

Perspectives of Human Ecology

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INTRODUCTION

Modern human ecology is a transdisciplinary science of human populations and their cultures, treating them as a creative element of ecosystems and social systems. More than 80 years ago, the term human ecology was formulated to describe a doctrine attracting attention to the role of environment in the formation of human biological and cultural characteristics. It was supposed to provide a new impetus for geography, that had nearly exhausted its possibilities of describing the world (Huntington, 1916) and for sociology, which was in crisis (Park, 1921). Over time, various established disciplines adopted the term human ecology in somewhat differing senses, from that of the study of relationships between humans and their environment. The understanding of the term in various disciplines was as follows (Wolanski, 1997):

1. In physical anthropology it was concerned with the origin and historic distribution of human populations.
2. In sociology, human ecology was considered to be the study of the formation of local communities.
3. In geography and ethnography it was concerned with local cultural specificity including artifacts produced. This included palaeoethnology as an archaeological approach.
4. In epidemiology human ecology was related to the incidence of diseases.
5. In psychology it was referring to human behaviours in natural rather than experimental situations.

Terms such as 'geography as human ecology' or 'sociology as human ecology' were used. With the advent of social anthropology and cultural anthropology as disciplines broader than sociology and ethnology, the role of human ecology in social sciences diminished. Moreover, new theoretical concepts, for example, in sociology, did not always agree with the approach considered to be 'human ecology'.

Biological anthropology had no need for the term human ecology or the new doctrine it denoted. In its essence, after accepting the theory of natural selection and the role played by environmental factors in forming the variability of human populations, physical anthropology became synonymous with

what is today accepted as the biological foundations of human ecology.

It is obvious from the aforementioned that in human ecology there were always considered to be two inseparable aspects of any phenomenon: human populations and their living conditions. The essence of human ecology is the systemic study of the complexity of the interrelationships between humans and their environment. Studies of the environment alone are the domain of geology, geography or botany and zoology on one hand or economics, sociology and ethnography on the other, while the study of the biological characteristics of humans falls into the domains of anatomy, physiology, genetics or demography. It is only the interdisciplinary focus into relations of humans and their environment that uniquely characterises human ecology.

In the past, human ecology studies were often incomplete, involving only one aspect of human biology in relation to an isolated aspect of human environment. Interactions with other variables, be it passive or active, biological or cultural, were often overlooked. It could be likened to studying simple regressions rather than multiple ones, often worsened by confusing coincidence with a true causal relationship. For instance, the relationship of body height to educational status was studied in separation from the relationship between height and occupation or height and income and without controlling for effects of each of the possible causal variables on the others. This produced not only incomplete results, but led to incorrect conclusions based on spurious correlation.

The introduction to human biology of mathematical tools of multivariate analyses allowed systematic studies leading to the development of synthetic models. Factor analysis made possible the exposure of latent factors characterising environments and individuals or populations.

Those mathematically revealed factors are formally independent of each other. Various forms of the analysis of variance and of multivariate regressions allowed appreciation and estimation of the magnitudes of interrelationships between numerous environmental, social and biological characteristics. This helped in the understanding of the biological and socio-cultural nature of humanity. These studies of interrelations between biological, social and cultural changes occurring during the process of constant ad-

aptation are still undervalued. This is lamentable because biological changes of significance for human health can be a measure of the efficiency of cultural, economic or even political decisions in the improvement of human life. Lack of such measures leads to paradoxical situations. For example in Mexico, politicians note that with economic development and concomitant growth in health services there is an increase in the incidence of diseases. It transpires that more numerous doctors diagnose more diseases, which increases values of negative indices of health (incidence and prevalence of diseases). In this case application of positive health indicators - physical child growth and psychomotor fitness - based on ecological concepts would explain the situation of improved health services immediately and without seeming confusion. The measurement of the biological status of all members of a population is used as a criterion of psychophysical health of the population (Wolanski, 1999). This measure should be the highest when the natural environment is unpolluted, nutrition optimal and life style active.

Human ecology requires interdisciplinary studies because of the pressure humans exert onto their environments, which in turn result in secondary biological, economic, social and cultural changes in human populations. These require further adaptations and so on. Biological adaptive changes occur on individual and on populational levels being accompanied by cultural adaptations.

CURRENT PROBLEMS OF HUMAN ECOLOGY

Interaction is the central theme of ecology. Interactions between individuals and populations, between organisms and their environments are studied in numerous ways. The environment imposes limits onto individual opportunities and restricts ability to reproduce. Adapting organisms expand those limits from generation to generation. This expansion in humans includes our creative abilities. In a sense, the interaction also occurs between structure and function of organisms and populations.

Populations respond to environmental stimuli through adaptation. In phylogenetic terms adaptation means reproduction of the fittest in the Darwinian sense. In the short term, adaptation is understood as adjustments during the individual growth and development. These include both acclimatisation and immediate responses to changing physical conditions. On the populational scale, adaptation still follows the Darwinian principle of differential fertility and mortality though it is more and more modi-

fied by technological and social factors. Life has a certain potential, vigour that constantly unfolds. There is a view that maintains that a certain pool of life potential is present in the form of a genome. An individual produces organ systems supporting life and thus allowing reproduction of genetic material. The organ systems supply nutrients, oxygen, allow locomotion and reproduction. Since the environment changes constantly, the process of individual growth and development is at the same time a process of continuous corrections of individual characteristics to allow them to function optimally in the new conditions. These corrections constitute ontogenetic adjustments. Between generations the corrections may also involve differential reproduction of genetic material. Life cannot exist without changes. It seems that its very existence relies on continuous change.

A niche is a result of interaction and adaptation. An ecological niche is not a geographic location, but functional relations between an organism and its environment. It is a place known to an individual through relations to its environment and a place in which others know it. Niche is of special importance in human ecology because of human ability to plan ahead. A human niche includes cultural elements. Humans do not choose their niches instinctively or by chance, they seek their niches consciously through education, occupation, construction of a home, nutritional choices and lifestyle. All these, usually conscious, decisions result in secondary changes due to the automatic operation of feedback systems. Hence the chosen lifestyle exerts secondary influences upon a human individual. The human niche is exceptional in the ecosystem.

HUMANS AND ENVIRONMENT

Problems in the human environment occupy today a dominant place in all subdisciplines of biological, cultural and social anthropology. It can be stated that human ecology concepts maintain links between these already separate disciplines. Some examples follow. Studies conducted under the aegis of the World Health Organisation indicate that optimally nourished children are not necessarily the biggest. In addition, too big neonates are considered cases of concern by paediatricians. Conditions in polluted environments seem to produce large body sizes. Despite this, tall stature is still socially preferred and considered synonymous with good living conditions. The problem of the developmental norm remains unresolved.

Population genetics needs studies of environmental conditions, because these conditions determine forces of natural selection. Physiological and mor-

phological variability of future generations will be determined by conditions, in which they will live and develop. Body proportions that are deemed to differ between various ethnic groups are strongly dependent on environmental conditions, especially nutrition and motor activity, which are related to living conditions.

Studies of human evolutionary history must include ecological conditions in which various earlier human forms arose. These earlier ecological conditions influenced selection of genetic material that was included into our current gene pool.

Humans are geographically variable. Earlier classifications supported the existence of biodiversity in our species and led to political concepts of racism. Reaction to the suffering caused by racism resulted in the current climate of political correctness in which variability of human biological characteristics is not discussed by scientists.

Ecological studies clearly show the relationship between morphological and physiological characteristics and environmental conditions in which various human groups existed. It would be scientifically incorrect to ignore this fact. It is important to remember that the fact that biological characteristics differ, on the average, between various geographical populations does not mean that some forms better than others are. It means only that each human group became adapted to a specific set of conditions. Since we humans are all adapted to culture and the use of technologies, the most important human characteristic, intelligence, was under the same adaptive pressures in all ecological conditions. The important role played by culture and technology in human adaptation resulted in the fact that only a small portion of total human variability can be accounted for by differences between populations, while most human variation occurs among individuals in each of the populations. For instance only about 25% of the variation in human brain size can be accounted for by differences between populations, about the same portion as that explained by differences between sexes. Fifty percent of variation in brain size is between same-sex individuals within the same population. The same portions of variance are explained by the same factors in human body size (Henneberg, 1992) and in many other characteristics. Considering that there is no significant relation between human brain size and intelligence (Henneberg, et al. 1985), the amount of difference between populations becomes negligible when compared to total variation among individuals. Even this small amount of difference between human populations has lost its importance in modern highly technological societ-

ies. Genetically coded differences among neonates decrease during development after birth. Living conditions of modern populations are more homogeneous than those that were encountered in the past. Individual growth and development, their dynamics and kinetics are to a large extent dependent on environmental conditions. Nearly all human biological characteristics show initially progressive development and later in life undergo regression (Wolanski, 1973, 1984; Koziol and Wolanski, 1980; Wolanski and Siniarska, 2000). The peak development of various characteristics occurs at various ages. This age depends on living conditions, especially nutrition, and on lifestyle, especially motor activity. An earlier occurrence of a peak in the development of a particular character, however, also means earlier onset of the regression. Rates of regressive changes and their timing can be regulated through appropriate nutrition and lifestyle. Thus unwelcome changes can be slowed down. Modern environments also result in the increase with age of, normally stable, blood pressure, which produces health problems.

A human being is born twice: once as an individual, and the second time as a representative of its species. Before both births inter-individual variability increases, after birth it decreases as a result of adjustments to the environment. In modern uniform living conditions, inter-individual variability is also reduced twice.

PERSPECTIVES OF ANTHROPOLOGY IN RELATION TO HUMAN ECOLOGY

Modern human ecology opens up a number of perspectives for anthropology.

1. Based on systems theory approaches human ecology demands that all phenomena regarding humans be interpreted through relations between humans and their environment; this environment also includes other humans.
2. Genetic variability must be interpreted as a reflection of past adaptations to earlier environments during human phylogeny.
3. Nature must be regarded as a permanent interaction; in particular a constant adaptation of organisms to their environments. In the face of environmental instability, continuous adaptation and development is a universal mode of existence. Unchanged existence leads to extinction.
4. Human ecology bridges the gap between the biological and social sciences, considering culture as an extension of biological adaptations.

5. Human ecology studies mutual interactions in the sense of systemic feedbacks between ecosystems and human communities.

THE PAST AND THE FUTURE

Human ecology in the past provided the perspective for a number of disciplines: geography, sociology, archaeology, psychology etc. Today it provides an important beacon for the development of all branches of anthropology. Following, already of historical significance only, monodisciplinary period, there commenced a period of interdisciplinary studies initiated by the International Biological Programme, and especially its section of human adaptability. It was, however, rather a mosaic of disciplinary inputs. It took some twenty more years to form systemic approaches, mostly under the influence of the International Commission of Human Ecology. Its main theoretician was GL Young, the editor of the *International Journal of Human Ecology*. The basic concepts were published in his excellent monograph (Young, 1989) while terminology was presented in the *Glossary of Terms for Human Ecology* (Wolanski, 1990). In 1996 the first volume of the *Annotated Bibliography of Human Ecology* was published (Siniarska and Dickinson, 1996). In this volume there was also proposed a subdivision of human ecology into basic sub-disciplines: (1) philosophical foundations of man-environment relations, (2) socio-economic problems of human environment, (3) environmental problems of human ecology, (4) cultural adaptations including education for the environment. It is curious that in general, biological ecologists are interested in the entire ecosystem minus humans. If they include the human presence at all, it is only in the form of human pressure on the natural environment. It seems, however, that the future of the entire ecology lies in the close relationship with studies of human populations, which should be studied to at least the same extent as other species. Problems of carrying capacity, energetic balance of ecosystems, definition of niches and many other fundamental ecological problems cannot be solved if systemic studies do not include humans. Even when one studies influence of catastrophic events onto ecosystems, the nature of the catastrophe must be taken into account. Thus in studies of human pressure onto natural environments, the nature of human populations and their functioning must be taken into account.

Theoretical foundations of bio-ecology and human ecology are the same, sadly this does not lead to common research programs. This situation leads to a deep misunderstanding between nature conser-

vationists and green activists, and builders and engineers. These latter often do not realise the ecological consequences of their construction activities, while conservationists defend their causes by appealing to emotions rather than using scientific facts. Human ecology that can bridge the chasm between nature and technology is a very important discipline, not only in the sense of human knowledge but also in the sense of social and political practice.

At the time of the foundation of the Commission of Human Ecology a question was posed: Is human ecology a science or just a point of view? (Wolanski, 1987). Now we must ask the same question once again. With the hindsight of the years that have passed, we can answer, that human ecology is a scientific discipline studying humans in their environment, but for bio-ecology it is just a point of view. A point of view with serious consequences for the future of humankind and the Earth.

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ABSTRACT It can be argued that the science of human ecology is a modern form of anthropology. All living things exist in their environment while their development involves adaptation to living conditions. This principle forms the theoretical basis of human ecology. Human ecology, using the systems theory, is understood as transdisciplinary science of human populations and their cultures, which are both creative and destructive elements of ecosystems. Following a period of uncritical belief in genetic determinism and resultant classifications of human groups into discrete units ("races"), a tendency to negate genetic differentiation among human populations occurred. This is understandable, because earlier ideas of subdivision of humanity were exploited by totalitarian ideologies, but such political correctness results in real genetic differences between populations resulting from adaptations to local conditions being ignored. Human body build and function are related to ecological conditions. Thus on the average, human populations will differ somewhat depending on the ecological conditions in which they originated and developed. The fact that various human groups, originating from various territories differ as to their morphological and physiological properties does not mean that their characteristics have a different value. Each is equally well adapted to its specific environment. The genetic variability of humans, as that of any other animal, is a result of mutations and natural selection producing differences in gene pools. In present-day human populations, genetic variability is greater than that needed for adaptation to the existing living conditions of the 'civilised' world. During ontogenetic development the amount of this variation seems to be decreasing. Genetic diversity loses importance in a technological society. Living conditions of present day populations are more uniform than those that occurred during human evolution. The science of human ecology postulates that we should find explanations of all phenomena concerning human organisms and hu-

man populations in their relationship to their environments. Moreover, inherited genetic diversity has its source in the ecological conditions of past populations. Nature is seen as a continuous development of organisms in their interaction with the environment. These interactions form a set of feedback loops at a systemic level between landscape, environment and human societies. Stability does not exist and the only possible way to survive is to undergo further developmental changes through adaptation to a constantly changing environment. Human ecology, being a transdisciplinary science, builds bridges between the biological and the social sciences. It views cultural adjustments as an extension of biological adaptations.

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