platform for accelerated research on these insects in the future. Each of the contributors has made it clear that his special topic offers abundant opportunities for young entomologists who wish to concentrate on a group of insects that are both economically important and exceptional in the intellectual challenge they provide.

E. O. WILSON
Biological Laboratories, Harvard University, Cambridge, Massachusetts

Neuronal Processes

Cellular Dynamics of the Neuron. A symposium, Paris, 1968. SAMUEL H. BARONDES, Ed. Academic Press, New York, 1969. xiv, 386 pp., illus. $19.50. Symposia of the International Society for Cell Biology, vol. 8.

The increasingly successful application of the methods of modern cell biology to nervous tissue strengthens the view that we may eventually bring to bear upon the brain, in spite of its bewildering complexity of structure and function, the full power of modern biology with its sophisticated grasp of biosynthetic processes, ultrastructure, and genetic control. This book provides a good insight into cell biological approaches to some of the central problems of neurobiology.

The volume begins by considering the phenomenon of axonal flow and the more general question of the sites of biosynthesis of proteins and other macromolecular constituents of the neuron. P. A. Weiss reviews the history of axonal flow studies and introduces the reader to the now widespread observation that there are at least two distinct rates of axonal flow, separated by one or two orders of magnitude. S. H. Barondes describes the slow flow of soluble protein synthesized in the cell body to nerve endings in the mouse brain. J. Zelená describes with the electron microscope the rapid accumulation on *both* sides of a crushed portion of nerve of vesicular and other particulate elements. This observation, also reported by A. Dahlström, raises the important question whether there is normally some reverse flow of material toward the cell body. However, in agreement with the view that most material flowing down the axon originates in the cell body, the accumulation on the proximal side of the crush continues for some time after that on the distal side ceases. Dahlström's paper emphasizes three other aspects of axonal flow in sympathetic nerves: (i) different proteins constitute the fast and the slow flow; (ii) peripheral and central nerves appear to differ by more than fivefold in the rate of fast axonal flow, and this difference is related to the amount of material in the synaptic field that must be replaced; (iii) the cell body may have to manufacture its own content of fast-flow material in as little as two hours. The papers of both Weiss and F. O. Schmitt consider the mechanism of axonal flow. Weiss describes the limitations imposed on the choice of a mechanism by hydrodynamic considerations. Schmitt suggests a "sliding vesicle" model for fast axonal flow which attributes a central role to the neurotubules that are found in axons. Direct evidence for this mechanism is provided by Dahlström, who shows that colchicine, which depolymerizes the microtubules, does block the rapid movement of noradrenaline storage granules.

As to the question of cellular sites of macromolecular synthesis, B. Droz and H. L. Koenig describe the kinetics of biosynthesis of protein in the neuron soma by means of electron microscopic autoradiography. A. Edström presents evidence that there is three times as much RNA in the goldfish Mauthner cell axon as in the cell body, and that newly synthesized protein and RNA appear in the axon even in the absence of the cell body. Barondes describes the rapid appearance in nerve endings from whole mouse brain of macromolecules labeled with glucosamine, which he attributes in part to local modification of preexisting glycoproteins.

One of the major advances in cellular neurobiology has been the success in isolating synaptosomes, pinched-off nerve endings with some postsynaptic membrane frequently attached. A second major topic of this volume is the biochemical organization of such synaptic endings. The contributions of R. M. Marchbanks and of M. Israel and J. Gautron describe the localization of acetylcholine, choline acetylase, and acetylcholineesterase in isolated synaptic endings. Dahlström reviews the general organization of the noradrenergic neuron and nerve endings; her paper serves to emphasize both the similarities and differences in the organization of cholinergic and adrenergic synaptic endings. J. Taxi and B. Droz describe electron microscopic autoradiography showing accumulation of labeled monoamines in synaptic endings which contain dense core vesicles. E. DeRobertis describes the isolation of the "junctional complex" that is thought to contain the receptors for chemical neurotransmitters on the postsynaptic membrane and presents evidence that the receptors are proteolipids.

A third major topic of this book is treated under the heading Functional Implications of Synaptic Ultrastructure. E. G. Gray presents correlative evidence that round vesicles and tight synaptic junctions are characteristic of excitatory nerve endings and that flattened vesicles indicate certain types of inhibitory contacts. N. Chalazonitis examines the interaction of vesicles with the unit membrane of the nerve endings. K. Akert and K. Pfenninger describe a staining procedure with bismuth iodide which shows clearly the material lying on both sides of the synaptic junction and within the junction itself. J. Szentagothai and J. Hamori emphasize the dendritic aspect of synaptic junctions and describe dendritic "spines" and "digits."

The ultimate aim of much neurobiological investigation is to examine environmentally induced alterations in the structure and biochemistry of the nervous system, and this is the final topic of the volume. M. J. Cohen describes the striking changes in RNA of the neuron soma of cockroach thoracic ganglia which accompany nerve section and shows how this has provided a mapping procedure for this nervous system as well as led to fascinating cross-innervation experiments. R. Levi-Montalcini and J. S. Chen describe the behavior of the embryonic cockroach nervous system in organ culture, showing in particular the interaction of growing neuron cell bodies and nerve fibers with glial cells, which suggests some kind of functional interdependence. J. Szentagothai and J. Hamori describe ultrastructural changes in synaptic complexes which accompany visual deprivation, crossed cerebellar atrophy, and postnatal destruction of cerebellar granule cells. G. Filogamo describes histological and chemical alterations in nerves accompanying intestinal hypertrophy and interference with neuromuscular development. H. Hydén and P. Lange describe alterations in amino acid incorporation and in the electrophoretic pattern of soluble protein of hippocampal neurons which accompany training of rats in an appetitive motor task.

The almost inevitable delay in publi-

cation of a symposium of this kind runs the risk of making the book out of date. However, this volume has the distinct advantage of providing a unique synthesis of the ultrastructural and biochemical aspects of a limited range of interrelated topics. Because of this interrelation, it is particularly unfortunate for the reader that this book does not have a subject index. Nor does the book contain any discussion, and the references are given without titles or full pagination. In spite of these shortcomings, the volume is of considerable value both as an introduction to the field for the novice and as an important source of information and reference material for the specialist.

BRUCE S. MCEWEN
Rockefeller University, New York City

Books Received

Advances in Chemical Engineering. Vol. 8. Thomas B. Drew, Giles R. Cokelet, John W. Hoopes, Jr., and Theodore Vermeulen, Eds. Academic Press, New York, 1970. xii, 386 pp., illus. $18.50.

Alaska Wilderness. Exploring the Central Brooks Range. Robert Marshall. University of California Press, Berkeley, ed. 2, 1970. xlii, 176 pp., illus. + plates. Cloth, $6.95; paper, $2.25.

The Analysis of Air Pollutants. W. Leithe. Translated from the German edition (Stuttgart, 1968) by R. Kondor. Ann Arbor-Humphrey, Ann Arbor, Mich., 1970. x, 304 pp., illus. $18.75.

Atomic Absorption Spectroscopy. Applications in Agriculture, Biology, and Medicine. Gary D. Christian and Fredric J. Feldman. Wiley-Interscience, New York, 1970. xxii, 490 pp., illus. $16.50.

British Palaeozoic Fossils. Trustees of the British Museum (Natural History), London, ed. 3, 1969. x, 208 pp., illus. Paper, 13s. Publication No. 624.

Capital Budgeting. A Quantitative Evaluation of Investment Alternatives. Robert V. Oakford. Ronald Press, New York, 1970. xii, 276 pp., illus. $9.

A Child's Mind. How Children Learn during the Critical Years from Birth to Age Five. Muriel Beadle. Doubleday, Garden City, N.Y., 1970. xxvi, 294 pp., illus. $6.95.

The Chimpanzee. Vol. 3, Immunology, Infections, Hormones, Anatomy, and Behavior of Chimpanzees. G. H. Bourne, Ed. University Park Press, Baltimore, Md., 1970. x, 402 pp., illus. $28.50.

Contemporary Readings in Psychology. John M. Foley, Russell A. Lockhart, and David M. Messick, Eds. Harper and Row, New York, 1970. x, 470 pp., illus. Paper, $4.95.

Description and Comparison in Cultural Anthropology. Ward H. Goodenough. Aldine, Chicago, 1970. xiv, 174 pp., illus. $6.95. The Lewis Henry Morgan Lectures, 1968.

Developments in Water Quality Research. Proceedings of an international conference, Jerusalem, June 1969. Hillel I. Shuval, Ed. Ann Arbor-Humphrey, Ann Arbor, Mich., 1970. xvi, 312 pp., illus. $17.50.

Dominica. A Chance for a Choice. Some Considerations and Recommendations on Conservation of the Island's Natural Resources. Conservation Foundation, Washington, D.C., 1970. 48 pp., illus. Paper, $2.

Eco-Catastrophe. The Editors of *Ramparts*. Harper and Row, New York, 1970. xiv, 158 pp., illus. + plates. $3.95.

Effective Study. Francis P. Robinson. Harper and Row, New York, ed. 4, 1970. xiv, 304 pp., illus. Paper, $5.95.

Estimation and Control with Quantized Measurements. Renwick E. Curry. M.I.T. Press, Cambridge, Mass., 1970. xiv, 126 pp., illus. $10. M.I.T. Research Monograph No. 60.

Functions of Mathematical Physics. Barry Spain and M. G. Smith. Van Nostrand Reinhold, New York, 1970. xii, 208 pp. $12.50. New University Mathematics Series.

General Chemistry. Experiment and Theory. Richard H. Eastman. Holt, Rinehart and Winston, New York, 1970. xxii, 602 pp., illus. $13.95.

Genetic Disorders of Man. Richard M. Goodman, Ed. Little, Brown, Boston, 1970. xviii, 1010 pp., illus. $38.50.

Genetic Resources in Plants. Their Exploration and Conservation. O. H. Frankel, E. Bennett, R. D. Brock, A. H. Bunting, J. R. Harlan, and E. Schreiner, Eds. Published for the International Biological Programme by Davis, Philadelphia, 1970. xxii, 554 pp., illus. + plates. $17.50. IBP Handbook No. 11.

Infrared System Engineering. Richard D. Hudson, Jr. Wiley-Interscience, New York, 1969. xxviii, 642 pp., illus. $19.75. Wiley Series in Pure and Applied Optics.

An Introduction to Spectroscopic Methods for the Identification of Organic Compounds. Vol. 1, Nuclear Magnetic Resonance and Infrared Spectroscopy. F. Scheinmann, Ed. Pergamon, New York, 1970. x, 202 pp., illus. Cloth, $7; paper, $4.75.

An Introductory Course in Practical Organic Chemistry. F. D. Gunstone, D. M. Smith, and J. T. Sharp. Methuen, London, 1970 (U.S. distributor, Barnes and Noble). xvi, 174 pp., illus. $5.50.

Laboratory Manual for Chemistry. A Brief Introduction. John W. Dawson. Saunders, Philadelphia, 1970. viii, 140 pp., illus. Paper, $3.75. Saunders Golden Series.

Language Development. Form and Function in Emerging Grammars. Lois Bloom. M.I.T. Press, Cambridge, Mass., 1970. xiv, 270 pp., illus. $8.95. M.I.T. Research Monograph No. 59.

The Law Relating to Activities of Man in Space. S. Houston Lay and Howard J. Taubenfeld. University of Chicago Press, Chicago, 1970. xiv, 334 pp. $17.50.

Man and Wildlife. C. A. W. Guggisberg. Arco, New York, 1970. 224 pp., illus. + plates. $12.50.

Materials for Ocean Engineering. Koichi Masubuchi. M.I.T. Press, Cambridge, Mass., 1970. xiv, 544 pp., illus. Paper, $9.50.

New Directions in Psychology 4. Kenneth H. Craik, Benjamin Kleinmuntz, Ralph L. Rosnow, Robert Rosenthal, J. A. Cheyne, and R. H. Walters. Holt, Rinehart and Winston, New York, 1970. x, 382 pp., illus. Paper, $3.95.

The New Elementary School Science. Willard J. Jacobson. Van Nostrand Reinhold, New York, 1970. xii, 580 pp., illus. $8.95.

Nitrenes. Walter Lwowski, Ed. Interscience (Wiley), New York, 1970. xiv, 457 pp., illus. $23.50.

Numerical Control. Nils O. Olesten. Wiley-Interscience, New York, 1970. xvi, 646 pp., illus. $19.95.

Numerical Methods that Work. Forman S. Acton. Harper and Row, New York, 1970. xviii, 542 pp., illus. $12.95.

The Pencil of Nature. William Henry Fox Talbot. Da Capo, New York, 1969. Unpaged, illus. $35. A facsimile of the 1844–1846 edition with a new introduction by Beaumont Newhall.

Physical Anthropology. T. Dale Stewart, Ed. University of Texas Press, Austin, 1970. x, 296 pp., illus. $15. Handbook of Middle American Indians, vol. 9.

Pieces of the Action. Vannevar Bush. Morrow, New York, 1970. xiv, 366 pp. $8.95.

Preliminary Bibliography of the Chol Lacandon, Yucatec Lacandon, Chol, Itza, Mopan, and Quejache of the Southern Maya Lowlands, 1524–1969. Nicolas M. Hellmuth. Museum of Anthropology, University of Northern Colorado, Greeley, 1970. xviii, 114 pp. Paper, $2. KATUNOB, Occasional Publications in Mesoamerican Anthropology, No. 4.

The Present Status of the Uto-Aztekan Languages of Mexico. An Index of Data Bearing on Their Survival, Geographical Location and Internal Relationships. James R. Jaquith. Museum of Anthropology, University of Northern Colorado, Greeley, 1970. 80 pp. Paper, $1.25. KATUNOB, Occasional Publications in Mesoamerican Anthropology, No. 5.

Recent Progress in Hormone Research. Vol. 26. Proceedings of a conference, Mont Tremblant, Quebec, August 1969. E. B. Astwood, Ed. Academic Press, New York, 1970. xii, 712 pp., illus. $35.

Reconstructing Prehistoric Pueblo Societies. William A. Longacre, Ed. University of New Mexico Press, Albuquerque, 1970. xii, 248 pp., illus. $8.50. School of American Research Advanced Seminar Series.

Sets. William W. Fairchild and Cassius Ionescu Tulcea. Saunders, Philadelphia, 1970. x, 122 pp., illus. Paper, $4.50.

Theory of Groundwater Flow. A. Verruijt. Gordon and Breach, New York, 1970. x, 190 pp., illus. $10; to libraries, $19.50. Civil Engineering Hydraulics Series.

Traditional Balinese Culture. Jane Belo, Ed. Columbia University Press, New York, 1970. xxviii, 422 pp., illus. + plates. Through 31 December 1970, $17.50; thereafter, $20.