Book Reviews

Ecology: Progress and Self-Criticism

Unifying Concepts in Ecology. Papers from a congress, The Hague, Sept. 1974. W. H. VAN DOBBEN and R. H. LOWE-MCCONNELL, Eds. Centre for Agricultural Publishing and Documentation, Wageningen, Netherlands, and Junk, The Hague, 1975. 302 pp., illus. Dfl. 75.

These are the 23 invited papers of the First International Congress of Ecology. Speakers from 12 nations (and as many disciplines) were challenged to find unity under the conference title, "Structure, Function, and Management of Ecosystems." Another 40 of the 800 who attended participated in discussions, summaries of which are also included in the volume. The contributed papers have been published separately (also by the Centre for Agricultural Publishing and Documentation) as the *Proceedings* of the congress.

Unifying concepts are sought in two domains. One includes all kinds of ecosystems: terrestrial and aquatic; natural, disturbed, and man-made. The other includes all the subdisciplines: plant, animal, and microbial ecology; most of renewable resource management; portions of many environmental sciences. The ideas discussed bear little resemblance to the content of a standard ecology course of a decade or more ago. This book succeeds very well in providing a cross section of the current state of the art of the study of ecosystems.

Iconoclasts will be delighted. The thesis that diversity contributes stability to ecosystems is attacked by E. P. Odum, G. H. Orians, R. Margalef (Spain), and R. H. May. Others variously modify and reuse the concept. But the search for unifying concepts is not furthered; these authors propose at least three alternative views of relationship between diversity and stability.

F. H. Rigler attacks the concept of trophic levels and any other concept that cannot be made operational (all ecosystems include species that do not fit into single trophic levels). Others note difficulty with the vagueness of such terms as "diversity" and "stability" or "efficiency" and "productivity." Rigler emphasizes the need in science for falsifiable hypotheses, and the unease that follows shows in several places in the book. This kind of self-criticism is needed. A present tendency in ecology to call a hypothesis a theory, or to give credence to concepts through repetition, has led to confusion between what is verified and what has only been postulated. The kinds of recantation shown at this conference are healthy.

Empirical ecology is making solid progress. Extensive fieldwork forms the basis of about half the papers. Several of the studies reported on were part of the International Biological Program, which ended in 1974. Especially in papers such as those by D. E. Reichle *et al.*, S. S. Schwarz (U.S.S.R.), O. W. Heal (United Kingdom) *et al.*, L. Ryszkowski (Poland), and J. Jacobs (West Germany), the authors try to derive principles by generalizing from data. The paper by Jacobs is refreshing in its lack of preconceived judgment and its willingness to look at all the possible results of a given environmental change. Throughout the book the emphasis on energy is greater than it should be, although other factors such as water, nutrients, climate, and soils are better appreciated and understood than is usual in the literature.

Spatial differentiation is recognized in several papers as an aspect of ecosystems that is too often ignored. No breakthroughs in ways to cope with this difficult subject are presented, however.

The papers were presented in five morning sessions. The first three are devoted to natural systems, with emphasis on energy flow, nutrient cycling, productivity, diversity, stability, and system structure. The fourth session considers disturbed ecosystems, and the last turns to ecosystem management.

The base of data and experience for these last two sessions is surprisingly good, considering that few ecologists were involved with these subjects a decade ago. We are reminded that people are part of, not apart from, ecosystems, and also shown that irreconcilable conflicts of interest grow each year with population growth. C. S. Holling and W. C. Clark (Canada) argue for a new science of ecological management/engineering. Applied science traditions in fisheries ecology and insect pest ecology (I would add soil, forest, and wildlife ecology) offer a sound empirical base, and theoretical ecology suggests concepts of ecosystem structure susceptible to management. In particular, Holling and Clark argue for less attention to small perturbations and more study of large ones to develop a better understanding of ecosystem resilience. Such understanding, they feel, offers guidelines for management strategies and environmental design. Altogether, the papers of these last two sessions are responsive to public need, with a sense of competence and responsibility that is a welcome change from the rhetoric of environmental activism.

This first conference of its kind was sponsored by INTECOL (International Association for Ecology), itself formed in 1967 as the section for general ecology in the International Union of Biological Sciences. A second congress is scheduled for 1978.

FREDERICK E. SMITH
Graduate School of Design,
Harvard University,
Cambridge, Massachusetts

Locomotion in Fluid Media

Swimming and Flying in Nature. Proceedings of a symposium, Pasadena, Calif., July 1974. THEODORE Y.-T. WU, CHARLES J. BROKAW, and CHRISTOPHER BRENNEN, Eds. Plenum, New York, 1975. Two volumes. Vol. 1, xxii + pp. 1–422, illus. $39.50. Vol. 2, xvi + pp. 423–1006, illus. $39.50.

Largely as a result of the efforts of Theodore Wu, a large portion of the people currently concerned with the biophysics of locomotion in fluids gathered for the symposium that generated these volumes. For a field as clearly definable as this one proved to be, it is curious that such a meeting had never before occurred; the written record shares with the meeting that uniqueness and from it derives most of its virtues. First among these is illustration of the variety of approaches to a common set of problems—at once impressive, stimulating, and bewildering. Contributions range from moderately quantitative natural history to complex theoretical analyses, from thoughtful reviews to current research re-