Book Reviews

The Production of Behavior

Neuroethology. Nerve Cells and the Natural Behavior of Animals. JEFFREY M. CAMHI. Sinauer, Sunderland, Mass., 1984. xvi, 416 pp., illus. $30.

Neuroethology as a new synthesis of neurobiology and behavior has had difficulty developing a respectability and an identity of its own. In the '50's many ethologists laid the foundations for the subject by offering explanations of behavior in terms of brain mechanisms. They developed many concepts, but these always evaporated when neurophysiologists sought to follow them up. Ethologists then went their separate ways, most to behavioral ecology, leaving few interested in brain mechanisms. It was left to neurobiologists to pick up the subject, but for them relating behavior to events in the brain has rarely been a respectable pastime. Perhaps the task of explaining how the brain produces behavior has always seemed too hard to manage. But that is what must be done in order to understand the brain, for it has no other purpose than to produce behavior. Moreover, relating the activity of neurons to behavior keeps the neurophysiologist in touch with reality. For example, would long-term changes in pre- and postsynaptic potassium channels now be a subject of much interest were it not possible to relate the changes to modifications of behavior? It is because it attempts the beginning of an explanation of how the brain produces behavior that Camhi's book is a welcome addition to the neurobiological literature. It differs fundamentally from the many good textbooks on neurobiology that have recently been aimed at medical students and considerably outshines two recent books on neuroethology.

Chapters 2 and 3 trace the contributions of behavioral studies and neurobiology to the new synthesis. Basic concepts of behavior and basic properties of neurons are covered briefly and at a very elementary level. Neurons are described only in terms of their classical methods of signaling; omitted is most of our modern knowledge of channels and our burgeoning knowledge of the chemistry of neurons. These chapters appear to be an attempt to generate an all-purpose neurobiology textbook. Though they do not achieve that aim they do indicate by their juxtaposition of discussions of altruism and ion channels in membranes that a vast task of synthesis lies ahead.

The style of the book is set by chapter 4, which describes the behavior of a cockroach escaping from a toad in terms of the properties of the receptors and the giant interneurons that are partly responsible for encoding the direction of the stimulus. Evidence and methods of collecting it are afforded more space than conclusions. The approach on the whole works well and only fails when references to research papers become too numerous or when hearsay is promulgated by reference to unpublished papers.

The next two chapters deal with sensory processing. The first, on vision, describes the way bees are able to communicate the direction of food sources, birds to navigate, and toads to recognize prey. The second, on hearing, deals particularly with echolocation in bats. Both are preceded by lucid accounts of the physics of the particular sensory modality, followed by descriptions of the behavior and of some of the neural mechanisms. In general the behavioral descriptions are more satisfying than the neurobiological ones, but this is no more than a reflection of the present state of the synthesis.

The final chapters describe the way movement is produced, drawing upon examples such as the tail flip of a crayfish, the rhythmical swimming movements of a leech, and the visual stabilization of the body of a fly. They exemplify the value of the neuroethological approach by showing how the properties and connectivity of neurons have more meaning when placed in the context of what they are doing. Even behavioral experiments can be more accurately focused once some of the neural mechanisms begin to be understood.

Inevitably the coverage of the book is restrictive and not everyone will find his or her favorite topic, but the selection is representative of current research. Many of us who try to teach undergraduate courses at the boundary between neurobiology and behavior have always been frustrated by the lack of suitable textbooks; this book should go a long way toward alleviating such frustration. I am sure it will do much to rekindle interest in this vibrant and essential subject.

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Magendie and His Milieu

Science and Medicine in France. The Emergence of Experimental Physiology, 1790–1855. JOHN E. LESCH. Harvard University Press, Cambridge, Mass., 1984. xii, 276 pp. $25.

It was in France, during the early decades of the 19th century, that physiology first developed its scientific identity as an autonomous discipline. This achievement was made possible by the work of many men, but the predominant contribution—the one that overshadowed by far any other efforts—was made by François Magendie (1783–1855). It is no accident, then, that the years covered by this book correspond almost exactly to Magendie's life-span and that five of the book's nine chapters are devoted almost exclusively to Magendie's career.

Lesch situates Magendie's work historically by opening his book with a chapter surveying the state of physiology in the 18th century and another outlining the institutional changes taking place in France during the 1790's that favored the advancement of physiology as a science. Lesch's third chapter then focuses on the work of Xavier Bichat (1771–1802), Magendie's most important predecessor in physiological research; and his final chapter symmetrically completes the picture by following the early career of Magendie's celebrated student and successor, Claude Bernard (1813–1878).

Although Magendie's physiology and its relationship with that of Bichat on the one hand, and with that of Bernard on the other, have been the subject of a number of detailed studies over the last 40 years, Lesch's book makes a significant contribution to the literature by demonstrating the central role that surgical practices, and the surgical tradition generally, played in the development of