nesium in the precipitation are sufficient to account for the accumulation in the annual growth of the moss carpet, but vascular plant material is clearly an important source of nutrients in the bog. Rosswall and Granhall discuss the nitrogen cycle. Nitrification and dentrification are absent or negligible. Total input amounts to 0.42 gram per square meter per year; biological fixation is responsible for about half of this (0.20 gram per square meter). Low mineralization rates and large spatial heterogeneity complicate the analysis of the nitrogen cycle.

Other chapters deal with such topics as factors controlling plant distribution, sampling problems, growth of vascular plants and *Sphagnum* species, and carbon dioxide and methane fluxes. The volume does not contain the results of all studies carried out as part of the Stordalen project. The appended list of previous publications is helpful in locating the results of studies that are omitted here. An excellent subject index is included. Unfortunately, the photographs are not printed on glossy paper, which affects their quality. But these minor problems do not detract from the value of this volume as a source of information on processes and conditions in a subarctic peat bog.

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Plant Cells

The Biochemistry of Plants. A Comprehensive Treatise. Vol. 1, The Plant Cell. N. E. TOLBERT, Ed. Academic Press, New York, 1980. xvi, 706 pp., illus. $65.

This volume is the first volume of an ambitious eight-volume treatise on plant biochemistry. These multiauthored volumes are intended to provide current information to people working on plants and to inspire students and workers in other fields with the fascinating problems provided by plant material. The present volume deals with the plant cell compartments and organelles, as well as with two special topics, plant tissue culture and cyanobacteria. The objective of providing information is clearly fulfilled, but inspiration, or even integration of the material, is scarce. The chapters review the techniques and current data in the field, and the quality of many of them is high. There is, however, a missing chapter: an introduction discussing the basic life strategy differences between plants and animals, which would set in context the role of the cell wall, the vacuole, and other plant features discussed in this and subsequent volumes. The inattention to the teaching function the book could have served is unfortunate. There seems to be a growing awareness of plant biology among cell and molecular biologists, and there is a need for basic information about plants combined with surveys of the current data. Also, as a plant chauvinist, I was disappointed that there is very little of the "gee whiz" biology of plants, the kind of information that makes you want to understand how a snow-covered skunk cabbage spadix heats up to 105°F and thus leads you into a study of alternate respiratory pathways.

The best chapters in the book equal or excel those found in typical collections. The general structure of the plant cell, one aspect of the introduction to plants that is provided, is presented in a well-illustrated chapter by Newcomb. Some of the unsolved problems of plant cell structure, such as how cellulose deposition is organized, are thoughtfully reviewed. The cell wall is the subject of another excellent chapter, by Darvill, McNeil, Albersheim, and Delmer, in which the goals and strategies for studying the wall are detailed before the chemistry and organization of the wall constituents are introduced. The cell wall is a challenging problem in cell biology and chemistry, the more so as we realize that pathogens as well as symbionts interact with wall constituents in host recognition.

Other valuable chapters are devoted to well-defined subjects such as the vacuole, microbodies, endoplasmic reticulum, cyanobacteria, protein bodies, and the Golgi apparatus. Comparison is made in these chapters between the role of specific organelles in plants and animals, and pertinent data on function, isolation, and biochemical constituents are presented. A great deal of information missing from standard biochemistry and cell biology textbooks is presented.

Subjects such as the plastids, mitochondria, and nucleus receive less successful treatment. A chapter on the development, inheritance, and evolution of the organelles contains an admirable attempt to discuss the diversity of plastid forms found in blue-green algae, algae, protists, and higher plants. However, the chapter is a highly selective overview of the subject and relies heavily on the author's favorite organism, *Euglena*. The inheritance of plants and what is known of their genetics are better discussed in two recent books, Grun's *Cytoplasmic Genetics and Evolution* and Gillham's *Organelle Heredity*. Because so much is known about plastid biochemistry, the chapters here are really just an outline of material to be covered in entire volumes on photosynthesis, carbohydrates, and lipids. Despite the important advances in the understanding of the transport of proteins into plastids and mitochondria and the interesting regulatory issues such transport poses, very little information is provided on the subject. Only two pages are devoted to protein synthesis in the chloroplast, and protein and nucleic acid synthesis in mitochondria are not discussed at all. None of the current molecular dissection of organelle genomes is described.

A long chapter on the plant nucleus provides a useful review of nuclear structure and chromosome behavior during mitosis and meiosis. However, the reviews of genome organization and transcription in eukaryotes are out of date and not critical. Little information is given on plants and too few of the interesting phenomena found in plants are mentioned. The tolerance of plants for monosomy, trisomy, aneuploidy, polyploidy, and other chromosomal changes is not discussed. Interesting tools for studying chromosomes, for example the chromosome addition lines and existing mutants of chromosome function in maize, are not mentioned.

The book does cover all of the subcellular structures of plant cells. The format and reproduction of photographs are of unusually high quality, so the material is easy to read, and this single volume covers material on plants that is unlikely to be found in textbooks. It is a very good reference work, but only a few of the chapters really engage a reader's attention.

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Pulsating Stars

Theory of Stellar Pulsation. JOHN P. COX. Princeton University Press, Princeton, N.J., 1980. xiv, 382 pp., illus. Cloth, $40; paper, $13.50. Princeton Series in Astrophysics.

Pulsating stars play an important role in astronomy because some of them serve to determine the distance scale of the universe. Even more important, perhaps, the study of the pulsations of a star permits the probing of its interior.

For more than 20 years, the article by

P. Ledoux and Th. Walraven in the *Handbuch der Physik* has been the standard reference in this field. Much progress has naturally been made since that article was written, for instance on the crucial issue of identifying instability mechanisms, and the astrophysical community was feeling an increasing need for an up-to-date review like the Ledoux and Walraven article.

Part of this need was filled by the excellent monograph *Nonradial Oscillations of Stars* by Unno, Osaki, Ando, and Shibahashi (University of Tokyo Press, 1979). That book is, however, restricted to nonradial oscillations and concentrates on the work done by the authors. John Cox's book encompasses the whole subject, with more than half devoted to radial oscillations. His approach is different, too; he is so careful in quoting everybody's contribution (his reference list totals a thousand entries) that his own contributions barely get the credit they deserve.

The treatment of radial oscillations is thorough and clarifies many fuzzy points, such as the differences between Eulerian and Lagrangian formulations, the evaluation of the stability coefficient through integral methods, and the cause of the phase lag between the light and velocity curves of the Cepheid variables. One can only regret that too little space is allotted to nonlinear theory, which governs pulsational amplitudes and mode selection and must therefore be invoked when confronting theory and observations.

Research on nonradial oscillations has expanded considerably since Ledoux and Walraven wrote, and Cox gives a well-documented account of its present state. It is natural that such an account reflect the personal preferences of the author; this probably explains why solar oscillations get a rather small share of attention. But the treatment as a whole is gratifying, and the reader will undoubtedly enjoy the illuminating discussion of many delicate questions, such as how to classify the oscillatory modes for the so-called complicated stellar models.

In the introduction, Cox explains that the book originated from a graduate course that he has taught. Yet his intent was to write not a textbook but a treatise that would be "of greatest use to students and research workers in this and related fields." One can be sure that this goal is achieved and that *Theory of Stellar Pulsation* will soon become an indispensable tool for such readers.

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