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The Concept and Method of Cultural Ecology

OBJECTIVES IN ECOLOGICAL STUDIES

At the risk of adding further confusion to an already obscure term, this chapter undertakes to develop the concept of ecology in relation to human beings as an heuristic device for understanding the effect of environment upon culture. In order to distinguish the present purpose and method from those implied in the concepts of biological, human, and social ecology, the term *cultural ecology* is used. Since cultural ecology is not generally understood, it is necessary to begin by showing wherein it differs from the other concepts of ecology and then to demonstrate how it must supplement the usual historical approach of anthropology in order to determine the creative processes involved in the adaptation of culture to its environment.

The principal meaning of ecology is "adaptation to environment." Since the time of Darwin, environment has been conceived as the total web of life wherein all plant and animal species interact with one another and with physical features in a particular unit of territory. According to Webster,[1] the biological meaning of ecology is "the mutual relations between organisms and their environment." The

[1] *New International Dictionary* (2nd ed., unabridged, 1950).

concept of adaptive interaction is used to explain the origin of new genotypes in evolution; to explain phenotypical variations; and to describe the web of life itself in terms of competition, succession, climaxes, gradients, and other auxiliary concepts.

Although initially employed with reference to biotic assemblages, the concept of ecology has naturally been extended to include human beings since they are part of the web of life in most parts of the world. Man enters the ecological scene, however, not merely as another organism which is related to other organisms in terms of his physical characteristics. He introduces the super-organic factor of culture, which also affects and is affected by the total web of life. What to do about this cultural factor in ecological studies has raised many methodological difficulties, as most human and social ecologists have recognized (Alihan, 1938). The principal difficulty lies in the lack of clarity as to the purpose of using the concept of ecology. The interaction of physical, biological, and cultural features within a locale or unit of territory is usually the ultimate objective of study. Human or social ecology is regarded as a subdiscipline of its own right and not as means to some further scientific end. Essentially descriptive, the analysis lacks the clear objectives of biology, which has used ecology heuristically to explain several kinds of biological phenomena. If human or social ecology is considered an operational tool rather than an end in itself, two quite different objectives are suggested: first, an understanding of the organic functions and genetic variations of man as a purely biological species; second, a determination of how culture is affected by its adaptation to environment. Each requires its own concepts and methods.

The first, or biological objective, involves several somewhat different problems, all of which, however, must view man in the web of life. Since man is a domesticated animal, he is affected physically by all his cultural activities. The evolution of the Hominidae is closely related to the emergence of culture, while the appearance of *Homo sapiens* is probably more the result of cultural causes than of physical causes. The use of tools, fire, shelter, clothing, new foods, and other material adjuncts of existence were obviously important in evolution, but social customs should not be overlooked. Social groups as determined by marriage customs as well as by economic activities in particular environments have undoubtedly been crucial in the differentiations of local populations and may even have contributed to the emergence of varieties and subraces of men.

The problem of explaining man's cultural behavior is of a different order than that of explaining his biological evolution. Cultural patterns are not genetically derived and, therefore, cannot be analyzed in the same way as organic features. Although social ecologists are paying more and more attention to culture in their enquiries, an explanation of culture per se has not, so far as I can see, become their major objective. Culture has merely acquired greater emphasis as one of many features of the local web of life, and the tools of analysis are still predominantly borrowed from biology. Since one of the principal concepts of biological ecology is the community — the assemblage of plants and animals which interact within a locality — social or human ecology emphasizes the human community as the unit of study. But "community" is a very general and meaningless abstraction. If it is conceived in cultural terms, it may have many different characteristics depending upon the purpose for which it is defined. The tendency, however, has been to conceive of human and biological communities in terms of the biological concepts of competition, succession, territorial organization, migration, gradients, and the like. All of these derived fundamentally from the fact that underlying biological ecology is a relentless and raw struggle for existence both within and between species — a competition which is ultimately determined by the genetic potentials for adaptation and survival in particular biotic-environmental situations. Biological co-operation, such as in many forms of symbiosis, is strictly auxiliary to survival of the species.

Human beings do not react to the web of life solely through their genetically-derived organic equipment. Culture, rather than genetic potential for adaptation, accommodation, and survival, explains the nature of human societies. Moreover, the web of life of any local human society may extend far beyond the immediate physical environment and biotic assemblage. In states, nations, and empires, the nature of the local group is determined by these larger institutions no less than by its local adaptations. Competition of one sort or another may be present, but it is always culturally determined and as often as not co-operation rather than competition may be prescribed. If, therefore, the nature of human communities is the objective of analysis, explanations will be found through use of cultural historical concepts and methods rather than biological concepts, although, as we shall show, historical methods alone are insufficient.

Many writers on social or human ecology have sensed the need to

distinguish between biological and cultural phenomena and methods, but they have not yet drawn clear distinctions. Thus, Hollingshead recognizes a difference between an "ecological order [which] is primarily rooted in competition" and "social organization [which] has evolved out of communication" (Hollingshead, 1940; Adams, 1935, 1940). This attempt to conceptualize competition as a category wholly distinct from other aspects of culturally determined behavior is, of course, artificial. Bates (1953), a human biologist, recognizes the importance of culture in determining the nature of communities, but he does not make clear whether he would use human ecology to explain the range of man's biological adaptation under environmental-cultural situations or whether he is interested in man's culture. The so-called Chicago school of Park, Burgess, and their followers were also primarily interested in communities of human beings, especially urban communities. Their methodology as applied to Chicago and other cities treat the components of each as if they were genetically determined species. In analyzing the zoning of a modern city, such categories as retail businesses, wholesale houses, manufacturing firms, and residences of various kinds, and even such additional features as rate of delinquency, are considered as if each were a biological species in competition with one another for zones within the urban area. Such studies are extremely enlightening as descriptive analysis of spacial distributions of kinds of activities within a modern Euro-American city. They do not, however, necessarily throw any light on world-wide ecological urban adaptations, for in other cultures and periods city zoning followed very different culturally prescribed principles. For example, most of the cities of ancient civilizations were rather carefully planned by a central authority for defensive, administrative, and religious functions. Free enterprise, which might have allowed competition for zones between the institutions and subsocieties arising from these functions, was precluded by the culture.

A fundamental scientific problem is involved in these different meanings attached to ecology. Is the objective to find universal laws or processes, or is it to explain special phenomena? In biology, the law of evolution and the auxiliary principles of ecology are applicable to all webs of life regardless of the species and physical environments involved. In social science studies, there is a similar effort to discover universal processes of cultural change. But such processes cannot be conceptualized in biological terms. The social science problem of explaining the origin of unlike behavior patterns found among differ-

ent societies of the human species is very different from the problems of biological evolution. Analyzing environmental adaptations to show how new cultural patterns arise is a very different matter than seeking universal similarities in such adaptation. Until the processes of cultural ecology are understood in the many particulars exemplified by different cultures in different parts of the world a formulation of universal processes will be impossible.

Hawley, who has given the most recent and comprehensive statement of social ecology (Hawley, 1950), takes cultural phenomena into account far more than his predecessors. He states that man reacts to the web of life as a cultural animal rather than as a biological species. "Each acquisition of a new technique or a new use for an old technique, regardless of the source of its origin, alters man's relations with the organisms about him and changes his position in the biotic community." But, preoccupied with the totality of phenomena within the locale and apparently with a search for universal relationships, Hawley makes the local community the focus of interest (Hawley, 1950:68). The kinds of generalizations which might be found are indicated by the statement: "If we had sufficient knowledge of a preliterate peoples to enable us to compare the structure of residence groups arranged in order of size from smallest to largest, we should undoubtedly observe the same phenomena — each increment in size is accompanied by an advance in the complexity of organization" (Hawley, 1950:197). This is the kind of self-evident generalization made by the unilinear evolutionists: cultural progress is manifest in increasing populations, internal specialization, over-all state controls, and other general features.

Hawley is uncertain in his position regarding the effect of environmental adaptations on culture. He states: "The weight of evidence forces the conclusion that the physical environment exerts but a permissive and limiting effect" (Hawley, 1950:90), but he also says that "each habitat not only permits but to a certain extent necessitates a distinctive mode of life" (Hawley, 1950:190). The first statement closely conforms with the widely accepted anthropological position that historical factors are more important than environmental factors, which may be permissive or prohibitive of culture change but are never causative. The second is nearer to the thesis of this paper that cultural ecological adaptations constitute creative processes.

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CULTURE, HISTORY AND ENVIRONMENT

While the human and social ecologists have seemingly sought universal ecological principles and relegated culture in its local varieties to a secondary place, anthropologists have been so preoccupied with culture and its history that they have accorded environment only a negligible role. Owing in part to reaction against the "environmental determinists," such as Huntington and Semple, and in part to cumulative evidence that any culture increases in complexity to a large extent because of diffused practices, the orthodox view now holds that history, rather than adaptive processes, explains culture. Since historical "explanations" of culture employ the culture area concept, there is an apparent contradiction. The culture area is a construct of behavioral uniformities which occur within an area of environmental uniformities. It is assumed that cultural and natural areas are generally coterminous because the culture represents an adjustment to the particular environment. It is assumed further, however, that various different patterns may exist in any natural area and that unlike cultures may exist in similar environments.

The cultural-historical approach is, however, also one of relativism. Since cultural differences are not directly attributable to environmental differences and most certainly not to organic or racial differences, they are merely said to represent divergences in cultural history, to reflect tendencies of societies to develop in unlike ways. Such tendencies are not explained. A distinctive pattern develops, it is said, and henceforth is the primary determinant of whether innovations are accepted. Environment is relegated to a purely secondary and passive role. It is considered prohibitive or permissive, but not creative. It allows man to carry on some kinds of activities and it prevents others. The origins of these activities are pushed back to a remote point in time or space, but they are not explained. This view has been best expressed by Forde, who writes:

> Neither the world distributions of the various economies, nor their development and relative importance among the particular peoples, can be regarded as simple functions of physical conditions and natural resources. Between the physical environment and human activity there is always a middle term, a collection of specific objectives and values, a body of knowledge and belief: in other words, a cultural pattern. That the culture itself is not static, that it is adaptable and modifiable in relation to physical conditions, must not be allowed to obscure the fact that adaptation proceeds by discoveries and inventions which are themselves in no sense inevitable and which are, in any individual community, nearly all of them acquisitions

or impositions from without. The peoples of whole continents have failed to make discoveries that might at first blush seem obvious. Equally important are the restrictions placed by social patterns and religious concepts on the utilization of certain resources or on adaptations to physical conditions. [Forde, 1949:463.]

The habitat at one and the same time circumscribes and affords scope for cultural development in relation to the pre-existing equipment and tendency of a particular society, and to any new concepts and equipment that may reach it from without. [Forde, 1949:464.]

But if geographical determinism fails to account for the existence and distribution of economies, economic determinism is equally inadequate in accounting for the social and political organizations, the religious beliefs and the psychological attitudes which may be found in the cultures based on those economies. Indeed, the economy may owe as much to the social and ritual pattern as does the character of society to the economy. The possession of particular methods of hunting or cultivating, of certain cultivated plants or domestic animals, in no wise defines the pattern of society. Again, there is interaction and on a new plane. As physical conditions may limit the possibilities of the economy, so the economy may in turn be a limiting or stimulating factor in relation to the size, density and stability of human settlement, and to the scale of the social and political unit. But it is only one such factor, and advantage may not be taken of the opportunities it affords. The tenure and transmission of land and other property, the development and relations of social classes, the nature of government, the religious and ceremonial life — all these are parts of a social superstructure, the development of which is conditioned not only by the foundations of habitat and economy, but by complex interactions within its own fabric and by external contacts, often largely indifferent to both the physical background and to the basic economy alike. [Forde, 1949:465.]

CULTURAL ECOLOGY

Cultural ecology differs from human and social ecology in seeking to explain the origin of particular cultural features and patterns which characterize different areas rather than to derive general principles applicable to any cultural-environmental situation. It differs from the relativistic and neo-evolutionist conceptions of culture history in that it introduces the local environment as the extracultural factor in the fruitless assumption that culture comes from culture. Thus, cultural ecology presents both a problem and a method. The problem is to ascertain whether the adjustments of human societies to their environments require particular modes of behavior or whether they permit latitude for a certain range of possible behavior patterns. Phrased in this way, the problem also distinguishes cultural ecology from "environmental determinism" and its related theory "economic

determinism" which are generally understood to contain their conclusions within the problem.

The problem of cultural ecology must be further qualified, however, through use of a supplementary conception of culture. According to the holistic view, all aspects of culture are functionally interdependent upon one another. The degree and kind of interdependency, however, are not the same with all features. Elsewhere, I have offered the concept of *cultural core* — 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. Innumerable other features may have great potential variability because they are less strongly tied to the core. These latter, or secondary features, are determined to a greater extent by purely cultural-historical factors — by random innovations or by diffusion — and they give the appearance of outward distinctiveness to cultures with similar cores. Cultural ecology pays primary attention to those features which empirical analysis shows to be most closely involved in the utilization of environment in culturally prescribed ways.

The expression "culturally prescribed ways" must be taken with caution, for its anthropological usage is frequently "loaded." The normative concept, which views culture as a system of mutually reinforcing practices backed by a set of attitudes and values, seems to regard all human behavior as so completely determined by culture that environmental adaptations have no effect. It considers that the entire pattern of technology, land use, land tenure, and social features derive entirely from culture. Classical illustrations of the primacy of cultural attitudes over common sense are that the Chinese do not drink milk nor the Eskimo eat seals in summer.

Cultures do, of course, tend to perpetuate themselves, and change may be slow for such reasons as those cited. But over the millenia cultures in different environments have changed tremendously, and these changes are basically traceable to new adaptations required by changing technology and productive arrangements. Despite occasional cultural barriers, the useful arts have spread extremely widely, and the instances in which they have not been accepted because of pre-existing cultural patterns are insignificant. In pre-agricultural times, which comprised perhaps 99 per cent of cultural history, technical devices for hunting, gathering, and fishing seem to have diffused largely to the limits of their usefulness. Clubs, spears, traps, bows, fire, containers, nets, and many other cultural features spread across

many areas, and some of them throughout the world. Later, domesticated plants and animals also spread very rapidly within their environmental limits, being stopped only by formidable ocean barriers.

Whether or not new technologies are valuable is, however, a function of the society's cultural level as well as of environmental potentials. All pre-agricultural societies found hunting and gathering techniques useful. Within the geographical limits of herding and farming, these techniques were adopted. More advanced techniques, such as metallurgy, were acceptable only if certain pre-conditions, such as stable population, leisure time, and internal specialization were present. These conditions could develop only from the cultural ecological adaptations of an agricultural society.

The concept of cultural ecology, however, is less concerned with the origin and diffusion of technologies than with the fact that they may be used differently and entail different social arrangements in each environment. The environment is not only permissive or prohibitive with respect to these technologies, but special local features may require social adaptations which have far-reaching consequences. Thus, societies equipped with bows, spears, surrounds, chutes, brush-burning, deadfalls, pitfalls, and other hunting devices may differ among themselves because of the nature of the terrain and fauna. If the principal game exists in large herds, such as herds of bison or caribou, there is advantage in co-operative hunting, and considerable numbers of peoples may remain together throughout the year, as described in Chapter 8. If, however, the game is nonmigratory, occurring in small and scattered groups, it is better hunted by small groups of men who know their territory well (Chapter 7). In each case, the cultural repertory of hunting devices may be about the same, but in the first case the society will consist of multifamily or multilineage groups, as among the Athabaskans and Algonkians of Canada and probably the pre-horse Plains bison hunters, and in the second case it will probably consist of localized patrilineal lineages or bands, as among the Bushmen, Congo Negritoes, Australians, Tasmanians, Fuegians, and others. These latter groups consisting of patrilineal bands are similar, as a matter of fact, not because their total environments are similar — the Bushmen, Australians, and southern Californians live in deserts, the Negritoes in rain forests, and the Fuegians in a cold, rainy area — but because the nature of the game and therefore of their subsistence problem is the same in each case.

Other societies having about the same technological equipment may exhibit other social patterns because the environments differ to

the extent that the cultural adaptations must be different. For example, the Eskimo use bows, spears, traps, containers and other widespread technological devices, but, owing to the limited occurrence of fish and sea mammals, their population is so sparse and co-operative hunting is so relatively unrewarding that they are usually dispersed in family groups. For a different but equally compelling reason the Nevada Shoshoni (Chapter 6) were also fragmented into family groups. In the latter case, the scarcity of game and the predominance of seeds as the subsistence basis greatly restricted economic co-operation and required dispersal of the society into fairly independent family groups.

In the examples of the primitive hunting, gathering, and fishing societies, it is easy to show that if the local environment is to be exploited by means of the culturally-derived techniques, there are limitations upon the size and social composition of the groups involved. When agricultural techniques are introduced, man is partially freed from the exigencies of hunting and gathering, and it becomes possible for considerable aggregates of people to live together. Larger aggregates, made possible by increased population and settled communities, provide a higher level of sociocultural integration, the nature of which is determined by the local type of sociocultural integration. Chapters 9 to 12 illustrate certain of these types.

The adaptative processes we have described are properly designated ecological. But attention is directed not simply to the human community as part of the total web of life but to such cultural features as are affected by the adaptations. This in turn requires that primary attention be paid only to relevant environmental features rather than to the web of life for its own sake. Only those features to which the local culture ascribes importance need be considered.

THE METHOD OF CULTURAL ECOLOGY

Although the concept of environmental adaptation underlies all cultural ecology, the procedures must take into account the complexity and level of the culture. It makes a great deal of difference whether a community consists of hunters and gatherers who subsist independently by their own efforts or whether it is an outpost of a wealthy nation, which exploits local mineral wealth and is sustained by railroads, ships, or airplanes. In advanced societies, the nature of the culture core will be determined by a complex technology and by productive arrangements which themselves have a long cultural history.

Three fundamental procedures of cultural ecology are as follows:

First, the interrelationship of exploitative or productive technology and environment must be analyzed. This technology includes a considerable part of what is often called "material culture," but all features may not be of equal importance. In primitive societies, subsistence devices are basic: weapons and instruments for hunting and fishing; containers for gathering and storing food; transportational devices used on land and water; sources of water and fuel; and, in some environments, means of counteracting excessive cold (clothing and housing) or heat. In more developed societies, agriculture and herding techniques and manufacturing of crucial implements must be considered. In an industrial world, capital and credit arrangements, trade systems and the like are crucial. Socially-derived needs — special tastes in foods, more ample housing and clothing, and a great variety of appurtenances to living — become increasingly important in the productive arrangement as culture develops; and yet these originally were probably more often effects of basic adaptations than causes.

Relevant environmental features depend upon the culture. The simpler cultures are more directly conditioned by the environment than advanced ones. In general, climate, topography, soils, hydrography, vegetational cover, and fauna are crucial, but some features may be more important than others. The spacing of water holes in the desert may be vital to a nomadic seed-gathering people, the habits of game will affect the way hunting is done, and the kinds and seasons of fish runs will determine the habits of riverine and coastal tribes.

Second, the behavior patterns involved in the exploitation of a particular area by means of a particular technology must be analyzed. Some subsistence patterns impose very narrow limits on the general mode of life of the people, while others allow considerable latitude. The gathering of wild vegetable products is usually done by women who work alone or in small groups. Nothing is gained by co-operation and in fact women come into competition with one another. Seed-gatherers, therefore, tend to fragment into small groups unless their resources are very abundant. Hunting, on the other hand, may be either an individual or a collective project, and the nature of hunting societies is determined by culturally prescribed devices for collective hunting as well as by the species. When surrounds, grass-firing, corrals, chutes, and other co-operative methods are employed, the take per man may be much greater than what a lone hunter could bag.

Similarly, if circumstances permit, fishing may be done by groups of men using dams, weirs, traps, and nets as well as by individuals.

The use of these more complex and frequently co-operative techniques, however, depends not only upon cultural history — i.e., invention and diffusion — which makes the methods available but upon the environment and its flora and fauna. Deer cannot be hunted advantageously by surrounds, whereas antelope and bison may best be hunted in this way. Slash-and-burn farming in tropical rain forests requires comparatively little co-operation in that a few men clear the land after which their wives plant and cultivate the crops. Dry farming may or may not be co-operative; and irrigation farming may run the gamut of enterprises of ever-increasing size based on collective construction of waterworks.

The exploitative patterns not only depend upon the habits concerned in the direct production of food and of goods but upon facilities for transporting the people to the source of supply or the goods to the people. Watercraft have been a major factor in permitting the growth of settlements beyond what would have been possible for a foot people. Among all nomads, the horse has had an almost revolutionary effect in promoting the growth of large bands.

The third procedure is to ascertain the extent to which the behavior patterns entailed in exploiting the environment affect other aspects of culture. Although technology and environment prescribe that certain things must be done in certain ways if they are to be done at all, the extent to which these activities are functionally tied to other aspects of culture is a purely empirical problem. I have shown elsewhere (Chapters 6, 7, 10) that the occurrence of patrilineal bands among certain hunting peoples and of fragmented families among the Western Shoshoni is closely determined by their subsistence activities, whereas the Carrier Indians are known to have changed from a composite hunting band to a society based upon moieties and inherited statuses without any change in the nature of subsistence. In the irrigation areas of early civilizations (Chapter 11) the sequence of sociopolitical forms or cultural cores seems to have been very similar despite variation in many outward details or secondary features of these cultures. If it can be established that the productive arrangements permit great latitude in the sociocultural type, then historical influences may explain the particular type found. The problem is the same in considering modern industrial civilizations. The question is whether industrialization allows such latitude that political democracy, communism, state socialism, and perhaps other forms are equally pos-

sible, so that strong historical influences, such as diffused ideology — e.g., propaganda — may supplant one type with another, or whether each type represents an adaptation which is specific to the area.

The third procedure requires a genuinely holistic approach, for if such factors as demography, settlement pattern, kinship structures, land tenure, land use, and other key cultural features are considered separately, their interrelationships to one another and to the environment cannot be grasped. Land use by means of a given technology permits a certain population density. The clustering of this population will depend partly upon where resources occur and upon transportational devices. The composition of these clusters will be a function of their size, of the nature of subsistence activities, and of cultural-historical factors. The ownership of land or resources will reflect subsistence activities on the one hand and the composition of the group on the other. Warfare may be related to the complex of factors just mentioned. In some cases, it may arise out of competition for resources and have a national character. Even when fought for individual honors or religious purposes, it may serve to nucleate settlements in a way that must be related to subsistence activities.

THE METHODOLOGICAL PLACE OF CULTURAL ECOLOGY

Cultural ecology has been described as a methodological tool for ascertaining how the adaptation of a culture to its environment may entail certain changes. In a larger sense, the problem is to determine whether similar adjustments occur in similar environments. Since in any given environment, culture may develop through a succession of very unlike periods, it is sometimes pointed out that environment, the constant, obviously has no relationship to cultural type. This difficulty disappears, however, if the level of sociocultural integration represented by each period is taken into account. Cultural types therefore, must be conceived as constellations of core features which arise out of environmental adaptations and which represent similar levels of integration.

Cultural diffusion, of course, always operates, but in view of the seeming importance of ecological adaptations its role in explaining culture has been greatly overestimated. The extent to which the large variety of world cultures can be systematized in categories of types and explained through cross-cultural regularities of developmental process is purely an empirical matter. Hunches arising out of comparative studies suggest that there are many regularities which can be formulated in terms of similar levels and similar adaptations.