Book Reviews

Chemical Weed Control

Herbicides. Physiology, Biochemistry, Ecology. L. J. AUDUS, Ed. Academic Press, New York, 1976. Two volumes, illus. Vol. 1. xxii, 608 pp. $48. Vol. 2. xx, 564 pp. $38.25. Second edition of *The Physiology and Biochemistry of Herbicides*.

Chemical pesticides, now a multibillion-dollar industry and still growing vigorously, have revolutionized agriculture in the last several decades. Until the mid-1960's, insecticides were the sales leaders among pesticides, but since then they have been far surpassed by herbicides, whose dominance continues to grow year by year. If "more energy is still expended on the weeding of man's crops than on any other single human task" (vol. 1, p. 1) and if the burgeoning human population continues to challenge the ability of the earth to feed it, then chemical weed control deserves all the careful attention that these two volumes give it.

Audus, a pioneer in the study of herbicide metabolism, has assembled 32 encylopedic chapters written by experts in the United Kingdom, the United States, Canada, New Zealand, the Netherlands, and Sweden. They cover all aspects of the subject from the history of herbicide use and the effects of herbicides on the morphology, physiology, and biochemistry of higher plants to the behavior and effects of herbicides in the soil, their interactions with environmental factors, their role in ecology, and the toxicological problems generated by their massive use. Virtually no topic remains uncovered, and the only gaps are those occasioned by our incomplete or faulty knowledge.

It is sobering to learn that we still do not understand the mode of selective toxic action of most of the common herbicides and that almost all successful weed killers have been discovered as a result of empirical screening procedures. In the United States, about 63,000 new compounds were screened in 1970. Development of a successful new product entailed the screening of about 7500 compounds, took about 6.5 years, and cost about $5.5 million. Within the industry, research and development costs were almost 10 percent of sales, about four times the percentage for all manufacturing industry. Certainly, much is to be gained by a more rational approach to this vast and complex undertaking. This state of affairs is assessed in a chapter on the search for new herbicides.

Most recently, with the increasing attention paid to environmental preservation, some alarm has been generated by the teratogenic dioxin impurities found in all samples of 2, 4, 5-T, the mutagenic metabolites of atrazine in maize leaves, and the general toxic side effects of halogenated phenoxyacetic acids, phenols, and hydrocarbons. A chapter on toxic hazards in the use of herbicides appraises and probably somewhat understates these dangers. Nonetheless, the problem is faced and discussed fairly, an improvement over other recent volumes on this subject.

While acknowledging the occasional unevenness and repetitiveness characteristic of many-authored compendia of this type, I congratulate Audus on his impresario role in generating the single most important source book on herbicides currently available.

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Anniversary Compendia

The Nervous System. DONALD B. TOWER, Ed. Raven, New York, 1976. Three volumes. Vol. 1, The Basic Neurosciences. Roscoe O. Brady, Ed. lxii, 686 pp., illus. Vol. 2, The Clinical Neurosciences. Thomas N. Chase, Ed. xiv, 542 pp., illus. Vol. 3, Human Communication and Its Disorders. Eldon L. Eagles, Ed. xiv, 564 pp., illus. Each volume, $25; the set, $65.

In 1950 the 81st Congress authorized the establishment of the National Institute of Neurological Diseases and Blindness, which has evolved into the present National Institute of Neurological and Communicative Disorders and Stroke (NINCDS). Seeking "the most appropriate, tangible way to celebrate the Institute's silver anniversary," its administrative staff decided to organize the production of these three symposium volumes, each of which focuses on a principal concern of today's NINCDS. In view of the fact that there is no lack of reviews and symposia on the neurosciences, one may fairly ask about the substance of this celebration, its intended readership, and its degree of apparent success.

Volume 1 ("The Basic Neurosciences") presents several introductory essays on the history of NINCDS and of basic neurosciences, as well as a parade of more than 60 review chapters. These are brief, averaging about ten pages, and various in scope, approach, and timeliness. The coverage is broad but uneven, with emphasis on neuronal cell biology, membranes, synapses, neuropharmacology, and neurochemistry. Several important areas of research in which NINCDS support has figured prominently receive unjustifiably cursory treatment. Readers will find little evidence of the importance of research on invertebrate preparations, in the emerging field of neuroethology, or on the vertebrate visual system. Although research on vision has been the province of the National Institute of Eye Research since 1968 (when that institute separated from NINCDS), studies of the visual system were long supported by NINCDS. Moreover, a survey of advances in neurobiology that barely acknowledges vision omits some of the most exciting knowledge we have about how the brain works.

Constrained to deal with major topics in minor spaces, many contributors have succeeded admirably. Palay's essay on neurocytology and Kandel's introduction to the neurobiology of behavior exemplify especially appropriate approaches to the difficult task of writing a capsule review for a general but undefined readership. Many of the authors take a different course by presenting aspects of their topic with greater technical detail. While most of these specialized reviews are likely to be useful to at least some readers, certain contributions give excessively personal views of their fields. For example, a chapter on the possible involvement of glycoproteins in learning and memory gives disproportionate attention to hypotheses that have yet to be adequately tested or generally accepted. Another chapter purporting to provide an overview of the history of our understanding of the role of GABA (gamma-aminobutyric acid) in the nervous system ignores the decisive research on crustacean preparations through which the neurotransmitter function of GABA was established.

Volumes 2 and 3 ("The Clinical Neurosciences" and "Human Communication

and Its Disorders") have a format similar to that of volume 1, but they are better books. Volume 2 presents an impressive array of papers from which the determined reader can get at least a taste of numerous and diverse aspects of clinical neurology. There are eight chapters on methods of clinical investigation, 32 on diseases of the nervous system, and eight on complex cerebral functions such as those involved in language, dementia, and pain. Many of these chapters are good introductory summaries and promise to be particularly helpful to basic neurobiologists interested in the clinical side of their field. Volume 3 is more focused. It offers 33 chapters on the auditory system, eight on central processes related to language, and ten on speech. Because of its narrower scope, this volume affords more satisfying coverage of its subject than do volumes 1 and 2, and by virtue of summarizing the work and views of a large gathering of leaders in the study of hearing and speech, it is a useful addition to the literature of neurobiology.

The questions loom: for whom were these volumes produced and to what end? Celebration or not, books should be appropriate and useful for an identifiable readership. One supposes that the organizers of this publishing project had answers to these questions in mind, but the product gives little evidence of it. As the foregoing remarks perhaps suggest, many of the reviews gathered in these volumes are too short (and therefore too selective) to be satisfying to professional neurobiologists, and at the same time the language of those papers and the amount of knowledge they presuppose on the part of their readers are serious obstacles for nonspecialists. It is unlikely that general readers—nonscientists—will be able, or inclined to try, to read these compendia. Nor do the volumes promise to be useful as textbooks. They are too fragmentary, too uneven, and too expensive for most educational purposes. Of course, a collection of nearly 200 review papers by as many authors is bound to include clearly written, informative, and engaging contributions. That is the case here. Aside from deserving to be placed in libraries serving life scientists, however, it is not clear what market these books may fit.

To celebrate the anniversary of NINCDS with an account of the achievements in basic neurobiology and clinical neurology that have been fostered by the Institute was a fine idea. But the account should have been a coherent, readable, and concise report directed to the congressmen and federal administrators who are responsible for mandating the funding and activities of the Institute and to the public who pay the bills. The excitement and the "take-home messages" of a quarter-century's research on the nervous system should have been communicated lucidly to those who are concerned today with the purposes and payoffs of federally supported research. That support is shrinking dangerously. One cannot help believing that effective exposition of the products of publicly funded research should help greatly to substantiate the mounting pleas for more money. The story these books could have told is spectacular, but they do not succeed in telling it satisfyingly at any level, nor do they speak to those whose appreciation of the silver anniversary of NINCDS we should most earnestly invite and ensure.

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Coastal Processes

Marine Sediment Transport and Environmental Management. Papers from a short course, Key Biscayne, Fla., Nov. 1974. DANIEL JEAN STANLEY and DONALD J. P. SWIFT, Eds. Wiley-Interscience, New York, 1976. xviii, 602 pp., illus. $35.

One of the most active and rapidly advancing fields in geological oceanography is the study of sediment transport in coastal waters between the shoreline and the continental slope. Part of this activity is in response to urgent questions that are being asked about such matters as sites for dumping dredge spoil and foundations for offshore structures. The activity is accelerated by the availability of a store of fairly solid understanding of sediment transport in laboratory flumes, rivers, and beaches that can be extrapolated (at least in principle) to the continental shelf.

In 1969, the American Geological Institute published a volume entitled *The New Concepts of Continental Margin Sedimentation*. We now have a second-generation product in *Marine Sediment Transport and Environmental Management*, like its predecessor an outgrowth of an AGI short course. Whereas the 1969 volume emphasized aspects of modern marine sedimentation that could be applied to the ancient rock record, the present volume is concerned with marine sediment transport as a here-and-now environmental concern. The 1976 volume contains not only mostly new information but a new outlook. Read today, the 1969 volume seems almost quaint.

In the first section of the new volume, five chapters by four authors cover steady shelf circulation, wind-driven currents, tides, and waves. The chapter on tides (H. O. Mofjeld) is classic stuff, and the one on waves (O. S. Madsen) gives a simple mathematical description based on much recent work. The chapters that deal with open shelf circulation (C. N. K. Mooers and A. Leetmaa) are general and uncomplicated statements of the problems and of some of the approaches that have been and are now being taken. Particularly valuable are statements of the limitations of the available tools and knowledge and a clearly and honestly conveyed message that we have a long way to go before we will have predictive models of the kinds of flows that affect sediment movement on the open shelf. This is a welcome antidote to the claims of those who mix a handful of available data with an overdose of assumptions and then tout the mixture as a reliable predictive model.

Sediment entrainment and transport are discussed in the second section by six authors in five chapters. P. D. Komar's treatments of boundary-layer flow in steady unidirectional currents and sand transport on continental shelves are largely mathematical—basic, concise, and easily followed. Komar outlines the available tools (giving references to the papers that contain further details), discusses how and where they might be applied, and appraises their limitations. He concludes, with regard to continental shelves, that "we are nowhere near a state of the art that permits quantitative predictions of sediment transport" (p. 122). Other chapters in this section are a complete and balanced summary of the state of knowledge (as of early 1975) of suspended-sediment transport and mud deposition on continental shelves by D. E. Drake, a turgid discussion of bedforms and grain sizes of bottom sediments by D. J. P. Swift and J. C. Ludwick, and an admittedly speculative but clear discussion of gravity flows (turbidity currents and the like) by G. V. Middleton and M. A. Hampton.

The third section (the longest and, to my taste, the least satisfactory) covers patterns of sedimentation in space and time. It begins behind the coastline and proceeds chapter by chapter (seven chapters in all) in a seaward direction. Komar's chapter on nearshore currents and beach sediments is a concise and analytical summary of material he covers in greater length in his new book (*Beach Processes and Sedimentation*, 1976), to which the interested reader will no doubt proceed for further details. Then follow