nate enthusiasm for "progress" and "development" has become tempered in this decade by a skeptical questioning of human activities that crowd other species into an ever shrinking corner.

If this is environmentalism, it is a seat-of-the-pants variety—one without inner coherence or biological rationale that may respond to the plight of the endangered condor but plump enthusiastically for the breeder reactor. For all its deficiencies and inconsistencies, however, this erratic environmentalism is a potentially powerful force which, if informed and deepened, can help advance the wise stewardship of our natural heritage in its entirety.

If the concerned environmentalist will actually study this big fat book, he or she will learn much about human affairs in the United States, yesterday and today, as they relate to wildlife conservation. A more probable readership consists of students and professors. With its well-referenced papers and its adequate index, this is an excellent compilation of reviews.

As an overall assessment of wildlife conservation in the United States, however, the book is deficient in critical analysis. While the initiated reader will find shadows of some continuing problems on these pages—the poverty of wildlife habitat on farmland, for example, or the increasing financial pressures on state wildlife agencies—the roots of these problems are not explained. And some fairly recent developments, such as the implications of the principles of island biogeography for the successful functioning of wildlife sanctuaries, are not mentioned. A chapter dealing explicitly with such matters, the current failures and problems, and new challenges and opportunities in wildlife conservation would have identified more clearly some targets for the future.

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The Growth of Fungal Hyphae

Fungal Walls and Hyphal Growth. Papers from a symposium, London, April 1978. J. H. BURNETT and A. P. J. TRINCI, Eds. Cambridge University Press, New York, 1980. x, 418 pp., illus. $57.50. British Mycological Society Symposium 2.

Fungal walls and hyphal growth are the subject of much activity in experimental mycology. It is thus not surprising to find that some of the topics covered in this volume of papers presented at a meeting of the British Mycological Society have also been reviewed recently in other publications, in some instances by the same authors. Such redundancies tend to limit the value of the book for specialists. For nonspecialists, however, the book offers advantages. It is the only recent one devoted exclusively to fungal walls and hyphal growth. The chapters are cross-referenced, and a detailed subject index and an index of names are provided. Most chapters are relatively short, clearly written, and adequately illustrated. The sequential arrangement of chapters is judicious.

The first six chapters are devoted to various aspects of wall structure and growth. The uninitiated will discover, for example, that fungal walls are chemically and physically complex and that the chemical composition of the majority of the fungi is still not known in detail. He or she is also likely to come to the realization that an understanding of wall growth will require the combined efforts of people trained in various disciplines. Both initiated and uninitiated readers will be reminded that protoplasts and temperature-sensitive mutants are important research tools that have too often been neglected.

Chapters 7 through 10 are devoted to chitin synthesis and degradation. This group of chapters is important not only for the demonstration that chitin plays a skeletal function in many fungi but also for the account of the progress that has recently been made with regard to the enzymology and the localization of chitin-synthesizing systems. Thus, chitin synthetase appears in most cases to exist in a zymogen form that requires partial proteolysis for activation. Microvesicular structures called chitosomes, originally discovered in *Mucor rouxii*, have now been isolated from a variety of fungi. These chitosomes seem to play the role of carriers of zymogen molecules, transporting them to the cell surface, where chitin microfibrils are synthesized and assembled. Progress is also recorded in the case of the mechanism of chitin synthesis taking place during stipe elongation in *Coprinus cinereus*.

The inclusion of three chapters on enzymes hydrolyzing wall polymers is appropriate since many such enzymes have been isolated from fungi and may play an indispensable role in wall growth, septation, and differentiation.

The rest of the book is devoted to the possible relationship between membrane transport and hyphal growth and to discussions of the regulation of macromolecular composition, branching, mathematical modeling, and the kinetics of mycelial growth.

The volume has real didactic value, both in its substance and in its technical features, and could well be adopted for advanced mycology and microbiology courses.

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Plant Motility

Physiology of Movements. W. HAUPT and M. E. FEINLEIB, Eds. Springer-Verlag, New York, 1979. xviii, 732 pp., illus. $100. Encyclopedia of Plant Physiology, New Series, vol. 7.

Because early schemes of classification typically categorized every living thing that is not an animal as a plant, botanists have traditionally had a wide range of organisms with which to explore the physiology of movements; gliding bacteria, flagellated algae, and amoeboid slime molds have shared attention equally with seedlings bending toward the sun or flowers snapping stylar lobes together when vibrated by insects. Given such diversity it has been possible to select a number of simple organisms specially suited for the study of subcellular actions that many of the "lower" groups share with "true" or vascular plants—for example, cytoplasmic streaming, chloroplast migration and orientation, flagellar beating, nuclear movement, and chromosome separation. Uninhibited by the modern narrowing of taxonomic bounds and enthusiastic about the rewards of comparative physiology, the editors of this volume in the new series of the *Encyclopedia of Plant Physiology* have continued this tradition, allotting only six out of two dozen chapters exclusively to vascular plants. Thus, the book is of far greater interest than the title of the series implies, serving both plant biologists and those who would never consider working on an organism with vascular tissue or even with chlorophyll.

The idea that model systems presenting one or a few cell types are more amenable than higher plants to analysis at the molecular level is reinforced by many of the chapters; indeed, it is a heady experience to compare chapters from the old and new series of the encyclopedia and realize how much progress has been made toward determining mechanisms in simpler systems. However, greater sophistication of approach to higher-plant movements is impressively documented in several chapters, and one wonders if

sometimes research on higher plants fares a little less well simply because it cannot borrow so readily from the developments of zoological and medical science and cannot be so readily intercalated into animal-oriented funding patterns.

In the introductory section, commendable effort has been devoted to sorting out the underlying similarities of different types of movements as well as to emphasizing the contrasting ways in which even quite similar organisms have sometimes evolved mechanisms of movement that are superficially similar. Four chapters are given over to broad considerations of stimulus reception and transduction and to endogenous aspects of movements. In these, useful encouragement to interdisciplinary communication is provided by the discussion of terms and concepts employed by students of different kinds of movements.

However, as one who believes that sensory physiology should not exclude the animal kingdom, I note that an attempt by the editors and some of the authors to encourage the standard use of "perception" to indicate the act of stimulus reception does not aid the biologist of comparative bent. Shropshire, in an introductory chapter entitled "Stimulus and perception," states that "the term perception . . . in the strictest sense is inappropriate to use . . . for all botanical systems"; in fact it is precisely defined in the zoological literature (as well as in general dictionaries) to mean the recognition of a signal or set of signals at a conscious or at least neurologically complex level. "Reception" should not be uprooted as a valid term for the elementary act of receiving sensory information.

Most of the authors have done an outstanding job of providing broad perspective and critical analysis. Therefore many of the papers should prove valuable as material for the classroom. For example, I will find immediate use for the papers by Raschke on stomata and by Satter on nastic leaf movements in my undergraduate course on plant biology because both are written in lively fashion and provide exceptionally thorough and scholarly views of their topics. The numerous papers on actomyosin- or microtubule-based movements, or any kinds of flagellar movement, or movements initiated or modified by light would be equally useful for students.

Almost any reader is bound to find some things to disagree with in a book covering such a wide range of topics that are still so incompletely explored, but this simply reflects the state of research on plant movements. The wealth of information, up-to-the-minute structuring of ideas, and variety of opinions expressed in the volume are bound to elicit in almost everyone a sense of excitement about plant movements and quite a few ideas for experimentation.

Physiology of Movements is equally useful for browsing or for cover-to-cover study. It is indeed encyclopedic rather than conglomeratic. Like its still useful predecessor in the old series, it will long remain an outstanding guide to the stage of historical development it covers.

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Hormones in Vitro

Hormones and Cell Culture. Papers from a conference, Cold Spring Harbor, N.Y., Aug. 1978. GORDON H. SATO and RUSSELL ROSS, Eds. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1979. In two volumes. xlii, 982 pp., illus. $95. Cold Spring Harbor Conferences on Cell Proliferation, vol. 6.

My dictionary defines a hormone as a substance found in some organ of the body and carried by a body fluid to another organ or tissue, where it has a specific regulatory effect. Hormonal regulatory functions thus presumably are played out only in a whole body. Cell culture frees the cells of the body from such distinctions as internal and external, tissue and organ, and makes them all equally accessible to experimental manipulation of their capacities to grow and to differentiate. For hormone physiology, what cell culture gives in convenience it takes in relevance: how can a hormone be defined without a body? In recent years, however, a convergence of the two lines of inquiry has come about as a result of the demonstration that serum, the stuff put in culture medium to get cells to grow, can be replaced in many cases by a mix of factors so like the hormones of classic physiology as to render their differences from such hormones merely semantic.

This convergence has had some of the awkwardness of battlefield armistices. In this two-volume set we see that, although the convergence has not been welcomed by all, the new territory formed from pieces of the old fields of growth factors, hormone receptors, endocrine cell culture, polypeptide and steroid hormone physiology, and of course cancer is quite secure. One founder surely must be the late Gordon Tompkins, and it is fitting that the editors have dedicated the volumes to him and graced them with warm personal recollections.

The volumes are well put together and are worth the price. The research of the editors provides the basis for the organization of the 63 papers in the book. Ross has pioneered in the purification of a growth factor from platelets that renders serum more mitogenic than plasma and presumably permits a scar to neatly form in a wound. Sato has shown that many cell lines can grow without any serum at all, provided a mixture of hormones is added to an otherwise simple mix of nutrients. Thus it is not surprising that the collection is an exhaustive reference on the properties and isolation protocols of growth factors. Of 12 sections, three are devoted to the characterization of polypeptide growth hormones and one to steroid hormones. The standouts in these sections are papers by Ross *et al.* on platelet-derived growth factors, by Todaro *et al.* on growth factors produced by tumors and transformed cells, and by Serrero, McClure, and Sato on the defined media for 3T3 fibroblasts.

The remaining chapters fall into two classes, those that deal with general and those that deal with specific systems. The former are probably the more provocative. Certainly the chapters on the cell cycle, differentiation, transport, and cell shape are packed with exciting ideas, and the authors are unlikely ever to find themselves writing papers in the same book again. I especially liked the paper by Pardee, Shilo, and Koch on cell synchronization, in which they argue convincingly against the need to hypothesize a stochastic event in the cell cycle.

In the chapters on specialized systems either single hormones or single cell types are described in great detail. In one such chapter protease plasminogen activator is shown to be under regulation by many hormones in situ and in culture, and in another hormone receptors are discussed, albeit in the unusual context of localization rather than regulation. Here, a paper by Roth *et al.* on disorders of receptor design is a superb review of one of the most dramatic convergences of molecular biology and medicine, the insulin-resistant diabetes that results from auto-antibody to insulin receptor.

Compared with other volumes in this series, *Hormones and Cell Culture* is rather more diffuse and less biochemical. Considering the choice of subjects this is