alcohols and carbonyl compounds, terpenoids and steroids, flavonoids and related compounds, amino acids and proteins, nucleic acids and derivatives, alkaloids, porphyrins, and miscellaneous nitrogen and sulfur compounds. Various classes of compounds and literature references to recent work are well covered.

A considerable portion of the book consists of very large structural formulas. These will be useful to the student, but it is regrettable that more space was not given to an additional discussion of the compounds. The formulas are misleading in many instances because carbon-carbon bond distances and configurations are often not accurately represented. Several complex metabolic pathways are diagrammed in a style not as clear as that generally provided by published charts. Occasionally sweeping general statements, to which exceptions can be taken, are made.

The discussion of the role of flavonoids in the physiology of sexual reproduction in algae does not include citation to the critiques. The newer spectrophotometric developments which have now replaced the direct-vision spectroscope, especially for in vivo examination of the porphyrins, are not mentioned.

A useful summary of the naturally occurring organic compounds in higher plants is provided for investigators in various fields of botany, pharmaceutical chemistry, organic chemistry, and biochemistry.

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Natural Products Chemistry

Les Cyclitols. Chimie, biochimie, biologie. Théodore Posternak. Hermann, Paris, 1962. 491 pp. Illus. Paper, NF. 48.

Under the editorship of Edgar Lederer, the Hermann Press has undertaken an ambitious program of publishing, in the French language, a series devoted to the chemistry of natural products. This is the third book in the series, and it is concerned with nearly everything that is known about the chemistry and biology of the cyclitols and their derivatives.

The most common of the cyclitols are the inositols, and the author of this book, Théodore Posternak, has been active in research on the chemistry and biochemistry of these substances for most of his scientific career. Certainly few people have the same intimate knowledge of or feeling for the subject.

Now, what kind of a book is this? First, it is comprehensive. The section on chemistry goes into great detail, citing reaction after reaction, often with melting points and optical rotations of the products. Occasionally, detailed experimental procedure is given: for example, methods of chromatography; chemical and biological assays for myo-inositol; and, of questionable value, directions for the hydrolysis of phytic acid. Thus, in some respects, this is a handbook, and the almost 1300 literature references are particularly valuable as a guide to original sources.

Second, I think it is fair to say that this book is not "modern" in its treatment. The author does give considerable attention in the first chapter to conformation analysis and its applicability to the cyclitols, but the main emphasis is on systematic description, not reaction mechanism.

Such a sizable undertaking by one person has both advantages and disadvantages. On the credit side, it must be admitted that the book has a definite personality, which is highly refreshing in this day of fragmented authorship (and responsibility). As an example, I can refer to the manner in which Posternak deals with the troublesome problems of nomenclature, and his amusing defense for retaining the name meso-inositol in the face of a general movement in the Anglo-Saxon world toward the name myo-inositol.

The disadvantages are that the size of the job, the problem of rewriting, and the time required in getting to press have meant that the literature is integrated, in the main, only through 1958. To compensate, the author has thoughtfully included an addendum to cover the literature to 1961. The last 5 years have seen rapid advances in our knowledge of the biochemistry of inositols, and it is in this section that an informed reader will realize the material was badly out-of-date on the day of its publication.

Technically, the book is not printed or bound well. It has a soft cover, and some of the pages already were coming out of the copy received for review. The many figures are generally satisfactory, but the printing is so light that some of the numerical subscripts of the formulas are not legible. Some, such as the figure on page 111, are simply confusing; this is the result of an unfortunate arrangement of structural formulas and arrows. The structure of D-erythrose 4-phosphate on page 360 is represented by the formula for D-ribose 5-phosphate.

My conclusion is that although *Les Cyclitols* will have some general use, its greatest value will be to the specialist in cyclitol chemistry, and it will rank as a reference second only to the reviews under the same title that have appeared in two past volumes of *The Advances in Carbohydrate Chemistry.*

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Techniques of Research

Botanical Histochemistry. Principles and practices. William A. Jensen. Freeman, San Francisco, 1962. vii + 408 pp. Illus. $10.

Research in histochemistry has been dominated by those who have worked with animals since the 1920's, and most of the new advances have been made on animal materials. Indeed, only a few workers in plant science have been active in histochemical investigations; therefore, the publication of this book for botanists is fortunate, in as much as it will unquestionably stimulate botanical interest in the field. Plant scientists working in either basic or applied research will find many advantages in the use of microscopic and quantitative histochemical techniques since, by means of these techniques, it is possible to localize, identify, and measure substances and enzymatic activities in cells, tissues, and cell parts.

The first half of the book includes descriptions of equipment used, techniques for preparing tissue, methods of sampling and analyzing tissue, and procedures for isolating cell parts. In all descriptions of equipment, valuable sources of supply are given. The presentation of classical microtechnique is superb, but probably unnecessary, particularly in the case of old nonspecific staining methods, since there are many books on the subject. Methods of preparing tissues by freezing are well described and will also be helpful to workers outside the field of histochemistry—for example those who are inter-

ested in maintaining living cells by freezing.

The last half of the book is devoted to specific microchemical and histochemical methods for locating and determining carbohydrates, proteins, nucleic acids, lipids, minerals, enzymes, and enzymatic activity. The excellent results that can usually be obtained by the complementary use of microchemistry and quantitative histochemistry are emphasized, but limitations, such as those found in the analysis of minerals, are also discussed. The two chapters on enzymes are particularly interesting and worthwhile, and the final chapter is an excellent account of autoradiographic methods. The book is well illustrated throughout.

Both the simplicity and the clarity of this work are to be lauded; but a danger does exist in that some morphologists may oversimplify the biochemical implications and physiologists may get the impression that all morphological problems can be solved by the procedures in this book. However, close cooperation between workers in the two disciplines should terminate in the resolution of such possible obstacles.

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Textbooks of Botany

The Science of Botany. Paul B. Weisz and Melvin S. Fuller. McGraw-Hill, New York, 1962. xi + 557 pp. Illus. $8.95.

Plants: An Introduction to Modern Botany. Victor A. Greulach and J. Edison Adams. Wiley, New York, 1962. xvi + 545 pp. Illus. $7.50.

An Introduction to Plant Biology. Dale C. Braungart and Ross H. Arnett, Jr. Mosby, St. Louis, Mo., 1962. 411 pp. Illus. $11.

A college teacher selecting a textbook of botany, or anyone interested in a volume from which they can learn about plants as subjects of scientific investigation, has a number of choices, among which are the three volumes reviewed here. One, *Plants: An Introduction to Modern Botany* by Greulach and Adams, is planned for use in a one-semester course, or for the semester devoted to botany in a biology course. It is pared to size by omitting the extended treatment of the plant kingdom, but it could be the text for a two-semester course, if supplementary material is used. The other two texts are for two-semester courses at the introductory college level.

Weisz and Fuller's book, *The Science of Botany*, and the one by Greulach and Adams, are new approaches to college botany, both successful and welcome. In both, the newer information, concepts, and insights that have been gained in biological and biochemical research are fully integrated, from the beginning, into the topics covered. In so many textbooks—for example in *An Introduction to Plant Biology* by Braungart and Arnett—DNA and the gibberellins and other "new" topics are discussed, but the conceptual implications of recent advances have not changed their descriptive approach to many topics. In fact, Braungart and Arnett's book is a traditional textbook with the occasional unfortunate twist that plants are made to fit pedagogical categories common to zoological thinking. One example is the paragraph on movement, in which movement is listed as a characteristic for distinguishing living things from nonliving. In an effort to make plants seem alive, movement is discussed without a clear distinction being made between turgor movements and changes in position which result from growth. Their description of plant life histories is printed on green paper, and bound together in a center section. If such a presentation makes it possible to reduce the emphasis on life histories, it may be a desirable innovation; that the histories, as they are usually presented, kill the interest of many students is well known. But an interesting treatment would be a more desirable solution. Unfortunately, the book contains far too many errors, in the text figures and their legends and in the written presentation. It is a harsh but inescapable conclusion, in my opinion, that there are better traditional botany texts.

A word more should be said about the two textbooks with the refreshing, new approach: *Plants: An Introduction to Modern Botany* by Greulach and Adams and *The Science of Botany* by Weisz and Fuller. Greulach and Adams provide (in an appendix) the chemistry that is needed to understand much of modern botany. They discuss the origin of life in the last chapter. Weisz and Fuller start with the origin of life and develop their presentation; they immediately introduce the chemical facts and concepts which they then use throughout the book. It will not be an easy textbook for students, but it should be an interesting one because it is challenging. The six parts of *The Science of Botany* are: The living world; The world of plants; Metabolism; Self-perpetuation: The steady state; Self-perpetuation: Reproduction; Self-perpetuation: Adaptation. The four sections of *Plants: An Introduction to Plant Biology* are: Man and the world of plants; Levels of plant organization; Plants in action; and From generation to generation.

All three texts are well illustrated. Photographs and diagrams are, with very few exceptions, well enough reproduced for a student to easily see what is described. The very excellent, and numerous, explanatory diagrams in Weisz and Fuller merit particular commendation. (Incidentally this is not the Fuller of Fuller and Tippo's well-known text.) Weisz and Fuller quickly make clear complicated botanical and chemical information. Students who have little or no chemistry should be able to understand not only what is known about the physiology of live plants, but also developmental morphology and the role of plants in the scientific world and in man's world. The same "feel" for the plants as biologically and humanistically important is achieved by the approach of Greulach and Adams. This cannot be said with equal force for the book by Braungart and Arnett.

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Marine Mollusks

Marine Molluscan Genera of Western North America. An illustrated key. A. Myra Keen. Stanford University Press, Stanford, Calif., 1963. x + 126 pp. Illus. $4.50.

Although this book is only 126 pages long, it contains diagnostic characters for all the genera of shell-bearing marine mollusks found along the west coast of North America from the Mexican boundary to the Arctic Ocean. The following classes are included—Gastropoda, Pelecypoda, Amphineura, Scaphopoda, and Cephalopoda. Each genus is illustrated with one or more very acceptable line drawings, and the illustrations appear on the same page on