sional paleontologist. This book presents information for both groups, prepared by a physicist whose interest in optics and whose love for trilobites are both abundantly reflected.

Introductory chapters provide an overview of trilobite morphology, and a short appendix discusses the author's photographic techniques as well as some problems of specimen preparation, but the meat of this book is the 150 pages of trilobite photographs.

As the author admits, the selection of illustrations was made more for esthetic than for scientific reasons. They represent materials from his personal collection, specimens photographed on visits to a few museums with large trilobite collections, and unusual specimens or morphologies the photographs of which were obtained from paleontologists working on trilobites. Photographs made with various techniques, often of the same specimen, illustrate the values and limitations of the techniques.

For the paleontologist, the book assembles a variety of photographs of generally complete trilobites of many ages. The coverage of trilobite groups is neither complete nor balanced. Furthermore, photographs that are esthetically pleasing are not necessarily scientifically useful. Nevertheless, there are many fine photographs in the book, and an imaginative teacher could use it to effectively introduce students to many aspects of trilobite morphology. A section on the structure of trilobite eyes and the physics of trilobite vision is excellently illustrated, and its detail reflects the author's special interest in this subject. This is perhaps the most scientifically valuable part of the book. In addition, there are many x-ray photographs of trilobites showing rarely preserved appendages and some fine photographs of complete Middle Cambrian trilobites discovered by the author in eastern Newfoundland and previously unreported from North America.

For the amateur, the illustrations provide a good indication of the range of trilobite morphologies and a good cross section of the kinds of trilobites most likely to be encountered in major trilobite collecting areas.

There are only a few technical errors, of concern only to specialists, and hardly any errors of typography. Although the book is of limited scientific interest, it is an attractive conversation piece for trilobite-lovers and a good introduction to trilobites for the nonspecialist and for the creative teacher of paleontology.

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Lipids in Fungi

Fungal Lipid Biochemistry. Distribution and Metabolism. JOHN D. WEETE with contributions by Darrell J. Weber and William M. Hess. Plenum, New York, 1974. xiv, 394 pp., illus. $25. Monographs in Lipid Research, vol. 1.

The biochemistry of fungal lipids is one of the more diffuse areas of biochemistry. Biochemical research on fungi consists of many diverse efforts and has not focused on phylogenetic and comparative themes. The yeast *Saccharomyces cerevisiae* and the ascomycete *Neurospora crassa* are probably the two fungal organisms that have had the most sustained biochemical research history, and work on them has left a vast number of research fragments to be consolidated. This book provides a much-needed ordering of the literature on fungal lipid biochemistry. Weete has organized the volume around the structural classes of lipids, and for each class analytical biochemistry, biosynthesis, and phylogenetic relationships are discussed.

The first section of the book is an introduction to fungal lipids. The total lipid content of many fungi is reviewed along with the occurrence of lipids in characteristic fungal structures, such as vegetative hyphae, yeast cells, and spores. Brief surveys of the effects of such cultural conditions as temperature, *p*H, carbon source, and inorganic nutrients make it clear that few generalizations can be expected concerning the environmental factors governing fungal lipid metabolism. Section 1 also introduces the subject of the subcellular location and function of lipids as related to their composition and metabolism. Concern with these relationships is maintained in the more detailed discussions of the specific classes of lipids and is a welcome feature of the volume.

Section 2 is based on a detailed review of the literature concerning the composition and metabolism of the following major lipid classes: aliphatic hydrocarbons, fatty acids, sterols, acylglycerides, phosphoglycerides, and sphingolipids.

The chapter on aliphatic hydrocarbons relates the discovery of these compounds in fungal spores to their postulated function in the spore wall or coat. The author cautions against such an interpretation since scanning electron micrographs show that the spore surface does not change after extraction with organic solvents and freeze-etch replicas of spore walls have not revealed a discrete cuticular layer similar to the waxy coating of plants. The discussion is illustrated with both freeze-etch and scanning electron micrographs of spore surfaces.

The chapters that follow on the occurrence, distribution, and biosynthesis of fatty acids and sterols are the strongest presentations in the book. They provide complete and lucid descriptions of the biochemistry of fatty acid biosynthesis and degradation and relate the major classical concepts in the study of fatty acid metabolism in plant and animal systems to the fungi. The discussion draws heavily on the literature concerning the higher plant and yeast systems in order to provide a coherent format.

The chapter on the distribution of fungal sterols consolidates many new data provided by the application of gas chromatography and mass spectrometry to analysis of fungal lipids. As in the chapters on fatty acid biosynthesis, a very complete discussion of both classical and current concepts of sterol biosynthesis is accomplished through the use of plant and animal models to fill in gaps in the research on fungi. The review of sterol biochemistry is highlighted by a discussion of the phylogenetic implications of sterol distribution and biosynthesis. Plants, fungi, and animals are compared with respect to such parameters as the ability to synthesize major sterols by alternate routes, primary cyclic intermediates (lanosterol and cycloartenol), and the stereochemistry of the desaturation of the $\Delta 22$ position and nuclear double bond shifts such as the $\Delta 8 \rightarrow \Delta 7$.

The final two chapters of the book summarize current concepts of the physiology and concomitant ultrastructure pertinent to sporogenesis, with emphasis on lipid metabolism. The physiology is summarized well, but ultrastructure is described primarily in words and is not represented by an adequate number of electron micrographs. Only one thin-section micrograph is presented. The use of scanning electron micrographs and freeze-etch replicas is certainly interesting, but the vast majority of ultrastructural research in fungi has been done with thin-section transmission micrographs, and these would provide the reader with a familiar base from which to interpret SEM and freeze-etch data. Thin-section micrographs of membranous cellular components would certainly enhance discussions of relationships of structural lipids such as sterols and phosphoglycerides.

The book will be valuable to all researchers concerned with fungi and their metabolism. The clear discussions of the relevant general biochemical concepts provide good background for researchers working in closely allied fields such as plant pathology. The book succeeds in placing the many fragments of research on fungal lipids in a framework of classical and current concepts in lipid biochemistry.

It will certainly guide researchers to areas where sufficient understanding is lacking and provide the overview necessary for the integration of new research findings into the broader understanding of the fungi.

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Nonhistone Proteins

Acidic Proteins of the Nucleus. IVAN L. CAMERON and JAMES R. JETER, JR., Eds. Academic Press, New York, 1974. xvi, 346 pp., illus. $28.50. Cell Biology.

Stimulated by discoveries that histones are phylogenetically very stable proteins lacking both the specificity and the heterogeneity expected from gene regulatory macromolecules, the attention of many investigators turned to another family of nuclear proteins—the acidic proteins, or perhaps more correctly, the nonhistone protein components of chromatin and chromosomes. This poorly defined group seems to hold answers to the paramount questions of cell growth, proliferation, and differentiation. Although many of the nonhistone proteins may serve only simple functions and, like the histones, fail the crucial tests of specificity required for the sophisticated game of selective gene activation and restriction, it can be expected that at least some of the proteinaceous components of chromatin and the cell nucleus will prove to be true regulators of genetic activity. This optimistic expectation runs like the thread of Ariadne through *Acidic Proteins of the Nucleus.*

With minor exceptions, the individual chapters cover their topics clearly and comprehensively. The presentation flows logically from accounts of the methods for isolation and characterization of chromosomal nonhistone proteins through discussion of their in vivo modifications and biosynthesis to a more speculative finale concerning their roles in selective regulation of the eukaryotic genome and gene activation via hormonal interactions.

In the opening chapter, V. G. Allfrey presents a skillful discussion of the biochemical mechanisms by which individual genes may be regulated in higher organisms. He draws attention to gene regulatory proteins in prokaryotes as indicating a promising direction for research into the existence of functionally specific proteins with affinity for DNA in eukaryotic chromosomes. In the next chapter, G. L. Patel presents an extensive account of the isolation and fractionation procedures used by various investigators to characterize nuclear proteins. A logical extension of this chapter is a detailed critique of nuclear protein extraction procedures, especially of those using buffered aqueous phenol solutions. Subsequent authors (W. M. LeStourgeon and W. Wray) present evidence that phenol extraction procedures may be no more detrimental to numerous proteins than is exposure to more conventional solvents, such as high salt and urea solutions.

The next two chapters deal with the phosphorylation of nuclear nonhistone proteins in vivo. L. J. Kleinsmith, who, with several of his colleagues at the Rockefeller University, first pointed out the importance of nuclear phosphorylation, describes the many interesting features of these macromolecules, together with the properties of the enzymes (phosphoprotein kinases) responsible for their phosphorylation in vivo. An analysis of nuclear phosphoproteins in *Physarum polycephalum* is presented by B. E. Magun.

The third group of papers deals with chromosomal nonhistone proteins during cellular growth and differentiation. Drawing on their experience with *Physarum* and other cells, W. M. LeStourgeon, R. Totten, and A. Foer describe their discovery of contractile proteins in isolated nuclei and chromatin and aptly tie this description into more general discussion of nonhistone protein changes in differentiating cells. Special advantages that polytene chromosomes offer for structural and functional studies on chromosomal proteins are reviewed in detail by H. D. Berendes and P. J. Helmsing. The last chapter in this group is an excellent discussion of nuclear nonhistone proteins during the temporal flow of the cell cycle by Jeter and Cameron, the editors of the book.

The last two articles attempt the difficult task of implicating chromosomal nonhistone proteins in specific gene regulatory functions. T. C. Spelsberg lends his expertise in steroid hormones and chromatin biochemistry to guide the reader through the difficult and sometimes controversial experiments of various investigators who have attempted to unravel the mechanisms by which steroid hormones activate the transcription of selected genes in target cells. Although definite answers are still wanting, the experiments discussed point to the chromosomal nonhistone proteins as mediators of the biological actions of steroid hormones. The book ends with a discussion of some special properties of the nonhistone proteins by R. S. Gilmour. He shows that these macromolecules are essential for the ordered expression of genes and for the transcriptional specificity of chromatin.

This is a well-written, lucid book summarizing the knowledge of chromosomal nonhistone proteins up to about the end of 1972. Although *Physarum* receives perhaps more than its share of attention, other model systems are discussed, and students of the cell nucleus and its proteins will find this book a valuable if not essential addition to their libraries.

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