The Brain and Behavior
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An Introduction to Behavioral Neuroanatomy

Third Edition

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Preface to the second edition

The last ten years have witnessed an explosion in the understanding of the neurochemical and neurophysiological processes that underlie behavior. Our understanding of the pathophysiology of many psychiatric disorders has increased as well. Clinicians are now faced with the overwhelming challenge of the need to keep up with the flood of basic neuroscientific knowledge that appears monthly in scientific journals, as well as the need to assimilate it with an ever-increasing number of reports in the clinical journals that identify structural and biochemical abnormalities associated with clinical disorders. The gap that has always existed between the basic science of neuroanatomy and clinical behavioral science seems to be widening at an increasing rate.

Although the current level of knowledge of behavior and psychopathology does not necessitate a detailed understanding of all neuroanatomy, a basic level of some neuroanatomical knowledge is necessary. Familiarity with those brain regions that are heavily implicated in both normal and abnormal behavior will help the clinician assimilate new knowledge as the field evolves. As the clinician becomes more aware of the structure and function of the behaviorally sensitive regions of the brain, the concept that brain abnormalities can produce the symptomatology that is seen in the clinic becomes progressively more understandable.

Currently available neuroanatomy books are written with the neurologist in mind. Emphasis is placed on the neuroanatomy that is examined during a standard neurological exam. Areas that are known to be heavily involved in behavior such as the nucleus accumbens and the nucleus locus ceruleus receive only passing mention. We wrote this volume with the behavioral clinician in mind. It is meant to be an introduction rather than a comprehensive neuroanatomy text. We hope to be able to convey the immense complexity of the neuronal circuitry that subserves our cognitive and emotional lives. At the same time we hope to present the reader with a simplified view of the complexity of the neuroanatomy that underlies certain behaviors.

We will have accomplished our mission if we can convince the reader that the brain is an organ worthy of being the seat for the immensely complex function of behavior. Each chapter includes a list of suggested texts, as well as selected references for those who find the topic interesting and would like further details.

In preparing this volume many sources were utilized (textbooks and published articles). We encountered some discrepancies, particularly in the description of anatomical regions subserving behavior. We either elected to exclude that particular detail or chose the version compatible with the excellent and highly recommended *Principles of Neural Science*, by Kandel, Schwartz and Jessell, and its companion text, *Neuroanatomy: Text and Atlas*, by John Martin. One goal of our book is to provide a summary view of each topic. Every effort has been made to make that view as accurate as possible. Many details have been omitted because of the summary nature of the text. We hope the accuracy of the text has not been distorted by the process of summarization. Please contact us if you find errors in the material or in its interpretation (clark.32@osu.edu, nboutros@med.wayne.edu, mmendez@ucla.edu).

Cross chapter references are provided to help the reader link the related parts of the different chapters. Simplified diagrams are provided throughout the text. Selected material from clinical experience (N.N.B. and M.F.M.) is included to help relate the dry science of neuroanatomy to our everyday clinical encounters. Other clinical material is referenced. It is not the purpose of this book to present a complete picture of what is currently known about behavioral/anatomical relationships. This is the domain of clinical neuropsychiatry, for which many excellent textbooks are now available. Much ongoing research is aimed at defining the neuroanatomical bases of the various psychopathological states. A complete discussion of this research is beyond the scope of this introductory volume. Selected references regarding this fascinating research are included and may be used as starting points for readers.
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who would like to obtain a more complete understanding of one specific area.

Two introductory chapters covering an overall view of the brain are included. Neuroanatomy has its own language. Such language tends to make reading neuroanatomy literature even more difficult. Chapter 1 includes definitions of the more commonly used neuroanatomy terms. Chapter 2 reviews some critical gross brain structures.

Many of the central nervous system (CNS) regions that are thought not to be central to behavior are mentioned only in passing in the two introductory chapters. It should be noted that as knowledge about brain and behavior increases such areas may attain more central positions. A chapter on histology includes an introduction to synaptic structure and to neurotransmission.

The book targets brain areas that are known to be heavily involved in behavior. Each chapter begins with a brief introduction. The majority of each chapter consists of anatomy and behavioral considerations. In some chapters further behavioral considerations are included before the select bibliography and references. We have allowed ourselves to speculate on the possible function of some of the CNS circuits for the purpose of stimulating the reader’s interest. The speculative nature of such statements is clearly stated.

We suggest that the reader reads through the entire book at least once to develop an overview of the brain. Be sure to examine the orientation and terminology displayed in Figure 1.1. The reader can then return to individual chapters to develop a further understanding of a particular region.

References


Preface to the third edition

Our intent in this as well as earlier editions has been to provide the psychiatrist, psychologist, and others in the mental health field with a simple, easy-to-read introduction to clinically relevant brain anatomy from a functional perspective. The story of brain function continues to unfold, told through the continued publication of an impressive number of functional imaging studies. We have attempted to put the published results in simplified language while minimizing the distortion inherent in such an approach. The line drawings also reflect this perspective. The goal is to help the reader remember the basics. More cited references have been included in this edition to allow readers access to the original studies so that they may peruse the original publications at their leisure.

The results of published studies have dictated extensive revision of the chapters of the book dealing with the cortex. Updates are included in other chapters as well. Our knowledge of the anatomy of the parietal lobe has been advanced by studies revealing the function of its medial aspect and the intraparietal sulcus. These two areas have been infrequently explored until now and still receive little attention in basic neuroanatomy texts. Evaluation of the prefrontal lobes is now more complete with a somewhat better understanding of the function of the medial aspect of that portion of the cortex.

A number of networks have been introduced in Chapters 4, 5, and 6. A network may span several lobes and include subcortical structures with interconnecting white matter. The networks operate in support of various functions including attention, spatial orientation, threat recognition, and theory-of-mind, as well as mind-wandering. Several of the networks are related to clinical disorders such as schizophrenia and depression.