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Reflections on ecological and biological theories in anthropology

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Abstract---Anthropology is characterized by the theoretical ideas cross-cutting disciplinary boundaries. This paper discusses the two such interdisciplinary theories i.e. ecological and biological theories in an attempt to highlight their increasing relevance in the contemporary socio-cultural research. Since the very beginning of late 19th century, natural environment and biology have been central to the evolutionary paradigm of ethnological underpinnings. However, ecological theories are now becoming more prevalent owing to emanating ecological crisis. Similarly, Covid-19 has reminded us about our bio-cultural existence. This article reflects upon the various approaches within both sets of theoretical umbrellas. It could be clearly argued in conclusion that the recent trends in the ecological and biological theories are influential for contemporary researches in anthropology and they keep prompting us about the overlapping concerns within the biological and cultural branches of anthropology.

Keywords---ecology, biology, sociobiology, theory anthropology.

Introduction

The anthropological understanding of society and culture has dynamic relations to natural environment and human biology. Anthropology has come into prominence owing to the overlapping interest of ethnology, geography, and biology. However, the ecological and biological approaches toward society and culture have interesting journey in the disciplinary history. Both these theories have reinvented their approaches with the passage of time to produce exciting ideas for socio-cultural inquiries of human being. To understand the journey of these two theories in the socio-cultural anthropology, my paper will first deal with the ecological approaches. The anthropological theories on ecology have been borrowed from several disciplines, and there is always overlap of concepts and ideas from other social sciences and even from natural sciences. This paper brings together the distinctive ecological theories and their increasing primacy in

the present-day world, experiencing severe ecological challenges. Further, the concepts and ideas inspired from biology and its role in understanding human society and culture will be elaborated. Biological anthropologist and human biologist have always discussed and hypothesized about the effect of cultural capacity of humans on biological makeup. The thinkers of sociobiology, ethology, evolutionary psychology and behavioral ecology have shown us pathways to conceive the bio-cultural existence of human species. In the present paper, we will discuss each theory separately, however, there are multiple overlaps and borrowing among the bio-cultural theories and ecological ideas in anthropology.

Ecological Theories

Man, the highly evolved organism on earth, is closely tied to his environment. Understanding the relationships between human societies and the natural environment brings the concept of culture at the fore. Ecologists have faced severe handicap in accommodating the cultural man in its primary mode of ecological inquiries. This challenge has been promptly taken over by anthropologists. The nature-culture binary has defined the discipline in its formative years and anthropologists have incorporated ideas from other disciplines to reflect upon the ecological existence of human being. In anthropology, the discussion over relationship between society and environment as well as nature and culture is conspicuous since evolutionary anthropology. However, over a period of time, the field of ecological anthropology or environmental anthropology has come into existence, having diversified yet specialized set of the theory and methods. Thus, ecological theories discussed below are historically deep, diverse and insightful.

Ecological Determinism

The idea of environmental determinism emphasizes the dominant role of nature on passive human beings. The determinists consider human being as a passive agent on whom the environmental factors are acting and determining his course of life. Friedrich Ratzel (1844-1904), a German geographer, is known as the founder of ecological determinism within the subfield of 'Anthropogeography'. Ratzel argued that similar environmental conditions would lead to similar forms of life. This idea of environmental determinism grew because the colonial expansion helped in accumulation of rich information about foreign lands. The people were stereotyped as 'noble savages' living in the pristine nature and wilderness. Early anthropologists were also influenced by this mode of thinking. American diffusionists like Mason, Kroeber and Wissler's approach of cultural area being parallel with the geographical areas is one such example of ecological determinism in early anthropology. Herskovites 'cattle complex' (1926) and Evans Pritchard's account of 'oecology' of Nuer (1940) also emphasized the dominant role of environment. Thus extreme environmental conditions have been presumed to be conditioning the life of people in these habitats and influencing the culture and social structure.

Ecological Possibilism

Ecological possibilism emphasizes the active role of human being in an environment. According to this thought, nature does not enforce its will on man and provides varieties of possibilities for selecting the course of interaction with nature. The role of nature is considered passive, thus providing raw material for human being to work upon them. French historian Lucien Febvre, who coined the term 'possibilism', wrote that "there are no necessities, but everywhere possibilities. The natural factors are much more the 'material' than the 'cause' of human development. The essential 'cause' is less nature, with its resources and its obstacles, than man himself and his own nature." (Febvre, in Johnston et al., 2000, p. 609). Franz Boas's historical approach was possibilistic and cultural traits were discussed in relation to the particular environmental conditions. Boas emphasized the role of particularistic history of each culture, which determines the choices human being make as well as amounts for the differences among culture. Boas being a geographer initially accepted cultural determinism but later on he realized that people choose what to use from the natural environment and that sets the process of cultural change.

Cultural Ecology

Julian H. Steward developed the concept of ecology in relation to human being as a heuristic device for understanding the effect of environment upon culture and cultural evolution. He used the term cultural ecology in order to distinguish it from biological, social and human ecology, and sought a more detailed and sensitive ecological analysis than provided by earlier assumptions (Milton 1997). Cultural ecology true to its Boasian legacy differs from human and social ecology while seeking to explain the origin of particular cultural in a given areas rather than to develop universal principal for all types of cultural situation. Steward assumed that cultural features have evolved in a multilineal fashion as adaptation to their local environments and within any one culture, there are complex features that are more directly influenced by the environmental factors than others, the set he called the 'cultural core' (Milton 1997). By cultural core, he meant "the constellation of features which are most closely related to subsistence activities and economic arrangements. The core includes such social, political and religious patterns as are empirically determined to be closely connected with these arrangements" (Steward, 1955). Steward's model called for direct empirical observation and thus is also harmonized better with the ethnographic methods of anthropologists. The three fundamental procedures of Steward's cultural ecology, first involved the analysis of the inter-relationship between environment and exploitative or productive technology. Second, the inter-relationship between behavior pattern and exploitative technology was examined. Third, the extent to which those behavior patterns affect other sectors of culture should be analyzed. Through these three empirical steps, Steward was interested in searching 'regularities' or cultural similarities that develop in similar environmental condition. This will help in assessing the impact of environmental factors responsible for any cultural and behavioral element. Cultural ecology moves from 'environment shapes culture' to 'specific environmental factors shape particular cultural features'. Leslie white (1959) developed a slightly different universalistic materialist approach in terms of energy use as determinant of

cultural evolution. He distinguished between the social, technological, and ideological levels of culture. The technological level in his scheme emphasizes the relative complexity of tools and technology required in a given environment to utilize more energy.

Marvin Harris pushed for materialistic explanation and argued that material culture exhibits deterministic influences over the behavioral aspects of culture. In his view, environmental conditions and subsistence techniques either together determine or severely limit the development of many other aspects of culture. Harris retained the concept of adaptation as the central explanatory, but he did so in a reductionist fashion. For Harris, all cultural practices serve this fundamentally functionalist assumption (1968). In 'The cultural ecology of India's sacred cattle' (1966) he urged that "explanation of taboos, customs, and rituals associated with management of Indian cattle be sought in 'positive functional' and probably 'adaptive' processes of the ecological system of which they are part rather than the influence of Hindu theology" (51). According to him, the Hindu taboo against eating the beef helps in conserving the resources vital to collective survival because cattle are important in providing milk, acting as labor for plowing and carrying loads, and providing dung for fertilizer, fuel, and floor covering; etc. Harris attention to detailed, quantitative economic and ecological data played an important role in the early development of materialistic analysis in ecological anthropology, although his excessively reductionist methods also affected credibility of the field.

Ecosystem Theories

Vayda and Rappaport advocated about incorporating the principle of biological ecology into the study of cultural ecology in order to make a single anthropological science of ecology. This enabled ecological anthropology to utilize concepts and models from biology like ecosystem, energy flows, adaptation etc. Ecosystem ecology has built on the definition of ecosystem, the 'structural and functional interrelationship among living organism and the physical environment within which they exist' (Moran, 1990). This ecological approach has been termed as 'Ecological Anthropology', 'System Ecology' or 'Neo Functionalism'. The exemplar of the ecosystem approach was *Pigs for Ancestors* (1968), written by Roy Rappaport. Rappaport preferred to view the human environment relationship not as a unidirectional determinism, but as a system of material exchange leading to a situation of 'homeostasis', i.e., environmental equilibrium. It requires ecological anthropologist to measure and compare such things as the dietary values of different foods, the impact on soil fertility of different modes of cultivation, the energy expansion in different types of human activity, the environmental impacts of domestic animals, and so on. Rappaport's effort to study a human population similar to other species is an innovative assault on artificial boundaries between nature and cultures. However, it has later been criticized for unrealistic premises regarding the culture, history and political dimensions of human as opposed to animal populations. "His use of cybernetic language to interpret the role that Tsembaga ritual plays in regulating key environmental variables was applauded as a creative bridging of materialistic and symbolic analyses, but it was also critiqued as vulgar materialism, naïve functionalism, and 'the use of fashionable metaphors from electronics'" (Wilson in Dove 2006, 60). By extending the

ecosystem approach, Moran, and some other scholars, argued passionately for the recognition that local societies are engaged in the ongoing processes of mutual adaptation with the environment. Their approach has the virtue of emphasizing the specificity of local worlds and of showing respect for local knowledge, and grows out of commitment to integrating the results of ethnographic research with large scale analysis conducted by agronomists and environmental scientists. Moran suggested that the macro level analysis can capture some of the larger effects of environmental change without either reducing it to sum up all local processes or reducing the local circumstances to a mere reflection of the larger picture. Bennett (1976) further developed a 'human system ecology' based on his long-term engagement with the agricultural system.

Ethno- Ecology

Ethno-ecology approach to ecological anthropology involves the method that have root in ethno-sciences or new ethnography of 1960s. It uses the concept of structural linguistics to get the emic perspective of environment, the environment that is actually perceived and organized by societies. Ethno-ecology focuses on local linguistic categories and system of taxonomies and classification. The ethno-ecologist collects native categories and terms on flora, fauna, seasonal pattern, soil types and cosmology. Charles Frake and Harold Conklin have been the pioneers in 'ethnoecology' as a paradigm in the ecological anthropology. The emic description of environment is conducted through the means of formal semantic analysis, which has also been highlighted as a comparative statement against the primacy of western system of classification developed by botanist and zoologist. The terms like ethnobotany and ethnozoology are coined as a subdomain of ethno-ecology. Several anthropologists have used the emic linguistic categories to point at the symbolic value of nature inherent in local ecology. The field of ethno-ecology devoted toward nomenclature and classification is now being called as 'folk biology'. Roy Ellen (2000, 2006) popularized the study of indigenous environmental knowledge and its transmission across generations as significant dimension of cognitive ecological approaches. Anthropologists are further emphasizing the role of local knowledge in preserving and sustaining the use of natural resources by people. Maffi (2001) traced the relationship between linguistic and biological diversity and its implications for both language and biodiversity preservation. Nazarea (2006) outlined the intersectionality of ethno-ecological knowledge across gender, class and race in relation to the indigenous farming method.

Political Ecology

During 1980s, the ecological approaches took inspiration from political economy, which led to the emergence of political ecology. Eric Wolf coined the term political ecology as early as 1972 (McGuire 2005). However, the early writings on political ecological approach came from geographers Piers Blaikie and Harold Brookfield titled *Land Degradation and Society* (1987). Anthropologists Little and Horowitz, published a collection the same year on *Lands at Risk in the Third World: Local-Level Perspectives* (1987). In *The Social Cause of Environmental destruction in Latin America*, Painter and Durham (1995) suggested the issues to be researched in political ecology, which included the nature of production, whether pre-

capitalist or capitalist, in a specific region; the class structure of the region and the patterns of conflict over access to resources; the nature of market relations and means through which surpluses are accumulated; the policies of the state that work to the benefit of certain classes over other; the role of international agencies and corporations in local resource use; and, “the ideology that orients resource use—for example, the position that rapid economic growth is the best way to address social and environmental problem—and what groups benefit from the ideology” (Painter and Durham 1995:8 quoted in McGuire 2005:93). Political ecology has stimulated a large body of work by anthropologists and geographers through the 1990s. McGuire (2005) argued that there are two major criticisms against political ecology. Vayda and Walters (2009) proposed ‘event ecology’, wherein research begins with an environmental event or change and then proceeds “to explain such changes by making causal connections to prior events, in so doing constructing causal chains backward in time and usually outward in space from effects to causes” (537). Watts and Peet (2004) critiqued the lack of politics in political ecology and proposed ‘liberation ecology’ borrowing the methods from poststructuralist discourse analysis. This approach seeks to ‘uncover the discourses of resistance’ to development and to ‘put them into wider circulation’

Deep Ecology

Deep ecology as an approach was devised by Norwegian philosopher, Arne Naess, who merged the findings of environmental science and pantheism (multiple gods and many of them representing nature) with the philosophy of Spinoza and Heidegger to arrive at the idea of deep ecological thinking. Naess being a mountaineer experienced the nature closely. He distinguished between two kind of ecological movement short range shallow movement and long-range deep ecology movement of his own. He was influenced by Carsen’s *Silent Spring* (1962) and Gandhian Non-violence. The deep ecology places human in nature not above it based on the basis of the principal of biospheric equality. Every organism is at equal level and has equal role intertwined with the web of nature. It advocates a new philosophical self, which intermingles a person with planet and makes them one. It means achieving identification with the natural world and let all things be the part of self. Human must learn to think like forest, water, and mountain. The deep ecology emphasizes the creation of and return to wilderness as ‘future primitives’ thereby rejecting the notions of industrial society as superior mode of living. People have to develop ecocentric approach while using the nonhuman nature by maintaining integrity of the ecosphere. Human should not exploit nature as master does to slave and try to control. He developed an eight-point ecological platform to pursue the aim of deep ecology. He later moved toward his personal ecological philosophy of ecosophy T. Deep ecology endorses the indigenous mode of ecological understanding and capabilities to survive in different environment (Merchant 2005).

Spiritual Ecology

Spiritual ecology is a complex and diverse arena of intellectual and practical activities at the interface of religions and spiritualities on the one hand, and ecologies, environments, and environmentalisms on the other (Sponsel, 2007,

2011). The term religion and nature, ecology and religion, sacred ecology, etc., are also used to name this school of thought, but spiritual ecology is more useful because of its inclusiveness. Various forums, workshops, and organizations have come up to organize elaborate ecological rituals directed toward awakening of spiritual understanding of human connection to nature. These rituals are meant for further social action by participants enriched with the understandings of present ecological crises. The spiritual ecology in this sense borrows its pathways of consciousness from multiple religions. However, the western centric Christian ethos has dominated the discourse of spiritual ecology in academics. The spiritual ecology is beginning to gain its place in the environmental anthropology classroom and text. In anthropology, spiritual ecology can contribute to the understanding of nature not only as a biophysical space but also as a sacred space with its own cosmic and intrinsic value. This view of nature has always been present in the indigenous knowledge system, the essence of which is never realized in its fullest capacity in the anthropological inquiries. Sacred Groves in India is one such example of sacred geography rooted in the tribal belief system. The work of Vidhyarthion the nature-man-spirit complex of tribals is an early reflection of spiritual dimension of environment in the Indian context. Rappaport (1984) pioneered some of the early studies in religion and environment in anthropology to capture the influence of religion on human environment interactions and adaptation. He extended his system ecology to the domains of rituals to understand the equilibrium maintained in the Tsembaga community through the *Kyako* rituals. Lansing and Kremer (1993) utilized this approach to understand the water temple system and irrigation system in rice cultivation areas of Bali, Indonesia.

Historical Ecology

Historical ecology as a methodological and theoretical approach has emerged in historiography to incorporate the man-nature interaction (Balée 2006, Crumley et al 2017). Different names like Environmental History, Historical ecology or Ecological History have been given to this approach. These approaches have emphasized the inquiries of short-term ecological transformations of nature instead of long-term adaptation. The approach shares a large subset of conceptual apparatus with environmental anthropology (Moran 2010). The historical ecology approach is broadening our view about of the ways in which humans have been affected by their natural environment through time and, conversely, their impact on that environment. It inquires the pattern of resource use by communities over the time and how it has shaped the present-day issues of conservation and preservation of nature. Historical ecology has traced the ecological journeys of human being in different historical periods starting from the Paleolithic times to present days of global environmentalism. The role of human agency in shaping the environment has been a continuous theme of these kinds of chronological inquiries. Many formulations of natural environment have been deconstructed to redefine it as man-made environments. Human has changed not only the landscape of an area but also distorted the flora and fauna by introducing new breeds and varieties unknown before. Historical unfolding like imperialism and colonialism has irreversible impact on the shaping of environment across the world. Some anthropologists have employed oral history to construct the indigenous mode of analysis of places and living organisms and

to recreate the history of people before colonization. This multidisciplinary approach is valuable in supplementing all other approaches in ecological anthropology.

Environmentalism

Environmentalism is a philosophy and a practice (Little 1999). The term environmentalism as a practice refers to the social movements and activism that exists today in different part of world for the preservation, restoration, or improvement of the natural environment. The theories of environmentalism emphasize the active and aggressive pursuit to achieve the goals of environmental rights and justice for all. The inherent within is the understanding of ecological crisis in the world and protagonist believe in the direct and radical social awareness and activities to save the nature from its potential threat. The focus in anthropology has shifted toward the ethnographic studies of environmental protests and activism where not only the civil society organizations but also communities are fighting the battle against environmentally destructive projects. Indigenous and other marginalized communities are challenging the state machinery and corporations for their acquisition of land, forest and mountains. The 'environmentalism of poor' (Martinez Alier 2002) and 'Ecological Nationalisms' (Sivaramakrishnan and Cederlöf, 2005) are neologism to theorize new environmental movements emanating from the margins. The issues of peoples' rights to their natural resources are being debated in the context of universal human right issues. The anthropological literature has particularly placed emphasis on indigenous claims to natural resources, territories and ecological knowledge. The western discourses of environment are being questioned for its limitation in universal applicability. There is call for a new set of comparative epistemology of human environment relations incorporating the cross-cultural examples. The indigenous worldview and value systems are prominent in the theorization of arguments of ecological advocacy. Environmentalism has emerged as a critic and challenge to industrial capitalism with its scientific base of knowledge and global network of practice.

Anthropocene and multispecies turn

Crutzen and Stoermer (2002) concurred that the geological epoch has now entered into new phase the Anthropocene. In this new geological time, "anthropos has become an ambivalent figure, possessed of an agency scaled up to embrace—and endanger—the whole planet" (Kirksey and Helmreich 2010, 549). Human being is capable of reaching every corner of earth and driving "climate change, mass extinctions, and the large-scale destruction of ecological communities" (Kirksey and Helmreich 2010, 549). The rapid pace and over exploitation of earth crust through mechanized mining is the best example of ecological disruption in 'Anthropocene'. These debates have created increased awareness and 'socially informed connections' for local people, thus promoting them to engage proactively with natural resources and its sustainable future. Local indigenous communities are more vocal in raising their concern over the challenges of neo-liberal capitalism. The temporal understanding of economic use of nature has highlighted the problems of overgrazing, deforestation, soil erosion, excessive hunting, overfishing and unsustainable appropriation of commons. The

anthropology in Anthropocene attempts to move beyond human to capture the historical essence of nature by asking questions like ‘how forest thinks?’ (Kohn 2013). This new engagement has been termed as ‘ontological turn’ or ‘anthropology beyond human’ and it conceives ‘multispecies ethnography’ as its desired method. Therefore, the constantly transcending ecological paradigms are gaining ground in the present day anthropology. Biological ideas discussed below are more often than not having overlaps with the ecological perspectives.

Biological Theories

Biological and cultural anthropology has two major specializations in anthropology. Both the subjects are taught together in most of the university departments worldwide, but these two specializations have maintained distinctive identity among practitioners. However, there have always been attempts by a coterie of anthropologist to create dialogue and reciprocal exchange of knowledge for better understanding of cultural animal called man. Since the early 60s quite a few biologists have shown interest in human behavior and have started emphasizing on the role of human biology in determining the human nature. This sensitivity in biology devised a set of biological theories of human society and culture in 1960s and 70s and has diversely influenced the anthropological theories. Initially, such interdisciplinary debates have informed the nature-culture dualism in anthropology with a thrust on unifying approaches. Though in last five decades biology inspired theories of culture have grown in scope and arguments, they have not been able to achieve larger acceptance. Few theory textbooks (Erickson and Murphy 2013, Layton 1997, Langness 2005, Eriksen and Nielsen 2001) have recently discussed biological theories in anthropology, and it is argued that bio-cultural researches in anthropology may take central space in coming future. The paper discusses some of these theories below.

Biology of Behavior

The starting point of biological theories of culture could be the beginning of human behavior studies in biological anthropology (Langness 2005). Following Erickson and Murphy (2013), this approach has been discussed here. Anthropologists of behavior have tried to explain the human nature in terms of innate behavioral features like aggression, sexuality etc. Robert Audrey, an anthropologist, sparked the debate with his influential four book series on Nature of Man. In his first book in the series *African genesis* (1961), he argued that one species of Australopithecus, *Australopithecus africanus* killed another species *Australopithecus robustus* during the course of human evolution. This is because of the aggressive and violent nature of evolving human primates. The violent killing nature was human specific trait present in our genes. This idea was initiated by Raymond Dart as ‘killer ape hypothesis’, which became famous because of Richard’s work and successive defense. In *The Territorial Imperative*, Audrey elaborated upon the human nature to extend and defend its territory and property from fellow human beings as genetic feature of human nature. Richards also highlighted the role of hunting in the successful evolution of human through his ‘hunting hypothesis’ (See Erickson and Murphy 2013). Desmond Morris a primate Zoologist wrote *The Naked Ape* (1967) and emphasized the importance of bipedal locomotion in the development of other

human characteristics; for example, the pendulous breast. According to Morris, it provided substitute for the buttocks in other animals for face-to-face sexual intercourse. These hypotheses were rejected by anthropologist but attracted general readership and contestation on various academic forums. *The Origin of Races* (1963) by biological anthropologist, Carlton Coon proposed five different geographical races of *Homo sapiens* evolving from *Homo erectus*, the Caucasoid race reached to the *Homo sapiens* status first and negroid last. It was criticized heavily as academic racism. The other works relating to human intelligence with racial features were debunked by anthropologists. Arthur Jensen, an educational psychologist, sparked controversy by suggesting a racial hierarchy of IQ. Anthropologist reacted sharply to such kind of racist classification based on IQ. Similarly, some other works like the *The Bell Curve* (Hernstein and Murray 1994) are examples of such hypothesis that are being targeted by anthropologist for its inherent racism. However, attempts have been made to use the biological measures for investigating the complexity of human behavior. These controversies have sparked a debate in anthropology about the biological contribution to human culture.

Human Ethology

Human ethology is a sub-discipline of ethology. Ethology means simply the study of behavior. Ethology is an interdisciplinary approach to understand the behavior of animals. The works of ethologist Nikolaas Tinbergen and Konrad Lorenz on animal behavior provided framework for human ethologists and led toward acceptance of these ideas in the anthropological theorizing of human behavior. Oberzaucher (2013) discussed the four important questions as focus of ethological research of Nikolaas Tinbergen: 1) What is the evolutionary function of a behavior? 2) How did this behavior evolve in phylogeny? 3) What is the proximate cause of behavior? 4) How does this behavior develop during ontogeny? Konrad Lorenz in his study of biological function of aggression tried to understand the positive adoptive function of drive for destruction. He claimed that aggression is not only because of responses to any stimulus but it also exists as adoptive function. The aggression is good for the long-term benefits of the species. The term Human Ethology was coined by I. Eibl-Eibesfeldt, a student of Lorenz. He started his academic career by studying communication in mammals; however, as early as in mid-1960's, he turned his attention to human beings and argued that ethological concepts and methodologies could be applied in psychology and anthropology. His work on the nonverbal behavior in congenitally deaf and blind people (Eibl-Eibesfeldt 1973) or studies on expressive behavior in nonindustrial cultures such as !Ko people of Botswana or Eipo of New Guinea (Havlíček and Blažek 2012) are exemplary. Behavioral observation became a treasured method for studying animal behavior, including that of our primate relatives. Primatologists, like R. A. Hinde (1972), proposed the need to apply ethological and comparative approaches to the study of human behavior (Havlíček and Blažek 2012). In biological anthropology, the ethological research focused on the non-human primate behavior. Some interesting fieldwork-based observations were conducted to understand the primate ethology. Anthropologists like Jan van Leuven Goodall (Chimpanzee), George Schaller (Gorilla) and Irvan DeVore (Baboons) did the primary work in this direction. These studies reflected upon the role of individual animals in groups, mating patterns, dominance and leadership

tendencies, and adoptive function of certain social behavior. Social anthropologist has used the ideas and methods of ethology for understanding human behavior as well. Robin fox in co-authorship with Lionel Tiger wrote *The Imperial Animal* (1970), which was one of the earliest attempts to bring ethological ideas in social anthropology. Robin Fox latter wrote *Biosocial Anthropology*(1975) to directly bring the ethology in mainstream anthropology. He asserted that “essence of the ethological approach is the acceptance of the synthetic theory of evolution as the master paradigm for the analysis of all life processes, including such uniquely human processes as language and culture”(Fox 1976:265).

Sociobiology

Sociobiology as a major theoretical idea has emerged from the contribution of Entomologist Edward O Wilson, who coined the term to refer to the application of specific theories of evolution to animal behavior. Wilson’s Book *Sociobiology: The New Synthesis* (1975) basically deals with insect behavior pattern and only its last chapter has some commentary on human behavior. The primary goal of the book is to extend the Neo-Darwinism for examining all kind of social behavior. The idea of social behavior as an evolutionary trait is new for the biological sciences during that time. He described culture as an adaptation to the natural environment, which has ensured the production of offspring. The Wilson hypothesized the genetic base of many cultural traits of Human animal species in his last chapter of Sociobiology, which has led to the vehement opposition across the biological and human sciences (Seegerstrale2013). Wilson emphasized the mechanisms through which cultural behavior are shaped by the interactions of genes and environment, thus making it an adoptive trait. He propounded that ‘man makes himself genetically’ and explained that behavior is not directly linked to genes. Genes prescribes a set of ‘epigenetic rules’, which shape the structure of human mind. Human mind is the operative center of cultural behavior, thus highlighting the way culture is influenced by gene. An epigenetic rule also determines the individual choices of cultural behaviors. The isolated units of cultural behaviors are called ‘culturgens’, which can either be selected or discarded by the individuals. Wilson’s *On Human Nature* outlines the different models that show the influence of human mental development by epigenetic rules towards certain culturgens rather than others. According to Wilson, this is how ‘Gene holds culture on a leash’ (Seegerstrale 2013).

Richard D. Alexander’s (1974) ‘The Search for a General Theory of Behavior’ is another founding contribution in sociobiology. The article deals with the idea of individual selection, which demonstrates the adaptation of certain characteristics for an individual in a given environment. The ability to transfer its gene into future generation is the main criterion of such adaptations, which is possible through the maximization of reproductive success by considering inclusive fitness. The inclusive fitness is an attempt to increase the transfer of one’s own gene and establish certain paternity. Sociobiology also borrows the game theory of economist to explain the Darwinian evolutionary process. The game theory focuses on rational individual actors and how they play in their self-interest of maximum utility of goal. In sociobiology, the self –interest has been replaced by the reproductive success of individual and also emphasized the individual centric explanation of human behavior instead of group.

Sociobiology has been strongly criticized by several biological scientist and social scientists. The anthropologists are critical of genetic explanations of human behavior and called it biological determinism. Marvin Harris discussed about the recent theoretical developments in relation to his own idea of *Cultural Materialism* (1979) and devoted a detailed chapter on sociobiology. He strongly rejected sociobiology and its goal of genetic explanation of human cultural variations and rather demanded explanations in the ecological, demographical, and technological factors. He pointed that 'genotype never account for all the variations in behavioral phenotype' and in most of the organism the learned behavior is a factor. These set of learned behavior in human being is 'gene free' (Bernard 2000). Marshall Sahalins wrote a short book *The Use and Abuse of Biology: An Anthropological Critique of Sociobiology* (1977) to present his critical arguments against sociobiology. He proposed that sociobiology is nothing but another kind of Social Darwinism. He questioned the idea of kin selection in sociobiology, wherein he opined that "within the void left by biology lies the whole of anthropology" and debunked the sociobiological myths. Levi Strauss also dismissed the concept of inclusive fitness being only an empty category of explanation and this could be used for explaining anything and everything. In his view from Afar, he politely questioned the use of sociobiology in explaining cultural reality (Eriksen and Nielsen, 2001). The strong criticism of sociobiology from different corner has resulted in the skeptical reception of Wilson's idea in anthropology. He attracted some followers like Napoleon Chagnon(1968, 1979), a controversial figure himself, and utilized sociobiology to understand the mating pattern among Yanomamo Indians of Amazonian Forest. In biological anthropology and primatology, sociobiology has a dominant theoretical insight.

Human Behavioral Ecology

Human behavioral ecology differs from human ethology because it studies human behavior in light of evolutionary biology. The study is interested in the survival value of human behavior in its given environment. The approach has made important contribution to the theories of social cultural anthropology. Behavioral ecology has modified some of the shortcomings of earlier biological theories of culture and gained better acceptances. It is also an important field of inquiry of the ecological theories in anthropology. The main difference in this theory is to focus on individual and gene as the explanation for adoptive selection of behavior (Cronk 2013). Human behavioral ecologists focus on the adaptations designed through the Darwinian process of variation and differential reproduction. The reason is that evolution is driven by differential reproduction, so, human behavioral ecologists often focus on behaviors that have clear impact on the reproductive rates. The behavioral ecologists base their understanding on 'Phenotypic Gambit'; thus focusing on phenotypes, they tried to understand the human behavior and cultural diversity as well as the ways in which our shared, evolved nature interacts with different physical, social and cultural environments to produce widely varying behavioral phenotypes. In the long run, selection is expected to favor high quality phenotypes regardless of the gene responsible for them. The behavioral ecologist focuses on behavior having both human and non-human elements in common like foraging mating parenting and cooperation etc. William D. Hamilton(1964) idea of inclusive fitness is the most important insight for the behavioral ecologist (Cronk 2013). Robert MacArthur and Eric Pianka's

(1966) use of the optimization model in the study of animal behavior is an important contribution of the behavioral ecology. This model is used to understand the optimal strategy employed by hunter gatherers in a given environment ((e.g., Hames and Vickers 1982, Hawkes et al. 1982, Jones 1980, O'Connell and Hawkes 1981, Lee 1968). Foraging behavior like diet breadth and patch choice has been studied to support the optimal foraging theory.

Dual Inheritance Theory

Dual inheritance theory is also called gene-culture coevolution theory. It emerged in 1960s and over the years it propounded the idea of dual evolution of human behavior. The theory as its name suggests is based on the assumption that both gene and culture have similar evolutionary effect in human evolution. The theory believes in the role of Darwinian selection of cultural features analogous to genetic features. The coevolution refers to a process where two or more different inherited traits affect selection of one another. But in gene-culture coevolution, there are two different tracks of inheritance, one for genetically transmitted information and the other for culturally transmitted information. Gene culture coevolution investigates the interactions between traits that are derived from these inheritance systems. Culture in this theory has been conceptualized as "socially learned behavior". These socially learned behaviors human acquire through the processes of observing, copying and imitating others. They learn behavior through teaching and social instruction etc. These learned behaviors when transmitted across several generations constitute a consistent environment that affects genetic selections. The units of selection in the gene-culture evolutionary models are combinations of both the genetic and cultural variant also called as phenogenotype. Since the human genome sequencing has become possible, many genes have been affected by culturally modified environments called culture niche construction. Such genes, for example, the genes for domains like intelligence, language learning capacity etc. are the most important in gene culture coevolution (Kendel 2013).

The most cited example of gene culture coevolution is dairy farming and lactase persistence. Most mammals including humans cannot digest the sugar lactose found in natural milk. However, there is small number of genetically evolved variants in European African and Middle Eastern population, which allows the lactose absorption because of the continued production of lactase. Most Europeans have lactose tolerance because of single nucleotide base substitution in gene responsible for the lactase enzyme. It is believed that European lactase is the result of concentrated dairy farming in these areas during the Neolithic time. It is hypothesized that lactose persistence will spread with the high probability of cultural transmission of using milk and milk products over the generations. This recognition of cultural and genetic features would facilitate statistical association between dairy farming and genetic variation for lactase over the evolutionary period, which can establish that genetic traits and cultural behavior coevolve (Kendel 2013). The other example of gene culture evolution is sickle cell anemia and malaria prevalence and its resistance in some yam farming communities of Africa. Many scholars have applied gene culture evolution idea across species to understand the human antibiotic use and bacterial antibiotic resistance strains. The gene culture coevolution has also been utilized in understanding the genetic

evolution of sex ratio distorter genes and the cultural preferences for sons through sex selective abortion or female infanticide (Kendel 2013). Gene culture evolution is different from behavioral ecology and evolutionary biology in its minimalist position. Behavioral ecology emphasizes the adoptive role of behaviors in maximizing reproductive success, and evolutionary psychology takes psychological behaviors as the resultant of earlier human evolution. The dual inheritance further distinguishes between cultural and genetic inheritance with stronger emphasis on coevolution of both (Kendel 2013).

Evolutionary Psychology

Evolutionary psychology focuses upon finding the basic psychological features in the human mind that have been adaptive during the evolution. Human brain has evolved over millions of years of natural selection. During this period, human brain has gone through recurring set of selection pressures. These selection pressures involve factors influencing survival and reproduction that result in problems of adaptation. Evolutionary psychology looks for these adaptive problems and models that have been developed to solve them. Thus, evolutionary psychology has moved the sociobiological debates of fitness maximizing success of behavior to an inquiry of evolved psychological mechanisms. The idea of evolutionary psychology is interdisciplinary and is applied to several disciplines interested in human mind and its evolutionary significance. The sincerest example of this approach in anthropology is John Tooby and psychologist Leda Cosmides. They along with Jerome Berkow edited *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (1992) as the founding text of Evolutionary Psychology. They believe that evolutionary psychology provides the missing link between biology and social sciences (Eriksen and Nielsen 2001). Biological evolution has produced human with evolved brain, which have produced society and culture; and evolutionary psychology provides the links for these two dimensions of biology and culture.

David Buss thus resolves that “the human mind can no longer be conceived as it has been in mainstream psychology, implicitly or explicitly, as a blank slate onto which parents, teachers, and culture impose their scripts; a domain-general learning device; a set of content free information processing mechanisms; or a content-free neural or connectionist network. Instead, the human mind comes factory-equipped with an astonishing array of dedicated psychological mechanisms, designed over deep time by natural and sexual selection, to solve the hundreds of statistically recurring adaptive problems that our ancestors confronted” (Buss 2015, xxiv). The questions being asked in evolutionary psychology have changed. What are the adoptive problems that human faced during the phase of hunter-gatherer societies? What cognitive information processes could have been implemented by evolution into human cognition? Does human cognition show traces of this kind of adoptions? These questions are asked in relation to gender role, mating strategies, evolution of languages, aesthetic tastes, etc. (Spahn 2011).

Conclusion

The present paper has discussed the various theories of human nature interaction, which are propounded by anthropologists over the years. Ecological theories provide the guiding framework for ethnographic research on a broad range of issues like economic use pattern of natural resources, human adaptation to natural environment, human reaction to global environmental change, etc. The ecological theories discussed above like cultural ecology, system ecology, ethnoecology, political ecology, deep ecology, etc., are fruitful toward understanding the complex environmental challenges of the present time. Amidst the challenges of global climate changes and the extinction of biodiversity, the ecological approaches are taking central place in social-cultural anthropology. By utilizing an eco-centric view of nature, human being can create sustainable future, not only for humans but also for all the species on the earth. Biological theories of human behavior society and culture describe the emergence of early attempt by biologist to relate human behavior to human biology. These attempts have been dumped as racism and pseudoscientific. Later, ethology has appeared as the most accepted theory in bio-cultural anthropology, which can reflect light on primate and human behavior by doing observation research. Subsequently, these bio-culture ideas have resurfaced in relation to the neo-Darwinian evolutionary thinking. Sociobiology, Human behavioral ecology and Evolutionary Psychology are the leading development crosscutting boundaries of several disciplines. These biological theories are contributing to diverse researches relating to human neuro-cognition, health and disease, and our bio-cultural realities. Above all, the ecological and biological approaches discussed above provide common theoretical platform for both the physical and social branches to carry forward the bio-cultural uniqueness of anthropology.

References

- Alexander, R.D. (1974). The Evolution of Social Behavior. *Annual Review of Ecology and Systematics*. 5, 325–83.
- Ardrey, Robert. (1961). *African Genesis: A Personal Investigation into the Animal Origins and Nature of Man*. New York: Atheneum.
- Balée, W. (2006). The Research Program of Historical Ecology. *Annual Review of Anthropology*, 35, 75-98
- Barnard, A. (2000). *History and Theory in Anthropology*. Cambridge: Cambridge University Press.
- Bennett John W. (1976). *The Ecological Transition Cultural Anthropology and Human Adaptation*. New York, Toronto, Oxford: Pergamon Press.
- Blaikie, P.M. & Brookfield, H. (Eds.). (1987). *Land Degradation and Society*. London: Methuen.
- Buss, D. M. (2015). Introduction: The Emergence and Maturation of Evolutionary Psychology. In David M. Buss (Eds.) *Handbook of Evolutionary Psychology*. (pp xxiii-xxvi). John Wiley & Sons, Inc.
- Carson, R. (1962/2016). *Silent Spring*. United Kingdom: Penguin Books Limited.
- Chagnon N.A. (1979). Is reproductive success equal in egalitarian societies? In: Chagnon NA, Irons W (Eds.) *Evolutionary biology and human social behavior: an anthropological perspective*. pp 374–401 Duxbury, North Scituate.

- Chagnon, N. A. (1968). *Yanomami, the fierce people*. New York: Holt, Rinehart and Winston.
- Coon, C. S. (1971). *The Origin of Races*. United States: Knopf.
- Cronk, L. (2013). Human Behavioural Ecology. In R. Jon McGee, Richard L. Warms (Eds.) *Theory in Social and Cultural Anthropology: An Encyclopedia*. Los Angeles: Sage Publications.
- Crumley, C. Lennartsson, T. & Westin, A. (Eds.). (2017). *Issues and Concepts in Historical Ecology: The Past and Future of Landscapes and Regions*. Cambridge: Cambridge University Press.
- Crutzen, P. J., & Stoerme, E. F. (2000). The Anthropocene. *Global Change Newsletter*, 41, 17–18.
- Dove M. R. (2006). Equilibrium Theory and Interdisciplinary Borrowing: A Comparison of Old and New Ecological Anthropologies. In Aletta Biersack, James B. Greenberg (Eds.) *Reimagining Political Ecology* 43-69. Durham, London: Duke University Press.
- Eibl-Eibesfeldt, I. (1973). The expressive behavior of the deaf-and-blind born. In: M. von Cranach, I. Vine (Eds.): *Social Communication and Movement*. Pp. 163–194. London: Academic Press.
- Eibl-Eibesfeldt, I. (1989). *Human Ethology*. New York: Aldine de Gruyter.
- Eriksen, T. H. & Nielsen, F. S. (2001). *A History of Anthropology*. London: Pluto Press.
- Evans-Pritchard, E. (1940). *The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic People*. Oxford: Oxford University Press.
- Fox, R. (1976). Human Ethology. *Annual Review of Anthropology*, 5, 265-288.
- Fox, R. (Eds.) (1975). *Biosocial Anthropology*. London and New York: Malaby Press
- Hames, R. B. & Vickers, W. (1982) Optimal diet breadth theory as a model to explain variability in Amazonian hunting, *American Ethnologist*, 9, 359-78.
- Hamilton, W.D. (1964). The genetical evolution of social behavior. *Journal of Theoretical Biology*, 7, 1–52.
- Harris, M. (1966). The Cultural Ecology of India's Sacred Cattle *Current Anthropology*, 7(1), 51-66.
- Harris, M. (1968). *The Rise of Anthropological Theory: A History of Theories of Culture*.
- Harris, M. (1979). *Cultural Materialism: The Struggle for a Science of Culture*. New York: Random House.
- Havlíček, J. & Blažek, V. (2012). What Is the Relation of Human Ethology to Anthropology? A Brief Historical Account, *Anthropologie L/1*, 3-7.
- Hawkes, K., Hill, K. & O'Connell, J. F. (1982). Why hunters gather: optimal foraging and the Ache of eastern Paraguay, *American Ethnologist*, 9: 379-98.
- Herrnstein, R. & Murray, C. (1994). *The Bell Curve: Intelligence and Class Structure in American Life*. New York: Free Press.
- Herskovits, M. J. (1926). The Cattle Complex in East Africa. *American Anthropologist* 28, (1), 230-272.
- Hinde R. A. (1972). *Non-verbal Communication*. Oxford: Cambridge University Press.
- Johnson, M. A. (2013). Environment. In James G. Carrier, Deborah B. Gewertz (Eds.) *The Handbook of Social Cultural Anthropology*. pp 336-354 New Delhi: Bloomsbury.
- Johnston, R., Gregory, D., Pratt, G., & Watts, M. (2000) *The Dictionary of Human Geography* 4th edition. Cambridge: Blackwell Publishing.

- Jones, R. (1980). Hunters in the Australian coastal savanna. In D. R. Harris (Eds), *Human ecology in Savanna environments*, pp. 107-46, London: Academic Press.
- Kendel, J. R. (2013). Gene-culture Coevolution. In R. Jon McGee, Richard L. Warms (Eds.) *Theory in Social and Cultural Anthropology: An Encyclopedia*. Los Angeles: Sage Publications.
- Kirksey, S. Eben and Stefan Helmreich. 2010. The Emergence of Multispecies Ethnography. *Cultural Anthropology*, 25(4), 545–576.
- Kohn E. (2013). *How Forests Think: Toward An Anthropology Beyond the Human*. Berkeley: University of California Press.
- Kopnina, H. & Shoreman-Ouimet, E. (Eds.) (2011). *Environmental Anthropology Today*, London New York: Routledge.
- Langness, L. L. (2005). *The Study of Culture*. (3rd ed). Novato, CA: Chandler & Sharp Publishers.
- Lansing, S.J., & Kremer, J. N. (1993). Emergent Properties of Balinese Water Temples. *American Anthropologist*, 95(1), 97–114.
- Layton, R. (1997). *An Introduction to Theory in Anthropology*. Cambridge: Cambridge University Press
- Lee, R.B. (1968). What hunters do for a living, or How to make out on scarce resources. In R. B. Lee and I. DeVore (Eds.), *Man the hunter*, pp. 30-48, Chicago: Aldine.
- Little, P. D., & Horowitz, M. M. (1987). *Lands at risk in the Third World: Local-level perspectives*. Boulder, Colorado : Westview Press.
- Little, P. E. (1999). Environments and Environmentalism in Anthropological Research, *Annual Review Anthropology*, 28, 353-84.
- MacArthur, R. H. & Pianka, E. R. (1966). On Optimal Use of a Patchy Environment *The American Naturalist*, 100(916), 603-609.
- Maffi, L. (2001). *On Biocultural Diversity: Linking Language, Knowledge and the Environment*. Berkeley: Univ. Calif. Press
- MartínezAlier, J., 2002. *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation*. Cheltenham, UK; Northampton, MA: Edward Elgar.
- McGuire T. R. (2005). The Domain of the Environment in SatishKedia and John van Willigen (eds.) *Applied Anthropology: Domains of Application*, Praeger Publishers.
- Merchant, C. (2005). *Radical Ecology: The Search for a Livable World (3/E)*. New York: Routledge.
- Milton, K. (1997). Ecologies: anthropology, culture and the environment. *International Social Science Journal*, 49(154), 477–495.
- Morán, E. F. (1990). *The Ecosystem Approach in Anthropology: From Concept to Practice*. Ann Arbor: University of Michigan Press.
- Moran, E. F. (2010) *Environmental Social Science*. Malden, MA: Willey Blackwell.
- Morán, E.F. (2008). *Human Adaptability: An Introduction to Ecological Anthropology*. Boulder, Colorado: Westview Press.
- Morris, D. (1980). *The Naked Ape*. New York: Dell.
- Nazarea V. (2006). Local knowledge and memory in biodiversity conservation. *Annual Review of Anthropology*, 35(1), 317–335.
- O’Connell, J. & Hawkes, K. (1981). Alyawara plant use and optimal foraging theory. In B. Winterhalder and E. A. Smith (Eds.), *Hunter-gatherer foraging strategies: ethnographic and archaeological analyses*. ,pp. 99-125. Chicago: University of Chicago Press.

- Oberzaucher E. (2013). Ethology Human. In R. Jon McGee, Richard L. Warmes (Eds.) *Theory in Social and Cultural Anthropology: An Encyclopedia*. Los Angeles: Sage Publications.
- Painter, Michael. (1995). Introduction. In Michael Painter and William H. Durham (Eds.) *The social causes of environmental destruction in Latin America*. pp 1-21 Ann Arbor, Michigan: University of Michigan Press.
- Paul A. E., & Murphy, L. D. (2013). *A History of Anthropological Theor*. Toronto: University of Toronto Press.
- Peet, R., & Watts. M. eds. (1996). *Liberation Ecologies*. London: Routledge
- Rappaport, R. (1968). *Pigs for Ancestors: Ritual in the Ecology of a New Guinea people*. New Haven and London: Yale University Press.
- Sahlins, M. (1976). *The Use and Abuse of Biology: An Anthropological Critique of Sociobiology*. London: Tavistock.
- Seegerstrale, U. (2013). Wilson, Edward O. In R. Jon McGee, Richard L. Warmes (Eds.) *Theory in Social and Cultural Anthropology: An Encyclopedia*. Los Angeles: Sage Publications.
- Sivaramakrishnan, K., & Cederlöf, G. (2005). *Ecological Nationalisms: Nature, Livelihoods, and Identities in South Asia* Delhi: Orient Longman.
- Spahn, C. (2010) Sociobiology: Nature and Nurture. In H. James Bix (Eds.) *21st Century Anthropology: A Reference Handbook*. London: Sage.
- Sponsel, L. E. (2007) Spiritual Ecology: One Anthropologist's Reflections, *Journal for the study of Religion Nature and Culture*, 1(3), 340-349.
- Sponsel, L. E. (2011) The Religion and the Environment Interface. In Helen Kopnina, Eleanor Shoreman-Ouimet, (Eds.) *Spiritual Ecology in Environmental Anthropology Environmental Anthropology Today*. pp 37-55 London: Routledge
- Steward, J. (1955). *Theory of Culture Change: The Methodology of Multilinear Evolution*. Urbana: University of Illinois Press.
- Tiger, L. & McGuire, M. (2010). *God's Brain. Blue Ridge Summit*. PA: Prometheus Books.
- Tooby, J. & Cosmides, L. (1992). 'The psychological foundations of culture'. In Jerome Barkow, Leda Cosmides and John Tooby, (Eds.) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, pp. 19-136. Oxford: Oxford University Press
- Vayda, Andrew P., & Walters B. B. (2009). Event Ecology, Causal Historical Analysis, and Human-Environment Research *Annals of the Association of American Geographers*, 99(3), pp. 534-553
- White Leslie A. (1959). *The Evolution of Culture*. New York; McGraw-Hill.
- Wilson, E.O. (1975). *Sociobiology: The New Synthesis*. Cambridge, MA: Belknap Press of Harvard University Press.
- Wolf, E. R. (1972). Ownership and political ecology. *Anthropological Quarterly* 45 (3), 201-205.