FASCINATING IDEAS

Hierarchy: Perspectives for Ecological Complexity, by T. F. H. Allen and Thomas B. Starr. The University of Chicago Press, Chicago, IL, 1982, 310 p., illus. $27.50 (81-22010).

In 1936 Joseph Needham predicted: "The hierarchy of relations, for the molecular structure of carbon to the equilibrium of species and ecological wholes, will perhaps be the leading idea of the future." A number of talented minds, including Koestler, Pattee, and Simon, have since proposed the framework of hierarchy theory as a key to understanding living systems.

The study of ecosystems is in particular need of such an intellectual framework. Allen and Starr have provided one possible framework by using hierarchy as an organizing concept for various aspects of ecosystems theory. The diverse assemblage of theory and observation that their book encompasses includes systems and mathematical ecology, evolutionary theory, and studies of ecological communities using multivariate statistics.

How does one look at an ecosystem as a hierarchy? The answer, according to Allen and Starr, is to consider how an external perturbation affects an ecological holon. (Holon is a term the authors, following Koestler, use to describe a quasi-autonomous biological entity that both integrates over lower-level holons and is a component of a higher-level holon; e.g., a cell is a holon made up of lower-order holons called organelles). If a given holon and a perturbation occur on the same spatial and temporal scale, the holon will be disturbed. But the next higher-level holon may incorporate and use the perturbation. For example, a fire may kill an individual plant, but fires are necessary for the survival of a fire-dependent community (higher-level holon). A volcano can destroy a community, but volcanic activity is incorporated into the dynamics of the biosphere.

The above idea is not new, but with refinement it can be a powerful tool in understanding ecosystems. Allen and Starr show that patterns in nature reflect this hierarchical relation. They cite studies showing that diversity in a prairie landscape (a high-level holon) does not seem to be correlated with the occurrence of a fire in the previous year, but depends instead on the long-term fire frequency. This is because a single fire does not correspond in scale to a whole landscape, but a long-term spatiotemporal pattern of fires does. The authors discuss other systems displaying similar scale-dependent behavior, a riverbank bryophyte community, algal communities, agroecosystems, forest succession models, and pest outbreak models among them.

Allen and Starr's book is witty and provocative. Unfortunately, however, clarity suffers here and there from overuse of jargon of systems theory ("near-decomposability," "filters," "antisurfaces"). The exuberance of the authors also leads them to attribute a bit more power to their ideas than really seems justified at this early stage. Still, the book is a brave beginning to the application of hierarchical concepts to ecosystems, and those interested in ecosystems, evolutionary theory, or the epistemology of science will find in the book a torrent of fascinating ideas.

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A PAROCHIAL VIEW

Comparative Correlative Neuroanatomy of the Vertebrate Telencephalon, edited by Elizabeth C. Crosby and H. N. Schnitzlein. Macmillan Publishing Co., New York, 1982, 830 p., illus., $75.00.

Comparative vertebrate neurobiology has been dramatically altered over the last 20 years by new and innovative experimental methods. Prior to this time, most comparative studies were primarily descriptions of the cell groups in a given division of the brain and speculations on the origin and termination of the pathways interconnecting these cell groups. In the early sixties, W. J. H. Nauta and colleagues began experimental investigations of the organization and variation of central nervous system pathways in a number of diverse species. These studies, more recent experimental investigations using autoradiographic and histochemical tracing methods, and numerous physiological and biochemical studies have resulted in a wealth of data that even comparative neurobiologists must struggle to assimilate. Equally important, the last decade has witnessed a renaissance in thinking regarding evolutionary theory and the methodology of making comparisons of structures in different organisms.

The staggering increase in new data and the analyses of these data within the framework of contemporary views of phylogeny need, more than ever, to be summarized and interpreted in a single text. Unfortunately, the volume edited by Crosby and Schnitzlein fails in both respects. Much of the new data are not reported and, more importantly, the book reflects little of the diverse opinion and excitement that characterize comparative studies today.

The volume contains 15 chapters by 23 contributors and is divided into three sections: telencephalic organization of "submammals," paraphysis and blood supply of vertebrate brains, and telencephalic organization of mammals. Most of the contributors are members of a single scientific school of thought that reached its apogee in the fifties. This school still stresses descriptive studies (to the virtual exclusion of incompatible experimental data) and a linear view of vertebrate evolution. Their contributions clearly reflect this parochialism. A recurrent theme throughout most chapters is that telencephalic evolution is a linear progressive, with the implication that "submammalian" or "premammalian" species are characterized by simpler brains than mammals. This theme is pursued with monolithic intensity: differing opinions are not mentioned, and speculations are offered on pathways and presumed connections that experimental studies have clearly refuted. Thus there are descriptions of some pathways that do not exist and some that carry information other than that stated by the author(s). Besides serving to legitimize invalid information, the failure to cite the conclusions and differing interpretations of other researchers gives the impression of a consensus of opinion among "experts" on the telencephalon. This is far from the truth, but to the extent that such a consensus does exist, it would not include many of the interpretations set forth in this volume.

This book purports to reflect the "state-of-the-art" for research on the telencephalon, but one wonders what sort of peer-review process was applied before publication. One might also be moved to question the values involved in contemporary publishing. Besides presenting a narrow and frequently invalid scholarly perspective, this volume has many figures that are photographs of poorly done or faded histological preparations. In addition, the titles have been deleted from all bibliographic entries, a serious detraction from the usefulness of a bibliography. The reader cannot judge the relevance of the citations and will certainly not be aided in attempts to locate the source.

Despite my general objections to the volume, there are three chapters that are notable exceptions. Chapters on the paraphysis (J. Ariëns Kappers), blood supply (Gillilan), and brains of insectivores (Stephan and Andy) are well-illustrated, scholarly summaries that will be of use to specialists.

As most buyers of this book will already know, Elizabeth Crosby has been a preeminent figure in comparative neurobiology for 50 years and is well deserving of the respect she is accorded. Many of her earlier contributions have become landmarks in the field, and for many years she set the standards that the rest of us tried to meet. Unfortunately, many of her followers have failed to take up the reins to demonstrate the same pioneering spirit. Their contributions badly reflect this and constitute a volume that is even more disappointing for her association with it.

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