavated at the site. The

5 <https://www.thehindu.com/news/national/tamil-nadu/Keezhdi-excavation-what-was-found-and-what-it-means/article18991279.ece/photo/1/>

antiquities discovered includes potsherds, terracotta figurines, a ring well, terracotta beads, carnelian beads, shell bangles and iron pieces.⁶ One of the potsherds is inscribed with an image of a fish which was once the symbol of the great Pandya rulers. One of the names on another sherd has been traced back to Sri Lanka, indicating a trade link or perhaps a long-ago immigrant. Many unearthed potsherds have a roulette design, similar to the kind used in ancient Rome. This points to the possibility of foreign trade at that time.

Other artefacts include stone celts for sharpening tools, circular and square coins from the Chola and Pandya period, chess games made of ivory, arrowheads made of bones and iron, gold beads, iron implements like knives and daggers.

The use of fired brick, the size of the building complex, an array of pots placed in such a way that it must have been used either as a lamp or for painting, and other finds suggest that the settlement is of a more civilized population than was previously suspected during the Sangam period.

Keezhdi excavation is significant in the way that it has given archaeological evidence for the existence of a secular civilization belonging to the Sangam era. If more excavations are conducted there, we will find more evidence that will definitely show the trace of a strong secular culture once existed in ancient Tamil Nadu known as Thamizhagam.

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Check Your Progress

1. Name the first ever excavated site in the Amaravathi river valley.
2. Who discovered the archaeological remains of Pallavaram for the first time in 1863?
3. What is the significance of Kodumanal?
4. Name the biggest ancient excavation site in South India?

9.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Karur was the first ever excavated site in the Amaravathi river valley.
2. Robert Bruce Foote discovered the archaeological remains of Pallavaram for the first time in 1863.
3. The significance of Kodumanal (identified with Kodumanam) is for being a bead manufacturing centre.
4. Keezhdi is the biggest ancient excavation site in South India.

⁶ <https://www.thehindu.com/news/national/tamil-nadu/1200-more-artefacts-unearthed-in-Keezhdi/article23829818.ece>

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9.4 SUMMARY

- The history of Tamil Nadu can be traced to the pre-historic period. ASI has conducted extensive excavations in the state and deciphered a number of facts about the socio-cultural life that existed in the past.
- Karur is the first ever excavated site in Amaravathi river valley. Important evidences like Tamil-Brahmi inscribed potsherds, graffiti marks, Chera coins, Roman artefacts like coins, amphorae and brick structures, have been unearthed, all indicative of urban nature.
- Regardless of its importance, either Karur or the entire valley did not receive the proper attention of archaeologists.
- In 1863, Robert Bruce Foote discovered the archaeological significance of Pallavaram which pushed back the antiquity of man in Tamil Nadu to more than half a million years ago and placed this region on the world map of pre historic culture.
- In the recent times 2,300 year old sarcophagi have been discovered from Pallavaram which is similar to the structure discovered by the British archaeologist, Alexander Rea some 140 years ago.
- The prehistoric site of Kodumanal was the site of booming ancient trade and finds its mention in Patittrupathu of Sangam texts. This ancient city of Chera dynasty was the home of skilled craftsmen who had expertise in making high-quality iron and beads.
- The antiquity of Kodumanal was first noticed in 1961 by an archaeologist of the ASI, V.N Srinivasa Desikan. However, the real archaeological potential of the site was first brought out by Pulavar S. Raju.
- Keeladi or Keezhdi is the biggest ancient excavation site in South India. It is considered as the parallel of Mohenjo-Daro.
- Carbon dating of charcoal found at the site has confirmed that the settlement there belonged to 200 BC. These excavations thus proved that urban civilization had existed in Tamil Nadu in the Sangam Age.
- The diggings at Keezhdi were conducted at two localities. Both the places have yielded different things and one can guess that they represent a social hierarchy.
- The antiquities discovered from Keezhdi includes potsherds, terracotta figurines, a ring well, terracotta beads, carnelian beads, shell bangles and iron pieces

- Keezhdi excavation is significant in the way that it has given archaeological evidence for the existence of a secular civilization belonging to the Sangam era.

9.5 KEY WORDS

- **Cairn:** It is a mound of rough stones built as a memorial or landmark, typically on a hilltop or skyline.
- **Cist:** It is an ancient coffin or burial chamber made from stone or a hollowed tree.
- **Epoch:** It refers to a particular period of time in history or a person's life.
- **Graffiti:** It means writing or drawings scribbled, scratched, or sprayed illicitly on a wall or other surface in a public place.
- **Sarcophagus:** It refers to a stone coffin typically adorned with a sculpture or inscription and associated with the ancient civilizations.

9.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Describe the archaeological excavations conducted at Keezhdi.
2. Discuss the archaeological excavations conducted at the site of Pallavaram.

Long Answer Questions

1. Elaborate on the archaeological significance of Karur.
2. Analyze the archaeological findings at the prehistoric site of Kodumanal.

9.7 FURTHER READINGS

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UNIT 10 EXCAVATION METHODS-I

Structure

- 10.0 Introduction
- 10.1 Objectives
- 10.2 Site Survey
- 10.3 Geological Survey
- 10.4 Horizontal Excavation
- 10.5 Burial Excavation
- 10.6 Archaeological Recording
- 10.7 Answers to Check Your Progress Questions
- 10.8 Summary
- 10.9 Key Words
- 10.10 Self Assessment Questions and Exercises
- 10.11 Further Readings

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10.0 INTRODUCTION

Excavation is the most traditional archaeological tool for understanding the human past, and it undoubtedly represents the type of activity that most people attribute to archaeology. Excavation methods are the different techniques employed within archaeology to dig, expose, identify, process, and record archaeological remains. It involves the removal of soil, sediment, or rock that covers the artefacts or other evidences of human activity. Early excavation methods involved destructive random digging and removal of objects with little or no location data recorded. Modern excavations generally involve slow, careful withdrawal of sediments in very thin layers, detailed filtering of sediment samples, and exacting measurement and recording of artefact location.

An archaeological project often commences with a survey of the site under examination. Geological surveys have proved to be useful in various archaeological researches. Human burials comprise a major source of evidence for human history. Burials excavated by archaeologists may report on both the individual commemorated and on society at large.

Two methods of excavations are generally followed—vertical excavation and horizontal excavation. Horizontal excavation refers to excavating a broad area with the purpose of exposing the remains of a single point in time. Archaeological excavation is innately destructive because it permanently removes both artefacts and the surrounding soil matrices from their original context. Therefore, responsible and accurate recording is the most vital component of any project, and excavation has no meaning without written and visual records.

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Archaeology has undergone far-reaching changes since the time when an excavation was simply a mining of artefacts. Nowadays, the removal of artefacts requires that the spatial relationships and context in which they are found be fully documented.

10.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the method of site survey
- Examine the process of geological survey
- Discuss horizontal excavation
- Describe burial excavation
- Analyse the process of archaeological recording

10.2 SITE SURVEY

An archaeological project often commence with a survey. A regional survey is an effort to methodically locate previously unidentified sites in a region. A site survey is an attempt to systematically locate features of interest, for example, houses and middens, within a site. Each of these two objectives may be achieved by more or less the same methods.

Initially in archaeology, a survey was not much practiced. The researchers and historians were generally satisfied with discovering the locations of monumental sites from the local people, and excavating only the clearly visible features there. Gordon Willey initiated the method of regional settlement pattern survey in 1949 in the Viru Valley of coastal Peru, and survey of all levels became famous with the rise of processual archaeology later on.

If conducted as a preliminary exercise, an archaeological survey is more beneficial than even the excavation. It needs comparatively less amount of time and expense, because it does not require processing large volumes of soil to search out the artefacts. However, surveying a large region or site can prove to be expensive, so archaeologists often use sampling methods. Just like with other types of non-destructive archaeology, survey avoids ethical issues related to destruction of a site by means of excavation. It is the sole means to gather some forms of information, like settlement patterns and settlement structure. Survey data is generally amassed into maps which may exhibit surface features or distribution of artefacts.

Surface survey is the simplest survey method which involves walking over the ground surface recording, mapping and collecting artefacts encountered. This method cannot notice sites or features that are completely buried under earth, or overgrown with vegetation. It may also comprise

mini-excavation methods like augers, corers, and shovel test pits. In case no materials are found, the surveyed area is considered to be sterile.

Aerial survey is carried out by using cameras attached to aeroplanes, balloons, or even kites to get a bird's-eye view. It is useful for quick mapping of large or complex sites. Aerial photographs are used to document the status of the archaeological excavation. Aerial survey also uses infrared, ground-penetrating radar wavelengths and other methods.

Another very effective survey to see beneath the ground is the geophysical survey. Magnetometers detect even slight deviations in the Earth's magnetic field caused by iron artefacts, kilns, some types of stone structures, and even ditches and middens. Machines that measure the electrical resistivity of the soil are also extensively used. Archaeological features whose electrical resistivity differs with that of surrounding soils can be detected and mapped. (See Unit 2 for more details on the topic)

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10.3 GEOLOGICAL SURVEY

For a long time, the study of geology has been basic in answering various questions in archaeology. Geological surveys have proved to be useful in various archaeological researches. In 1976, the term Archaeo-geology was, for the first time, used by Colin Renfrew to describe the contribution of the geological sciences to archaeology.

To tribute the importance of geology in archaeological tasks, the geological society of America (GSA) established the Archaeological Geology Division in 1977, with the aim of providing suitable forum for presentation of papers on archaeological geology and to encourage research and teaching in archaeological geology. The previous documentation of the influence of geology in archaeology is supposed to have started in 1830 when Charles Lyell published his work *Principles of Geology*. In 1863, he published his famous book *The Geological Evidence of the Antiquity of Man*, in which he used geological context to document the remains and artefacts of early humans.

Fagan defines archaeology as the scientific study of the human past, of ancient human behaviour, from the earliest time right up to the present. By itself, archaeology is part of wider discipline of archaeology which studies all aspects of humanity, ancient and modern. However, archaeologists are unique among scientists in that they study changes in human culture over long period of time.

Collin and Paul, on the other hand, define archaeology as partly discovery of treasures of the past, partly the meticulous work of scientific analyst and partly the application of the creative imagination. It is both physical activity out in the field and an intellectual quest in the study of

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laboratories. In general, the study of archaeology is concerned with analysis of human culture by using cultural remains and other cultural phenomena.

Geology can be defined as an earth science of solid earth, the rocks of which it is composed, and the procedures by which they change with time. It can also mean the study of the solid features of any celestial body. It gives insight into the history of earth by providing the primary evidence for plate tectonics, the evolutionary history of life, and past climates.

Applied geology is the geology that is used in various areas of practice including mining, engineering, hydrology and environmental issues and, in due course, archaeology. Norman and Evan, in their book, *Geological Methods for Archaeology*, mention that geology covers considerable roles in various archaeological processes. Geology smoothen the progress of archaeological sites exploration. The first decision that must be taken in any new archaeological venture is where to dig. This decision can be based on historical records in many of the cases, by the visible remains of ancient construction, or by the discovery of plentiful artefacts. However, to see deep enough into the surface so that decision can be taken on particular target areas for excavation, and also to get an idea of what artefacts and constructions to expect, techniques involving geology are increasingly used.

In archaeology, landscapes and environment can be reconstructed by means of studying of geomorphology and sedimentology entrenched in geology. As such, geology is used for the analysis of the deposits found in the surface that gives ample evidence for changes in land forms over time. These deposits may include residual materials, formed by the weathering of underlying formations, or may have been formed elsewhere and then transported by wind, water, or humans to their present site of deposition. The kind and amount of surficial materials alter with changing land surface and climatic conditions and so provide the best evidence regarding the evolution of the landscape. An understanding of these changes on a site can be used to recreate the palaeo environment at the time of occupation and modelling of the prehistoric land-use patterns. Archaeological exploration in an area is made convenient by first indicating desirable habitation sites of the time and then targeting these sites for geophysical and geological vision.

Excavation strategies can be developed with the help of excavation process, geology and geomorphic-sedimentologic information. This information usually allows a better idea of the distribution and nature of buried artefacts and may explain irregular surficial redistribution of artefacts. There are three major phases involved in this-Geomorphic mapping which furnish descriptions of the landforms, drainage pattern, surficial deposits, tectonic features and any active geomorphological process; analysis of the process of erosion that carved the land forms-including soil formation, sediment removal or deposition and tectonic uplift-are documented; the land-forms,

climate, and surficial deposits of today are extrapolated back to recreate palaeo-environment and palaeo-climate at the time of the habitation of the site.

Geology aids in analyzing the archaeological artefact since it can be used to determine the sources of raw materials used in the artefact. For instance, the development and spread of iron technology could be clearly seen in the production of pots at different sites in the Tigris-Euphrates Valley beginning around 5500 BC. The designs were used across the world and originated from single sites, so that archaeologically it appeared that the pots were being exported from those sites. However, it was found that the materials used at each site were local. This implied that technology was exported and not the pottery.

Both archaeology and geology employ a number of dating techniques for determining the dates of various materials. The methods used in dating can be explained through various laws or principles that comprise:

- (i) **The Principle of Uniformitarianism:** It was a fundamental principle of geology advanced by James Hutton which states that the geologic processes observed in operation that modify the Earth's crust at present have worked in much the same way over geologic time.
- (ii) **The Principle of Intrusive Relationships:** In geology, when an igneous intrusion cuts across a formation of sedimentary rock, it can be determined that the igneous intrusion is younger than the sedimentary rock. There are a number of different kinds of intrusions, including stocks, laccoliths, batholiths, sills and dikes. Such principle can be applied in archaeology to ascertain the age of sediments.
- (iii) **The Principle of Cross-cutting Relationships:** This principle is concerned with the formation of faults and the age of the sequences through which they cut. Faults are younger than the rocks they cut; therefore, if a fault is found that penetrates some formations but not those on top of it, then the formations that were cut are older than the fault, and the ones that are not cut must be younger than the fault. Finding the key bed in these situations may help determine whether the fault is a normal fault or a thrust fault. In archaeology, this principle enables to determine the age of artefacts found in such fault rocks.
- (iv) **The Law of Superposition:** The law of superposition was first proposed in the late 17th century by the Danish scientist Nicolas Steno. According to this law, sedimentary rock layer in a tectonically uninterrupted sequence is younger than the one beneath it and older than the one above it. Rationally a younger layer cannot slip underneath a layer deposited before. This principle allows sedimentary layers to be observed as a form of vertical time line, a partial or complete record of the time elapsed from deposition of the lowest layer to deposition of the highest bed.

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Stratigraphy can also be used to ascertain the relative age of different remains. This is done by means of analysis of stratigraphic position, style and absorption of transient elements. Objects found in the same undisturbed stratigraphic horizon are supposed to have the same age, those in a lighter horizon are perceived to be younger, and those are perceived to be older. However, we cannot give specific dates or date ranges to the different episodes of deposition.

Thus, archaeology and geology are closely related disciplines. It is not possible to conduct archaeological operations without geology, but the whole process of conducting archaeological excavation requires knowledge of geology. It is from such understanding that Colin Renfrew in 1976 coined the term Archaeo-geology to combine the two disciplines as they were seen to be inseparable from one another.

Check Your Progress

1. What is a site survey?
2. Who first proposed the law of superposition?

10.4 HORIZONTAL EXCAVATION

Excavation is a destructive, but a most systematic and scientific, documentation of archaeological sites. Through this process the cultural remains are brought out very carefully. It is a time consuming and expensive field activity. Generally, excavations are team efforts and require enormous funds for their successful completion. Augustus Pitt Rivers was the British Archaeologist who contributed to the development of different excavation methods. In the present scenario of the problem oriented archaeology, archaeologists plan excavation according to the imminent problem. For the excavation team, it is now almost essential to engage a palaeo-zoologist, palaeo-botanist, geo-archaeologist, archaeological chemist and other such experts. Before the commencement of excavation, the contour map of the site is prepared.

The nature of the excavation depends basically on the character and needs of the site and the methods of excavation can also vary depending on its objectives. It is very important to have an index trench in any excavation which goes up to the natural soil and gives an idea about the cultural sequence of the site. On the basis of the nature of the site, such as, architectural features, diverse activity areas etc., it is to be decided whether the site is needed to be excavated horizontally or vertically. Two types of excavations are generally conducted—vertical excavation and horizontal excavation. Of these, a vertical excavation is generally undertaken at a limited scale. Due to their limited nature, these are restricted to providing only patchy information regarding the

social, economic and religious practices of the people of a particular culture. Therefore, for getting further details horizontal excavations are meticulously planned and conducted in a systematic manner. A horizontal excavation is a method of excavation in which full horizontal extent of a site is cleared and large areas are open while preserving a stratigraphic record in the balks between large squares. A gradual probe may then occur. So the horizontal excavation aims at exposing the deposits horizontally. Sir Mortimer Wheeler is one of the chief opponents of this excavation by using the grid method.

Extensive horizontal excavations are conducted to obtain detailed knowledge of the cultural periods or phases present at an archaeological site. Unlike the vertical excavation which is not extendable towards the area away from the parallel peg lines, the horizontal excavation is definitely advantageous in that it is extendible in all directions, thus, expanding the scope of the excavation. As a result, horizontal type of excavation is followed to unearth the town planning of a site.

Horizontal excavation is generally conducted for a habitation site in order to know the area of its extent.¹ However, to conduct a horizontal excavation some fundamentals are required to be considered:

- (i) Easily and clearly sub-divide the site for record and control;
- (ii) Capable of progressive expansion in any direction without breaking down or weakening preliminary datum lines;
- (iii) Ability of preserving for constant reference at a maximum number of points, complete vertical sections until the last phase of excavation;
- (iv) Capable, ultimately, of easy integration into a continuously exposed regional excavation;
- (v) Readily accessible at all points for the soil removal, without impediment from intervening cuttings or traffic across excavated surfaces; and
- (vi) Adequately open to the sky to make certain the easy inspection of well-lighted sections at all the required depths.

Laying out a trench

The layout of the horizontal excavation is based upon a square. After the contour mapping of the site, the entire mound is divided into a grid of square trenches. The squares or grids are separated by a baulk measuring around 50cm. the baulk is the unexcavated region and is held intact till the end of the excavation and this act as the four sides of each trench. It also allows the preservation of the vertical sections of the site. To impose a grid of square trenches, reference lines are drawn from the centre of the single

¹ <http://egyankosh.ac.in/bitstream/123456789/41391/1/Unit-4.pdf>

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mound type sites. These lines intersect each other at a right angle leaving the mound divisible into four quadrants. Each of these four quadrants is further divided into equal sized small squares. Each of these squares is referred by the reference peg located towards the left side in the north. The central peg marked by the intersection is generally referred to as the peg A1. Towards the south the pegs are traditionally numbered A2, A3, A4.....from A1. Towards east, the pegs are marked A1, B1, C1..... It is recommended that the director of excavation himself should excavate a small control pit in each trench. Both the vertical and horizontal excavations are complimentary to each other.²

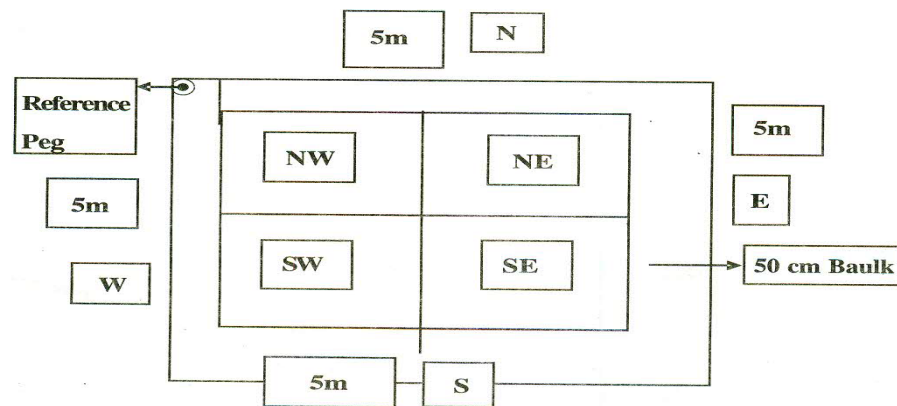


Fig 10.1 Trench Layout

10.5 BURIAL EXCAVATION

At the archaeological site, burials are also found. Burial excavation enables us to understand various facets of human life in the past centuries include ritual practices, beliefs, ancestral belief and belief about life after death. The skeletal remains aids in identifying the racial affinities, family groups, age, sex, nutrition, palaeo-demography, palaeo-diseases and other cultural information. Quartering or quadrant method is generally used for burial excavation. The burial is divided into four quarters by two strings, laid to the cardinal points of the compass and over the estimated centre. Opposite quarters are excavated sequentially. A suitable width of unexcavated area is left between each quadrant in such a manner so as to give a complete transverse section across the mound in both the directions. After removing the soil of one quadrant, the archaeologist attempts to understand the actual position of the burial and then proceed with the removal of remaining three quadrants. For the purpose of recording the excavated materials from the burials, reference points are fixed at successive intervals and the three

² Vijneshu Mohan, 1998, "India: 50 Years of Independence (1947-97)-Status, Growth & Development-16: Archaeology" B.R Publication Corporation, Delhi, p.10

dimensional aspects of the artefact are recorded in situ with reference to the abovementioned points.

Recording of stratigraphy is one of the most significant observations required to be made during the excavation. The principle of stratigraphy is based on the law of superimposition which means that the earliest deposit is at the bottom followed by succeeding deposits. Thus it becomes convenient for an archaeologist to make out which is earlier and which is later. The periodization is done on the basis of the association of different strata with different structural stages. Each layer is assigned by Roman numerals. The numbering of layers is always done from the top depending on the border of exposing whereas the periodization is done always from the bottom. However, in case of secondary deposits, the periodization may adopt a different pattern. Pit or dump is the most common feature found during the excavation. In so far as the pit is concerned, its date is taken as contemporary to the sealing layer. In case of dumps, however, the date is taken as contemporary to the resting layer. After the excavation, the data is recorded in a systematic and careful manner. In major diggings, which yield numerous ceramics and bones, bone yards and pottery yards are constructed to house the bone and pottery finds according to its stratigraphic context. This improves the post-excavation data processing significantly.

The data obtained is then subjected to a series of analysis which comprise documentation, classification, quantitative and qualitative analysis, typo-technological analysis, socio-cultural analysis, and so on. The data thus collected is stored in appropriate places with adequate labelling. The excavator then writes the final report of the excavation on the basis of the daily notes prepared by him. Therefore, while writing daily notes, a common understanding is vital among the excavators.

While excavating and writing the daily notes, the excavator should keep the following points in mind:

- (i) First of all the excavator should be well aware of the background of the site. While providing this information all those factors which are listed under exploration are required to be included.
- (ii) The objective of putting the trench, its identification number and its association with the surrounding trenches.
- (iii) Measurements are generally taken in relation with the North-Western peg of the trench and the datum line (depths in a trench are measured from the datum line using + and -symbols).
- (iv) After each excavation the newly uncovered surface is scraped, brushed and the identifiable features are recorded.
- (v) To make the things more convenient, the trench is generally divided into four sub-squares and each sub-square is dug individually.

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- (vi) The finds of every excavation is washed, dried, labelled and recorded. The depth of each dig is required to be measured. While labelling the excavator should mention the name of the site, trench number, sub-square locus, depth, layer number and date.
- (vii) During the excavation, the excavator is required to observe the features of the layers, like colour, composition, thickness, texture, compactness, disturbances (e.g. erosion features) in layers, if any, its slope, its continuity and its resemblance and dissimilarity with the neighbouring trenches.

10.6 ARCHAEOLOGICAL RECORDING

The archaeological record is the body of physical (not written) remains retrieved from the past. It is the physical record of human prehistory and history, of why ancient civilizations prospered or failed and why those cultures changed and grew. Archaeological record is the story of the human world. It is one of the core concepts in archaeology. For a better understanding of human cultures, an archaeological theory is used to interpret the archaeological record. It is the duty of all the archaeologists to record precisely what is being retrieved during the excavation irrespective of their background and experience. Apart from this the recording of what is found has to be accurate and clearly understandable by other people. It should always be remembered that an excavation destroys the site and that once a context has been completely excavated, it can never be re-excavated. The written and pictorial record of a site is usually all that is left of the deposits and features once an excavation has been completed.

As soon as the excavation has been initiated, every bit of information retrieved from the site must be associated with the layers, finds and structures around it, so that the complex relationships that contribute to the interpretation of the site can be recorded. For example, the recovery of Roman pottery kilns. The location and the quantity of the pottery itself, the kiln structure and the waste material from the manufacturing process are mutually essential for understanding the site. If an individual piece of pottery is separated from this, the other information loses almost all its meaning.

The archaeological record may comprise the earliest ancient findings as well as contemporary artefacts. Human activity has had a large impact on the archaeological record. Human activities, such as agriculture and land development, might cause damage or destruction of the potential archaeological sites. Some other threats to the archaeological record include natural phenomena and scavenging. Archaeology might prove to be a destructive because it permanently removes both artefacts and the surrounding soil matrices from their original context. Therefore, archaeologists restrict the

amount of excavation that they conduct at each site and keep a meticulous record of their finds.

Each layer, structure or deposit discovered during the process of excavation is called a 'context' and is given a unique context number. On large or complex sites, these can run into thousands. When the site is excavated, each context is described and related to artefact finds and surrounding contexts. The primary information of the site is recorded on a paper or computer. Scale drawings and photography record each context visually. Catalogues of contexts, finds, soil samples, drawings and photographs are required to be compiled because these will be used later to re-trace the steps followed during the excavation. After the completion of excavation, the resulting collection of information is still required to be sorted, processed and written-up. This is termed as the 'post-excavation' phase of work.

When the excavation and post-excavation processes are concluded, future researchers should be able to re-examine the archaeology by searching the site records and asking probable questions such as the depth of stratigraphy, the dimension of structures or the quantity and the content of storage pits. The information gathered from the excavations is considered to be of permanent value only if it is published and the site records are deposited in publicly accessible archives. It has long been said that an archaeological discovery has been made only after it has been published.³

Archaeological Recording System

Wheeler's method of recording the vertical stratigraphy of a site was through sections taken from baulks left unexcavated in a grid system across sites. This quickly became the standard for the majority of excavations, and is a system that is still sometimes used today. However, during the 1960s new techniques for the recording of excavations were developed. Ed Harris, working in Winchester, took a particularly strong lead in recognizing the need for a sound theoretical approach to archaeological stratigraphy. Initially, Ed Harris and Patrick Ottaway in 1976 developed the single context recording system from a suggestion by Lawrence Keene. The system is the most prevalent in Britain today.

Under this system each excavated context is assigned a unique context number and is recorded by type on a context sheet and maybe drawn on a plan and/or a section. Depending on time limitations and importance contexts may also be photographed, but in this case a grouping of contexts and their associations are the objective of the photography. Finds from each context are bagged and labelled with their context number and site code for further cross reference work carried out after excavation. The height above sea level of relevant points on a context, such as the top and bottom of a wall are taken

³ https://nortoncommarch.files.wordpress.com/2010/09/recording_system.pdf

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and added to plans sections and context sheets. Heights are recorded with a dumpy level or total station by relation to the site temporary benchmark. Samples of deposits from contexts are occasionally also taken, for later environmental analysis or for scientific dating.⁴

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Check Your Progress

3. What is excavation?
4. Why are extensive horizontal excavations conducted?
5. During the process of excavation, what is a context?

10.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. A site survey is an attempt to systematically locate features of interest, for example, houses and middens, within a site.
2. The law of superposition was first proposed in the late 17th century by the Danish scientist Nicolas Steno.
3. Excavation is a destructive, but a most systematic and scientific, documentation of archaeological sites.
4. Extensive horizontal excavations are conducted to obtain detailed knowledge of the cultural periods or phases present at an archaeological site.
5. Each layer, structure or deposit discovered during the process of excavation is called a 'context' and is given a unique context number.

10.8 SUMMARY

- Excavation is the most traditional archaeological tool for understanding the human past. Excavation methods are the different techniques employed within archaeology to dig, expose, identify, process, and record archaeological remains.
- An archaeological project often commence with a survey. Site survey is an attempt to systematically locate features of interest, for example, houses and middens, within a site.
- For a long time the study of geology has been basic in answering various questions in archaeology. Geological surveys have proved to be useful in various archaeological researches.

4 Ibid

- Geology smoothen the progress of archaeological sites exploration. It aids in analyzing the archaeological artefact since it can be used to determine the sources of raw materials used in the artefact.
- Excavation is a destructive, but the most systematic and scientific, documentation of archaeological sites. Through this process the cultural remains are brought out very carefully.
- Augustus Pitt Rivers was the British Archaeologist who contributed to the development of excavation methods. On the basis of the nature of the site, such as, architectural features, diverse activity areas etc., it is to be decided whether the site is needed to be excavated horizontally or vertically.
- Horizontal excavation is a method of excavation in which full horizontal extent of a site is cleared and large areas are open while preserving a stratigraphic record in the balks between large squares.
- Extensive horizontal excavations are conducted to obtain detailed knowledge of the cultural periods or phases present at an archaeological site.
- At the archaeological site burials are also found. Burial excavation enables us to understand various facets of the human life in the past centuries include ritual practices, believes, ancestral belief and belief on life after death.
- The archaeological record is the body of physical (not written) remains retrieved from the past. It is the physical record of human prehistory and history, of why ancient civilizations prospered or failed and why those cultures changed and grew.
- As soon as the excavation has been initiated, every bit of information retrieved from the site must be associated with the layers, finds and structures around it, so that the complex relationships that contribute to the interpretation of the site can be recorded.
- Ed Harris and Patrick Ottaway in 1976 developed the single context recording system from a suggestion by Lawrence Keene. The system is the most prevalent in Britain today.

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10.9 KEY WORDS

- **Baulks:** They are unexcavated walls which may be left between pits to provide stratigraphic control.
- **Contour Map:** It is a topographic map showing the shape of land surface by contour lines, the relative spacing of the lines indicating the relative slope of the surface.

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- **Datum Point:** It is a specific, fixed reference point on an archaeological site from which measurements are taken.
- **Feature:** It refers to any physical structure or element that is made or altered by humans but is not moveable and cannot be removed from a site. For example, wall, pit, floor etc.
- **Midden:** It refers to an old dump for domestic waste which may consist of animal bone, botanical material, human excrement, mollusc shells, sherds, stones, and other artefacts and ecofacts related to past human activities.
- **Square:** In archaeology, it denotes subdivisions of a site or a larger excavation unit. The subdivisions are small regular units often square or rectangular in shape. A continuous network of squares is called a grid.
- **Test Pit:** It refers to an excavation unit used in the initial investigation of a site or area, before large-scale excavation begins, that allows the archaeologist to preview what lies underneath.

10.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on site surveys.
2. Discuss the process of burial excavation.
3. List the principles for dating various artefacts discovered during excavations.

Long Answer Questions.

1. Explain how the geological survey has proved to be useful in archaeological researches?
2. What is horizontal excavation? Discuss in detail the method of horizontal excavation.
3. What do you understand by archaeological recording? What is its significance? Discuss the archaeological recording system.

10.11 FURTHER READINGS

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Excavation Methods-I

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BLOCK - IV
DATING, SURVEY AND CONSERVATION

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UNIT 11 EXCAVATION METHODS-II

Structure

- 11.0 Introduction
- 11.1 Objectives
- 11.2 Land Survey
- 11.3 Topographical Survey
- 11.4 Stratigraphy and its Importance
- 11.5 Answers to Check Your Progress Questions
- 11.6 Summary
- 11.7 Key Words
- 11.8 Self Assessment Questions and Exercises
- 11.9 Further Readings

11.0 INTRODUCTION

In archaeology, a survey is a field research by which archaeologists explore archaeological sites and collect information about the location, distribution and organization of past human cultures. Archaeologists conduct surveys to search for sites, to identify patterns in the distribution of material culture over regions, to make generalizations or test hypotheses about past cultures, and to evaluate the risks that development projects will have on the archaeological heritage. The surveys may be intrusive or non-intrusive, depending upon the needs of the survey team and extensive or intensive, depending on the types of research questions being asked of the landscape in question. Surveys can be a practical way to decide whether or not to carry out an excavation, but may also be ends in themselves, as they produce important information about past human activities in a regional context. Land survey and topographical survey will be discussed in this unit. Stratigraphy is a key concept to modern archaeological theory and practice. Modern excavation techniques are based on stratigraphic principles.

11.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand land survey
- Examine topographical survey
- Discuss stratigraphy and its importance

11.2 LAND SURVEY

Land surveying is a method, profession, and science of precise determination of the terrestrial or three-dimensional location of points and the distances and angles between them, generally adopted by licensed surveyors, and members of various building professions. These points are by and large on the Earth's surface, and they are often used to establish maps and boundaries for ownership, locations, such as building corners or the surface location of subsurface features, and other or other objectives to be fulfilled by government or civil law, such as property sales.¹

Archaeological survey is a special type of land survey carried out to report the finds made in an archaeological site or to demonstrate the association of the archaeological site to the landscape. This survey is generally conducted at the request of archaeologists or government agencies and employs GIS, GPS, aerial photography, and other tools for surveying. In majority of cases, these surveys are done as remotely as possible to avoid disturbing the archaeological site.²

Even as archaeological land surveys are often carried out at the conclusion of an excavation, land surveying methods can prove to be useful in identifying the sites before excavation. Previous utilization of the land can leave physical marks on the modern landscape, such as raised ridges where the walls of buildings once stood. Sometimes, it is not feasible to observe these features from the ground. Aerial surveying technique can be utilized to create maps that show these markings from an aerial vantage point showing elevation changes, which can make such features apparent. This map can then be converted into a grid that guides the archaeological excavation of the site.

Archaeological land surveying attempts to be as non-intrusive as possible. Unlike many other types of surveys, it might not be possible for the surveyor to go across the entire landscape on foot because of the sensitive nature of the archaeological finds. The type of survey conducted on archaeological sites is often known as a 'geophysical survey,' and it may be carried out with LIDAR or other ultra-modern methods used to survey the area without even actually visiting the area. Sometimes, specialized tools can map not only the above-ground artefacts but also probable archaeological features buried underground. Similarly, as above-ground surveys are conducted, the readings taken from the equipment become a dataset, which can then be turned into a visible map of the area.

The result of an archaeological land survey is a high-resolution image of the landscape. This display can take several forms depending on the proposed purpose of the survey. It may be two-dimensional recording of the location

1 <https://en.wikipedia.org/wiki/Surveying>

2 <https://www.pointtopointsurvey.com/2016/07/archaeological-land-surveying/>

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of the site and surrounding landscape or may be three-dimensional, offering additional information about the layout of the archaeological site, such as the height of any walls uncovered. Sometimes this data can be used to create a virtual 'fly through,' or a three dimensional image that can be manoeuvred to show the view from different points.

The outcomes of an archaeological land survey become a record of the layout that can be compared to later surveys to ascertain the stability of the archaeological site and record any damage after excavation. This map can also be used as an all-inclusive view of the structures found by an archaeological excavation, providing the foundation of research and other activities. Sometimes, archaeological land surveys may prove to be an evidence for the listing of such sites on registers of historic places.

11.3 TOPOGRAPHICAL SURVEY

A land survey deals basically with defining the boundaries of a parcel of land. Topographical surveying, however, is primarily concerned with noting the natural and artificial features on the land itself. These may comprise hills, streams, ravines, trees, fences, buildings, and other improvements over the natural state of the land. A topographic survey demonstrates the location, size, and height of these types of improvements, in addition to the gradual changes or contours in elevation. A topographic survey emphasizes more on elevation than on horizontal measurements. Most of these measurements are taken either with a surveying-quality GPS unit, or with an Electronic Distance Measurer (EDM) device. The results of the topographic survey are drawn as contour lines on a map of the land (topographic surveys are sometimes called contour surveys). Nowadays, sophisticated computer programs facilitate digital versions of these maps, plus interactive elevation views of the land. The data may be used in Computer-Aided Design (CAD) programs, where it can be manoeuvred by engineers or architects to show how the topography will transform through planned improvements.

Topographical survey enables archaeologists to measure and map the ground surface, precisely locating archaeological features, structures, finds or excavation areas. Topographical survey for military purposes started in the late 18th and 19th centuries when the Ordnance Survey (OS) was established. The early techniques were resorted to archaeological use by pioneer archaeologists with a military background such as General Pitt Rivers. In the early 20th century, a number of Britain's ancient monuments were accurately mapped for the first time by archaeological surveyors such as O.G.S Crawford, who was the official Ordnance Survey archaeologist.

Topographical survey is based on the idea that the earth's surface is divided into a regular system of measurement, so that each place has a unique

position. In British archaeology, the most recognizable use of this idea is in Ordnance Survey grid references, where depending on the number of figures in the reference, a site or find-spot can be located to pin-point accuracy.

Archaeologists rely on surveying instruments, such as a GPS or Total Station, in order to relate what they are measuring to the national system of the OS grid. The position of any point on the ground surface can be calculated by measuring (or ‘triangulating’) from a known point (such as an OS benchmark or corner of a building on an OS map), using trigonometry. Formerly, when analogue instruments such as theodolites were used in combination with traditional distance-measuring devices such as surveying chains, this was done manually. During those times, only highly skilled and experienced surveyors could work quickly and accurately. Presently, however, computer technology has rendered some aspects of surveying a bit less arduous.

Every archaeological site has its own regular internal system of measurements and co-ordinates, called as the site grid. By means of a Total Station, the corners of the site grid are precisely positioned by measuring off fixed features in the surrounding area such as buildings, or OS bench-marks and ‘trig points’. If these fixed points are not available, a GPS can be used to locate the site grid corners. Inside the site grid, measurements can be taken with a Total Station or measuring tapes. Earthworks, excavation trenches and find-spots can be measured and mapped elaborately by using simple techniques like off-setting with tapes or a plane-table. For larger areas, a Total Station or GPS serves best. All the measurement points have a reading for East and North on the site grid, and there should be regular levelling measurements. These are either used to compile a drawn plan of the site (a traditional but still important way of presenting data) or by using a computer program to produce a digital plot.

Methods of Topographic Surveys

A topographic survey includes horizontal and vertical plane surveys. It can be carried out using different methods. Some popular methods are explained below:

- (i) **Geographic Information Systems (GIS):** GIS enables to combine layers of digital data from different sources and to manipulate and analyze how the different layers are associated with each other. The process of converting 3D topographic maps to digital form includes raster to vector conversion using CAD-based software such as AutoCAD.
- (ii) **Theodolite Surveys:** A theodolite is a surveying instrument that measures the angles, and the distances are measured with either a steel measuring tape or, more commonly, EDM. An EDM can measure great distances very quickly and precisely. It measures distance with

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the usage of light and radio waves. Its development is considered as a milestone in survey measurement methods.

- (iii) **GPS:** A group of Global Positioning System (GPS) satellites orbiting the earth is used to determine the position(s) of GPS ground receivers as they are moved from point to point. The data assembled may either be processed in the office to produce GPS receiver positions (control surveys) or in the field to give the field surveyor immediate receiver positions (real time GPS surveys) for use for example in construction or for subdivision layout surveys.
- (iv) **LIDAR:** It stands for Light Detection and Ranging and is a method of remote sensing that uses light to measure varying distances to the Earth. Airborne LIDAR systems can produce very accurate elevation models for terrain (even measuring ground elevation through trees), while offering a quick and efficient method of surveying terrain that is not easily available LIDAR, like the similar radar technology (which uses radio waves instead of light), determines the range to an object by measuring the time delay between transmission of a pulse and detection of the reflected signal.
- (v) **Photogrammetry:** It is a technique in which stereographic pairs of photographs are used to indirectly measure objects on the ground and then calculate point coordinates and height differences.

Check Your Progress

1. What is the result of an archaeological land survey?
2. What is a topographical survey based on?
3. What is a theodolite?

11.4 STRATIGRAPHY AND ITS IMPORTANCE

Stratigraphy simply means the science or study of rock strata or layers. It is concerned with all characters and attributes of rocks as strata and their interpretation in terms of mode of origin and geologic history. Stratigraphy is an important concept to modern archaeological theory and practice. Modern excavation techniques are based on principles of stratigraphy. It is derived from the idea that sedimentation occurs according to uniform principles. When archaeological finds are beneath the ground, the identification of the context of each find is crucial in enabling the archaeologist to draw conclusions about the site and about the nature and date of its occupation. It is the role of the archaeologist to make an effort to discover what contexts exist and how they are formed.

The artefacts that are found in successive undisturbed cultural layers can be dated relatively on the basis of stratigraphic principles. The principle of cultural/archaeological stratification is fundamental and it plays a pivotal role in archaeological investigations. The method is borrowed from geology. Sir Charles Lyell shaped the concept of stratigraphy in geology and published it in his outstanding book *Principles of Geology* in 1830. This notion was introduced in archaeology by the scholars like C.J. Thomsen, J.J. Worsaae, Kathleen M. Kenyon and Mortimer Wheeler. There are certain fundamental laws and notions adopted in identifying and studying stratigraphy. These are: Laws of Superposition, Laws of Original Horizontality, Laws of Original Continuity, Laws of Stratigraphical Succession and Laws of Faunal Succession as are explained below:

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- (i) The Law of Superposition states that strata and features found in them are in same position as to when they were first deposited. Thus, with a series of layers, the upper layers are younger and the lower are older.
- (ii) The Law of Horizontality states that layers of sediment were originally deposited horizontally under the action of gravity. Archaeological layers are split up when laid down and thus have a natural tendency towards a horizontal position, as well accommodating to the position of pre-existing layers.
- (iii) The Law of Original Continuity states that each stratigraphic layer originally extended spatially as a whole, continuous sheet or lens and that any discontinuities or edges that now exist are due to erosion, faulting, and other processes that dislocate or remove portions of the layer.
- (iv) The Law of Stratigraphical Succession states that any given unit of archaeological stratification exists within the stratigraphic sequence from its position between the under most of all higher units and the uppermost of all lower units and with which it has a physical contact.
- (v) The Law of Faunal Succession is based on the observation that sedimentary rock strata contain fossilized flora and fauna, and that these fossils succeed each other vertically in a specific, reliable order that can be identified over wide horizontal distances.

Contribution of Edward C. Harris

Stratigraphy was later on developed to suit the needs of archaeology by Edward C. Harris in 1970s. In his book *Principles of Archaeological Stratigraphy* (1979), Harris questioned the application of geological laws directly in archaeology. He worked out a new method in the interpretation of archaeological stratification which is popularly called as *Harris matrix*. It works on a simple fundamental principle that if one cultural layer lies upon another, then the lower layer must have been deposited before the upper

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layer. The time interval between the depositions of two cultural layers may be a century or a millennium depending upon the nature of cultural deposit. According to this concept, the contextual layer on the top is regarded as younger than the layer that is found below. Therefore, a succession of layers would give a relative chronological sequence from earliest to latest. Any cultural material found in a particular contextual layer can be dated relatively younger and older based on from which layer the particular artefact is recovered. The artefacts recovered from orderly placed stratified layers would help to classify them in certain chronological order. For example, the collection of Stone Age tools such as Palaeolithic tools, Micro lithic tools and Neolithic tools in different cultural layers helps to determine the approximate date of a particular cultural layer.

Importance of Stratigraphy

As you know that stratigraphy is the natural and cultural deposition of sediment, debris, and other materials in separate layers, or strata. In order to understand the method by which these deposits have accumulated to form the layers of archaeological site the knowledge of stratigraphy is essential. Archaeologists rely a lot on stratigraphy to reconstruct the history of the site-before during and after they were inhabited by the humans. Stratigraphy is an important relative dating technique i.e. it does not give you an absolute date, but indicates something is older or younger than things found above or below it. It gives the proper cultural sequence and aids in understanding of different cultures.

Generally we excavate from the most recent (usually the uppermost) layers down to the earliest (which tend to be the lowest) ones. Merely depth of burial, however, is not by itself a reliable guide to age. For example, a Victorian cellar could be cut through the foundations of a Roman building. In this case, the Victorian deposits in the cellar would be at a lower depth than the surrounding Roman foundations, despite of being much more recent in age. Utmost care must be taken to identify any such 'cuts' and to make sure that finds or soil samples collected from them are not mixed with materials collected from outside the cut.

During excavation, complex changes of texture, colour and content of layers are observed. These are recorded horizontally in plans and vertically in sections. By detecting cuts and fills, superimposition and episodes of soil removal and re-deposition, we can tell the order in which the deposits were laid down. This is termed as the 'sequence'. The sequence aids in establishing the chronology of activity on the site by allowing dating evidence such as artefacts or scientific dating samples to be related to the build-up of layers across the area under investigation.

A majority of the archaeological sites have been dated by using stratigraphy. For instance, the existence of Mesolithic phase in between

the earlier upper Palaeolithic and later Neolithic phase was realized by this method only. Stratigraphic technique can also be applied in open air sites due to successive occupation of these areas, layers may be formed one after another and some mound may be formed.

However, stratigraphic method has its own limitations also. The type of chronology one can derive by means of stratigraphy surmise a culture in terms of older or younger than the other one. But it cannot determine the exact date for any of these cultures. Apart from this, it is not possible to obtain stratigraphic sequence everywhere; therefore its applicability is restricted. In many places stratigraphic sequence can be exposed only by excavation, which is very time consuming and expensive.

Check Your Progress

4. What are modern excavation principles based on?
5. What is stratigraphy?

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11.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The result of an archaeological land survey is a high-resolution image of the landscape.
2. A topographical survey is based on the idea that the earth's surface is divided into a regular system of measurement, so that each place has a unique position.
3. A theodolite is a surveying instrument that measures the angles, and the distances are measured with either a steel measuring tape or, more commonly, EDM.
4. Modern excavation techniques are based on principles of stratigraphy.
5. Stratigraphy is the natural and cultural deposition of sediment, debris, and other materials in separate layers, or strata.

11.6 SUMMARY

- Land surveying is a method, profession, and science of precise determination of the terrestrial or three-dimensional location of points and the distances and angles between them, generally adopted by licensed surveyors, and members of various building professions.

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- Archaeological survey is a special type of land survey carried out to report the finds made in an archaeological site or to demonstrate the association of the archaeological site to the landscape.
- The result of an archaeological land survey is a high-resolution image of the landscape. This display can take several forms depending on the proposed purpose of the survey.
- The outcomes of an archaeological land survey become a record of the layout that can be compared to later surveys to ascertain the stability of the archaeological site and record any damage after excavation.
- Topographical surveying is primarily concerned with noting the natural and artificial features on the land itself. These may comprise hills, streams, ravines, trees, fences, buildings, and other improvements over the natural state of the land.
- Topographical survey enables archaeologists to measure and map the ground surface, precisely locating archaeological features, structures, finds or excavation areas.
- It is based on the idea that the earth's surface is divided into a regular system of measurement, so that each place has a unique position.
- Topographical surveys can be conducted by using different instruments like the GIS, Theodolite, GPS, LIDAR, Photogrammetry etc.
- Stratigraphy is an important concept to modern archaeological theory and practice. The artefacts that are found in successive undisturbed cultural layers can be dated relatively on the basis of stratigraphic principles.
- Stratigraphy method is borrowed from geology. Sir Charles Lyell shaped the concept of stratigraphy in geology and published it in his outstanding book *Principles of Geology* in 1830.
- There are certain fundamental laws and notions adopted in identifying and studying stratigraphy. These are: Laws of Superposition, Laws of Original Horizontality, Laws of Original Continuity, Laws of Stratigraphical Succession and Laws of Faunal Succession.
- Stratigraphy was later on developed to suit the needs of archaeology by Edward C. Harris in 1970s. In his book "*Principles of Archaeological Stratigraphy*" (1979). Harris questioned the application of geological laws directly in archaeology.
- He worked out a new method in the interpretation of archaeological stratification which is popularly called as *Harris matrix*.
- It works on a simple fundamental principle that if one cultural layer lies upon another, then the lower layer must have been deposited before the upper layer.

- Stratigraphy is an important relative dating technique i.e. it does not give you an absolute date, but indicates something is older or younger than things found above or below it. It gives the proper cultural sequence and aids in understanding of different cultures. However, it has its own limitations.

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11.7 KEY WORDS

- **CAD:** CAD or Computer-aided design is the application of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design.
- **Geology:** It refers to the science which deals with the physical structure and substance of the earth, their history, and the processes which act on them.
- **Ravine:** It refers to a deep, narrow gorge with steep sides.
- **Trigonometry:** It is a branch of mathematics that studies relationships involving lengths and angles of triangles.

11.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Define stratigraphy.
2. Write a short note on the contribution of Edward C. Harris in stratigraphy.
3. Describe land survey in archaeology.

Long Answer Questions

1. What is topographical survey in archaeology? Discuss its significance.
2. Elaborate different methods of topographical survey.
3. Explain the various laws of stratigraphy.
4. Analyze the importance of stratigraphy in archaeology.

11.9 FURTHER READINGS

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UNIT 12 EXCAVATION METHODS-III

Structure

- 12.0 Introduction
- 12.1 Objectives
- 12.2 Three Dimensional Recording
- 12.3 Drawing
- 12.4 Aerial Photography
- 12.5 Cataloguing
- 12.6 Conservation Methods
- 12.7 Answers to Check Your Progress Questions
- 12.8 Summary
- 12.9 Key Words
- 12.10 Self Assessment Questions and Exercises
- 12.11 Further Readings

NOTES

12.0 INTRODUCTION

Archaeological excavation is the process by which archaeologists define, retrieve and record cultural and biological remains buried in the ground. The past activities leave traces in the form of house, graves, artefacts, bones, seeds, and other traces which signify human experience. Before any excavation, the site must be located. Aerial photography is one of the techniques employed for this work. The technique of three dimensional recording of objects evolved with time. Conservation of an artefact is of prime importance in archaeology. After an artefact is conserved, its drawing provides the most relevant and detailed information. The reporting of artefacts from an excavation involves many stages, and cataloguing is one such step. It involves the description of the characteristics of individual artefacts.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand three-dimensional recording
- Explain archaeological drawing
- Discuss the technique of aerial photography
- Describe cataloguing
- Understand various conservation methods in archaeology

12.2 THREE DIMENSIONAL RECORDING

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For a long time the capturing of the third dimension, the depth or height was challenging. Traditionally, excavation plans and sections were documented in two dimensions. Objects were also recorded in two dimensions, often from different angles. Remote sensing images like aerial photographs were represented as flat surfaces. Although depth could be visualized with techniques such as stereoscopes, analysis of relief was troublesome. Three-dimensional recording is the recording of artefacts and structures in time and space. The provenience of archaeological finds is recorded with reference to the site grid.

The need for recording archaeological finds by three-dimensional method has been emphasized by Sir Mortimer Wheeler in his renowned work, *Archaeology from the Earth*. Several methods for three-dimensional recording have been prescribed. For example, by intersecting measurements from two reference points and levelling with a bubble level attached to a surveying pole or similar straight edge. Wheeler advanced an Orthogonal System of measurement. It consisted of a line of datum pegs connected by string and not more than one meter distant from each other and of a strong wooden square long enough to cover the width of a normal excavation trench. Thus the string marks a reference line and measurements are taken at right angles to it, the square being held level.¹

Another method described later on is based on another principle in general usage in modern surveying. From a base point or station we measure a direction, the distance between base point and the feature to be recorded and finally the difference in level. To get the direction more conveniently the angle between true north and the line pointing to the feature (azimuth) should be determined as in surveying practice. Since the distances involved are very limited for the present purpose, any complicated and expensive instrument is not required. A simple angular division fixed upon the wooden peg marking the base point is needed. Other things required comprise a tape, a small spirit level, a plumb bob and a prismatic compass. This method is very economical and yields very reliable results. When the excavation work is conducted in a simple, straightforward way, Wheeler's Orthogonal System may be superior.

All this changed at the end of the last century with the introduction of computer based digitization technologies, 3D software, and digital near-surface sampling devices. 3D recording is conducted preferably with an electronic recording device, the total station or base point; or if no total station is available, with tapes, plumb bobs, and surveyor's levels. The new technology which usually involves off-site computer manipulation of the data, adds further accuracy to three-dimensional recording.

¹ <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1475-4754.1967.tb00615.x>

The spatial properties of the multi-scale archaeological dataset can now be accurately recorded, analysed and presented. Relationships between artefacts can be elucidated by visualizing the records in a three dimensional space, computer-based simulations can be made to test hypotheses on the past use of space, remote sensing techniques help in detecting previously hidden features of landscapes, thus shedding light on bygone land uses.²

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12.3 DRAWING

After the conservation of an artefact, a drawing provides more relevant, detailed, easily edited, and potentially comparable information than is possible in a photograph. One of the most common jobs of an archaeological illustrator is drawing the finds and features from excavations and museums. The archaeological drawings are not just making a pretty picture of the item. The purpose is to provide most of the information in a form that the viewers can read. A good archaeological illustrator is well aware of the conventions governing how artefacts should be drawn. The knowledge of techniques of recording and drawing artefacts makes the work accurate and clear. The definition of a quality artefact drawing is ‘...one which incorporates an understanding of the component parts of an artefact with an ability to make an accurate and aesthetic rendering of its character.

Drawing artefacts reinforce an archaeologist’s observational powers, and highlights features relevant to identification and interpretation. Drawings can depict both easily visible and fainter surface areas. All illustration should have a metric scale. What gives drawing its strength is the amount of information that can be expressed in a single image. By excluding the detail that renders a drawing realistic and applying a variety of conventions for various materials, archaeological drawings become interpretive diagrams rather than artistic or realistic portrayals of the artefact. The illustrator can furnish the drawing to his or her intended audience whether it is for publication, where a more technical drawing is common, or for museum display, where a more artistic portrayal is appropriate. This is also depends upon the available technology, and while 3D imaging is becoming increasingly possible, most illustrators continue to use the more cost-effective pen and ink method. When illustrating for publication, drawings make it convenient for researchers to examine and interpret the artefact to better understand its use in both a historical and archaeological context.³

Techniques of Drawings

There are many different techniques that are used for artefact drawings nowadays. Also, different projects, laboratories, and illustrators use different

2 <https://www.universiteitleiden.nl/en/research/research-output/archaeology/the-three-dimensions-of-archaeology>

3 http://www.conservation-wiki.com/wiki/Archaeological_Objects

‘in-house’ techniques that are specific to that specific person or place. In spite of this, there are many universal goals within artefact drawing, and a limited way of achieving them. These common principles are described below:

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Orientation

It refers to the minimum to be included in a plan view of both sides and profile view, as required. If an object is bent it should be drawn as such, but the original shape can also be included. Conventions for orientation are based on types of artefact. For instance, pointed objects such as swords or pins are drawn with the tip facing down; however projectile points are aligned with the point upwards. The illustrator should provide as many views as necessary to convey the most amount of information.

Scale

It is important have the knowledge of the scale before drawing and how much the reduction or enlargement will affect the details of the artefact. A linear scale should also be included indicating which scale is being used on the actual drawing for future reference. A majority of the small finds can be drawn at a 1:1 scale, meaning 1cm in reality = 1cm on paper. Tiny artefacts, such as beads could also be enlarged to show more detail. For larger objects it may be necessary to scale down as necessary, which can include a scale of 1:2 or 1:4, etc. generally objects are drawn at a larger size, considering the reduction that will take place during the publication process.

Outline

There are different methods of outlining the object according to the available material. It can be traced directly, measured with an object such as a set-square, drawn using a grid system, scanned, projected, or traced from a scaled photograph provided that the image in the photo was not distorted or taken from an undesirable angle, etc.

Views

When including multiple views of an object, it is vital for the illustrator to show the relationships between those views. Link lines are used to indicate this relationship, and are typically short dashes to clarify to the reader what he or she is looking at. When suitable, it is also sensible to include a cross-section of the object. This is performed by variety of methods, but in the final drawing the cross-section is either blacked in or for some materials diagonal lines or stippling is used.

Shading

Shading is always done with the light source at an angle of 45° from the top left corner of the drawing. For different materials either stippling or lines are

used to fill in the shaded areas. Shading is basically used to depict the relief of the object and should be kept to a minimum if possible.

Check Your Progress

1. Where has the need for recording archaeological finds by three-dimensional methods been emphasized?
2. What is one common job of the archaeological illustrator?
3. From where is shading always done?

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12.4 AERIAL PHOTOGRAPHY

After the invention of camera, people were ascending the skies in balloons to capture the unique outlook that only the birds see. Aerial photography is one of the best methods of understanding archaeological landscapes, because it reveals and make sense of features which are too faint, large and irregular to be better appreciated from the ground level. In cases like the Nazca lines (in southern Peru), the features are meaningless from the ground but easily visible from the air.

In 1906, the stone circle at Stonehenge (a prehistoric monument in Wiltshire, England) was one of the first archaeology sites to be photographed from the air. Although aerial photography was used during the First World War, it was not until after aerial developments during the Second World War that its use in archaeology became more popular.

Aerial photographic research consists of three main elements—reconnaissance (actually flying and taking pictures), archive search (investigating pictures of the site or area taken earlier) and mapping (where the information in aerial photography is interpreted and correctly placed).

Two kinds of aerial photographs are taken—vertical and oblique. Vertical photographs are mostly captured at high-level, i.e., more than 1000 feet height, continuously with machine cameras mounted at the base of aero-planes flying in straight regular traverses. In the 1940s many such photographs were taken for military purposes. Oblique photographs are generally taken with a handy zoom camera from closer to the ground, at an angle to the site in view. These photographs are captured actively when the photographer has positively identified a subject. Vertical photographs are usually passive in the sense that they only provide blanket coverage with no particular archaeological bias. With the purpose of providing a three-dimensional effect, an overlapping pair of vertical photographs, taken from slightly offset positions, can be viewed stereoscopically.

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Aerial photography revolutionized the landscape archaeology in the 20th century. Early investigators attempted to gain birds-eye views of sites using hot air balloons, scaffolds or cameras attached to kites. It started with balloon flights in the first decade of the 20th century and expanded using open-seated biplanes in the second and third decades and later on covered almost the entire England. Methodical archaeological aerial photography has been conducted by organizations like the Royal Commissions on Historical Monuments (RCHMs), Cambridge University Committee for Aerial Photography (CUCAP) and several other organizations. Sometimes helicopters are used as an alternative to fixed wing aero-planes, having the advantage of the ability to hover in mid-air over a site.

There are multiple advantages of aerial photographs for the archaeologists. For the first time large sites could be viewed accurately, in their entirety and within their landscape. This aided the creation of drawn plans and also inspired archaeologists to look beyond the distinct monument and to appreciate a site's role within its setting. Photographs are taken vertically for the purposes of planning and spatial analysis and obliquely to highlight certain features or give perspective. Vertical photos can be converted into scaled plans by the process of photogrammetry.

Obviously, archaeological features are more visible from the air than on the ground. In temperate Europe, aerial reconnaissance is one of the principal methods by which new archaeological sites are discovered. Minor variations in ground conditions caused by buried features can be highlighted by numerous factors and then viewed from the air.

Slight variations in ground levels will cast shadows when the sun is low and these can best be viewed from an aero-plane. These are called shadow marks. Buried ditches will hold more water and buried walls will hold less water than undisturbed ground, this phenomenon causes crops to grow better or worse, taller or shorter, over each kind of ground and hence define buried features which are evident as tonal or colour differences. Such effects are referred to as crop-marks.

During winters frost can also appear on ploughed fields where water has naturally accumulated along the lines of buried features. These are known as frost-marks. Minor differences in soil colour between natural deposits and archaeological ones can also often show in ploughed fields as soil-marks. Differences in levels and buried features will also affect the behaviour of surface water across a site and can produce a remarkable effect after heavy rain.

Roger Agache (France), Antoine Poidebard (Syria), L.W.B Rees (Jordan) O. G. S. Crawford (England), Sir Henry Wellcome (Sudan) and Giacomo Boni (Italy) are considered to be pioneers of aerial archaeology. Kite aerial photography is now being used on archaeological sites outside

the visible spectrum, from the near ultra-violet through to the near and thermal infra-red. Aerial archaeology is used in the course of research and investigation in aviation archaeology.

12.5 CATALOGUING

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Cataloguing refers to the accounting used in the laboratory after the artefacts and eco-facts are processed initially and giving the numbers with which they are marked for storage. Its records describe and record what was found during an archaeological exploration and it is the primary record for all materials after excavation. The catalogue number is a unique number given to each individual item, or group of items, in an archaeological collection. Most archaeologists are fanatical about cataloguing their finds because it is easy for one distracted lab worker to mess up an artefact's record of provenience.⁴

Cataloguing is the assembly of all basic information about each item in the collection. This process is essentially a descriptive one, in which a series of observed variables are noted, identified and recorded. The most important aspect of cataloguing for an archaeological collection is permanently associating a specimen with its archaeological context. It involves keying a number that is associated with the specimen to a written record of its provenience.

The cataloguing process starts at the excavation and continues in the lab after the field season is over. Each and every object must be accounted for and its provenience maintained through a catalogue. The beginner's first job in a lab is almost always cataloguing. This can consume a lot of time. As per the thumb rule in archaeology, for every week spent excavating, archaeologist spend three to five weeks or more cleaning, conserving, and cataloguing the finds. Sometimes it appears tedious, but meticulous cataloguing is essential because without recording its precise provenience, an artefact's value to future researches is greatly reduced.

The chief objective of cataloguing is to identify and document an object or a group of objects with the purpose of collecting valuable information. Such information may comprise object's identification number or code and its provenience. Even though the purpose of cataloguing is not to record characteristics or collect data for research purpose, catalogue information is important and useful for research. It allows the researcher to know about the objects in collection and the identifications made for cataloguing sometimes can be used for very general analysis. Without cataloguing, an item cannot be properly indexed and will not be easily accessible to the museum staff or the public. Sometimes a repository may also catalogue the records concerned

⁴ Robert L. Kelly, David Hurst Thomas, 2013, "*Archaeology: Down to Earth*", Cengage Learning

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with an archaeological collection. Generally the accession number is linked to both the specimens and the records.

Catalogue or identity numbers give a code for uniquely identifying objects and for linking archaeological objects to their provenience. The cataloguing can be done on paper and later entered into an electronic database, or it may be recorded electronically first. It is not possible to visualize all the variables that another archaeologist might desire to analyse, but a good catalogue provides ample information to enable others to know what artefact is being described without even looking at the artefact. All artefact cataloguing depends on the ability to recognize and interpret artefacts and their characteristics, and this comes only through training and experience.⁵

An artefact catalogue is a record of the characteristics of an artefact pertinent to the dimensions of space, form and time. For archaeologists, space-or which site, and where on the site, the artefact come from is the most important variable. It should be recorded both in the catalogue and on the label associated with the artefact. Form means the shape, size, colour, weight, material, pattern and the manufacturing technique. Information regarding these attributes can be acquired by observation and measurement of the artefact. Time or the age of the artefact can be ascertained with reference to the variable of form, because mostly one or more the characteristics will vary with time as the fashion and technology changes. Lastly, the quantity of artefact remains should be recorded.

Apart from these characteristics, the artefacts are often classified as per the functional characteristics on the basis of assumptions made about their usage. Accordingly artefacts can be grouped into categories such as domestic, architectural and personal. Domestic comprise the items used at home, for example, ceramic tableware, bone and metal cutlery, glass bottles etc. Architectural items includes those which were used in constructing buildings such as ceramic bricks, plaster, wallpaper, iron nails etc. The majority of functional classification systems are based on the work of Stanley South, who was the proponent of the use of functional classification with the purpose of facilitating pattern recognition on sites. This comprised the identification of site-specific activities and activity areas within sites, and the comparison of different sites. However, functional analysis has its limitations.⁶

12.6 CONSERVATION METHODS

Conservation is an action in order to prevent, stop or retard the process of deterioration of the artefacts. It is sometimes supplemented by the restoration work, which means the treatment of objects with necessary corrections and

5 Jane Balme, Alistair Paterson, 2009, “*Archaeology in Practice: A Student Guide to Archaeological Analyses*”, John Wiley & Sons, p.364

6 *Ibid.*, p.365

alterations. The idea of conservation is an eventual reality, which comprise both preservation and restoration.

Any buried artefact would have reached a chemical and physical equilibrium with its environment. It remains quite stable in that environment. After burial in the earth, they have to acclimatize with the new environment through certain modifications to establish equilibrium with its microenvironment. The artefacts will again need to adjust with the new environment when it is excavated. Consequently, this process leads to breakdown of the object either physically or chemically or biologically or combination of all these factors.

The recovered materials are needed to be conserved. Earlier the artefacts were washed with water (except things that water could harm). But nowadays, many archaeologists hesitate to wash some artefacts as this might lead to damage and destruction of some information. For example, stone and ceramic artefacts can contain pollen or blood residues, plants, or other materials that can be identified and used to reconstruct tool use and diet—but not if an overenthusiastic lab worker has thoroughly polished the piece. Though, in general, a simple cleaning is in order.

Some artefacts may require more attention, particularly organic or metal artefacts recovered from wet deposits. It may also be necessary to reconstruct broken pieces. This is frequently done with pottery since ceramics are mostly found in broken state, and reconstruction apparently tells us about the shape, size and decoration of the vessel.

Archaeologists need to employ certain methods for the care of archaeological materials. There are three methods--cleaning, repair and stabilization. Cleaning implies the careful removal of dirt to facilitate examination, recording and conservation of the artefacts. Repair means securing the original position of the objects. Stabilization refers to strengthening of the specimens in all means to reduce or arrest its further deterioration. Different methods are applied for the conservation of organic and inorganic materials. Organic materials like bone, wood, leather, ivory are best kept under the conditions in which they are found. If their microenvironment is dry, wet, or humid, the object must be placed in the same microenvironment. Various chemical applications are practiced for the preservation of inorganic materials like potteries, stone, metals etc.

Archaeological Museums

An archaeological museum is an institution that preserves a collection of artefacts and other objects of artistic, cultural, historical, or scientific importance. The purpose of museum is to serve the material remains not only to the researchers but also make it available to public to get an idea about their cultural heritage.

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The earliest necessity to house objects of antiquarian remains in India dates back to late 1796 AD when the Asiatic Society of Bengal felt the need to house the vast collection of archaeological, ethnological, geological, zoological pursuits. However, they started the first museum in 1814.

Apart from this due to different explorations conducted by Archaeological Survey of India during the tenure of its first Director General, Alexander Cunningham vast quantities of antiquarian remains were collected. The establishment of site museums had to wait until the arrival of Sir John Marshall, who initiated the founding of the local museums like Sarnath (1904), Agra (1906), Ajmer (1908), Delhi Fort (1909), Bijapur (1912), Nalanda (1917) and Sanchi (1919). National Museum Delhi, Salar Jung Museum Hyderabad, Madras Museum, Trissur Sakthan Museum, Pazhassi Raja museum Kozhikkode, Ambalavayal museum Waynad, and so on, have a good collection of archaeological materials. Tamil Nadu has Government Archaeological Museums at Chennai, Erode and Karur.

Check Your Progress

4. Why is aerial photography one of the best methods of understanding archaeological landscapes?
5. What is cataloguing?
6. What are the three methods employed for the care of archaeological materials?

12.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The need for recording archaeological finds by three-dimensional method has been emphasized by Sir Mortimer Wheeler in his renowned work, *Archaeology from the Earth*.
2. One of the most common jobs of an archaeological illustrator is drawing the finds and features from excavations and museums.
3. Shading is always done with the light source at an angle of 45° from the top left corner of the drawing.
4. Aerial photography is one of the best methods of understanding archaeological landscapes, because it reveals and make sense of features which are too faint, large and irregular to be better appreciated from the ground level.
5. Cataloguing refers to the accounting used in the laboratory after the artefacts and eco-facts are processed initially and giving the numbers with which they are marked for storage.

6. Archaeologists need to employ certain methods for the care of archaeological materials. There are three methods--cleaning, repair and stabilization.

12.8 SUMMARY

NOTES

- Archaeological procedure involves identifying a potential area, systematic collection of data, its organization, situating it in a particular cultural period, conserving and preserving them and also interpreting them.
- Traditionally, excavation plans and sections were documented in two dimensions. Sir Mortimer Wheeler emphasized the need for three dimensional recording. It is the recording of artefacts and structures in time and space.
- After the conservation of an artefact, a drawing provides more relevant, detailed, easily edited, and potentially comparable information than is possible in a photograph.
- The archaeological drawings are not just making a pretty picture of the item. The purpose is to provide most of the information in a form that the viewers can read.
- Aerial photography is one of the best methods of understanding archaeological landscapes, because it reveals and make sense of features which are too faint, large and irregular to be better appreciated from the ground level.
- Cataloguing refers to the accounting used in the laboratory after the artefacts and eco-facts are processed initially and giving the numbers with which they are marked for storage.
- Its records describe and record what was found during an archaeological exploration and it is the primary record for all materials after excavation. The catalogue number is a unique number given to each individual item, or group of items, in an archaeological collection.
- Conservation is an action in order to prevent, stop or retard the process of deterioration of the artefacts. It is sometimes supplemented by the restoration work, which means the treatment of objects with necessary corrections and alterations.
- An archaeological museum is an institution that preserves a collection of artefacts and other objects of artistic, cultural, historical, or scientific importance.

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12.9 KEY WORDS

- **Azimuth:** It is magnetic bearing sighted from your position to a known landmark. Used in navigation and in determining site locations.
- **Catalogue:** It is the systematic list recording artefacts and other finds, retrieved by archaeological research, including their description and provenience.
- **Conservation:** It is a branch of archaeology concerned with the stabilization, preservation, repair, reconstruction, and general management of material culture and natural resources.
- **Nazca Lines:** They are a group of very large trenches in the Nazca Desert, in southern Peru. They were created between 500 BC and 500 AD.
- **Photogrammetry:** It is the science of making measurements from photographs. The input to photogrammetry is photographs, and the output is typically a map, a drawing, a measurement, or a 3D model of some real-world object or scene.
- **Provenience:** It means the source, origin, or location of an artefact or feature and the recording of same. It is the position of an archaeological find in time and space, recorded three-dimensionally.
- **Reconnaissance:** It is a technique of gathering data, often associated with surface surveys, in which archaeological remains are systematically identified and plotted on a map.

12.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write an explanatory note on three-dimensional recording.
2. What is archaeological drawing?
3. Define cataloguing in archaeology.
4. Write a short note on archaeological museums.

Long Answer Questions

1. Discuss various techniques employed in this process. Also explain the significance of drawing.
2. Explain the origins, development and types of aerial photography. Also write a note on its significance.

3. How is cataloguing done and what is its significance?
4. Describe the methods and significance of conservation of artefacts in archaeology.

12.11 FURTHER READINGS

NOTES

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UNIT 13 DATING METHODS IN ARCHAEOLOGY-I

NOTES

Structure

- 13.0 Introduction
- 13.1 Objectives
- 13.2 Relative Dating
 - 13.2.1 Typology
 - 13.2.2 Stratigraphy
 - 13.2.3 Seriation
 - 13.2.4 Geo-Archaeological Dating
 - 13.2.5 Obsidian Hydration Dating (OHD)
 - 13.2.6 Chemical Dating of Bones
- 13.3 Absolute Dating
 - 13.3.1 Radio Carbon Dating (C-14)
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- 13.4 Answers to Check Your Progress Questions
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13.0 INTRODUCTION

Archaeology is a multidisciplinary social science that routinely follows analytical techniques from various spheres of inquiry to answer questions about human behaviour and material in different phases of history. Archaeological investigations have no meaning unless the chronological sequences of events are reconstructed faithfully. Dating of remains is vital in archaeology, in order to place finds in correct relation to one another and to find what was present in the experience of any human being at a given time and place.¹ Dating is the process of assigning to an object or an event a date in the past, allowing such object or event to be located in a previously established chronology. This generally requires a 'dating method'. A number of dating methods are used by the archaeologists to determine the antiquity of archaeological materials, organic remains like plants and animals, and of archaeological sites. These dating techniques can be broadly subdivided into two groups: Relative Dating and Absolute Dating. Relative dating identify the order in which the sites or artefacts were used in a sequence from earliest to latest. Absolute dating techniques attempts to establish an exact or approximate calendar date for a site or artefact.

1 <https://www.ucl.ac.uk/museums-static/digitalegypt/archaeology/dating.html>

13.1 OBJECTIVES

After going through this unit, you will be able to:

- Understand the concept of relative dating and its various methods used in archaeology
- Examine absolute dating methods in archaeology

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13.2 RELATIVE DATING

Relative dating is basic to chronology. It is the ordering of events in the absence of any written record or evidence. Under relative dating method a tentative date is achieved based on archaeological stratigraphy, palaeography seriation, linguistic style, context, art and architectural features. Archaeologists use relative dating techniques when the absolute dates are not possible or feasible. Before the advent of the scientific techniques, most of the archaeological and historical objects were dated based on relative dating methods. Relative dating techniques identify the order in which sites or artefacts were used in a sequence from earliest to latest.

13.2.1 Typology

Typology involves putting a number of finds into chronological order. It is a method of comparing reference objects with the purpose of classifying them according to their similarity or dissimilarity and associating them to a specific context or period. This technique is often used when it is not possible to make use of absolute dating methods. It generally allows the archaeologists to identify the period to which a cultural site or object belongs, without stating the date of occupation. This method is mainly applied to projectile points and ceramic vessels. These present many characteristics that are used for comparing them, such as morphology and raw materials in the case of stone tools, and decorative techniques and motifs in the case of ceramics.

13.2.2 Stratigraphy

Stratigraphy can be described as a 'layer cake' type arrangement of deposits called strata, with the older layer beneath the latest. It is also known as the 'Law of Superposition'. It is the branch of the geology that deals with the study and interpretation of the sedimentary stratified rocks, as well as of the identification, description, sequence, both vertical and horizontal, cartography and correlation of the units stratified of rocks. The artefacts that are discovered in successive undisturbed cultural layers can be dated relatively on the basis of the principles of stratigraphy. The principle of cultural/archaeological stratification is fundamental and it plays a dominant role in archaeological investigations. Modern excavation techniques are based on stratigraphic principles.

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The concept of stratigraphy in geology was shaped by Sir Charles Lyell. There are certain fundamental laws and notions that are followed in identifying and studying stratigraphy. These are Laws of Superposition, Laws of Original Horizontality, Laws of Original Continuity and Laws of Faunal Succession. This concept was introduced in archaeology by the scholars like C.J. Thomsen, Kathleen M. Kenyon, J.J. Worsaae, and Mortimer Wheeler.

Subsequently, it was developed to suit the needs of archaeology by Edward C. Harris in the 1970s. In his book *Principles of Archaeological Stratigraphy* published in 1979, Edward Harris questioned the direct application of geological laws in archaeology. He worked out a new method of interpretation of archaeological stratification which is popularly known as the **Harris matrix**. It works on a simple fundamental principle that if one cultural layer lies upon another, then the lower layer must have been deposited before the upper layer. The time gap between the depositions of two cultural layers may be a century or a millennium and it depends upon the nature of cultural deposit. According to this concept, the contextual layer on the top is considered younger than the layer that is found below. Therefore, a succession of layers would provide a relative chronological sequence from earliest to latest. Any cultural material found in a particular contextual layer can be dated relatively younger and older depending upon from which layer the particular artefact is picked up. The artefacts recovered from orderly placed stratified layers would help to categorize them in certain chronological order. For example, the collection of Stone Age tools such as Palaeolithic tools, Microlithic tools and Neolithic tools in different cultural layers helps to establish the approximate date of a particular cultural layer.²

13.2.3 Seriation

Seriation is a relative dating method in which artefacts from several sites, in the same culture, are placed in chronological order. It is a method of ascertaining the age of the artefacts on the basis of style, type, and technique. It is broadly classified into two categories namely stylistic seriation and frequency seriation. Stylistic seriation is a method in which artefacts and attributes are positioned on the basis of resemblance in style. For instance, dish-on-stand, S-shaped jar and perforated jar are some of the diagnostic styles available in Harappan sites. The carinated vessel is the diagnostic pots of Jorwe ware. The availability of such diagnostic wares would help to determine the cultural phase. The frequency seriation is more strictly inclined towards sequential ordering of the artefacts and assessing the origin, popularity and disuse of the artefacts. The length of time and degree of popularity (frequency) would be assessed in the given archaeological context. The frequency with which each form of artefact appears can be plotted as bars on a timeline.

² http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S0008291C/P001688/M020081/ET/1493287698P07-M17-RelativeDatingMethods-ET.pdf

Generally it produces a shape known as a 'battleship curve' because it resembles the aerial view of a battleship. The changing popularity of each form will appear as a sequence of battleship curves. Other sites can be dated relative to the first site by comparing their seriation. For example, Painted Grey ware, Northern Black Polished ware and rouletted ware were observed in a particular time range only. Based on the quantity and frequency of the diagnostic ware, the date of the particular cultural phase is established. The Harappan ceramics were also examined on the basis of structure and shape.

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13.2.4 Geo-Archaeological Dating

For the early prehistoric period archaeologists have borrowed techniques from geography, geology and the other earth sciences to reconstruct the environments of early people and also to establish a relative chronology based on environmental changes. With the change of climate, the types and relative numbers of different flora and fauna also changed. Where organic preservation is good, changes can be traced by analyzing pollen (palynology) found in sediments and animal bones. To provide pollen sequence a core through a deposit such as peat is taken and for each layer the proportions of different types of pollen are recognized. Sites within these deposits can then be cross-dated to particular phases of climate history in local sequences. This analysis is based on many factors which include the different amounts of pollen produced by each plant and the different distances the pollen travels. Likewise, sites can be relatively dated from the type of animal bones present. This method is particularly useful where the sequence of the appearance or extinction of species (for example mammoths) is known. Absolute techniques are needed to date these sequences.³

13.2.5 Obsidian Hydration Dating (OHD)

Obsidian is a hard, dark, glass-like volcanic rock formed by the rapid solidification of lava without crystallization. In 1960, two geologists, Irving Friedman and Robert Smith introduced Obsidian Hydration Method (OHD) to the archaeological community. It is a geochemical method of determining the age of an artefact made of obsidian either in absolute or in relative terms. Obsidian contains about 0.2 percent water. As soon as a piece of obsidian is fractured it begins to absorb water from the atmosphere and begins to diffuse into the glass at a known rate. By measuring how far water has penetrated into the obsidian (hydration) on one site a relative date can be estimated to other sites. In some cases, obsidian can be regulated to provide absolute dates but that requires substantial additional data since the speed of hydration varies with local temperatures and the chemical composition of the obsidian. This is one of the cheaper laboratory dating techniques.

³ Jim Grant, Sam Gorin, Neil Fleming, 2008, "*The Archaeology Coursebook: An Introduction to Themes, Sites, Methods and Skills*", Routledge, London & New York, p.82

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However, there are certain shortcomings in this method. The rate of hydration is not uniform throughout the world. The temperature varies over time from site to site. It is especially difficult to evaluate effects of temperature. Variation also exists in sample chemical composition. Reuse of artefact may lead to an erroneous date.

13.2.6 Chemical Dating of Bones

Bones are one of the important organic samples recovered in excavations. These bones help to reconstruct various aspects human life such as the dietary pattern, palaeo-climate, trade network and rituals performed in ancient times. Therefore, the control over the date would help to identify the changing pattern of diet, climate, ritual and trade. Buried bones absorb fluorine and uranium from water in the ground at the same time as their nitrogen content reduces as collagen in the bones decays. These processes take place at a uniform rate so it is possible to establish the relative age of different bones by measuring the proportions of these chemicals.

Check Your Progress

1. What is relative dating?
2. Who shaped the concept of stratigraphy in geology?
3. What is obsidian?

13.3 ABSOLUTE DATING

Absolute dating is a method in which involves precise dating of artefacts using various scientific techniques and in a few cases it is dated based on the hidden historical data available with historical documents such as inscriptions, copper plates, seals, coins, inscribed portrait sculptures and monuments.

13.3.1 Radio Carbon Dating (C-14)

Radiocarbon dating (also known as carbon dating or C-14 dating) is a method for determining the age of an object containing organic material by using the properties of radiocarbon, a radioactive isotope of carbon. The radiocarbon dating is the oldest and perhaps the most widely used in archaeology. This method was developed in 1948 by Willard F. Libby as spin-off from atomic research during the Second World War. He received the Nobel Prize in Chemistry for this work in 1960.

It is based on the principle that radiocarbon C-14 is constantly been formed in the atmosphere by the interaction of cosmic rays with the nitrogen present in the atmosphere. The resulting C-14 combines with atmospheric

oxygen to form radioactive carbon dioxide which is absorbed by the plants by means of photosynthesis and by animals through eating. When the plant or animal ceases to be living it stops receiving fresh supply of C-14. The existing C-14 now undergoes a process of decay which is called radioactivity. C-14 is a radioactive isotope or element of C-12, and both are present in equal amounts. We may measure the decaying C-14 with reference to C-12, and find out the number of years that have elapsed since the decay began. The object which contains less C-14 proves to be older in age, and that which contains more C-14 turns out to be younger. This measurement is based on the fact that the half-life of C-14 is 5568 years. The half-life of a radioactive material is defined as the period during which one-half of the amount of the material decays out. Since most organic materials perish in due course, charcoal because of its high content of carbon is the commonest material utilized for radiocarbon dating.

The development of radiocarbon dating has had a profound impact on archaeology. Apart from allowing more accurate dating within archaeological sites than previous methods, it allows comparison of dates of events across great distances. Histories of archaeology often refer to its impact as the 'radiocarbon revolution'. Radiocarbon dating has allowed key transitions in prehistory to be dated, such as the end of the last ice age, and the beginning of the Neolithic and Bronze Age in different regions.

It was believed that the dates produced by radiocarbon dating were precise until it was discovered that amounts of carbon in the atmosphere have varied over time. This had led to underestimating the age of prehistoric sites by up to 800 years. To overcome this problem, radiocarbon dates are calibrated. Radiocarbon dates are never exact. Even after calibration there is a scope of error that is calculated statistically. This generally means that there is a 68 per cent chance or 'level of confidence' (LOC) that the real date is within the range indicated and a 95 per cent LOC that it is within twice the range. C-14 is mostly used to date organic materials including bone, shell and plant remains. It does not work on cremated bone although it will work for charred bone. It is more precise with wood samples from twigs and nuts than from trees that may have lived for hundreds of years. Radiocarbon's practical use is for periods from 200 to about 10,000 years with less reliability to around 40,000 years. Until recently at least 10 grams of charcoal or 200 grams of bone were needed for results. However, the development of a process known as **Accelerator Mass Spectrometry** (AMS) has facilitated much smaller samples of material to be dated, down to the one grain of cereal. It is a technique that measures the amount of Carbon-14 in an organic object and provides a rough indication of its age. Samples need to be handled carefully to avoid contamination.⁴

4 Jim Grant, Sam Gorin, Neil Fleming, p.86

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13.3.2 Dendrochronology

Dating of wooden objects on the basis of tree rings or growth rings of a tree is called dendrochronology. It is derived from the Greek word Dendron meaning 'tree limb' chronos mean 'time' and logy meaning 'study'. It is a dating method that uses the number, thickness and density of annual growth rings of ancient trees. This method was first developed by the American scientist A.E. Douglas at the beginning of the twentieth century.

This is the most accurate chronometric dating method. It is based on the principle that every year many species of trees produce growth rings of new wood under their bark during annual growing seasons. The width of the ring (i.e., the amount of growth) for each year is determined by various internal and external factors, but it tends to vary mainly in proportion to either the amount of available precipitation or the prevailing temperatures. The rings are wider in good conditions than in poor ones. Samples are obtained by using an increment borer, a simple metal tube of small diameter that can be driven into a tree to get a core extending from bark to centre. This core is split in the laboratory, the rings are counted and measured, and the sequence of rings is correlated with sequences from other cores.⁵ Trees located in the same area will have similar ring pattern which means wood from different periods can be matched in overlapping sequences. These are tied to historical dates by modern trees anchors the tree-ring chronology in time.

Dendrochronology mostly uses softwood species that are sensitive to changes in growth conditions, while hardwoods exhibit rather little variation in ring width. This method provides precise dating, sometimes to the nearest year. It is especially used to develop calibration curves used to correct data obtained from radiocarbon dating, a technique that remains imprecise due to fluctuations in the concentration of C-14 in the atmosphere over the centuries.

The bristlecone pines of California, which live for 4,000 years, were used to construct sequences over 7,000 years in the USA. However, this method has limitations. Not all areas have sufficiently varied seasons or sufficient surviving timber to make it possible to construct sequences. To effectively date wood around fifty years of tree rings are needed. Since this represents quite a thick piece of wood, the technique is better for dating building timbers than artefacts. Its direct use is from the Neolithic onwards when buildings were used and it has been widely used on medieval ships and buildings.

Dendrochronology actually dates when the tree dies or is felled. Where wood has been reused, as often occurred with structural timbers in the past, this method can overestimate the age of a structure. However, dendrochronology is also the key method for calibrating radiocarbon dates

⁵ <https://www.britannica.com/science/dendrochronology>

and therefore is indirectly used in dating a wide range of organic materials for up to 11,500 years.

13.3.3 Thermoluminescence

Thermoluminescence (TL) dating is a method that is based on the analysis of light release when heating crystalline material. It is used in mineralogy and geology, but is also increasingly being applied for dating of anthropological and archaeological samples. Thermoluminescence uses the phenomenon of ionizing radiations that exist naturally in the atmosphere. This dating method is mainly applicable for material with mineral or crystalline structure or with spurious crystalline contents. It is only functional for insulating material not for metallic artefacts. This technique is based on a unique physicochemical property of certain minerals (especially quartz and feldspar) that have an imperfect structure and therefore retain radioactive elements in the natural environment. Radioactive decay in the quartz crystals found in clay leads to a build-up of electric charge at a known rate. The electrical charge is released as light when the crystals are heated. When pottery is heated the energy in the flash of light is measured and used to calculate the time since it was fired.

Thermoluminescence is a technique which involves complex manipulation. To obtain a date for a single pottery sample, it is necessary to perform a laboratory fractionation of the clay mineral used in the manufacture of the pottery and prepare around 75 sub-samples; some of these are heated to release the level of thermoluminescence, while others receive a radiation dose to measure their sensitivity to radiation. Thermoluminescence can replace radiocarbon dating to date events that occurred more than 50,000 years ago; it is used mainly for dating stone fireplaces, ceramics and fire remains.⁶

Thermoluminescence dating is used for material where radiocarbon dating is not available, like sediments. Its use is now common in the authentication of old ceramic wares, for which it gives the fairly accurate date of the last firing. This technique has been used with reasonable success to date heat altered stone tools, burned hearths, and pottery. It is not as accurate as C-14 dating and can give incorrect readings due to radiation from the soil or if the initial heating was at low temperature. However, it is useful for older periods and cases where there are no organic remains such as dating Upper Palaeolithic figurines.

Check Your Progress

4. What development has facilitated the dating of extremely small samples of materials?
5. What is the most accurate chronometric dating method?
6. When is thermoluminescence dating used?

⁶ <https://www.thecanadianencyclopedia.ca/en/article/dating-in-archaeology>

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13.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

NOTES

1. Relative dating is basic to chronology. It refers to the ordering of events in the absence of any written record or evidence.
2. The concept of stratigraphy in geology was shaped by Sir Charles Lyell.
3. Obsidian is a hard, dark, glass-like volcanic rock formed by the rapid solidification of lava without crystallization.
4. The development of a process known as Accelerator Mass Spectrometry (AMS) has facilitated much smaller samples of material to be dated, down to the one grain of cereal.
5. Dendrochronology is the most accurate chronometric dating method.
6. Thermoluminescence dating is used for material where radiocarbon dating is not available, like sediments.

13.5 SUMMARY

- The chronology of events is a major element of reflection for researchers working in the field of human history.
- Archaeologists have access to various techniques for dating archaeological sites or the objects found on those sites.
- In archaeology, usually two types of dating are recognized- relative and absolute.
- Relative dating comprises methods that are based on the analysis of comparative data or the context (eg, geological, regional, cultural) in which the object one wishes to date is found.
- This approach helps to order events chronologically but it does not provide the absolute age of an object.
- Relative dating uses methods like Typology, Stratigraphy, Seriation, Geo-archaeological dating, Obsidian Hydration Dating and Chemical dating of bones.
- Absolute dating includes all methods that give figures about the real estimated age of archaeological objects.
- These methods generally analyze physicochemical transformation phenomena whose rate are known or can be estimated relatively well.
- Absolute dating is the only method that can help to clarify the actual age of an object. Absolute dating methods mainly include radiocarbon dating, dendrochronology and thermoluminescence.

- Any one or combination of these dating methods is of great help in extending the time dimension to the objects of study.
- In chronological studies the precession of the dating adds value to the object or event in the spatio-temporal scale.

NOTES

13.6 KEY WORDS

- **Attribute:** It is a characteristic or property of an object, such as weight, size, or colour.
- **Ceramic:** It refers to objects, often pottery, made of fired or baked clay.
- **Finds:** The term ‘finds’ is taken to include all artefacts, building materials, industrial residues, environmental material, biological remains and decay products.
- **Law of Superposition:** It is a law that states that deeper layers of sediment or archaeological strata will naturally be older than the layers above them (in the absence of unusual, disruptive, activity, such as earthquakes).
- **Matrix:** It refers to the physical material (often dirt), in which the archaeological objects are located.
- **Palynology:** It refers to the recovery and study of ancient pollen grains for the purposes of analyzing ancient climate, vegetation, and diet.
- **Prehistoric:** It refers to a time period of history for which no written records are available; the absolute date for the prehistoric period varies from place to place.
- **Projectile Point:** It is a general term for stone points that were hafted to darts, spears or arrows; often erroneously called ‘arrowheads’.

13.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write short notes on the following:
 - (a) Stratigraphy
 - (b) Seriation
 - (c) Geo-archaeology
 - (d) Chemical Dating of Bones
 - (e) OHD
 - (f) Thermoluminescence

2. What is the difference between relative and absolute dating methods?
3. Discuss the radio-active methods used in dating archaeological materials.

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Long Answer Questions

1. What is relative dating? Elaborate the relative dating methods applied in archaeology.
2. Describe the absolute dating methods in archaeology, highlighting the importance of each method.
3. What is dendrochronology? Discuss its importance as a dating method.

13.8 FURTHER READINGS

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UNIT 14 DATING METHODS IN ARCHAEOLOGY-II

NOTES

Structure

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- 14.1 Objectives
- 14.2 Other Relative Dating Methods
 - 14.2.1 Fluorine Test
 - 14.2.2 Nitrogen Test
 - 14.2.3 Pollen Test
- 14.3 Other Absolute Dating Methods
 - 14.3.1 Archaeomagnetism
 - 14.3.2 Potassium-Argon (K-Ar) Dating
- 14.4 Answers to Check Your Progress Questions
- 14.5 Summary
- 14.6 Key Words
- 14.7 Self Assessment Questions and Exercises
- 14.8 Further Readings

14.0 INTRODUCTION

As you learnt in the previous unit, archaeologists use many different techniques to work out the age of artefacts and sites for which they have no historical dates and the order in which they were used. These dating techniques can broadly be subdivided into two groups: Relative dating and absolute dating. Different methods used by archaeologists for relative and absolute dating have been discussed in the previous unit. This unit will deal with some more relative and absolute methods.

14.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the different types of methods of relative dating used in archaeology such as fluorine test, nitrogen test and the pollen test
- Describe the absolute dating methods in archaeology such as archaeomagnetism

14.2 OTHER RELATIVE DATING METHODS

Relative dating is fundamental to chronology. As you learnt in the previous unit, it refers to the categorizing of events in the absence of any written record

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or evidence. Relative chronology is important in reconstructing prehistoric archaeology. In relative dating the duration of the event is not known, so also the elapsed time between events is very difficult to determine.

14.2.1 Fluorine Test

Fluorine test dating is another method of relative dating. It is based on the fact that amount of fluorine deposited in bones is proportional to their age. Most of the ground waters contain small amount of fluorine. The fluorine ions combine with hydroxyapatite crystals of the bone to form fluapatite. A bone buried for a longer time will absorb more fluapatite and vice-versa. The date of the bone is determined on the basis of the amount of fluapatite present in the bone. This test is useful in dating bones that cannot be attributed with certainty to any particular stratum and cannot be dated according to the stratigraphic method. A limitation of this method is the fact that the rate of fluorine formation is not constant, but varies from region to region. The quantity of fluorine can be determined either through chemical analysis or with the X-ray crystallographic method. In 1953, this test was used to easily identify that the 'Piltdown Man' was forged, almost fifty years after it was originally 'unearthed'. Like fluorine, uranium or nitrogen content of the bones also can be measured.

14.2.2 Nitrogen Test

Nitrogen provides another measurement of relative age. Nitrogen dating is a form of relative dating which relies on the reliable breakdown and release of amino acids from bone samples to estimate the age of the object. Bones are composed of calcium phosphate, fat and bone protein or collagen. In contrast to fluorine, nitrogen in the bone decreases with the length of time it has been buried. On death, the collagen decays at a uniform rate and turns into nitrogen. Like fluorine method, the amount of presence of nitrogen is measured and dated accordingly. The rate of decay depends on physical and chemical composition of the soil. Therefore, it is not universal. However, one can differentiate the date of the bones collected from a single deposit or from a single burial. In some situations, like thin porous bones might more rapidly change the dating created by multiple methods.

14.2.3 Pollen Test

Relative dating can also be done on the evidence of floral remains. A common method of dating through floral remains is known as palynology. All flowering plants produce the almost non-destructible grains called pollen. The outer skin (exine) of these grains is resistant to decay and is hence preserved in lake sediments that have allowed the pollen experts to reconstruct detailed sequences of past vegetation and climate. The botanical samples are collected

by means of a technique called *flotation technique*. Several screening methods are being used in the recovery of micro or macro botanical remains. The Flotation technique developed by Anthony J. Legge remains the best method and is being adopted throughout the world as it yields the best recovery rates. The pollen is extracted and then concentrated and stained before being examined under a microscope. Pollen grains can be recognized by their shape, and the percentages of different species present in each sample are recorded on a pollen diagram. A comparison of the pollen diagrams for different levels within a deposit allows the identification of changes in the percentages of a species and thus changes in the environment.

The most well-known chronologically placed pollen sequences are those developed for the Holocene times of northern Europe. By examining the pollen samples from a particular site, one can safely place them in particular time-ranged pollen zones. The type of pollen found in any geological stratum depends on the kind of vegetation that existed at the time such stratum was deposited. A site or locality can therefore be dated by determining what kind of pollen was found associated with it.

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14.3 OTHER ABSOLUTE DATING METHODS

As you learnt, absolute dating is the method of determining an age on a particular chronology in archaeology and geology. Some scientists prefer the terms chronometric or calendar dating, as use of the word 'absolute' implies an unnecessary certainty of accuracy.

14.3.1 Archaeomagnetism

Archaeomagnetic dating is the study and interpretation of the signatures of the Earth's magnetic field in the past recorded in archaeological materials. Archaeomagnetic dating is based on the established fact that the direction and intensity of the earth's magnetic field fluctuate over the years. Clay soils contain magnetic minerals and when the clay is heated to a certain temperature, these minerals will assume the direction and a proportional intensity of the magnetic field, which surrounds them. They will maintain this direction and intensity after they are cooled. By measuring these qualities, the age of the sample can be ascertained if the changes in the earth's magnetic field at that location are known.

The magnetic field of the earth at any given point is defined by three measurements, the angle of declination, the angle of dip, and the magnetic intensity. When a needle is suspended at its centre of gravity so that it can swing freely in all directions, and is then magnetized, it will get inclined to the horizontal direction. The angle of magnetic dip depends strongly on the

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latitude. In addition to inclination, the needle will exhibit definite directions in a figurative horizontal plane. The directions defined by the needle are called magnetic north and magnetic south. The angle between magnetic north and geographic north is called the angle of declination.

Robert Dubois, an expert in archaeomagnetic dating, uses the parastatic magnetometer in his dating laboratory. This magnetometer embodies the principle of the compass needle. It consists of three bar magnets, spaced on a slender rod suspended from a very fine wire of phosphor bronze or quartz. The entire assembly is enclosed within a plastic tube that protects it from air currents. A thin beam of light shines on a mirror attached to the rod, then reflects, like a pointer, to a numbered scale. The horizontal component of the earth's magnetic field is annulled by passing an electric current through large coils of wire that surround the magnetometer by means of wooden scaffolding. Locally produced magnetic fields with a vertical gradient are annulled by the use of the three bar magnets. The upper and lower magnets are equal in strength and anti-parallel to the middle magnet, which has double strength. With this arrangement there is zero torque from any vertical magnetic field.

The three magnets work like a double set of diametrically opposing magnets of equal strength. Since the pull on the two parts of each magnet system is equal and opposite, the effect of the earth's field is cancelled and the beam of light points to zero. When a sample is placed on a platform directly under the suspended magnets, the entire assembly above it rotates slightly. This rotation is caused by the lower magnet, which is affected more strongly than the other magnets, and swings towards the direction of the sample, rotating the entire assembly as it moves. The reflected beam of light moves across the scale, exactly like a compass needle, indicating just how far the clay sample has caused the magnets to turn. By setting the sample on its top and bottom, its angle of declination is measured directly; the angle of dip is calculated from readings taken when the sample is positioned on each of its four sides. These values then are used to calculate where the geomagnetic pole was located when the clay was fired. Measurements on a number of samples facilitate the investigator to compute a mean vector. This is the common and suggested procedure for archaeomagnetic dating.

14.3.2 Potassium-Argon (K-Ar) Dating

Potassium-Argon dating is also a radioactive method. Potassium (K) is one of the elements that occur in great abundance in the earth's crust. It is present in almost every mineral, either as a principal constituent or as a trace element. In its natural form, potassium contains 93.2% K-39, 6.8% K-41 and 0.00118% radioactive K-40. For each 100 K-40 atoms that decay, 89% become Calcium-40 and 11% become Argon-40, one of the rare gases.

As potassium in rock crystals decays it produces argon gas at a known rate. Argon-40 is an inert or inactive gas, which by means of diffusion can easily escape from its parent material under certain conditions.

During rock formation virtually all Ar-40 that had accumulated in the parent material escapes. As the rock or mineral crystallizes the concentration of Ar-40 drops off to practically zero. The process of radioactive decay of K-40 continues, but the concentration of Ar-40 that develops over time will now, when dated, denote the moment of rock formation. By measuring the amounts and ratios in a laboratory a date at which the crystal was formed can be obtained. This technique has been used in volcanic regions to date layers of rock which sandwich human remains. For instance, at Koobi Fora in East Africa early hominid remains were dated to 1.89 million years BP ± 0.01 million years.

The potassium-argon dating method can only be used in situations where new rock has been formed. The lavas, tuffs and pumice found as overlying strata at localities that contained culture-bearing deposits in such diverse areas as Italy, East Africa and Java are useful for this dating.

The preparation of sample involves first, crushing of the rock samples, second concentrating it to high purity, third washing it on sample screens to remove fines, and fourth, treating it with hydrofluoric acid. The major problem of the technique is the removal of atmospheric argon from the sample. By removing the outer layer of the sample, most of the atmospheric argon will be removed. However, treatment of samples with hydrofluoric acid has proved to be very effective in reducing the atmospheric argon in the sample. Soon after sample preparation and drying it should be put into the extraction line and placed under vacuum.

Potassium-argon dates are calculated from measurements of the sample content of Argon-40. The amount of potassium in a sample fraction can be determined by a flame photometer, although for small concentrations, isotopic dilution analysis and even neutron activation analysis can be used. The determination of the concentration of argon is determined by mass spectrometric analysis.

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Check Your Progress

1. What is fluorine testing based on?
2. Why do some scientists prefer the term calendar dating to absolute dating?
3. Where can the potassium-argon dating method be used?
4. What is the magnetic field of the earth at any given point defined by?

14.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. Fluorine testing is based on the fact that amount of fluorine deposited in bones is proportional to their age.
2. Some scientists prefer the terms chronometric or calendar dating over absolute dating, as use of the word 'absolute' implies an unnecessary certainty of accuracy.
3. The potassium-argon dating method can only be used in situations where new rock has been formed. The lavas, tuffs and pumice found as overlying strata at localities that contained culture-bearing deposits in such diverse areas as Italy, East Africa and Java are useful for this dating.
4. The magnetic field of the earth at any given point is defined by three measurements, the angle of declination, the angle of dip, and the magnetic intensity.

14.5 SUMMARY

- Archaeologists increasingly rely on various scientific techniques in order to obtain precise information about the lives of past communities. These are especially useful in dating the archaeological material.
- There are two ways of determining the age of an object, would it be a fossil, an object or an event of culture. They are relative and absolute dating methods.
- The relative dating is useful in putting the objects on relative timeframe in a bracket of millennia or million, while absolute dating method pinpoints the age in numerical years (very close to decades or centuries).
- Several kinds of dating methods are presented in this unit--Chemical analysis based (Fluorine and Nitrogen Test), Fossil studies (Pollen Test), Earth science related (Archaeomagnetism) and Radioactive isotopic analysis dependent (Potassium-Argon Method).
- Archaeologists resort to the use of relative dating techniques when the absolute dates are not possible or feasible.
- Determination of the age was simply a guess work in the initial stages of archaeological investigations particularly in the 18th-19th centuries.

- As the research progressed, different techniques were applied to estimate the age. The vast accumulation of data and the significant data analysis provided sufficient scope for relative dating techniques.

14.6 KEY WORDS

- **Palynology:** It refers to the recovery and study of ancient pollen grains for the purposes of analyzing ancient climate, vegetation, and diet.
- **Pitldown Man:** Pitldown Man was a paleo-anthropological hoax in which bone fragments were presented as the fossilized remains of a previously unknown early human.
- **X-ray Crystallography:** It is a method used for determining the atomic and molecular structure of a crystal, in which the crystalline structure causes a beam of incident X-rays to diffract into many specific directions.

14.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. Write a short note on the fluorine test.
2. Discuss the nitrogen test and pollen test method of relative dating in archaeology.

Long Answer Questions

1. Explain the archaeomagnetism dating method.
2. Describe the potassium-argon dating (K-Ar) technique.

14.8 FURTHER READINGS

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