the chapter by P. Bourgaux are particularly bad. This is a useful book, although its lifetime, like that of many other proceedings of meetings, will be limited.

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Algology

Algal Physiology and Biochemistry. W. D. P. STEWART, Ed. University of California Press, Berkeley, 1974. xii, 990 pp., illus. $40. Botanical Monographs, vol. 10.

This is an encyclopedic effort to help people who are interested in algae. In 1962 a book called *The Physiology and Biochemistry of Algae* was published, and it dealt with a great range of subjects—many at a very elementary level. The new book is larger and treats many of the same subjects at a much more specialized and detailed level. The science represented here has grown in both factual content and sophistication so that most of us who are interested in algae will find great value in this book. The students of algal physiology and biochemistry are widely scattered in a geographical sense; their publications are widely scattered in the research literature. Thus Stewart's work in organizing this volume is especially useful. Distinguished practitioners review 32 subjects, including natural-products chemistry, subcellular morphology, processes such as photosynthesis and nitrogen fixation that can be described in biochemical terms, and processes such as morphogenesis and reproduction that are described in physiological terms. The review of algal nitrogen fixation by G. E. Fogg is a marvel in both coverage and style. One wishes that all scientific writings were so well done. Further, one hopes that some of the chemists whose work is described in the early chapters will become interested in the physiological processes described in the later chapters. There are fascinating problems in algal physiology that, like the animal pheromone problems of a decade ago, are just waiting for the attention of the chemists.

By some specially meritorious technique, the editor has kept each of the contributors informed in detail of the contents of companion articles, so there is no overlap. The authors have concentrated on the eukaryotic algae (the blue-green algae are covered in a separate volume of this series). This reviewer's only criticism is of the tendency of some of the articles to read like laundry lists. One can't avoid sorting experimental results into taxonomic categories, but every field worthy of review should have some other unifying concepts that the nonspecialist reader needs to be reminded of.

Each review includes an extensive list of references. It is interesting that in such diverse kinds of science there is a rather consistent ratio of references to text. There is also a rather constant and large proportion of papers cited that have been published since 1970, allowing the conclusion that nearly all the fields in algology represented here have been moving at the same accelerated pace.

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Direct Cell Interactions

Cell Communication. RODY P. COX, Ed. Wiley, New York, 1974. x, 262 pp., illus. $22. Wiley Series in the Dynamics of Cell Biology. A Wiley Biomedical-Health Publication.

The coordination of growth and function of individual cells in animal cell populations requires intercellular communication. Such communication can be either indirect (humoral) or direct. Much attention has been paid to hormonal control mechanisms, but until recently the nature and functions of direct cell-cell interactions were largely unknown.

Direct interactions between cells can be classified into two types. The first type involves a general surface-surface recognition of cells in contact, which has been studied, at least in part, as the functional role of cell adhesion. The second type involves the interaction of cells in contact to form specific intercellular junctions. There are several types of junction, each type having a particular function. One type, the gap junction, appears to be freely permeable to small ions and molecules and can therefore provide a direct pathway of communication between the cytoplasms of coupled cells.

This book is a collection of papers dealing with direct cell interactions. It begins with a brief, clear account by N. B. Gilula of what is known of the structures and possible functions of gap junctions, tight junctions, septate junctions, and desmasomes. Gap junctions have a very characteristic subunit structure and can be isolated with little alteration in morphology for chemical analysis. It is proposed that channels in the gap junctional subunits are the routes of intercellular diffusion of small ions and molecules; the evidence for this correlation is summarized by Gilula.

The permeability properties of intercellular junctions have been investigated by electrophysiological and biochemical methods. Papers by J. D. Sheridan and R. P. Cox *et al.* summarize the information obtained from these complementary approaches, and Sheridan (surprisingly the only author to do so) attempts to explain control in a number of biological systems in terms of the known features of junctional communication.

The factors that govern the specificity of synapse formation are unknown, but a form of cell communication must be involved at some stage. G. D. Fischbach reviews the various stages that lead to the formation of the neuromuscular junctions, including the "recognition" stage, which precedes the onset of chemical transmission. Low-resistance junctions (gap junctions) have been detected between nerve and muscle cells, but as yet there is no definitive evidence to implicate them in the recognition process.

Other chapters include a qualitative examination of cell interactions in the skin, a thorough and useful review of contact inhibition of cell locomotion by A. Harris, and an article on cell interactions in the immune response. The remaining authors, unfortunately, have not examined their specialties in terms of cell communication.

This is the first book to try to deal specifically with the new and fascinating problems of direct intercellular communication. The selection of contributions from a range of fields that might be expected to contribute to a better understanding of these problems was clearly made with good intentions. But, as is often the case in multiauthor volumes, not all contributors responded to the challenge.

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Strategies of Prey

Defence in Animals. A Survey of Anti-Predator Defences. M. EDMUNDS. Longman, New York, 1974. xviii, 358 pp. + plates. Paper, $14.50. A Longman Text.

Since the patterns of color, form, and behavior used in avoiding predation reach their greatest diversity in the tropics, it is fitting that a book on predator defense be written by a tropical biologist. Malcolm Edmunds, for 10 years at the University of Ghana, draws extensively upon his African

experience in writing this book and includes many of his own photographs among the excellent color plates. From these and the text, one gets a good impression of the nature of both cryptic and aposematic (warning) coloration. Other aspects of predator defense from anachoresis (hole dwelling) to thanatosis (death feigning) are also extensively covered.

In spite of these merits, however, the book must rate as a disappointment. This is too bad because it had available a clear niche as successor to H. B. Cott's *Adaptive Coloration in Animals* published in 1940. Edmunds does review much of the information accumulated in the last 35 years, but by and large he fails to place it in ecological and evolutionary perspective and fails to indicate the relevance of his subject to recent advances in evolutionary theory. A good example is his discussion of "chemical ecology," the study of the synthesis of various noxious or poisonous chemicals by plants and their subsequent incorporation by herbivores. Edmunds adopts the current argument that many herbivores incorporating these substances are protected from predation by aposematic coloration. Indeed this may be the case, but there remains the fundamental question of how the system evolves when a predator, while learning to avoid a noxious prey, still kills its first intended victim (as in the case of blue jays which swallow and then vomit monarch butterflies or their caterpillars). As Edmunds indicates, one solution is automimicry as suggested by Brower; but there are also obvious issues of kin selection, and these are never mentioned. In fact Edmunds himself falls back on a naive group selectionist argument involving "benefit" to the species. Group selectionist statements of this sort are scattered throughout the book, and discussion of the current ferment over kin selection, group selection, and the evolution of parenthood and social groups is conspicuously absent in spite of obvious relevance.

The book also has other faults. Throughout the author reduces every experimental design to its simplest chi-square, frequently misleadingly and sometimes incorrectly. He leaves one with the feeling that he believes that if one can do a chi-square one can do quantitative ecology; in fact, he virtually says as much in the preface. As a result the book imparts quite misleading notions about experimental design. In some cases Edmunds also falls into the "inflated N" trap of testing for differences between frequencies of prey items taken when in fact the sample is the predators. Finally, there is only superficial mention of the importance of predator behavior as a selective force in spite of a penultimate chapter on the evolution of predator-prey interactions.

Thus a significant opportunity has been missed. For some time we have needed a critical review of our assumptions regarding defense mechanisms and a synthesis of empirical evidence and current evolutionary theory. Regrettably that is still the case.

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