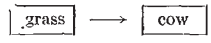
MODEL ECOLOGY

The Ecosystem Concept in Natural Resources Management

Edited by George M. Van Dyne. Pp. xii + 383. (Academic: London and New York, January 1970.) 154*s*.

"An ecosystem results from the integration of all of the living and non-living factors of the environment for a defined segment of space and time." It includes the plants, animals, soil and associated microclimate. Clearly it is a complex system and ecologists are only now learning to describe ecosystems, both in terms of their structure and composition and of their functioning. Utopia lies ahead; if we could understand how ecosystems function and could make not only descriptive models but predictive ones, we could use this concept in managing them. That is, we could apply it to the efficient management of forests, parks, nature reserves, recreational areas, water catchment areas, lakes and rivers, sea fisheries, deer forests, prairies and so on. The models would be based on systems analysis which is a form of magic designed to cover up the uncertainties in our measurements and interpretations and still allow the computer to come up with the (right) answer. Some of us, being a little uncertain of the appropriate incantations to achieve this magic, were hoping to find the answer in this book.

But, in fact, systems analysis is logic, not magic. In a sense it is nothing new, just an organized way of studying the elements of the ecosystem, their states and their relationships with one another. Of course the total complexity of the system must be simplified into a model and the model can be no more precise than the observations and hypotheses on which it is based. The first agricultural author (possibly Virgil) to note that cow eats grass was deriving a simple verbal model from observation. It can also be formulated as



or more precisely as

intake of grass by cows = faeces + urine produced by cows + growth, reproduction and milk produced by cows + respiration by cows

all in some suitable unit such as watts/m²/day.

But it is only in the past ten years that this approach has been used to tackle the complexity of whole ecosystems. It needed ecologists with the confidence to use computers. It needed also some large multidisciplinary studies of ecosystems such as have been especially promoted by the International Biological Programme. This book provides a good review of the present state of progress.

The thirteen authors involved approach different ecosystem problems in different ways. There is no simple or universal recipe for successful modelling. Some chapters, like that on the Canadian IBP prairie project at Matador, describe the approach to be used in a study still very much in progress. Other chapters, such as that by Schultz on the Arctic tundra ecosystem or by Bormann and Likens on the mineral balance of small catchment areas, apply the systems analysis approach to data obtained and formulate hypotheses about ecosystem relationships. Several of the chapters represent a very real synthesis of ecology with traditional management disciplines like forestry, range management and fish and game management.

The treatment is uneven; there is some overlap, and in some cases there is not sufficient information to allow the application of these principles and methods to one's own problems. It is part symposium, part textbook. But if we are to realize the real practical value of ecology, all ecologists should read this book, in spite of its cost and although they may not find all the answers they are looking for.

P. J. Newbould

INSIDE THE EARTH

Phase Transformations and the Earth's Interior

Edited by A. E. Ringwood and D. H. Green. (Proceedings of a Symposium held in Canberra, January 6–10, 1969, by the International Upper Mantle Committee and the Australian Academy of Sciences.) (*Physics of the Earth and Planetary Interiors*, Vol. 3.) Pp. xi + 518. (North-Holland: Amsterdam, 1970.) 280*s*.

This volume will be a delight to the Earth scientist interested in the latest state-of-the-art review of our knowledge about the upper and the lower mantles of the Earth. It suffers from the usual problems of conference proceedings, such as delayed publication (one year in this case), juxtaposition of review papers as well as original contributions in highly specialized fields, and sheer volume (518 journal pages with two columns per page) and the commensurate, high price.

There are five sections which describe the physics of the mantle; phase transformations in the deep mantle; magmas, xenoliths and petrology; petrology of the upper mantle and lower crust and tectonophysics. The first and the last sections have the shortest content seven and six papers, respectively. The other three sections have an average of fifteen papers each. Of these some review papers stand out magnificently for their authors' ability to see "the wood" in spite of "the trees". Among these are Ringwood's 47-page-long article on "Phase Transformations and the Constitution of the Mantle" and Anderson and Sammis's joint paper on "The Composition of the Lower Mantle". No practising or budding Earth scientist can do without these reviews in geophysics. There are also a number of valuable papers summarizing the latest achievements of a particular mathematical experimental technique; among these are Press's paper on the application of the Monte Carlo technique to Earth model building by computers; Kawai *et al.*'s paper on the laboratory techniques to produce static pressures in excess of 300 Kb at 1,200° C. and the separate papers on the petrology of nodules by Kuno and Aoki and by McGregor and Carter. In spite of a strong geochemical flavour, there are enough papers which combine geochemistry, seismology and even theoretical lattice dynamics (O. L. Anderson and Liebermann) to provide a unified picture. Personally, however, I would have liked to see more papers dealing with the solid state aspects of the mantle materials; thermal, electrical and optical properties.

Another interesting inclusion appropriate for such a volume would have been the discussions of papers. As it is, one can only guess at the scintillating comments and ripostes that must have accompanied some of the controversial papers.

It is curious to note that apart from the two valuable papers by O'Hara and Fyfe, there were no other contributions from Great Britain. Surely there are more research groups in Britain that claim to work on the problems of the upper and lower mantle?

Subir Banerjee

ALPINE GEOLOGY

Alpes (Savoie et Dauphiné)

By J. Debelmas *et al.* (Guides Géologiques Régionaux.) Pp. 216. (Masson: Paris, 1970.) 30 francs.

This is the second volume to be published in a planned series of guides to the regional geology of France. Professor Debelmas and his co-authors (H. Arnaud, C. Caron, M. Gidon, Cl. Kerckhove, M. Lemoine and P. Vialon) approach the problem of displaying the geology of the Western Alps by means of itineraries which follow a series of six cross-sections or partial cross-sections roughly normal to the regional strike. The most north-