Poached Ecology

Human Ecology: A Theoretical Essay

by Amos H. Hawley, *University of Chicago Press, 1986. $26.00/£20.75 hbk, $9.95/£7.95 pbk (viii + 168 pages) ISBN 0 226 31984 9*

Both the editorial staff of TREE and I were tricked by the title of this book. A sociologist's treatise on human ecology has, in fact, very little to do with ecological science. Hawley proposes a nebulous mix of community and systems ecology as the key to understanding the nature of modern human society; I doubt that many readers of TREE would persevere much beyond the first couple of pages.

An assessment of the sociological message of this book would be the fairest form of review, but of little relevance here. Instead, I shall describe Hawley's view of the role of ecological theory in human sciences, examine some of its problems and suggest that the more empirically-orientated models from evolutionary and behavioural ecology promise greater insights into the diversity of human behaviour and organization than those offered by Hawley.

'Human ecology' emerged as a subdiscipline of sociology in the 1930s, studying the growth and development of American urban communities as if they were analogous to successions observed in plant communities. Over the years two developments have occurred. First, interest has gradually shifted away from localized urban units to more complex systems – the corporate state, modern nations and ultimately the international community. Second, with the adoption of systems theory, communities are now seen as cybernetic entities that maintain an internal homeostasis by means of positive and negative feedbacks and that evolve towards ever-increasing efficiency. With these developments, you might expect that the analogy between social and ecological systems would no longer be very useful. Hawley, however, thinks differently, claiming that the most important contribution of human ecology lies in viewing 'collective life as an adaptive process consisting of an interaction of environment, population and organization. Out of that process emerges the ecosystem, a concept that serves as a common denominator for bioecology and human ecology'.

What does all this mean? With abstract terms defined in further abstractions, it is difficult to give a precise answer. Essentially, we are presented with a form of holistic functionalism that is simply unknown in the biological sciences. A community, for example an industrial complex, is made up of a number of interdependent functions – management, production, labour, waste disposal, housing schemes. The nature of these units (for example a labour union) can only be understood in terms of its function within the larger system. Similarly, the potential maturation, growth, evolution and inertia of the system can only be understood in terms of its constituent units.

To his credit, Hawley avoids the classic pitfalls of functionalism, in particular teleonomic arguments and unsupportable assumptions about the extent to which any system can be closed. A number of objections can nevertheless be raised to his kind of 'human ecology'. I shall focus, briefly, on four: his devotion to systems theory for its own sake, his unorthodox understanding of evolutionary processes, his disregard for key ecological concepts and his failure to use empirical examples.

First, socieities are viewed as cybernetic entities, self-regulating, self-organizing systems of internal coherence. Despite (what Hawley calls) 'a rather grudging acceptance' of systems ecology by sociologists, it became very fashionable among anthropologists in the 1960s[1], who saw parallels between the homeostatic functions of ecosystems and tribal customs. The principal weakness in social scientists' use of systems theory is that conflicting selective pressures at different levels of organization are not recognized[2]. Because there are no theoretical grounds for assuming that evolutionary processes will consistently favour the interests of ecosystems over those of individuals, the approach is fundamentally flawed.

Second, the evolutionary dynamics of ecosystems are ultimately construed as systems' improvements in expansion and efficiency. Can energy efficiency and expansionary principles really account for the evolution of diverse patterns of human behaviour? I doubt it. Furthermore, in connection with evolutionary processes, Hawley mistakenly favours Lamarkian over Darwinian selection, on the grounds that man can affect and influence his environment.

Third, despite the title, important ecological concepts barely get a mention in the text. For example the distribution, access to and predictability of resources are dealt with in less than a page; the role of competition as an important causal factor in evolutionary change is rejected; furthermore, unfamiliar terms such as 'ecumenic environment' are substituted for well-known concepts such as 'conspecific environment', only adding to cross-disciplinary confusion.

Finally, there is no empirical content to this essay. We are duly warned of this in the Preface, but 130 pages without more than a couple of descriptive paragraphs is tough reading.

Luckily the fate of ecology in the human sciences is not as bleak as all this would suggest. First, there are 'cultural ecologists' and 'applied anthropologists' who fully recognize the importance of environmental influences on cultural behaviour and conduct painstakingly detailed ethnographic and ecological research[3]; rarely do they resort to blind use of systems theory. More recently, anthropologists and archaeologists have applied evolutionary and behavioural ecological theory to the study of small-scale communities: hunter–gatherer subsistence strategies are analysed with optimal foraging models[4,5]; residential patterns are related to resource distribution and territorial defence[6]; sex differences in mating strategies[7], the occurrence of sibling caretaking[8] and patterns of senescence[9] are examined as individual adaptations to specific environmental and social conditions. Finally, paleoanthropologists use niche theory and community ecology to examine changing selective pressures during hominid evolution[10].

The tension between systems ecology and evolutionary ecology has spread into the human sciences, reviving a long-standing sociological debate – do social systems exhibit emergent properties that cannot be more simply explained in terms of individual behaviour? Few contenders change sides. However, if social and biological scientists are going to talk to one another, the chances seem greatest in evolutionary and behavioural ecology, where there is a common focus on individual adaptation, competition, empiricism and hypothesis-testing.

In short, this book demonstrates how easily a term such as ecology can be transformed out of all recognition when incorporated, as an analogy, into another discipline.

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Ecology and Pest Control

Spider Mites: Their Biology, Natural Enemies and Control (World Crop Pests Vols 1A and 1B)

edited by W. Helle and M.W. Sabelis, *Elsevier Science Publishers, 1985. Vol. 1A: $105.50/Dfl 285 (xviii + 406 pages) ISBN 0 444 42372 9; Vol. 1B: $111.00/Dfl 300 (xviii + 458 pages) ISBN 0 444 42374 5*

Elsewhere in this issue of TREE[1] there is a discussion of some fascinating new work on spider mites (Tetranychidae) carried out by Yutaka Saitō. Saitō is also the author of an extremely interesting paper on life patterns in the spider mites, in which he classifies the various types of web that they produce, with the goal of better understanding the evolutionary implications in feeding, locomotion and dispersal, mating and avoidance of largely coevolved phytoseiid predators. This paper is one of 72 contributions included in the impressive and informative two-volume work *Spider Mites*, published by Elsevier as the first of a series of volumes on world crop pests. Volume 1A is devoted to the biology of spider mites and the techniques used in their study, while Volume 1B deals primarily with the Phytoseiidae and other arthropod predators of spider mites, predator–prey interactions, control of spider mites on various agricultural crops, damage assessment, and problems of pesticide resistance.

It should be clear even from this overly brief synopsis that the editors have assembled a work of enormous breadth; it is gratifying to report that closer examination reveals considerable depth as well. A few examples should suffice to illustrate the point.

Sabelis and Dicke address the role of chemical cues in prey location by phytoseiid mite predators, and evaluate their importance in the reproductive success of both predator and prey. Of special interest in this thoughtful and provocative work is the discussion on the possibility of a tritrophic chemical relationship between the mites and their plant hosts. Sabelis and Dicke speculate that the plant may release volatile chemicals at sites of spider mite feeding which signal nearby phytoseiid predators to converge at these sites, thereby improving the predator's chances for reproductive success. Certain phytoseiids may respond only to the kairomonal signal of a given isolated spider mite species[2], which likewise may reflect a tritrophic relationship if the kairomone is produced as a result of the spider mite having fed earlier on a particular plant host.

The anatomy of spider mites is elegantly presented in the opening two papers of Volume 1A. Lindquist reviews surface morphological features of spider mites with emphasis on ontogeny and homologies of leg setae, and on comparative ambulacral morphology in the superfamily Tetranychoidea. Establishment of character polarities through comparisons with representatives of the putative outgroup superfamilies Raphignathoidea and Cheyletoidea provides a basis for a phylogenetic ordering of tetranychid subfamilies and tetranychoid families. Incorporation of this information into a cladistic analysis of the Tetranychoidea leads Lindquist to suggest, in a later essay, that the spider mites are not the highly derived assemblage that their reduced setation and specialized host associations imply, but rather may represent the most ancient family lineage within the Tetranychoidea.

Alberti and Crooker have gathered and distilled the many studies conducted on spider mite internal structure subsequent to the classic work of Blauvelt[3], and have created a beautifully illustrated and eminently readable review. Their thin-section transmission micrographs add a new dimension to earlier works describing internal systems, while their text brings together a wealth of information that has previously been available only in scattered journals. There is new information here as well. For example, the rostral fossette, an enigmatic medioventral aperture in the infracapitular floor of the tetranychid gnathosoma, opens into a short duct that Alberti and Crooker found to be connected to the prepharyngeal canal. The authors do not speculate on the function of this duct but, since successful operation of the pharyngeal pump would appear to rely on maintenance of a partial vacuum between the rostral tip and the pharynx during contraction of the pharyngeal dilator muscles, the eventual solution to this mystery should prove of special interest to functional morphologists.

There are many other contributions to *Spider Mites* that deserve mention, but the need for brevity allows me to cite only a few of them. Van der Geest carefully explores the complex and often remarkable sequence of events involved in spider mite digestion, excretion and water balance, while Pijnacker and Feiertag-Koppen provide lucid reviews of the development of male and female reproductive systems and their products. Cone unravels the complexities of pre-mating and mating behavior in spider mites, and discusses the role of pheromonal cues in mediating these activities. Finally, mention should be made of the several valuable papers dealing with spider mite dynamics on a variety of crops ranging from cotton to cassava, from tea to tomatoes. Introducing this group of papers is a cogent discussion by Rabbinge on assessment of losses occasioned by spider mite damage, and on simulation models using population dynamics data for predicting the consequences of mite feeding.

Wim Helle and Mous Sabelis have produced a splendid work in *Spider Mites* – one that will be of major significance to acarologists and biologists in general for many years to come. It is a pleasure for me to recommend it.

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