

## Beyond Tansley's 'ecosystem'

Peter D. Moore

*Grasslands, Systems Analysis and Man.* Edited by A. I. Brey Meyer and G. M. Van Dyne. Pp.950. (Cambridge University Press: 1980.) £65, \$140.

It is now 45 years since A. G. Tansley coined the term 'ecosystem'. The concept of looking at nature as an integrated whole, with intricate connections between its various component parts, both living and non-living, has now been exploited to an extent which is no doubt far beyond Tansley's wildest dream. The limitations of purely mental models have now been cast aside with the advent of sophisticated computer analogues and precise mathematical analysis. Consequently, the work of the International Biological Programme (IBP) has been designed, carried out and assembled using a systems approach to the ecology of various habitats.

The book reviewed here is a further addition to the various syntheses of IBP data which are currently being published and it is concerned with grassland ecosystems. It differs from the previous volume, *Grassland Ecosystems of the World* edited by R. T. Coupland (reviewed in *Nature* 283, 317; 1980), in that it is concerned with seeking a description of common processes within grasslands rather than with surveying the variations within the world's grassland types. It is thus a book in which the systems analysis approach to ecosystem study is fully developed and illustrated. Since it has involved 38 different authors from all over the world, it must have been a headache to edit in order to maintain some uniformity of style and approach.

The book is arranged in three parts. In the first, the total system is analysed into its components — abiotic, autotrophic, small and large herbivore, invertebrate and vertebrate predator, and decomposer subsystems respectively. In the second part, the ecosystem is assembled and such total system processes as nutrient cycling, energy flow and trophic structure are considered. Finally, in Part III, the use of the systems approach in the management and exploitation of grassland ecosystems is discussed.

The general approach of editors and authors has been to begin with a simple, easily conceived, low-resolution model of the various systems and subsystems covered and to develop it and elaborate it as necessary. One danger with this is that the initial model can become oversimplified to the extent that it is no longer helpful. This is the case, for example, in the general ecosystem model presented by Brey Meyer in the Introduction, in which energy and matter

are not separated and both appear to cycle. Hinds and Van Dyne, however, use the same technique very effectively when describing the abiotic subsystem of the grassland ecosystem. Taking water movements, they construct a simple, low-resolution model involving only three components and then expand it to illustrate the complexity of subcomponents within these major divisions and, even more important, the intricacy of likely paths of water movement within such a high-resolution model.

All chapters have strongly developed review components and each is equipped with its own bibliography. Thus, for example, the chapter on the autotrophic subsystem by Singh *et al.* reviews the various models which have been developed to describe the photosynthetic process and its relationship to environmental factors. Particular attention is given to the Waggoner, Chartier and Lommen models of carbon uptake by the leaf.

Among the herbivores, it is evident that there is considerably more information concerning the large herbivores than the small (invertebrates). For the former, a great deal of interesting information is collated, relating not only to energy flow within the large herbivore, but also to

food selectivity on the part of many such grazers.

Ecologists concerned with the practicalities of grassland management, rather than the satisfying symmetry of computer-drawn curves, will also find something to interest them in this book. Data are presented from experimental grazing trials in the USA which examine such subjects as the influence of stock density upon floristic composition.

Overall, the book leaves two lasting impressions. One is the value of the systems analysis approach to understanding processes in the ecosystem. The second is the advantages gained by an international approach to the development of such models for habitats with similar structure and life-form composition. In this way one can proceed beyond the high-resolution, complex model to general statements concerning the function of such an ecosystem and the nature of the global variation upon the general theme. This volume, with its predecessor, Vol. 18 in the series, represents a significant step towards this goal. □

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## Reviews of galactic research

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*Photometry, Kinematics and Dynamics of Galaxies.* Edited by D.S. Evans. Pp. 492. (Department of Astronomy, University of Texas: 1980.) \$16 + postage.

THIS volume reports on a conference that was held in Austin, Texas, in August 1979. The proceedings of the conference communicate the current excitement over 'nearby' galaxies — a field of research (once considered prosaic by many) that has been transformed by a new generation of technology.

Many of the major scientific results that were presented in Austin are in press, or else have already been published. This of course detracts from the usefulness of the conference proceedings, but nevertheless reflects favourably on the scientific importance of the meeting to participants and their co-workers. Of particular interest are papers (by T.X. Thuan and W. Romanishin, and by R.E. Schild and T.C. Weekes) that purport to show that so-called 'cD' galaxies in poor clusters are simply giant ellipticals. Other exciting new results include the detection of a 'thick-disk' component in SO galaxies (by D. Burstein), and the detection of rotation in the bulges of spiral galaxies (by J. Kormendy and G. Illingworth). This latter

finding is in contrast to the (now well-known) non-rotation of elliptical galaxies — a result that is considered at length in this volume. Other topics of extensive discussion include the kinematics of HI and HII in spiral galaxies, and the surface photometry of spirals.

Perhaps the most commendable feature of this volume is the presence of several excellent review papers — by S.E. and K.M. Strom (on the effects of environment on the evolution of elliptical and disk galaxies), by K.C. Freeman (on disk galaxies), by M. Capaccioli (on the kinematics of early-type galaxies) and by J. Kormendy (on component analysis of galaxy luminosity profiles). Two other reviews, on galaxy photometry (by G. de Vaucouleurs and by H. Corwin), provide a historical perspective which may well be instructive to younger astronomers. Though somewhat tersely written, the papers in this compendium maintain an up-to-date and authoritative focus on areas of current interest; all will be of some value to specialists and browsers alike.

*Photometry, Dynamics and Kinematics of Galaxies* can be recommended to all readers with an interest in modern extragalactic astronomy. The editor, D.S. Evans, and contributors are to be commended for making this volume available sufficiently promptly so as to ensure its immediate scientific value. □

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