sence of odor would cancel the preoccupation with this type of pollution, but life would certainly be much drearier. Those who lose their sense of smell tend to complain bitterly. They can expect little sympathy, however, for clinicians commonly do not regard them as handicapped.

The contribution on vapor pressures and deviations from Raoult's law is most useful. The common practice of blithely assuming the validity of Raoult's law for any solvent-solute pair must be stamped out. The contribution on sampling in airborne odorant analysis is an excellent review, with illustrations. Here, the stress is placed on organoleptic testing, that is, smelling, to follow the progress of instrumental manipulations of such variables as vapor pressure, dissolution, and sorption.

The title of the short article "The stability of emitted odorous compounds in the atmosphere" should have been amended to read "reduced sulfur compounds." The very long paper on laser Raman spectroscopy does not belong (a justification is attempted in the epilog). It may be as prophetic as papers written two decades ago on the combination of gas-liquid chromatography and mass spectrometry, however.

The blurb on the dust jacket loosely states that the book "describes the latest techniques of sampling ambient odors: transmission and scanning electron microscopy, autoradiography, anatomical techniques for tracing central connections, and electrophysiological recording from the olfactory bulb." The items after the colon are not in the book, even if they could be construed as ancillary methods of odor sampling.

Olfactory theories have clearly not been very productive. The inclusion of four odor qualities in the Public Health Service quality/intensity series for use in characterizing diesel exhaust odor, the Turk kit, is interesting, and one wishes that the compositions of the standard solutions had been tabulated here. The relation between intensity and stimulus strength is studied most. The more applications-oriented contributors hew to the classical notion that odor intensity is a logarithmic function of odorant concentration. The psychologists, instead, embrace the Stevens power law concept. All agree, however, on the capriciousness of human subjects and the difficulty of obtaining suitably quantitative data.

DON TUCKER
Department of Biological Science, Florida State University, Tallahassee

Variables in Sexuality

Reproductive Behavior. Proceedings of a conference, Beaverton, Ore., July 1973. WILLIAM MONTAGNA and WILLIAM A. SADLER, Eds. Plenum, New York, 1974. viii, 376 pp., illus. $26. Advances in Behavioral Biology, vol. 11.

An impatient reader of a mystery novel reads the last chapter first to see how the story ends. This volume should be approached in the same way. In the last chapter Frank Beach claims that human sexuality has only a distant relationship to mating behavior of other species. The important concept presented by Beach is that the development of male and female reproductive characteristics should be considered separately from masculine-feminine differences. The point being made which sets the scene for the remainder of the volume is that, although a great deal about the biology of reproduction in terms of anatomy, physiology, and behavior can be learned by studying nonhuman species and much of this information is transferable to man, when the epigenesis of masculinity and femininity is examined the complex cultural and developmental history of each sex or each individual must be considered.

The material that precedes Beach's chapter focuses on the description and explanation of physiological and behavioral interactions and does not deal directly with human masculinity and femininity. Little attempt is made to interpret research findings. Perhaps discoveries are being made more quickly than they can be synthesized to provide a more complete understanding of the physiological bases and ecological significance of reproductive behavior.

Most authors describe research findings from their own laboratories and only to a minor degree integrate their research with previous work. Owing to the excellent selection of authors, many of the significant findings during the past five years in reproductive behavior are presented. We learn, for example, that development of male and female fetuses in close proximity in the uterus of the rat can result in increased masculine traits in the females. When only one fetus at a time is gestated, as in the rhesus monkey, the development of sexual behavior may be influenced by endogenous levels of gonadal hormones, particularly the ratio between testosterone and progesterone in the fetal circulation. Recent advances in knowledge about internal and external chemical signals influencing reproductive behavior of the adult are described with a wealth of tabular and graphic material, some of it presented for the first time. The treatment of this material is uneven. A few chapters are brief and almost breezy, and others present a thorough description of a body of research. Two of the authors, Howard Moltz and Norman Adler, broke from the pack and attempted to more thoroughly integrate their research with other developments. Both succeeded. Their chapters reveal a dominant theme in recent research on reproductive behavior, namely, the interrelatedness of environmental, hormonal, neural, and behavioral events. Moltz shows how coordination between the mother and infant rat is achieved largely through chemical signals, and Adler in a superb chapter reveals how behavior can influence many parameters of reproductive physiology.

This volume is not an encyclopedic review of reproductive behavior, but, as a volume in a series reporting on advances should, it presents the important findings of the past few years in the field. In addition, many of the findings reported in the volume suggest new research leads, and perhaps the next "Advances" volume on this topic will be able to integrate research on reproductive behavior more effectively.

JOHN G. VANDENBERGH
Division of Research, North Carolina Department of Mental Health, Raleigh

Pesticide Biochemistry

The Biochemical Mode of Action of Pesticides. J. R. CORBETT. Academic Press, New York, 1974. x, 330 pp., illus. $18.50.

This book evaluates the current knowledge of how pesticides act, arbitrarily excluding some agents, such as fumigants, bactericides, and rodenticides. It runs counter to the tendency to write separate books on insecticides, fungicides, and herbicides, a tendency that is based on the different roots of those studies and has been reinforced by the fast growth in knowledge that has encouraged parochialism.

As the author writes, because "all living things have an underlying biochemical similarity" it is more logical, in principle, to treat all pesticides together. This proposition is excellently supported in the two of the nine chapters that deal with inhibitors of respiration and of biosynthesis, which include

toxicants used on a variety of plants and animals. Except in these chapters and two untidy chapters on pesticides with a nonspecific mode of action and on those whose mode of action is unknown, herbicides and insecticides are treated in different chapters. Most herbicides are found in chapters on photosynthetic inhibitors and on plant growth inhibitors, most insecticides in chapters on anticholinesterases and on neuroactive nonanticholinesterases. The book finishes with a seven-page chapter entitled "Conclusions; pesticide design."

This is a compact, readable source book that covers its diverse fields in considerable depth, yet provides enough relevant introductory biology (accounts of, for example, respiration, photosynthesis, neurobiology) to enable anyone familiar with elementary organic chemistry to understand the essential points. Furthermore, the author provides a critical review rather than a simple report of "what-the-authors-claim." Most of the important findings published in 1972 or before are well covered, and the 14-page chapter on pesticides of unknown mode of action may indeed, as the author hopes, stimulate research by spotlighting areas of ignorance.

On the negative side, the author relies rather heavily on secondary sources, and some of his choices of original references are odd; for example, he documents the action of DDT with unpublished work by Pichon (p. 176), but omits the classic 1968 studies of Narahashi and of Hille. Nor has he mentioned the numerous objections to the proposal that DDT acts by blocking an adenosine triphosphatase. Too little attention is given to the actions of rotenone, cyanide, and fluoracetate and to the effect of DDT on eggshell thickness. Acetylcholinesterase is nearly always postsynaptic, not presynaptic and postsynaptic as stated in the book. In the seven lines devoted to insect neurobiology, the author fails to note the extensively documented fact that neuromuscular transmission in insects does not involve acetylcholine and almost certainly does involve glutamate. This striking physiological fact is a particularly exciting invitation to those who would design pesticides on biologically rational grounds.

Corbett has not published extensively on the subject of pesticide action, and the book is perhaps deficient in offering really new insights. The chapter on pesticide design provided an opportunity for original contributions, for the subject has not often been explicitly addressed and this is the author's own field of interest; but design is dismissed in a page and a half of truisms. The book does not in itself, therefore, advance the science of pesticide action. But it is a valuable record of how things stand. It gives a more synoptic view of the whole range of pesticide action than the treatments to which workers in this field are accustomed.

R. D. O'BRIEN
Section of Neurobiology and Behavior, Langmuir Laboratory, Cornell University, Ithaca, New York

Neuron Properties in Insects

Insect Neurobiology. J. E. TREHERNE, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1974. xvi, 450 pp., illus. $44.25. Frontiers of Biology, vol. 35.

We are waiting for a second volume of this work because this beautifully produced volume lays all the groundwork but covers almost none of the exciting areas of recent discovery in insect neurobiology. There is an incomparable account of the cellular structure of the nervous system, especially of glia and ultrastructure, by Nancy Lane, followed by careful and most useful accounts of axonal conduction and central synaptic transmission in insects by Yves Pichon and Jean-Jacques Callec. The chapter by Treherne on the environment and function of nerve cells shows exemplary moderation in both conclusions and volume. These, and the section on neuromuscular transmission by Peter Usherwood, are very solid, bread-and-butter productions by up-and-coming experts. That is refreshing: they are not reiterations of battle cries by old campaigners, but useful summaries by middle-of-the-road researchers who are with it. That is the kind of summary that is handy to have on the shelf.

I found the chapter by Simon Maddrell on neurosecretion the most exciting, perhaps because Maddrell sticks his neck out occasionally, possibly because this is a most rapidly growing and difficult area. As we are brought up to date our attention is drawn to many exciting possibilities just around the corner, whereas the earlier chapters treat mostly topics that are becoming rounded off. Even in the account of neurosecretion, however, I noted the feeling of bowdlerization the whole volume conveys. The daring passages have been removed or were never there.

The implication in the hopes for a volume 2 is that the rest of the subject of insect neurobiology contains the fascinating front line research, notably on sense organs, noise generation, specific odors, and defensive behavior. The action and function of sense organs have now become such a large topic that they warrant a whole volume.

Peter Miller makes a gallant attempt to summarize the neurobiology of insect behavior in 50 pages, but he offers no explanations of mechanisms. Most of his chapter is a careful survey of capabilities of the system, with reference to the kinds of other data that will ultimately be useful in framing explanations. At present, however, the components of the central nervous system are not even listed, nor are their activity and interactions recorded. The topic for the third volume, the neurobiology of insect behavior, is as yet a glimmer reflected occasionally from the eyes of the proposal readers. There are only a handful of papers that say anything useful on the topic, and probably we must wait till next century for a volume on that topic as thorough as this one. Here is a book for lecturers and researchers on insect nervous systems; let us hope for more, and more exciting ones, from the same stable.

G. ADRIAN HORRIDGE
Department of Neurobiology, Australian National University, Canberra

Marine Protozoans

Foraminifera. Vol. 1. R. H. HEDLEY and C. G. ADAMS, Eds. Academic Press, New York, 1974. x, 276 pp., illus. $15.

This is the first volume in an open-ended series intended to provide a current review and evaluation of foraminiferal research for student and specialist. Foraminiferal research is international in scope and has become highly diverse in approach. The editors' belief that there is a need for synthesis is well founded. The volume contains four articles: "Recent advances in the classification of the Foraminiferida" by Loeblich and Tappan, "Biometry of the foraminiferal shell" by Scott, "Field and laboratory techniques for the study of living foraminifera" by Arnold, and "Towards understanding the niche of the foraminifera" by Lee. There is also a four-