ARCHAEOLOGICAL ANTHROPOLOGY

Archaeological anthropology has been derived from the broad field of Archaeology (archaios means ancient and logia means study) which is concerned with the study of the extinct cultures. Man, the central figure of anthropology existed long before the development of written record. Therefore, archaeology is able to supplement anthropology by recovering the remains of ancient men of bygone days along with the material evidence of his culture.

Classical archaeology is a combination of fine arts, history, and classics. It seeks the antiquities of the past. So, it cannot be an exclusive domain of anthropologists, but anthropologists have to depend on archaeologists in describing the human of the past and to find out the ancient cultures which were flourished before 5000 years from now.

Archaeologists often work with the paleontologists, geologist, and chemists to reconstruct the days of prehistory. For many parts of the world like Australia, Melanesia, Polynesia and most of the New World and Africa, knowledge of writing is fairly recent. Naturally to discover the prehistoric man and his cultural activities, anthropologists have found no way other than to rely on the archaeologist' work.

Archaeology, thus, has become an indispensable part of anthropology. Without archaeology, physical anthropologists could not have been successful in determining the place of Homo sapiens in nature; the long process of human development would very little to be understood. Cultural anthropology also depends on archaeology. Cultural anthropologists deal with the social behaviour of man; the past and the present are equally important to them. They trace the emergence and development of customs and social behaviour from the prehistoric level and go up to the contemporary level where both the primitive and civilized people from the social counterpart.

Since most of the evidences of human life in prehistoric days are intangible and perishable, they leave no permanent imprint behind. Past life-ways and cultural processes can only be understood on the basis of a few tools, which have been dug out and interpreted by the archaeologists.

Four Sub-branches Or Types of Archaeological Anthropology

1) Prehistoric Archaeological Anthropology

It is the study of prehistoric cultural history since the first appearance of the humans, till the age when they began writing about themselves. It covers origination, evolution, and diffusion of culture and traditions.

2) Text-Aided Archaeological Anthropology

It is commonly known as classical archaeology. It basically deals with the reconstruction of various ancient civilization which has developed the art of writing documents.

It makes use of the written documents to bring into account the textual description as a material to study about all those civilizations who are lost in the history.

3) Salvage Archaeological Anthropology

Extra effort is done by the archaeologist anthropologist in order to find the maximum information possible thorough investigation. They usually excavate the site which is threatened by natural calamities and try to bring out facts and statistics about cultural life.

All these types together constitute the culture of extinct humans.

Anthropologists examine the culture, social behaviour, climatic condition, and civilization from the beginning of the prehistoric existence to the advent of the civilizations. They tell us about their culture, how it expanded, evolved, and progressed.

Relation with other disciplines of sciences

BIOLOGICAL SCIENCES

Biological sciences deal with organic components (plant and the animal worlds) of the environment. Ecology seeks to reveal the interrelationships between man and the biological world.

Flora

Archaeobotany is the study of all kinds of plant remains found in archaeological sites. These comprise actual materials like charcoal, wood remains and grains as well as indirect evidence in the form of impressions of leaves and husks on clay and pottery. These are microscopic remains too in the form of phytoliths and pollen. Flotation and other techniques are used to collect these plant remains from excavations and are then subjected to scientific examination in the laboratory. Plant remains are particularly important for studying food economy of ancient societies. In the Paleolithic and Mesolithic stages man was essentially parasite on nature. In tropical regions like India, wild plant foods played a bigger role, and these included a variety of roots and tubers, fruits, seeds, berries, gums, and leafy greens and flowers. Wood was also used for preparing tools and weapons. In the Neolithic stage food production commenced and man eventually began to raise crops of many cereals and pulses. This brought about a drastic change in man-nature interaction, including vegetation clearance leading to environmental degradation. Plant remains are helpful in other ways too. These provide clues for reconstructing past climate. Dendrochronology or tree ring analysis is a useful relative dating method. Charcoal is commonly used for C-14 dating of archaeological sites.

Fauna

Animal kingdom is the second important component of man's biological environment and is again intimately connected with human adaptations. That this was so right from Stone Age times is revealed by the occurrence of animal bones and other animal-related features on archaeological sites of various time periods. Palaeontology is the study of fossilised remains of extinct wild animals which lived in the Pleistocene period. **Archaeozoology** is the study of animal remains found on Holocene archaeological sites (Mesolithic onwards). Animal remains found in archaeological sites are varied in character: bone and antler, shells, fish remains, bird and rodent bones, even insect remains. Animals were exploited for various purposes. Bones and antlers were sometimes used for tool-making and hides were employed for clothing and roofing of huts. Also ornaments like beads were prepared. More importantly, animals were

used for food purposes. Hunting of large game and scavenging of kill sites of carnivorous animals were common in the Palaeolithic. Small animals and birds were also trapped for food purpose. In the succeeding Neolithic stage animals like, cattle, sheep/goat, pig, were domesticated. But hunting and collecting still continued. Animal remains could also give clues about past climate and vegetation.

EARTH SCIENCES

Earth sciences play a pivotal role in the analysis of archaeological sediments and in the reconstruction of physical features of ancient landscapes. Geomorphology, Sedimentology and Geology are very important from this point of view.

Geomorphology

Geomorphology is a branch of Physical geography which is primarily concerned with the study of the land forms and the evolution of landscape. Archaeological sites are generally found with reference to geomorphological situations like hills, foothills, plains, river banks, lakes, coasts etc. Stone Age groups generally preferred rocky terrain with open forest vegetations which facilitated easy movement as required for hunting purposes. Availability of raw materials like stone for tool making and perennial surface water sources, and good landscape visibility influenced location of Stone Age sites. From the Neolithic period onwards, human groups also began to occupy plain lands like alluvial and coastal plains suitable for agricultural purposes. Geomorphology enables us to reconstruct these varied landscapes.

Sedimentology

Archaeological sites are nothing, but small or large deposits of soils and sediments associated with past human activities of various kinds. Sedimentology deals with a systematic study of these sediments both in the field and in the laboratory. Examination of physical and chemical properties of soils like nitrogen and phosphate contexts provides complementary evidence to recognise various activity areas on an archaeological site, e.g., human-dwelling spots, animal penning spots, animal-butchering areas, pottery-making workshops, burial spots, etc. Studies of soils and sediments can also tell us about the formation of natural sediments on the landscape by non-human agencies like water, wind, and volcano. This study is extremely useful for palaeo-landscape reconstruction.

Geology

Geology is one of the oldest scientific disciplines and deals with study of various rock formations on the earth's surface. Its application for studying archaeological sites has led to the origin of what is called geoarchaeology. Geology served as the basis for the development of archaeological stratigraphy. Also, the terms like Paleozoic, Mesozoic, etc. used for partitioning geological time inspired archaeologists to coin terms like Palaeolithic, Mesolithic, etc. to divide prehistoric time. Geoarchaeology now helps archaeologists in understanding the properties of rocks, minerals and ores and their utilisation by ancient communities. It also

helps us in understanding how archaeological sites have been preserved or disturbed due to natural forces like wind, water, ice, earthquakes etc.

PHYSICAL AND CHEMICAL SCIENCES

Physical sciences (Physics and Chemistry) also play a very important role in the reconstruction of past human societies from the archaeological record.

Chronometry

Earlier archaeological sites and their deposits were dated in relative terms with the help of methods like stratigraphy, stylistics of artifacts and monuments, and degree of patination. During the last half a century a number of absolute dating techniques developed in Physics and Chemistry have proved to be very useful for dating archaeological sites. Their time range has now been extended to nearly three million years. Radiocarbon, archaeomagnetism, potassium-argon, uranium thorium, fission-track, electron spin resonance, and thermoluminescence are some of these methods. The carbon 14 (radiocarbon-carbon of atomic weight 14) method gives absolute date up to ca. 50,000 B.P. on wood, wood charcoal from fire, peat, grass, cloth, shell, bones, dung, remains of plant and animal life. This dating technique was for the first time introduced in 1949 by Williard F. Libby. Similarly, potassium argon method gives dates ranging up to a few million years on rocks, minerals, pottery, volcanic glasses and meteorites etc. and the thermoluminescence (TL) give dates on rocks, minerals and pottery. In India too, these and other dating methods have now begun to be used commonly for dating archaeological materials and sediments. C-14 dates have pushed the antiquity of the Indus civilization to the beginning of the third millennium B.C. and the beginning of crop and animal husbandry to 6th-7th millennium B.C. Likewise, the Stone Age sites of Riwat and Uttarbaini in the Siwalik zone have been dated to beyond two million years by palaeomagnetism. The Acheulian sites of Isampur and Attirampakkam in South India are dated to 1.2 and 1.5 million years by electron spin resonance and cosmogenic nuclide methods, respectively. Indeed, we realise that these dating methods taken from physical sciences have caused a revolution in archaeological chronology in India.

Chemical Analyses

Techniques borrowed from organic and inorganic chemistry have also contributed in a significant way towards the analysis and interpretation of archaeological materials. The application of these techniques has, for example, given fresh knowledge about ancient copper, iron and glass technology. Also, analyses of food and blood residues on ancient objects and pottery containers led to interesting information about preparation of food items and their consumption. For example, chemical analysis of starch grains on stone tools shows that already in Middle Palaeolithic times sun-dried bread of wild grass seeds was being prepared and consumed in Africa and Europe.

SOCIAL SCIENCES

Our foregoing observations about the role of natural sciences should not be construed to mean that archaeology has no interconnections with social sciences. In particular, it benefits from interpretations and analogies drawn from anthropology, history and human geography. Clues derived from cultural anthropology are used in archaeological reconstruction. These are ethnographic parallels or analogies derived from the study of contemporary simple (peasant, pastoral and hunting-gathering) communities. These analogies are of two types: general comparative and direct historical. Considering that India is home to a tremendously large number and variety of simple societies inhabiting hill tracts still clothed in good vegetation. It is reassuring to know that prehistorians have already studied hunting-gathering communities

like the Chenchus, Yanadis, Irulas, Hill Pandarams, Pardhis and Van Vagris, and Gonds and made use of the analogies for reconstructions of Palaeolithic and Mesolithic life ways. Likewise, studies of pastoral communities like the Todas, Badagas, Kurubas, Dhangars and Bharvads have provided to be very helpful for understanding various aspects of early agropastoral communities.

Biological or physical anthropology is concerned with the origin, evolution, and variation of human beings. It seeks to study the physical characteristics like physique, age, sex, cranial capacity, DNA, blood group, gene, medical history, nutrition, food habits, dental formula, pathology, and demography.

Human geography also helps archaeological reconstruction. It deals with the study of distribution of human settlements on a given landscape and how this distribution is governed by consideration of physical factors like terrain form, soils and availability of water and other resources and also by symbolic and religious factors. Such studies in human geography provide many useful clues for reconstructing settlement geography of ancient societies. Archaeology and history are sister disciplines; both seek to reconstruct ancient societies and their lifeways in a comprehensive way. The differences lie in methodology. While archaeology is based upon the use of non-written or antiquarian materials, history makes use of written documents of all kinds. The notion of history as the story of kings and rulers and their political victories and defeats which prevailed for a long time has now given way to total history involving the study of economic, social, religious, and other aspects of ancient societies. The Annales school of France has played a pivotal role in this transformation. The concepts and methods of this new history are helpful in archaeological reconstruction. Other social sciences like sociology, psychology, and economics as well as humanities like philosophy, literary theory and art history also contribute to archaeology in terms of concepts and methods.

ARCHAEOLOGY: METHODOLOGICAL DEVELOPMENTS/FIELD METHODS USED IN ARCHAEOLOGICAL ANTHROPOLOGY

In field investigations random and selective recording and study of sites of the antiquarian stage are now replaced by systematic and intensive survey of all categories and sizes of sites in a given region. This work may involve the use of maps, aerial photos, satellite images, etc. This is followed by vertical or horizontal excavations, which involve detailed recording of evidence in the form of site and trench maps, three-dimensional recording of finds in the trenches, and photography. While it is true that all excavation is destruction of original evidence, the site record is preserved in maps, plans, stratigraphical sections, and photographs.

Over and above these field methods which are peculiar to archaeology, the discipline also employs certain broad methodological strategies for studying and interpreting archaeological evidence. These are environmental archaeology, settlement archaeology, ethnoarchaeology, experimental archaeology and ethology.

ENVIRONMENTAL ARCHAEOLOGY

Environmental archaeology is the study of past human interactions with the nature. It finds its focus in the impact of the environment on past cultures and its influence on the social and economic aspects of past societies. The importance of these studies is such that Karl Butzer termed archaeology as past human ecology. Geoand bioarchaeology are the two main branches of environmental archaeology.

The common types of evidence used in environmental archeology are (a) animal remains, such as bones, eggshell pieces, insects, ostracods, foraminifera, molluscs, parasite eggs and cysts, (b) plant remains such as wood, charcoal, pollen, and spores, phytoliths and diatoms; and (c) archaeological and geological stratigraphy, chemical and physical analyses of sediments and soils, soil micromorphology and mineralogy. The two main issues in environmental archeology are how the human societies in the past were shaping themselves in tune with their respective landscape settings and how in turn the human groups directly or indirectly were changing the physical and biological components of their landscapes.
Environmental archaeology involves very detailed field studies as well as laboratory analyses.

SETTLEMENT ARCHAEOLOGY

Settlement Archaeology is the study of societal relationships of ancient societies as can be inferred from the study of spatial distribution of archaeological sites on the landscape. In the 1940s Gordon Willey of Harvard University initiated settlement pattern studies in the Viru valley of Peru in South America. In his own words Willey (1953) “Settlement pattern is the way in which man disposed himself over the landscape on which he lived which reference to dwellings, to Definitions and Scope their arrangement, and to the nature and disposition of other buildings pertaining to community life.
These settlements reflect the natural environment, the level of technology on which the builders operated, and various institutions of social interaction and control which the culture maintained”. Settlement archaeology seeks to understand the geographical, political, and military, economic, and religious/symbolic factors governing settlement locations.
Likewise, it provides important clues for reconstructing socio-economic, demographic, and other aspects of ancient life ways. Settlement pattern studies have been carried out with reference to prehistoric and protohistoric sites in different parts of India.

ETHNOARCHAEOLOGY

Ethnoarchaeology deals with the use of analogies or parallels drawn from the study of contemporary simple hunter-gatherer and farmers/pastoral societies for reconstructing and interpreting the archaeological cultures. As such ethnography serves as an important tool for archaeological reconstruction.

In the initial stage’s archaeologists were content with the study of published reports and books of anthropologists on contemporary societies and use of objects shown in museums and archival records. In more recent year’s archaeologists have felt the need to undertake fieldwork themselves among present-day simple societies and study them from

archaeological points of view. Lewis Binford's study of the Nunamiut Eskimos of Alaska and John Yellen's work on the Bushmen of Africa are excellent examples of ethnoarchaeology.
Ethnographic analogies are of two types. General comparative analogies deal with comparative studies of cultures irrespective of geographical limits. Direct historical analogies involve unbroken links between past and present in specific regions. India has tremendous potentialities for ethnoarchaeology. Many studies have already been undertaken with reference to hunter-gatherer groups like the Chenchues, Yanadis, Vanvaghris, etc. and agropastoral communities like the Dhangars, Bhils, etc.

EXPERIMENTAL ARCHAEOLOGY

Archaeologists also frequently make use of analogies drawn from experimental studies for reconstructing ancient societies. Experimental studies have a long history of more than 150 years and have been very helpful to archaeologists when other methodological strategies failed to give clues. Like ethnographic analogies, analogies from experimental studies give no final answers but only tentative or hypothetical solutions which need to be checked in the context of actual archaeological evidence. While undertaking experimental studies, archaeologists observe certain precautions. First, materials similar to those used in the past should be employed in the experiments. Secondly, modern technology and gadgets of various kinds associated with it should not be allowed to influence the experiments.

Experimental stone tool making has been in practice from the early part of the 19th century. Louis Leakey, Donald Crabtree, and Francois Bordes have made experimental specimens of all important stone tool types of the old and new world prehistory, including leaf-shaped bifacial points such as Solutrean points of Europe and Clovis and Folsom points of North America. Experimental studies covered many other aspects of the archaeological record such as building of dwelling structures, construction of megalithic tombs, preparation and consumption of foodstuffs, animal butchering, and agricultural practices.

Ethological Studies

Ethological studies deal with the understanding of behavioural patterns of various animal species. Prehistorians have in particular found analogies drawn from primatological research very helpful in reconstructing the behaviour patterns of ancient hunter-gatherer societies. In earlier stages investigations of behaviour of monkey species and higher apes (chimpanzee, baboon, orangutan, and gorilla) were restricted to animals kept in Zoos. Such studies gave only limited observations about primate behaviour. In the last half a century full-fledged field studies of these primate groups in their natural habitats were carried out; these in some cases extended for several years. In particular, the studies on chimpanzees, baboons and other higher primate groups have supplied many useful analogies for reconstructing the behavioural patterns of prehistoric hunter-gatherer communities.

One of these aspects concerns group living among higher apes, which facilitates learning of life skills by the young and affords security against other groups. Occupation of a certain favorable areas called core areas with a home base is common among higher apes; this

analogy is helpful for reconstructing Stone Age hunter-gatherer land-use patterns. In certain situations, chimpanzees make artificial objects like flakes by breaking stone blocks. This may give clues for understanding the origins of stone tool making and use.

DATING METHODS

Dating is an indispensable tool in the field of evolutionary investigations. It helps researchers to make a better assessment of time of any relict objects like fossils, artifacts and also geological deposits. There are two different approaches to dating, namely- **Absolute or Chronometric Dating and Relative Dating.**

Relative Dating gives information about **the age of an object in relation to other objects**. In another way, it can be said that this dating method can determine whether any object is older or younger than other objects. With the help of this method of dating archaeologists can group or rank various archaeological materials like artifacts, fossils etc. according to their relative age. Thus, the relative method of dating produces only comparisons of age or date, not actual or calendrical date of an object. Stratigraphic analysis is an essential component of this method of dating. Besides Fluorine test method help to determine the relative age of different objects belonging to the same stratum.

The approach of relative dating has its root in the science of Geology, particularly in Stratigraphy. Within the class of relative dating methods, there are **mainly four different methods of dating**, namely**, Typological** dating of ancient artifacts, **Stratigraphic** dating, **Fluorine analysis** method of dating and **Pollen analysis** method of dating.

Typological Method of Dating:

In the typological method of dating at first various attributes of an artifact like shape, design, raw material or fabric etc. are selected to characterize or classify that artifact into a particular 'form' or artifact 'type', after that the typified or classified artifact is compared to the other type of artifacts to allocate the newly typified artifact in a particular time period. In this way once a good typological sequence for an area is established it can be referred to when new finds and sites are discovered and used to cross date them.

Stratigraphic Dating Method:

Stratigraphy is a sub-discipline of Geology. It is the study of the origin, physical characteristics, and spatial relationships of stratified rocks, primarily to understand the history of events documented in the strata (Delson et al, 2004). Usually, sedimentary rocks are studied in stratigraphy, however layered igneous rocks and even layered metamorphosed rocks can also be studied using principles of stratigraphy. The science of stratigraphy is mainly governed by **three basic principles or laws**; they are **Principle of Superposition**, **Principle of original Horizontality** and **Principle of Lateral Continuity**.

The principle of superposition says that **means if one series of rock lies above another then the upper series was formed after the lower series.**

The Principle of Original Horizontality states that layers of sediment are originally deposited horizontally under the action of gravity. The principle is important to the analysis of folded

and tilted strata. From these observations is derived the conclusion that the Earth has not been static and that great forces have been at work over long periods of time, further leading to the conclusions of the science of plate tectonics; that movement and collisions of large plates of the Earth's crust is the cause of folded strata.

The **principle of lateral continuity** states that layers of sediment initially extend laterally in all directions; in other words, they are laterally continuous. As a result, rocks that are otherwise similar, but are now separated by a valley or other erosional feature, can be assumed to be originally continuous.

In Stratigraphy rock strata are classified according to their nature and age of origin, lithological components, and biological components. On the basis of the said features, three different branches of stratigraphy- **lithostratigraphy, biostratigraphy and chronostratigraphy** have been developed.

Lithostratigraphic studies are based only on the nature of rocks and minerals of stratigraphic units alone. Various lithostratigraphic units can be classified as laminae, bed,

formation, groups etc. on the basis of their lateral extent and relative thickness in a particular area.

Biostratigraphy classifies various Stratigraphic units on the basis of the fossils found in each of them. Biostratigrapher tries to correlate various Stratigraphic units on the basis of evolutionary relationship or absolute age of the fossil remains found in various strata.

Chronostratigraphy tries to correlate various Stratigraphic units on the basis of their relative age. The major objective of chronostratigraphy is to gather all strata of the same age into the same chronostratigraphic unit.

Fluorine Analysis:

Fluorine analysis is one of the most widely used relative dating methods. This method of dating is used to compare age of fossilized bones buried underground for a long time. Studies have shown that fluorine is widely distributed in the form of soluble fluorides which occur in trace quantities in ground water. When fluorine ions come into contact with buried bones and teeth, they are absorbed and become locked in it.

When fluorine atoms have once been fixed in bone, they are not readily dissolved out. In course of time buried bones and teeth deposit fluorine progressively. The rate at which fluorine deposits occur in bone varies from one region to the other; however, bones that are deposited in soil in a same period of time will have approximately same amount of fluorine content within them.

Pollen Analysis:

This method of dating is sometimes known as Palynology. It is the microscopic identification of the pollen grains of particular species of plants in soil samples recovered from a particular site. By identifying the plants growing in a locality at some time in the past, and by counting the relative number of pollen grains from different plants in a Stratigraphic sequence, it

becomes possible to develop pollen diagram which summarizes the shifting of vegetation pattern over time.

ABSOLUTE METHODS OF DATING

C14 Dating:

The best-known absolute dating method is 'radiocarbon dating' or C14, a method that relies on measuring the degree of 14C decay in a sample and comparing this to the known decay rate of the isotope. The C14 isotope is unstable and eventually decays to N14, and the decay rate is measured using a convention known as the half-life (the amount of time a sample loses one half of its radioactivity). The half-life of C14 is relatively short at 5730 years. Through feeding and photosynthesis, a living organism constantly exchanges C14 with the atmosphere, but this process ceases upon death. The amount of C14 remaining in an organic sample, then, is dependent on the time of death of the organism's cells and constitutes the event that is dated.

Potassium-Argon Dating:

Certain Volcanic rocks contain radioactive potassium (K-40) that decomposes into Argon (Ar40) in a 1.3 billion years half-life. Because process of decomposition is much slower than that of C-14, potassium argon dating can be used to date much older remains- millions of years old but can't be used on the remains younger than 400,000 years.

To date fossil or cultural remains by this process, the volcanic rock must be deposited at the same time as the remains in question, a coincidence of event not too frequently found. Also, it has been demonstrated that the half-life has not been very accurately measured and statistical margin for errors are large. Nevertheless, potassium-argon dating has been helpful in certain case, the most useful being dating of robust Australopithecine.

Thermoluminescence Dating:

Many minerals emit light when they are heated, even before they become red hot. This cold light comes from the release, under heat, of outside electrons trapped in crystal structure. Thermoluminescence dating makes the use of the principle that if an object is heated at some point to high temperature, as when clay is baked to form pot, it will release all the trapped electrons it held previously. Overtime, the object will continue to trap electrons from radioactive elements around it. The amount of the thermoluminescence emitted when the object is heated during testing allows researchers to calculate age of object, if it is known what kind of radiation the object has been exposed to in its surroundings.

Thermoluminescence dating is well suited to ancient pottery, brick, tile, terracotta and other objects that are made at high temperatures.

Electron Spin Resonance Dating:

Is a technique that, like thermoluminiscence dating, measures trapped electrons from surrounding radioactive material. But the method in this case is different. The material to be dated is exposed to varying magnetic fields and a spectrum of the microwaves absorbed by the tested material is obtained. Because no heating is required for this technique, electron

spin is especially useful for dating organic material such as bone and shell, which decompose if heated.

Paleomagnetic Dating:

When rock of any kind forms, it records the ancient magnetic field of the earth. When this knowledge is put together with the fact that the earth's magnetic field has reversed itself many times, the geomagnetic patterns in rock can be used to date the fossils within those rocks. Paleomagnetic sating method dates rocks in terms of the sequence of geomagnetic patterns in them.

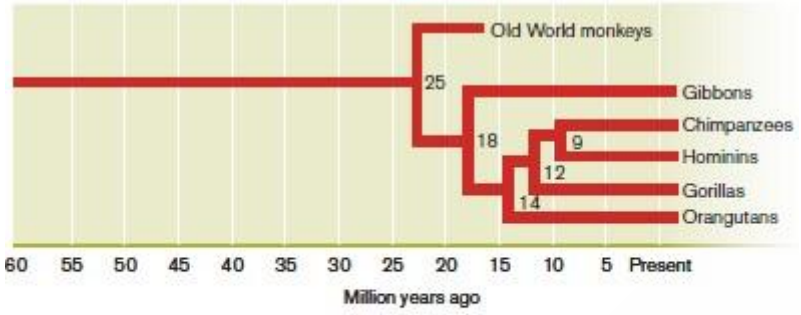
Strictly speaking, paleomagnetic dating is not an absolute dating method. Paleomagnetic dating has dated primate fossil finds from the Eocene through Miocene, from 55 million years to 5 million years ago.

Uranium series:

(U-series) techniques use the decay chain of ^{238}U, ^{235}U, and ^{232}Th, all of which decay to stable lead isotopes, to provide age estimates for calcium carbonates, such as flowstones precipitated in caves, shells of invertebrates, and sometimes teeth. U-series techniques usually date strata associated with a fossil, not the fossil itself. Associations therefore are critical to providing the correct age estimate for a fossil. It may be possible to date a fossil directly with u-series techniques, but the method is more complicated. Flowstones and teeth at Chinese hominin sites have established ages for the famous Peking Man site that suggest a time range between about 200,000 and 400,000 years ago.

GENETIC DATING: THE MOLECULAR CLOCK

The DNA in living organisms is an important source of information for retrospectively dating key events in their species' evolution, including divergence from closely related species and phylogenetic relationships with other organisms. In light of the well-founded assumption that a species accumulates genetic differences in general and mutations in particular over time at a more or less constant rate, it should be possible to develop a chronology showing the amount of time since two species diverged in their evolution. Simply, more closely related species should have more similar DNA than less closely related species have. The American geneticist Morris Goodman and others developed the molecular clock for dating the divergences of the major primate taxa in the 1960s. This record indicates that Old World monkeys first diverged from all other primates at about 25 mya; gibbons diverged at about 18 mya, orangutans at about 14 mya and so on.



Genetic Dating: Divergence of Higher Primates Modern primates diverged from a common ancestor millions of years ago. A "molecular clock" helps determine the time since the divergence of monkey and ape species. This system assumes that species accumulate genetic differences over time at a regular rate.

Fossils are the primary source of information for documenting the evolution of past life. Paleontologists have developed various means for determining a fossil's age.

METHOD	BASIS	MATERIAL	DATE RANGE
Relative Age			
Law of Superposition	Older is lower	Just about anything	Just about any time
Stratigraphic Correlation	Like strata from different regions are related to the same event	Rocks and fossils	Just about any time
Biostratigraphic (Faunal) Dating	Evolution of animals	Bones and teeth	Just about any time
Chemical Dating	Fossils absorb chemicals, such as fluorine, in soil	Bones	Less than 100,000 yBP
Cultural Dating	Artifacts are time-specific	Technology generally	Up to about 2.5 mya
Numerical Age			
Dendrochronology	Tree growth	Specific tree types	12,000–8,000 yBP
Radiocarbon Dating	Carbon-14	Anything organic	75,000–50,000 yBP
Radiopotassium Dating	Potassium-40	Volcanic rocks	More than 200,000 yBP
Amino Acid Dating	Racemization	Bones, shells	1 mya–40,000 yBP
Fission Track Dating	Fission tracks on rock crystal	Volcanic rock	Up to 3 mya
Paleomagnetic Dating	Shifts in Earth's magnetic field	Sedimentary rocks	Up to 5 mya
Electron Spin Resonance Dating	Concentrations of radioisotopes	Bones, teeth	Several thousand to more than 1 mya
Luminescence Dating	Trapped energy	Sediment, stone, ceramics	Up to 800,000 yBP

ETHNOARCHAEOLOGY

Ethnoarchaeology is a research technique that involves using information of a living cultures in the form of ethnology, ethnography to understand patterns found at archaeological site. An ethnoarchaeologist acquires evidence about ongoing activities in the society and uses those studies to draw analogies from modern behaviour to explain and understand the pattern seen at archaeological site.

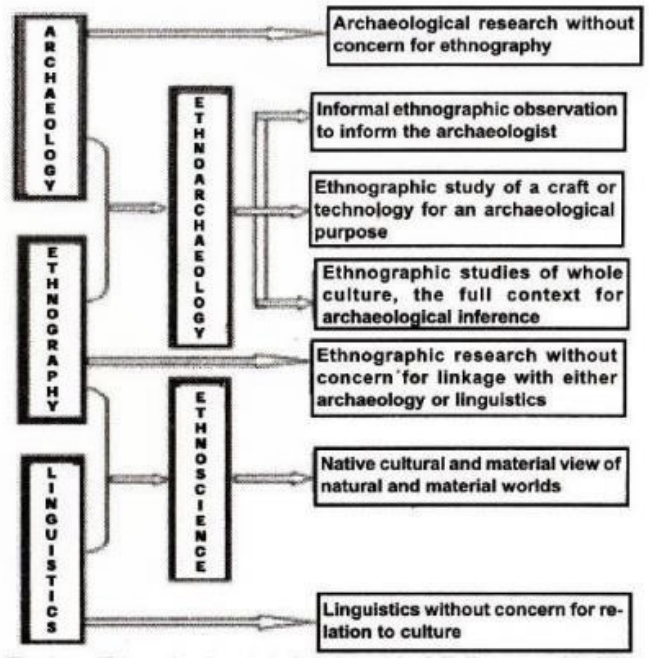
Coined by **Jesse Fewkes in 1900**, the term 'ethno-archaeology' is formed out of ethnography and 'archaeology'. Since long back, the archaeologists were involved in collection, identification, classification and establishment of chronology of antiquities and were giving a little attention to the significance of social organization of a particular group, site or region. According to Kramer, ethnographic fieldwork carried out with the express purpose of enhancing archaeological research by documenting aspects of socio-cultural behaviour likely to leave identifiable residues in the archaeological record (Kramer 1996).

According to **Lawman** 'ethnoarchaeology is the study of contemporary cultures, with a view to understanding the-behavioural relationships which underlie the production of material culture.

In **Stainslawaki's** word "Ethnoarchaeology is the direct observation field study of the form, manufacture distribution, meaning and use of artifacts and their institutional setting and social unit correlates among living non-industrial people for the purpose of constructing better explanatory needs, to aid archaeological analogy and inference.

It studies the behaviour and practices of living communities in order to interpret archaeological evidence related to the communities of the past.

In other words, systematic processing and ordering of archaeological data in relation to ethnographic data not only to reconstruct past ethnic systems, but also to build models of the process and patterns of socio-cultural evolution of the past population is called ethnoarchaeology. That means ethnoarchaeology "refers to ethnographic field work carried out with the exclusive purpose of enhancing archaeological research by documenting aspects of socio-cultural behaviour likely to have identifiable residues in the archaeological record."



(The place of Ethnoarchaeology in Anthropology (After R. H. Thompson, 1991 : 233)

Types of Ethnoarchaeological Approach

Analogy is the principal theoretical apparatus by which an archaeologist gains ethnological knowledge. Interpretation made through analogy evaluates any belief about non-observed

behaviour in reference to observed behaviour which is thought to be relevant. There are two kinds of analogies commonly employed by the archaeologist:

1) **The Direct Historical Analogy**: This type of analogy is applied when there is a temporal continuity between the archaeological culture and the ethnographic culture. It is generally considered to provide the highest probability of being correct. Such continuity is based either from historical records and· description known as "area historical" or, based on field work in the area under consideration known as "area ethnographic model".

(2) **General Comparative Analogy**: This analogy is based mainly on the similarities between contemporary cultures and the cultural materials from an archaeological context. In such analogy, correlation between the two sets of cultures can be made on a cross- cultural level without any special restriction.

Off-late Ethnoarchaeology has developed as an established field. It has challenge of its own. The challenge is it deals with two types of data sets: i) The archaeological data belonging to past society

ii) The ethnographic data belonging to contemporary societies

It has developed some of the concepts to deal with the basic challenge. **Survival and Parallel** are two important concepts to deal with this challenge.

Survival evoke principle of continuity and **parallel** evoke principle of similarity.

The Juangs of Keonjhar

the Juangs of Keonjhar have a dormitory which is called Mandoghar. One would find at Mandoghar a wooden log continuously burning. Juangs believe that fire is auspicious. They take fire from here on auspicious occasions.

According to folklore, Juangs lost fire at some point of history. But by divine's blessing they regained it back. The folklore in order to prevent this danger in future tried to protect it by continuous burning.

According to Mahapatre this practice of preserving fire could have long roots not only in history but also in prehistory. This could be regarded as an example of survival of prehistoric practice.

Onges of Andaman and Nicobar

Onges are known to be decorating their body with microliths. They use microliths for tattooing purpose also. But no Mesolithic site has been found in the area they live. This could be regarded as parallel to prehistoric practice.

Limitations of Ethnoarchaeology

Ethnoarchaeological approach must be used cautiously and should be seen as suggesting the possible and not necessarily conclusive ways of interpreting the archaeological data, always keeping in mind the difference between present and past contexts.

Another issue often faced is the potential for a single archaeological situation to have multiple possible analogies drawn from it. This way of connecting clearly ignores the factors of migration due to pressure on land or external invasions.

Ethnoarcheology in India

India has always been regarded as a land with sound tradition of her own, in respect of religious, cultural or social field as well as in other a aspects of life, may it be agricultural, artistic or craftsmanship. Here in India, the past has never been divorced from its present, rather it has been matured without obliterating and absorbing that, which has gone before. As Kosambi observes, 'perhaps nowhere in the World, can such parallels be found more readily than in India'. Many aboriginal tribal culture here, are recognizable which stem from the prehistoric period. So, when we deal with Indian archaeology no other discipline than ethnography emerges as most suitable for a proper understanding of the value and significance of the prehistoric artifacts.

- Indian archaeologists studied the tradition of carnelian bead manufacturing in Khambat Gujarat. This study gave valuable clues about the way in which the Harrapan beads have been made and the possible social organization of the bead makers, the relation between craft persons and traders and between craftperson and customers.
- Some ethnoarchaeologists made inferences about women's role in subsistence and craft related activities in early times. They studied the modern communities of huntergatherers and compared their women's lifeways with the lifeways of the woman who followed similar subsistence strategies in the past. This has given them an account of women's role in subsistence and craft related activities in the past.
- KK Basa started an ethnographic study of artisan community in and around Bhimbetka. The points of investigation were to find out the motive/theme of the artisans behind one or other kinds of paintings (contemporary). The motive behind meaning of sculpture and trying to connect it to motive of Bhimbetka painting. The study is relevant in establishing connection between contemporary practices with archaeological one.