dedicated to erasing Gardner's still valid reproach.

Volume 1 of *The Lower Tertiary Floras of Southern England* commenced with study of Paleocene plant fossils and new collections from the Lower Eocene London Clay. Volume 2 considers Middle Eocene remains from freshwater sediments lying above London Clay in the Hampshire Basin. It concentrates, as will the remaining volumes of the series, on carbonaceous fruits and seeds recently collected by Chandler, rather than on the impressions that attracted pioneer paleobotanists.

The body of the monograph (145 pages) presents detailed systematic descriptions of 86 species in some 64 named genera, representing 40 families (or major sections of families), whose remains have been recovered from the Lower Bagshot Beds. Angiosperms predominate; only two families of ferns and one of gymnosperms are represented. The accompanying 29 plates are of high calibre, and they include over 800 photographs of specimens taken by Chandler herself.

Compared with the London Clay materials, the Bagshot collections are small, the specimens lack fine details of structure, and they are often crushed or damaged: the possibilities for taxonomic determinations are correspondingly rather poor. In view of these circumstances, establishing 22 new species, some on as few as three specimens, most on only a single specimen, seems questionable practice. Seven new species of *Vitis* alone are named, mostly from single examples.

A brief introduction reviews the geology of the plant-bearing sediments and the general characteristics of the flora. Data on the age and stratigraphy of the Bagshot Beds was also provided in volume 1. The physiognomy, habitat, and modern distribution of Lower Bagshot families and genera are summarized on pages 14 through 18. Most of the Lower Bagshot families occur in the London Clay, although seven (Polypodiaceae, Cyperaceae, Capparidaceae, Rosaceae, Thymelaeaceae, Styracaceae, and Caprifoliaceae), are new to the Eocene of Britain. The Lower Bagshot flora reconfirms the presence of Indo-Malayan vegetation in southeast England during the Tertiary. Under the impetus of a stable climate, a tropical-subtropical forest apparently maintained itself in that area for some time.

Volumes 1 and 2 in the current series by Chandler, and doubtless those to come, provide detailed information on Tertiary paleoecology, plant evolution, and migration. Thus they are significant references for paleobotanists as well as for evolutionists and phytogeographers.

JANE GRAY
Paleoecology Laboratory,
Museum of Natural History,
University of Oregon

Stimulus and Behavior

Nerve Cells and Insect Behavior. Kenneth D. Roeder. Harvard University Press, Cambridge, Mass., 1963. xi + 188 pp. Illus. $4.95.

Some of us have been lucky enough to be in a laboratory during a period when we felt, nay, when we *knew*, that a secret of Nature was being unraveled, that new relationships were being discovered and understood. There is an electric tension in the air, an exhilaration, so that the 24 hours in a day are not enough to work, to experiment, to calculate, and we become impatient with our own limitations of energy. This is "contagious excitement," and it can be found in this little book.

Roeder is a careful scholar, a facile writer, but above all, he is an excited scientist, and with his book, he infects the reader with this excitement. This is not surprising, for the central topic with which he deals is of intrinsic interest to all of us, scientists and nonscientists alike. And the source of the excitement is simply this: the students of nerve physiology, animal behavior, animal orientation, and psychology share a growing feeling that a real understanding of the cellular basis of organism behavior may be achieved. We can state this more bluntly: there is promise that we will reach a basic understanding of the workings of the brain.

Roeder does not say this; indeed, in a carefully written chapter (chapter 7, "Discrimination") he shows clearly how far we are from understanding the functioning of a single nerve cell, much less that of an entire nervous system. But, in a thoughtful summation of the different methods of approach and the utilization of new techniques of analysis, he shows the promise that the interplay of knowledge gleaned from different methods of approach may circumvent those gaps in our knowledge which cannot be filled in at the present time. There is extrapolation and speculation here, with which many workers may not agree, but in their proper context they indicate the exciting possibilities.

The title does not indicate the book's scope, for this is not a specialized account of a narrow field of investigation. Indeed, the opening chapter is a brilliant generalization of why biological systems are what they are and the place of stimulus-impulse-behavior relationships as a fundamental biological process. There are particulars and technicalities, of course, but the reader never loses sight of the woods for the trees. For example, details about the morphology of nerve activity, and about the techniques used to measure nerve activity and behavior patterns, are interesting. But the reader is fascinated when he is able to "see" the world through the typanic membrane of the noctuid moth and to understand the moth's behavior as a consequence of its contact with its bat-filled world. And it is important to understand that it is the morphological simplicity of this system which gives the advantage to insect material as an object of study for nerve cell-behavior relationships.

Roeder has written a good book, thoughtful and penetrating, with flashes of humor. It should be educationally rewarding to scientists and nonscientists alike.

TERU HAYASHI
Department of Zoology,
Columbia University

Chemical Botany

The Organic Constituents of Higher Plants. Their chemistry and interrelationships. Trevor Robinson. Burgess, Minneapolis, Minn., 1963. iv + 306 pp. Illus. $6.75.

Higher plants contain a wondrous array of organic compounds. The plant is able to synthesize a much larger and more diverse group of substances than the animal, a fact usually unappreciated by many biologists and chemists. Robinson has surveyed the organic compounds in higher plants with respect to occurrence, isolation, characterization, and metabolic pathways. The following subjects are considered: carbohydrates, water-soluble organic acids, aromatic compounds, saponifiable lipids, miscellaneous unsaponifiable lipids, volatile

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.

H. W. SIEGELMAN
Agricultural Research Service,
U.S. Department of Agriculture

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.*

C. E. BALLOU
Department of Biochemistry,
University of California, Berkeley

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-