UNIT 2 RELATIONSHIP WITH OTHER DISCIPLINES

Contents

Learning Objectives

Once you have studied this unit, you will be able to understand the:

- meaning of interdisciplinary and trandisciplinary approaches;
- its relevance in physical anthropology; and
- relationship with other disciplines.

2.1 INTRODUCTION

In this unit, it will be our endeavour to know what does interdisciplinary and trandisciplinary approaches mean with reference to physical anthropology. As mentioned in the earlier unit that physical anthropology involves other disciplines too, we will also explore in this unit the relationship of anthropology with forensic science, life sciences, medical sciences, earth sciences, human biology, environmental sciences, social sciences, human engineering and technology, and physical sciences.

2.2 INTERDISCIPLINARY AND TRANDISCIPLINARY APPROACHES

Anthropology is a vast field of study, and hence can be seen in association with numerous other fields. Often divided broadly into two branches, anthropology is either the science that deals with the cultural development, characteristics, social customs or beliefs of humankind referred to as cultural anthropology, or the study of human similarity to or divergence from other animals, their growth, evolution, development etc. named as physical anthropology. Physical anthropology is unarguably not an isolated field but incorporates all the branches

of learning that concerns human. Physical anthropologist often comes in close contact with archaeologists in the cross disciplinary area of Palaeoanthropology which is the study of human evolution through fossils and artifacts. Archaeologists may find a fossilized human skull, but the job of describing and studying the specimen falls in the domain of the physical anthropologist. Or physical anthropologist may find it essential to put together their knowledge of skeletal biology with that of cultural and living contexts that the archaeologists had discovered in order to get a holistic picture of the adaptation of past human populations. Physical anthropologist also studies the behaviour of non-human primates and thereby has close intellectual ties with psychologists. Consequently, it is undisputable that there are some strong connections between physical anthropology and other subdisciplines.

2.2.1 Forensic Science

Let me explain how physical anthropology holds coveted position in forensic science. Physical anthropology has always been an acknowledged area of forensic proficiency at least since 1850. Forensic anthropology is the application of the science of physical anthropology associated to the identification of skeletal material (badly decomposed or otherwise unidentified human remains). Main objective of forensic science is to detect the criminal(s) through the evidence obtained from the crime site by means of the study of various bodily remains. It is in this sphere that physical anthropology plays a pivotal role through its various methodologies by identifying the deceased from insignificant remains. The study of blood types, palm and sole prints provides clues in forensic science. Thus, an association with physical anthropology enables in the detection of crime.

Forensic anthropologists often work in combination with forensic pathologists, odontologists and homicide investigators to identify a deceased, ascertain evidence of foul play, and/or the postmortem interval. In addition to supporting in locating and recovering doubtful remains, forensic anthropologists work to agree on the age, sex, ancestry, stature and unique features of a deceased from the skeleton. Forensic anthropologists are often described as “bone detectives” who assist police unravel intricate cases involving unidentified human remains by validating the identity of the victims of accidents, fires, plane crashes, war or crimes such as murder.

What is the role of physical anthropologist in arriving at a conclusion? What is the role expected of a forensic anthropologist in it? It is well known that forensic anthropology utilise the standard methodical procedures established in physical anthropology to identify human remains, thus assist in the unraveling the mystery of crime. A forensic anthropologist can determine if the person was a male or female by reviewing the pelvis, base of the skull, the forehead and the jaw. To elucidate to you further, males usually have a more noticeable brow ridge, eye sockets, and jaw, whereas women have a broader pelvis. Anthropologists’ are able to approximate the age of the person by examining the suture closures in the skull, joints, bones and teeth. Likewise, a child’s skull has more separation between the bone plates. If the skull is found to be smoother, the indications are that it belongs to older person. Forensic scientists use formulas to establish height based on the length of leg and arm bones. The longest bone in human, the femur, is best for this, but inference can also be made from the metacarpals of the hand. The consideration of wrist development for children under thirteen is another

reliable method of determining age. By and large, the estimation of age works best if the victim is under 30 years when the bones are taken into consideration.

Anthropologists are able to calculate approximately the person's weight by the wear on the bones at certain points. Racial identification is possible by probing the dimensions of the nose-width and height. Facial or head hair, when found with the skeleton, can also assist determine race. To give an example, it is known that Caucasian nasal openings are triangular, Negroid's square and those of Mongoloid's diamond-shaped. Negroid femur bones are also straighter than other racial groups. On examination, Anthropologists can also reflect on the occupation of the person. For example, if the person played an instrument such as a flute or clarinet, the teeth and bones around the mouth will be influenced. A carpenter's or a roofer's teeth might be clipped in front where he seized nails in his mouth. Also the ridge where muscle was attached to the bone reflects the persons' physique.

Physical anthropologist can make out whether the person was right or left-handed. Observe carefully, there would be more muscle attachment on the bones on the dominant side. A physical anthropologist can also be adjudging the injury suffered by the deceased that is if ever the deceased injured or fractured a bone during his lifetime and whether his death was aggressive. All these warning signs can be determined by looking for signs of trauma which could possibly be stab marks, marks on the skull, broken bones, and bullets or pellets in or near the body. A physical anthropologist plays a decisive role in determining the time when the individual died. This is evidenced by the amount of soft tissue that is still present which actually is key to determining the time of death. It is established that the females lose one pound of tissue a day during decomposition; while males loose three pounds a day. Acidic soil hastens decomposition whereas the alkaline soil hinders it. A good number of these such as age, sex, race, and height are class characteristics, but some are individual characteristics such as trauma. Court substantiates other evidences or supplements the authentication of other experts along with forensic anthropological identification, to arrive at their verdict.

Police utilise the expertise of physical anthropologists for facial reconstruction, recreating a face by taking clues from the skeleton to help them identify the deceased. When a physical anthropologist is asked to create a reconstruction, he first deduces as much information from the skeleton, including the most basic and vital information such as age, race and sex.

2.2.2 Life Sciences

There are so many branches of science like biology, medicine, anthropology, or ecology, which are invariably related with living organisms and their organisation such as life processes, and relationships to each other along with their environment. All this can be categorized under one roof that is Life Sciences. It is concerned with all fields of science that engage the scientific study of living organisms, like plants, animals, and human beings. But then, when the study of behaviour of organisms, such as that practiced in ethology and psychology is concerned in these disciplines, it is only included when it involves a clearly biological aspect. There is a very strong relationship between biology and medicine which is the main attraction of the life sciences, at the same time its divergence towards technological progress in molecular biology and

biotechnology has led to rapidly increasing of specialisations and often new interdisciplinary fields.

How human beings originated have caused lot of curiosity and has been an attraction for millennia. This aspect forms a core part of physical anthropology. It occupies a significant issue in many systems of mythological and religious belief; however the systematic scientific study of human origins is rather recent. The seventeenth and eighteenth centuries witnessed the advancement in studies in anatomy. While the scientists began concentrating in organising species into genera and speculating on evolution; the others focused their attention to man's relationship with other animals, especially the primates. This led to the explanation to many questions which have been endorsed to the progress that life sciences have made.

Even though anthropology supplies life sciences with their basic fodders, the stepping stones are laying down the fundamentals of evolution, growth, development, and behaviour which are part of life sciences and strengthens it further.

2.2.3 Medical Sciences

Physical anthropology and medical sciences have close proximity and enjoy a close inter- and trans disciplinary relationship. It is understood that physical anthropology is incomplete and programmatic with its specific branches being in close relationship with medical sciences. Physical anthropology significantly contributes in investigating the nature and extent of various diseases, like whether a concerned disease is hereditary that is running as a family trait or non-hereditary. Not only this but also the growth studies relating to their pattern, growth trends, abnormalities and environmental effects are also assessed by physical anthropologists in the backdrop of medical sciences. Study of anatomy forms an integral part of medical sciences and hence can be said to be the scientific study of the morphology of the human body. Medical science in addition includes subjects like physiology which is the study of function and biochemistry - the study of the chemistry of living structures which are complementary basic medical sciences when applied to the human body. Basically it means that each of the fairly recognised principles from the fields of anatomy, morphology, growth, health, biochemistry and physiology are significant specialties in anthropology. Physical anthropology is concerned with the evaluation of the anatomy of various races of humans. Under its purview also comes the morphological distinction with the help of anthropometric dimensions and genomic diversity which are judged through genetic parameters of anthropology. Medical Sciences with such wide spread field facilitates a framework in anatomical, biochemistry and physiological knowledge which helps anthropology intensively and vice versa.

In the following units you will realise that anthropology can be credited to its own strong theoretical and scientific foundations some of which are by far oriented in medicine. The aim of anthropology is to demonstrate rationally what being specifically human is in the most fundamental physiological functions, with medical science defining the standards. This has led to the origin of a new discipline-Medical Anthropology which incorporates both physical anthropology and medical science.

2.2.4 Earth Sciences

Earth science embraces the study of nature of structural pattern of the earth that throws light on its various land forms, its waters, the air that engulfs it, how the rocks are formed, the different strata of the earth and their formation and also includes the geologic, hydrologic, and atmospheric sciences. The perspective of Earth sciences is to recognise the present features and past evolution of the Earth and to exploit this knowledge, wherever found appropriate, for the benefit of humankind, the basic premise on which physical anthropology is based. It gives us great deal of information about the series of events which occurred in the distant past and through these evidences the oldest forms of life can be known that prospered umpteenth number of years ago on earth. This achievement is possible through the systematic study and analysis of the earth's crusts and different strata of earth bearing fossils as evidence, by employing geological methodology. Not only has it held an invaluable contribution towards the understanding of human evolution, but as well of various cultural stages of man especially when the information on time sequence is crucial.

The physical surroundings which are inhabited by humans include the immediate surface of the solid Earth along with the land beneath it and the water and air above it. The facts of life were of concern to the early man rather than with theories, and thus his survival depended on his ability to get metals from the ground which enabled him in producing alloys, for example, bronze from copper and tin, for tools and armor. He was also concerned to find adequate water supplies for creating dwelling sites, and to predict the weather, which had an immense bearing on human life in earlier times than it has today. These situations correspond to the fundamentals of the three principal disciplines of the modern earth sciences. While physical Anthropologists focuses on the evolution of early man, the earth scientist concentrates on the raw material available to this early man which either helped or slowed down their evolutionary process. Only when one is aware of the marvelous complexity of the Earth, it would be easier to appreciate how the world today is growing with environment around and how humans are adapting to this changing earth. Each in its own premise, both physical anthropology and earth science is a comfortable field and together they emphasise on two important features, yet basic questions as to how did life on Earth begin, and from what did man evolve remains a mystery.

Earth Sciences area of specialisation involves with the geologic history of the earth, study of fossils and the fossil record (paleontology), the growing of sedimentary strata accumulated typically over millions of years (stratigraphy), and the isotopic chemistry and age dating of rocks (geochronology). These provide vital input to anthropology.

Similar to physical Anthropology, the applied aspect of earth sciences deals with practical applications beneficial to society. They engage in the study of fossil fuels (oil, natural gas and coal); oil reservoirs; mineral deposits; geothermal energy for electricity and heating; the structure and composition of bedrock for the setting of bridges, nuclear reactors, roads, dams and skyscrapers and other buildings; risk involving rock and mud avalanches, volcanic eruptions, earthquakes, and the collapse of tunnels; and coastal, cliff, and soil erosion. Most of these would have a direct impact on human beings hence come under global anthropology's focus.

2.2.5 Human Biology

Physical anthropology as you have rightly understood is the study of the biological perspectives of man. Undoubtedly its proximity to biological sciences is natural. Let us see how it works, when we are trying to build up sequence of human evolution, physical anthropologists' basic instinct is to compare the biological features of man and with other animals. Now-a-days human genetics forms the integral part of physical anthropology. The focus of physical anthropology on human heredity, factors relating to growth and development has boosted the field of human biology.

2.2.6 Environmental Sciences

Nature holds no significance without the participation of human, similarly the science of nature is incomplete if it is studied without human involvement. Therefore, it becomes imperative for both disciplines namely ecology and anthropology to take part in the discourse on sustainability of working environment that has human involvement. Environmental science is predisposed to focus on the nature front and to realise the human condition while the anthropological sciences tend to focus on their respective specialties and on "nature" as concept, and then consider ecological reality into account. Environmental science and anthropology as disciplines take into account both the nature and human. They go beyond the dualism of nature-culture to a further holistic outlook on ecological and cultural realities in their inbuilt connectedness with humans. Ecoanthropology is dedicated to a large extent by contributing to the analysis and actions towards such a conversion, by taking both the nature comprising the local environmental management and culture defined as ways of living and of making a living to sustain, which are identifiable with environmental sciences. In view of the fact that it is a discipline that has been exploring both the sides, eco-anthropology has the merit to widen its horizon towards "futures".

Anthropology has its applications for future by exploring the conditions adjoining a civilization's endurance or disintegration with respect to its environments by being appreciative of adaptations, weather, biological, behavioural or cultural in reaction to environment. Environmental sciences point towards the adverse conditions an environment can pose to its inhabitants and while anthropology, in all its genuine concern points out the diversity of outstanding characteristics of life supported by different cultures in different environments. The conservation and understanding of its significance to human life and its endurance and hence continued existence are other issues dealt by both disciplines.

2.2.7 Social Sciences

"Social science" is universally used as a flagship embracing number of fields not in the sphere of the natural sciences whereas Anthropology is the holistic "science of man," - a science of the sum of human existence. Anthropology incorporates different aspects of the social sciences and physical anthropology.

Time and again it has been observed that anthropological social sciences give meaning even to minutest difference in rather than deriving the general laws as found in natural sciences. Not only this, it boasts of explaining individual cases through more general principles, like in many fields of psychology. It is rather difficult for anthropology just as in history to easily fit into one of these categories;

but then different branches of anthropology draw on one or more of these fields which concerns human. Essentially, the main objective of anthropology is to grant a holistic account of humans and human nature which corroborates that although anthropologists usually specialise in only one sub-field the biological, linguistic, historic and cultural aspects of any problem are always kept into consideration.

The quest for holism interested most anthropologists to study people in explicitly, exploiting the biogenetic, archaeological and societal data. This would also take into account direct observation of present-day customs which in turn correlates the close relationship it shares with the social sciences. It is not unjustifiable to believe that all human cultures as part of one large, developing global culture, which is a basic contention of social scientists. These dynamic relationships, between what can be observed on the ground, in contrast to what can be observed by assembling many local observations still remains essential in anthropology, be it cultural, biological, linguistic or archaeological.

2.2.8 Human Engineering and Technology

Human engineering and technology applies techniques to living cells to result in a particular product of superior quality. It is basically taking advantage of the resources for the benefit of mankind. The techniques of anthropometry are intensively utilised in the field of "Human engineering" – a term used by the experimental psychologists and applied engineers working on biomechanical problems. In anthropological sense, human engineering indicates the efforts to design and build modern machines which would suit the person working with these. Human engineering is applied in the jet engines – an important implication. The jet flies at a very high altitude and at such height, human body has a tendency to swell up due to reduced atmospheric pressure. Dr. J.P. Henry, a medical physiologist, invented a one piece 'jacket' which had perfect fitting, non-stretch garment with air tubes connected to it. This facilitated the situation when the air pressure dropped, air would be introduced in the spaces within the clothing that assisted in the prevention of muscles from expanding. The unit served the function but there was major size drawback. The necessity was that each suit fit like skin from neck to wrists and ankles, but then there was paucity of anthropological data. Anthropological data came in handy and it was found that stature and weight were best correlated with other bodily dimensions and could become the model for complex fitting garments.

2.2.9 Physical Sciences

The life concerns both the organic and inorganic world; Physical science is the systematic study of the inorganic world. It is different from the study of the organic world which is the sphere of biological science. Physical science by and large comprises of four broad areas: astronomy, physics, chemistry and the earth sciences. Each of these is distinguished and is further in turn divided into fields and subfields. On the other hand, Physical anthropology is a biological science that concerns with the adaptations, variability, and evolution of human beings and their living and fossil relatives that is past and present. Unanimously it has been agreed upon by both physical and biological scientists that technological breakthroughs like DNA splicing, spacecraft docking in outer space, and the development of very small computer chips could not have taken place without an enormous amount of basic research to unearth the laws of nature in physical

and biological worlds. Applied and practicing anthropology is explicit in its concern with making anthropological knowledge useful.

2.3 SUMMARY

What an amazing concept interdisciplinary and transdisciplinary approach is especially when physical anthropology is concerned. You just read how the different disciplines join hands and work together for the benefit of mankind and yet maintain their own identity. Is it not incredible the way anthropology projects itself. The unit describes the interdisciplinary relation which involves two or more academic disciplines that are usually considered distinct and also trans–disciplinary; i.e., the research approach that crosses many disciplinary boundaries to construct a holistic approach. The following chapter would enlighten how we apply the knowledge of anthropology in practice.

Suggested Reading

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Sarkar, R.M. 2000. *Fundamentals of Physical Anthropology*, Calcutta, Vidyodaya Library Private Limited.

Shukla B. R.K. and Rastogi, S. 1999. *Physical Anthropology and Human Genetics- An Introduction* Delhi, Palka Prakashan.

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Sample Questions

1) What do you understand by interdisciplinary and transdisciplinary approach?
2) Give examples of interdisciplinary and transdisciplinary approaches in physical anthropology?
3) Explain the relationship of physical anthropology with special reference to forensic science and medical science?