

Jonathan M. Silver, M.D.
Book Review Editor

The Brain and Behavior: An Introduction to Behavioral Neuroanatomy

By David L. Clark and Nashaat N. Boutros
 Malden, MA, Blackwell Science,
 1999, 214 pages, ISBN 0-63204-295-8, \$34.95

Reviewed by James R. Merikangas, M.D.

There was a time when the anatomy required of psychiatrists was that of the ego, the id, and the superego. The physiology required included sublimation, repression, and abreaction. That time, however, has passed, and now psychiatrists and other students of human behavior require a knowledge of the brain mechanisms underlying consciousness and behavior. This required knowledge is not only broader and deeper than that expected of behavioral scientists in the past, but, to a degree, essentially unavailable to these specialists in neurophysiology or neuroanatomy even ten or twenty years ago.

The textbooks of neuroanatomy, such as the classic *Neurological Anatomy in Relation to Clinical Medicine*, by Alf Brodal, originally published in 1943, attempted to correlate clinical symptoms that appeared in disorders of the nervous system with the anatomical lesions that produced them. Unfortunately, many disorders of the nervous system do not have a discernible anatomic lesion, even when studied with the more sophisticated techniques of the modern

day. We are, however, on the verge of discovering the pathophysiology of schizophrenia, depression, autism, anxiety, and the like. The essential body of knowledge required for this endeavor remains anatomy. To quote Brodal, "Anatomy is one of the fundamental branches of medicine, but anatomy alone, without relation to function, is a somewhat barren study, for it is function which primarily interests us in medicine" (p. 3).¹

Traditionally, topographical diagnosis and etiological diagnosis were most closely correlated in the specialty of neurology. Psychiatry now has laid claim to the same territory, and the specialty of neuropsychiatry is a testament to this fact. We now know that many of the degenerative neurological diseases have their origin in abnormal expansions of amino acid sequences in the genome. We know that other degenerative diseases may be the result of an abnormally twisted protein in the form of a prion and that others are the result of inborn errors of metabolism, which themselves have a genetic origin, perhaps from deletions on chromosomes. There are, however, great gaps of information between these fascinating errors in development and the process by which they produce their effects. The field of psychology is still an essential part of this process, and it reveals that the deeper one goes into the study of the mind, the more complicated the underlying physical reality of the brain becomes.

Because of this complexity, a guide is needed to give an overview lest one become hopelessly bogged down in details. Fortunately, logical organizing principles exist, such as stimulus response, inhibition modu-

lation, input and output, and other functional concepts. These helped organize the anatomic divisions of ascending and descending pathways, commissures, and nuclei down to the units of the neurons, axons, dendrites and glia from which this marvelous mechanism is composed. Many of us as medical students relied upon Manter and Gatz's *Essentials of Clinical Neuroanatomy and Neurophysiology*, now approaching its tenth edition,² as a guide to neuroanatomy. This complex and useful book is still an excellent guide for the medical student or house officer, but it remains primarily of use in neurology. Words like *schizophrenia*, *anxiety*, and *depression* do not appear in the index, and dementia occupies less than three of its 308 pages. Another popular text, *Correlative Neuroanatomy* (a Lange medical book now in its 24th edition, edited by Stephen G. Waxman),³ contains mainly clinical correlates and attempts to include advances in neuroimaging to make the study of neuroanatomy more user-friendly. The book succeeds as far as it goes, as a primer of neuroanatomy for neurologists, but again we find nothing about schizophrenia or anxiety and only one line about depression (as the differential point for the diagnosis of dementia). This book provides little of direct interest to psychiatrists. Both books are useful outlines of neuroanatomy, and of the two, the Lange book with its sections on clinical testing and practical aspects of the neurological exam may be more useful to neurology or psychiatry house officers.

There remained, however, a pressing need for a new anatomy book of relevance to psychiatrists. That was the stimulus for the production by

Clark and Boutros of *The Brain and Behavior*. This book finally provides an introduction to behavioral neuroanatomy that begins to fill the need for an anatomy book for psychiatrists. It is not a substitute for the other neuroanatomy books, which are required for the practice of neurology, but it completes and supplements the behavioral aspects, the cognitive aspects, and the emotional aspects of brain structure and function.

This is a book that is meant to be read from cover to cover and then referred to in regard to particular questions. To make this easier, the anatomical details appear in regular type, the behavioral implications in blue type, and the physiological implications in italics. There are many simplified diagrams throughout the text. The book is heavily footnoted, and an excellent index is provided for easy reference. I would put this book on a list with Kaplan and Sadock's *Comprehensive Textbook of Psychiatry*,⁴ Lishman's *Organic Psychiatry*,⁵ and Kandel's *Principles of Neural Science*⁶ as the basic library for psychiatry. Clark and Boutros have succeeded in making a very readable book that employs its clarity to illustrate the complexity of the central nervous system. Where consensus does not exist as to function, the am-

biguity is admitted, and that which remains uncertain or in need of further evaluation is indicated as well. It is not meant to be an exhaustive survey of behavioral anatomy, nor is it a book that leads directly to differential diagnosis in clinical care. It is, however, a beginning of a journey to the understanding of the neuroanatomical substrates of behavior and mind. As such, it is an outline that will provide the structure to which further elaborations and detail may be attached as our knowledge of neuropsychiatry grows. Fourteen chapters in this book address the importance of the inextricable link between the "organic" and behavioral dimensions of medicine. This is a book that should be read by students of psychology as well as students of neurology, and certainly by students of psychiatry.

In an introductory book as groundbreaking as this one, a few omissions are inevitable. For instance, the section on neuroglia makes a number of statements about the functions of astrocytes and microglia without footnotes and then fails to reference the definitive text by Kettenmann and Ransom.⁷ This is one spot where a reference to the enormous importance of neuroglia, which contain neurotransmitters, receptors, ion channels, and trophic

factors, in addition to their function in energy metabolism, would be helpful. That, however, is a very minor criticism. The book is highly recommended to neurologists, psychiatrists, psychologists, and especially neuropsychiatrists. I am looking forward to the next edition as this exciting field of behavioral anatomy continues to expand.

Dr. Merikangas practices as a neurologist and psychiatrist in Woodbridge, CT.

References

1. Brodal A: Neurological Anatomy, 2nd edition. London, Oxford University Press, 1969 (3rd edition: 1981)
2. Gilman S, Newman SW: Manter & Gatz's Essentials of Clinical Neuroanatomy and Neurophysiology, 10th edition. Philadelphia, FA Davis, 2001
3. Waxman SG (ed): Correlative Neuroanatomy, 24th edition (Lange Medical Books Series). New York, McGraw-Hill, 2000
4. Sadock BJ, Sadock VA: Comprehensive Textbook of Psychiatry, 7th edition. Philadelphia, Lippincott Williams and Wilkins, 2000
5. Lishman WA: Organic Psychiatry: the Psychological Consequence of Cerebral Disorders, 3rd edition. Oxford, UK, BLACKWELL SCIENCE, 1998
6. Kandel ER, Schwartz JH, Jessell TM: Principles of Neural Science, 4th edition. New York, McGraw-Hill, 2000
7. Kettenmann H, Ransom B: Neuroglia. Oxford, UK, Oxford University Press, 1995