systematics (with the exception of the work on cytogenetics). This may be because plant evolutionists continue to follow the so-called "synthetic approach," which stresses studies at many different levels of organization from plant community and ecology to cytology and morphology. Although seemingly faultless in conception, the results of this approach have been at the level of survey and correlation and rarely have tested rigorously framed hypotheses. In the present volume, this is clearly evident in the contrast between the papers by many of the botanists and the more disciplined treatments by the breeders and cytogeneticists and several of the zoologists.

In sum, the usefulness of the book is primarily in its substantial amount of current information. But even though polyploids are wonderful natural experiments in gene regulation and interaction, most of the research described does not seem directed toward integrating this field with results in other relevant areas, particularly molecular genetics and development.

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## Plant Physiology

**Plant Membrane Transport**. Current Conceptual Issues. Proceedings of a workshop, Toronto, July 1979. R. M. SPANSWICK, W. J. LUCAS, and J. DAINTY, Eds. Elsevier/North-Holland, New York, 1980. xviii, 670 pp., illus. $73.25. Developments in Plant Biology, vol. 4.

The study of ion transport into plant cells presents considerable problems for the investigator. The presence of a wall and vacuole makes special difficulties for those who want to probe membrane processes. As if this were not sufficient, the cells that have proved most easy to probe electrically—those algae that produce "giant cells"—cannot readily be made to provide large amounts of material, and those cells that can be cultured can only with difficulty be encouraged to give the sort of yield of uniform cells available to the bacteriologist or to the animal physiologist investigating ion transport into blood cells.

This volume presents the proceedings of the fourth international workshop on this subject since 1972. Nearly all the major investigators in the field contributed to the book. Some contributions are ones invited by the organizers, some are confined to two pages and summarize posters, and others are in the fully recorded discussions. The reader therefore has a broad representation of plant membrane studies.

Does the book constitute a good statement about the state of the field? Well frankly, no. The invited contributions vary from reviews to presentations of hitherto unpublished data, and although the contributors were asked to "place special emphasis on problems and issues that deserve attention in future studies" the reader frequently finds that it is difficult to obtain a clear idea of what they are. A good model for the other contributors would have been the excellent review by Walker of the transport systems in charophyte and chlorophyte giant algal cells. It is an admirable attempt to produce some order in what is already known, to indicate technical problems by using experimental data, and to provide a look into the future.

But I have a more fundamental worry. The volumes produced from the first meetings, at Liverpool and Julich, were exciting to read because the Liverpool meeting was the first coordinated expression of ideas that were bubbling to the surface in the early 1970's, and the Julich meeting built on what had been done at Liverpool, producing a comprehensive statement of knowledge. But the present volume has an inward-looking, slightly incestuous air. There are signs that certain concepts, particularly chemiosmosis, are getting dangerously popular. In a chapter entitled "The chemiosmotic viewpoint" Raven and Smith deal with the subject at length, yet in the reported discussion Raven admits to having difficulty in defining what is meant by chemiosmosis. Several other authors refer to the process with even less clarity. There is an atmosphere about the subject reminiscent of that of the 1950's, when there was an obsession with anion respiration. Plant physiologists then paid the penalty of allowing theory to dominate their thinking about ion transport into plant cells and at the same time failed to pay attention to the significant advances that were being made by those working with animal cells. A similar situation could occur again, compounded by the fact that there are relatively few workers in the field and that they use a variety of cellular systems, most of which are difficult to probe. The catalog includes bacteria, a plethora of algae, lower and higher fungi, lower green plants, and some 30 genera of flowering plants from which various cells and organs have been chosen for study. The volume provides little guidance about how we might progress from this situation, particularly biochemically. Control of transport is one of the themes that emerges somewhat tentatively from the volume, but it is unlikely that much more of substance can be said until we have a clearer idea of the molecular nature of the transport processes that are being controlled. As it is, there is still an overemphasis on biophysics in plant membrane transport studies, the bulk of the papers in the volume being so concerned.

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## Visual Adaptations

**The Ecology of Vision**. J. N. LYTHGOE. Clarendon (Oxford University Press), New York, 1979. xii, 244 pp., illus. + plates. $57.20.

It is difficult to imagine two subdisciplines of biology more different from one another than ecology and visual science. The latter has become reductionist in approach and mechanistic in analysis, centering on the eye in isolation, the particular neuron within the visual system, or the particular molecule extracted from the visual cell, whereas the former embraces and celebrates the complexity of the functional connections between organisms. It is clear that animals' interactions with the environment are dependent upon recognition of its salient features and that vision is the dominant sense of many animals, but visual scientists do not offer much help to the ecologist who wishes to know how an animal sees its surroundings. They have attempted quite successfully to analyze visual performance objectively but in the process have created a set of subdisciplines so numerous and arcane that they are almost impenetrable by the novice. Most books purporting to summarize vision are directed toward psychologists and physiologists. The ecologist or natural historian interested in the subject has been largely dependent on Walls's celebrated tome of 1942, *The Vertebrate Eye and Its Adaptive Radiation*. In the ensuing years, our understanding of vision in both vertebrates and invertebrates has advanced considerably. Lythgoe has incorporated some of these advances into his book, and the result is quite successful.

The book is composed of seven chapters. The first summarizes the physical aspects of light on earth, the second visual mechanisms. The remaining five deal with particular kinds of visual situa-