

Facets of the fern

R.M. Lloyd

The Experimental Biology of Ferns. Edited by A.F. Dyer. Pp.657. (Academic: London, New York and San Francisco, 1979.) £37.50; \$79.

FERNS exhibit all basic phenomena of the life-cycles of vascular plants in a form which is exceptionally suitable for experimental investigation. In spite of their geological age, the group as a whole is in an active state of evolution. Although numerically small relative to the rest of the world's flora, their contribution to our understanding of the physiology of differentiation and development, genetic systems and evolution, cannot be underestimated. This multi-authored book is an attempt to put together in one volume an overview of the ultrastructural, biochemical, physiological and genetical research which has taken place during the past 40 years in experimental pteridology. All significant facets of the fern life-cycle are covered, from meiosis and spore initiation, through gametophyte morphogenesis, gametangial initiation, gametogenesis and the influence of antheridiogens, to sporophyte development, apogamy, biosystematics and experimental ecology. The book is intended to make more biologists aware of the experimental research already completed in ferns as well as their potential for further highly productive research. To facilitate this, all of the authors have quite exceptionally circumscribed the available literature in their

Basic statistical mechanics

P. T. Landsberg

Convexity in the Theory of Lattice Gases. By R. Israel. Pp.167. (Princeton University Press: Princeton, New Jersey, and Guildford, UK, 1979.) £10.40.

By developing a series of theorems of considerable abstractness and generality, the author links together the statistical thermodynamics of lattice gases (for example using models) and the theory of convex domains. The connection between the convexity and homogeneity of thermodynamic functions is considered (a) in a finite system and (b) in the thermodynamic limit when the number of particles n and the volume v of the system both tend to infinity in such a way as to keep their ratio constant.

This book is clearly essential reading for those interested in the modern discussion

respective fields and have stressed not only those aspects which are in need of further work but also the currently prevalent controversial hypotheses.

Contributions of particular note are those by Peter Bell, who discusses the fern life-cycle in the conceptual framework of vascular life-cycles as a whole and presents the case for the cytological control of gametophyte sex as well as the evidence pertaining to the expression of gametophytic and sporophytic genes in spores and zygotes; Ed Klekowski, who summarises much of the evidence in support of his controversial theories on homoeologous chromosome pairing and the genetic system; J.M. Pettitt, who details our relatively meagre knowledge of spore wall structure, morphogenesis and cytochemistry; and Richard White, who effectively perpetuates the opposing arguments on the extent of developmental activity in the shoot and root apical systems. Over half of the text is devoted to research on the gametophyte generation, reflecting accurately the heavy emphasis it has received due, no doubt, to its ease of culture and manipulation. In contrast, modern ecological work in ferns is severely limited and the contribution by Chris Page adamantly exposes the critical need for further work in this area.

As this volume is technical and an excellent literature summary and as it emphasises the current sophistication and problems of experimental pteridology, it will be an important reference book for years, if not decades, to come. I, for one, am extremely pleased that it has appeared.

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of basic statistical mechanics. It requires familiarity with the technical mathematics developed by Ruelle and colleagues. Both the concept of Hausdorff dimension and Banach space are here needed for a discussion of the Gibbs phase rule, which is treated in the sixth and last chapter of the book. New proofs concerning the existence of phase transitions are given in chapter five, by means of a modification of a theorem in pure mathematics about convex sets, which was given in 1963 by E. E. Bishop and R. R. Phelps.

To extract the physical significance of the results beyond the rather general indication given above is difficult, even if adequate space were available in this review. The job of obtaining an intuitive understanding of these detailed results is eased by the masterful Introduction which is provided by A. S. Wightman in 81 pages. Even so, much 'vulgarisation' will have to be done before this topic will find its way into the textbooks. □

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Quantitative electron microscopy

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Introduction to Analytical Electron Microscopy. J.J. Hren, J.I. Goldstein and D.C. Joy. Pp. 601. (Plenum: New York and London, 1979.)

THE history of light optical microscopy has shown a steady progression in the use of methods for obtaining quantitative information about a specimen. Modern high-power microscopes permit measurements of absorption, refractive index, birefringence and so on, as well as morphometry. It is not surprising, therefore, that electron microscopy is following the same trend, but with greater acceleration. During the past 25 years a whole range of *In situ* analytical techniques have been developed, from crystal structure determination by microdiffraction to localised chemical analysis by X-ray excitation and energy-loss spectrometry.

The present volume presents the first comprehensive attempt to bring this battery of research tools to the attention of electron microscopists. It comprises the lectures at a 'Workshop' with the same title which was part of the annual meeting of the Electron Microscopy Society of America in August 1979. The editors succeeded in persuading the 22 co-authors to provide their manuscripts in time for the book to be printed and handed to participants when they arrived in San Antonio. Any editor of a collective work will appreciate the magnitude of this achievement, partly dependent perhaps on the use of a word processor.

We thus have available a complete review of the subject, starting with basic chapters on image formation and the electron optics of the microscope, through the instrumentation and application of the various analytical techniques, to discussion of radiation damage effects and the computer simulation of images. All the authors are expert in their particular fields, so that the numerous references are well selected and up-to-date. As acknowledged by the editors in the preface, such an enterprise undertaken at such a speed has inevitably resulted in a fair number of minor errors both technical and typographical. In view of the value of the product of their labours, however, we may accept the plea that these are 'tolerable imperfections under the circumstances', and wish them the opportunity of a second edition in which they can be corrected. □

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