

Subject: **Anthropology**

Production of Courseware
-Content for Post Graduate Courses

Paper No. : 01 Physical/ Biological Anthropology
Module : 29 Applied Physical Anthropology



Development Team

Principal Investigator Prof. Anup Kumar Kapoor
Department of Anthropology, University of Delhi

Paper Coordinator Prof. Subho Roy
Department of Anthropology, University of Calcutta

Content Writer Dr. Rashmi Sinha
Department of Anthropology, Ignou.soss

Content Reviewer Prof. Barun Mukhopadhyay
Indian Statistical Institute, Kolkata

Description of Module	
Subject Name	Anthropology
Paper Name	01 Physical/Biological Anthropological
Module Name/Title	Applied Physical Anthropology
Module Id	29

 **Pathshala**
पाठशाला
A Gateway to All Post Graduate Courses

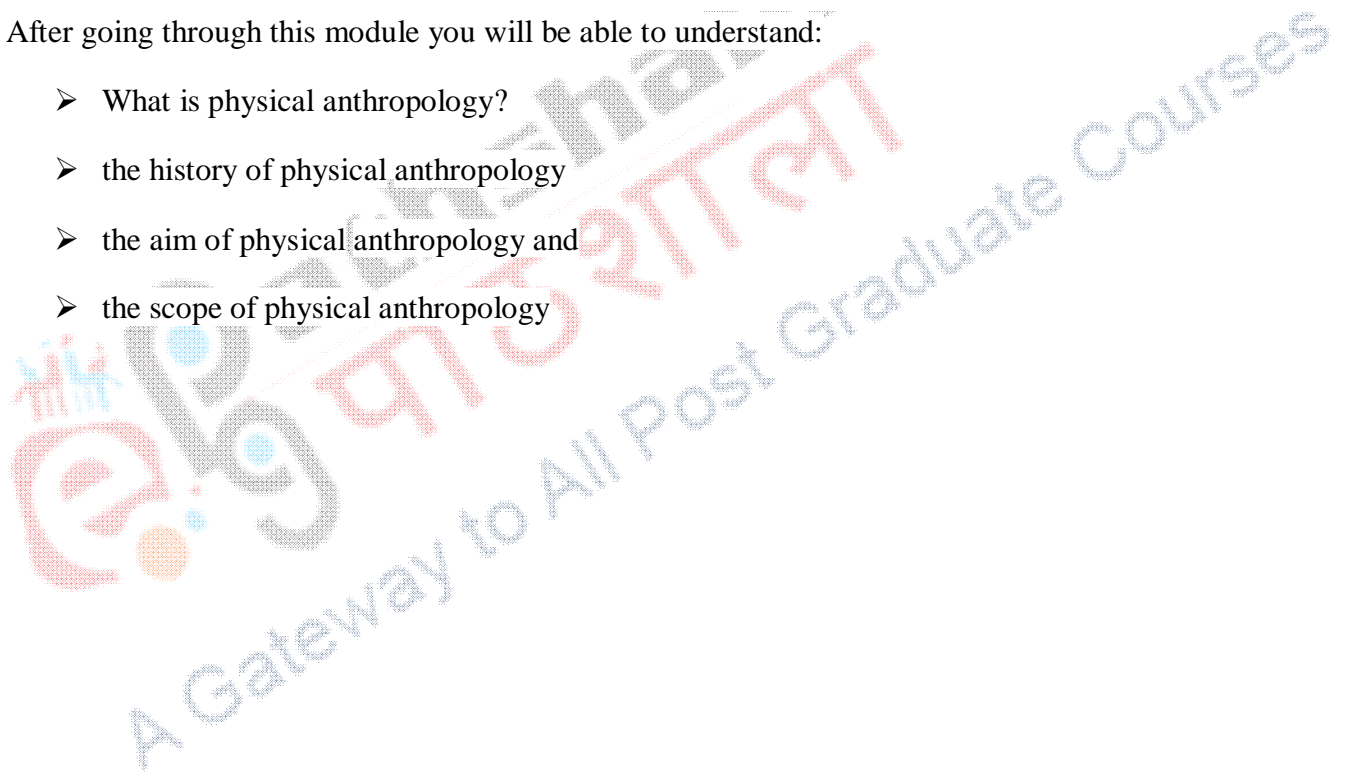
Contents of this unit

- Introduction
- Learning Outcome
- Definition
- History
- Aim
- Scope
- Summary

Learning Outcome:

After going through this module you will be able to understand:

- What is physical anthropology?
- the history of physical anthropology
- the aim of physical anthropology and
- the scope of physical anthropology



Introduction

Humans are the only species to ponder their own existence and question how they fit into the spectrum of life on earth. Man is a product of organic evolution and he achieved his humanity at a reasonably recent date in geological time. Therefore, it becomes imperative to study man as an animal before he can be understood and appreciated as modern day human being. The discipline that is committed with the study of man from this point of view is physical anthropology, and it may perhaps be claimed that, of all the subdivisions of anthropological science, physical anthropology is the most fundamental. Many scientists (at that time called natural historians or naturalists) were very curious about the origin of modern species. It was the publication of Charles Darwin in 1959 -On the Origin of Species that changed the perception and put end to speculation.

Definition

Physical anthropology integrates bio-cultural studies of human diversity, the physical variation in current human groups mainly studied by the methods of genetics, examines man's place in nature and his taxonomic classification within the animal kingdom, apparent origin with the help of fossilized remains, comparative anatomy, ecology, history of primates, primate behavior reflecting the social life of early man and his development in time and space and growth and development. Physical anthropologists are in position to precisely describe human physical structure both past and present and also explore how function and behavior are integrated into the environment in which human beings live. The fact that all studies are understood in context of culture and behavior makes physical anthropology a unique link between the social and biological sciences. Although integrated to cultural anthropology and archeology, physical anthropology has its own biological methods.

It is not very easy to define physical anthropology as it involves interdisciplinary approach and encompasses wide horizon. Paul Broca defines it as natural history of the genus *Homo* and more concretely as the science whose objective is the study of humanity as a whole and in relationship to the rest of the nature. Herskovits identifies that physical anthropologists study such matters as the nature of racial differences; the inheritance of bodily traits; the growth, development and decay of human organism; the influence of natural environment on man. According to Juan Comas, it is defined as science which studies variation, comparative study of the human body and its inseparable functions, exposition of the causes and courses of human evolution, transmission and classification, effects and tendencies in the functional and organic differences, etc. The discipline thereby assists us in exploring the sources of variation which are the result of genetic differences and environmental modifications. Examining the biological variations between the populations of any species explains evolutionary process that gives valuable information as what could be the mechanism of genetic change in group overtime- a domain of physical anthropology.

Biological anthropology, also known as physical anthropology, is a scientific discipline concerned with the biological and behavioral aspects of human beings, their related non-human primates and evolution and their extinct hominid ancestor, the biological variability and its significance. It is a sub discipline of anthropology that provides a biological perspective to the systematic study of human beings. Portions of these subjects are studied by scientists in many diverse disciplines, but general and holistic study of them is the domain of biological anthropology. Physical anthropology is the original term and it mirrors the early interests anthropologists had in describing human physical variation. The American Association of Physical Anthropologists, its journal as well as many college courses and numerous publications retain this term. Hence Physical or biological anthropology is concerned with the evolution of humans, variability, adaptations to environmental stresses using an evolutionary perspective, the bones, muscles, and organs and its functions, survival and reproduction. Biological Anthropology echoes the shift in stressing more biologically oriented topics such as genetics, evolutionary biology, nutrition, physiological adaptation, growth and development. This shift occurred in quest of understanding origins of structure, exploring human genetics, growth and development and evolutionary history that led to advances in the field of genetics and molecular biology.

History

The history of physical anthropology dates back to the time, physical anthropologists deliberated on the nature and geneses of human races. 17th century witnessed the western scholars presuming that all humans were descendants of Noah and his family, consequently belonging to a single species, which meant that all contemporary human races was monogenic. The founder of physical anthropology German Physician Johann Friedrich Blumenbach (1752-1840) of Gottingen, regarded as the inventor of craniology and an empirical power on the questions of human diversity divided the mankind into five races: American, Caucasian, Ethiopian, Malayan, and Mongolian.

James Cowles Prichard (1786-1848), proposed a controversial idea that as the descendants of Adam became lighter-skinned they attained higher intellects and civilization. Ultimately all races would become similar to western Europeans, the race that in his view had progressed farther or more rapidly. However, encountering huge number of different looking human beings, the diversity among mankind struck to them. Infact, scientific physical anthropology began in the 18th century with the study of racial classification (Marks, 1955); this scientific study of race was an answer to the presence of so many human types. Man's origin was from more than one gene, picked up momentum in the scientific circles of Europe especially France and America in late eighteenth and early nineteenth centuries, stressing races were polygenic. The advocates of polygenism submitted that there was a wide variation among human population and this variation could not be attributed to the environmental difference and too great for humanity to be credited to single species. Hence, God must have created several human species right from the beginning. Philadelphia physician and advocate of polygenism, Samuel George

Morton (1799-1844), in later nineteenth century reflected upon concept of human variation using anthropometric measurements.

Anthropological Society of Paris, first in the field of Anthropology, was established in 1859 by a French surgeon, Paul Broca (1824-1880) who pursued the tradition of Samuel Morton. The anthropological laboratory set up became the Centre for training program for anthropologists where activities of these early physical anthropologists were devoted to racial craniology. Anthropology became the focus and extended from Broca's laboratory to other institution and facilitated in understanding why polygenism was favored over Monogenism. The polygenists were now categorically in a position to make their point more acceptable. Broca was of the view that it was incorrect to attribute the huge diversity in races due to degeneration and also argued that it would be demeaning to consider the diversity of racial variation as degeneration from a single superior species.

Edward Tyson (1650-1708), a London physician and member of the Royal Society, started the European primate studies and distinguished between the animal, humans, and monkeys by dissecting a chimpanzee. Even though the early scientific investigations were basically anatomical, lot of curiosity was generated among people in primate behavior. Thomas Henry Huxley's in Man's Place in Nature (1863) applied Darwinism to stress the origins of human. Primatology was basically concerned with the anatomy and considered evolution from paleontological record. Ernst Haeckel (1834-1919) published an encyclopedia of primate anatomy and came up with first scientific phylogenetic trees. These studies formed basis of understanding evolution of man through paleontological records. Their attempt facilitated in understanding us in present day context, though anatomy remained the focal point until after 1900.

The German tradition, led by Rudolf Virchow (1821-1902) stressed that the variation observed in the human form was a consequence of environment and disease on the human body and the lack of fit among race, nation, and culture. The American tradition gave attention to the 'pacified' aboriginal (Indian) inhabitants of the North American continent, finding and gathering skeletons as scientific objects, along with artifacts, languages, and culture.

Subsequently, with the start of nineteenth century, anthropometry came into limelight becoming more sophisticated under the patronage of Karl Pearson (1857-1936), co-founder and editor of the journal, Biometrika, Karl Pearson treated the measurements of bones and bodies to statistical tests that made the exercise more scientific, including computations for variation and correlation, and tests of significance for comparing samples. Physical anthropology was committed to the study of racial determinism- a philosophy that assumed the superiority of Caucasoid in the last half of the nineteenth century.

Physical anthropology was considered a mystique medical specialty, in the United State after the Civil War (1861-65). Franz Boas (1858-1942) an architect of today's face of physical anthropology in 1897, led physical anthropology from just taxonomic òraceö classification to practical research in human biology and unearthed and erased the doubts in the area of race and culture studies; propagating the changeability of the human form. Ales Hrdlicka (1869-1943), was a prominent physical anthropologist hired by United States National Museum in 1903 and who worked hard to counter Nazi wartime belief about race and rejected the idea of racial superiority. The establishment of American Journal of Physical Anthropology in 1930 goes to him. Hooton, a Ph.d from the University of Wisconsin, entered anthropology as an Oxford Rhodes Scholar, under R.R. Marett, and the anatomist Arthur Keith. In the following decades, Hooton trained most American physical anthropologists like Harry L. Shapiro and Carleton S. Coon whose input to the discipline is unmatched. As Harvard began to train physical anthropologists, the discipline began to diversify.

Though the emphasis continued in anatomy and medicine, human biology catered to several questions about man than just anthropometry and racial origin, Unaware of the conflict of scientific interpretation, the priceless input towards the field of anthropology continued between Germans and Americans, by Eugen Fisher, Fritz Lenz, and Erwin Baur.

In the middle of twentieth century in 1951, a Hooton alumnus, Sherwood Washburn rediscovered the fieldwork with newer vistas in physical anthropology; highlighting evolutionary process and history. Washburn's anthropology ventured to paleo-anthropology and primatology. He was one of the many anthropologists who followed modern trends in biology and science and paved way for the present bio-social scenario of physical anthropology. Scientists whose prolific work and unparallel contribution laid foundation of current physical anthropology includes W K Gregory, William Krogman, Dudley Morton, Adolph Shiltz, Harry Shapiro, William Straus, T Dale Stewart and many more. Consequently, current anthropology claims diverse methodology to get a more vivid picture of animal behavior, human genetics, and medical anatomy. It has taken several roads of development in recognizing physical anthropology and giving it a very vital position in scientific fraternity.

Aim

The old physical anthropology symbolizes the descriptive stage of the subject, distinguished by anthropometric measurements and classification of indices and computation of statistics. This approach with stress on taxonomy remained static till genetics and its applications in the explanation of evolutionary theory surfaced; hence the objective of old physical anthropology was principally classification by which it was assumed that description of the differences would suffice for solving the problem. The new physical anthropology on the other hand concerns in understanding the processes

and mechanisms involved in the problem, where classification plays a trivial role. Thus, the new physical anthropology embarks on where the old conclude, with aims and interests of both the traditions remaining same, although the accent of new physical anthropology is reorientation in methodology and comprehension and interpretation.

The strength of physical anthropology lies in wide spectrum covered in understanding of human; and some of the arenas covered under this range are discussed. Physical anthropology integrates bio-cultural studies of human diversity and is in agreement that all men living today belong to single species, *Homo sapiens*, and that all men are derived from a common stock. Physical anthropology answers the question on who were the ancestors of human species and how they evolved to the present form. They ascertain the different stages and mechanism during the evolutionary history. Human paleontologists reconstruct the skeletons of extinct that may have been our forerunners to understand the present day man. Using the fossil record and from what can be determined through comparative anatomy the paleoanthropologists studies the evolution of primates and hominids. Physical anthropology depends on studies of the comparative anatomy of present-day vertebrates and especially the primates. It relates the anatomy of these present-day animals with that of the knowledge on fossil primates.

Physical anthropologists apply human demographic and ecological data (of birth rates, death rates, marriage practices, nutritional intake, health condition, and so on) to the study of human population genetics. Demography directly related to fertility and morality is another subject which attracts attention of physical anthropologists. The factors responsible for variation in different populations of these phenomena are answered by the physical anthropologists.

The molecular differences between species and the relative frequencies of different molecules in the same species necessitate explanation on acceptance of how these species live, or have lived in the womb, or how their ancestors lived in the distant past, is the domain of molecular anthropologist. The growth in man is reliant on two broad categories - heredity and environment. The study of growth and its related fields are important aspects of physical anthropology. Growth curves, growth standards and the reasons for normal and retarded growth are utilized to build a healthy nation.

The development of physical anthropological research has amazingly altered during the last three decades. The subject has made a rapid progress exploring more diversified fields covered under it. The emphasis has shifted from measurements, osteology, blood groups to nutrition, physiology and eugenics.

Scope

Physical anthropology no more remains only an academic discipline, the recent past reflect an ever increasing recognition of what anthropology has discovered and can discover about humans. The latest developments in the field have opened new avenues in physical anthropology. Human biology is at times incorrectly used as a synonym for physical anthropology, despite clear cut divisions in both the fields. Human biology encompasses structure and function of modern man, while physical anthropology refers to all that is chronological, racial, social and even pathological groupings of human. They are very close knit, yet they uphold individual identity in working methods, techniques and objectives.

Globally the scope of physical anthropology is best identified within the framework of the tradition followed in the different stages of its development. These traditions may be called 'old or classical' physical anthropology and 'New or Analytical' physical anthropology. Ever since the coining of the term 'New physical Anthropology' by Washburn in 1951, the study of man has come long way.

Physical anthropology is generally accepted as the comparative sciences of man as a physical organism in context to his total surroundings be it social or cultural or physical; because development of his physical and cultural, factors is reliant on the environment prevailing at that time, form an important anthropological perspective.

The extent of human variability and their factors responsible for the current distribution have been of vital concern. Genetics and anthropometry are used to determine the cause of diversification and human variations-a specialized branch of physical anthropology.

Human diversity, a component of physical anthropology takes into account human taxonomy, which in anthropological perspective refers to study of races. The genetic diversities observed in different racial groups can be explored through factors of mutation, gene recombination, chromosomal alterations, isolation, genetic drift, social selection and so on. The difference in frequencies of phenotypic and genotypic characters, classification of human population form basis of race, ethnic groups, isolates or Mendelian population or endogamous groups.

The stage of evolution particularly the 'pre-human' history of man to his present form is the foundation of primatology apart from anatomy, physiology and ethnology. Unquestionable is the contribution of Primate Paleontology on extinct primates, tracing the origin of man and his evolution under Palaeo anthropology.

The major concern of human evolution is to trace the ancestral form and to understand the course of evolutionary processes and mechanism involved in the making of the erect walking, bipedal, brainy creature who is a tool maker. This is accomplished by the assessment of biological distinctiveness of the living as well as extinct non human primates and by the comparison of the same with those of the living and extinct people. All living populations of the world had common ancestor irrespective of theory morphometric variation. This necessitates contribution from primatology, primate paleontology, Palaeo anthropology and comparative anatomy.

Human genetics a significant part of physical anthropology has witnessed incredible growth. Inheritance patterns of trait in humans have generated lot of curiosity. The assessment of the gene frequency and distribution of the traits form a significant basis for evaluating the incessant process of human differentiation. The study of human genetics has facilitated treatment and genetic counseling to prevent inherited disorders. Human population genetics use mating pattern as a method that assist in the estimate of inflow and outflow of genes that are accountable for evolution. Eugenics forms a fundamental part of physical anthropology responsible towards the progress of populations.

Growth and development in physical anthropology has its own significance, be it studying secular trends (e.g., increase or decrease of weight in the next generation), stage of growth, growth pattern of a population, factors affecting nutritional status and reproductive biology, population variation, all come under the individual is indicator of growth of nation.

Recent years have witnessed physical anthropology playing irrefutable service in the field of dentistry, medicine and industrial research. Physical anthropology plays a vital role every time human body in part or whole needs any explanation be it the form, functional or age changes. The scope of physical anthropology in the field of forensic science is tremendous. The various branches of physical anthropology which assists a forensic scientist in arriving at conclusion are dermatoglyphics, osteology, osteometry, and serology; somatic and genetic characteristics contributing towards the determination of age and sex. Kinanthropometry uses somatological knowledge in interpreting the body types for different sports or even in relation to specific disease.

The varied dimensions of academic/ research and applied significance of physical anthropology have developed into a number of evidently discernable subfields of the subject as a result of advanced researches elevating physical anthropology to the level of independent discipline. The numerous specialized field of physical anthropology are human population genetics, Primatology, human biology, palaeoanthropology, human genetics, medical anthropology, physiological anthropology, forensic anthropology, nutritional anthropology, dental anthropology, anthropometry, ergonomics, demography, ethnology, etc.

Summary

- Physical anthropology has been defined in various ways depending upon the focus at that time. It is not a simple task to give precise definition to physical anthropology as it embraces interdisciplinary approach.
- The mechanism of biological evolution, genetic inheritance, human adaptability and variation, primatology, growth and development and evolutionary history and the fossil record of human evolution constitute physical anthropology and the discipline provides opportunities to physical anthropologists to explore all in an endeavor to exactly describe human physical structure both in the present and in the past and also probe how function and behavior are integrated into the environment in which human beings live.
- Human variation, the degree and the causes has been primary concern of early anthropologists. To facilitate this genetics and anthropometry have played an important role in estimating the detailed cause of individual variation and diversification of the varieties of man.
- Physical anthropologists are painstakingly working to reveal the mysteries of human beings; working not in isolation but involves varied fields resulting in newer concepts and better understanding about human.