Behavioral Neurology & Neuropsychiatry

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Foreword

Practitioners of Behavioral Neurology & Neuropsychiatry should consider themselves privileged to have been assigned the uniquely challenging task of treating the most complex disorders of the most complex organ in the body. The facts and figures are quite daunting. The cerebral cortex alone contains 40 billion neurons crowded into 30 square feet of surface area. Each neuron makes thousands of contacts with other neurons. At these contact points, known as synapses, information flows from one neuron to another at a rate of approximately 100 times per second. The total number of neural contacts on the surface of the brain alone is 40 followed by 12 zeros, a number that is as large as the number of all the stars in our galaxy.

This complexity is not devoid of order. A distinctive principle of brain function is the regional variation of specializations—different parts of the brain have different responsibilities. Some of these job descriptions defy common sense. What kind of engineering logic would have made memory for recent events, a faculty essential for all aspects of behavior, critically dependent on a tiny part of the temporal lobe known as the hippocampus? Why is language, a faculty that permeates all aspects of thought, critically dependent on only one hemisphere?

The past 150 years have allowed us to accumulate mountains of facts at a continuously accelerating rate. The classic case reports of the late nineteenth and early twentieth centuries, the advent of new methods for tracing structural and chemical neuroanatomy, single cell recordings in behaving primates, and the modern revolution in neuroimaging are some of the engines that powered this growth. The next revolution will arise when these facts are linked to explanatory theories of brain function, theories that can explain, in some principled way, how patterned synaptic activity can transform muscle contractions and sensory input into memories, words, and actions.

While we wait for new insights to emerge, we have patients that need our help. In many instances, the diseases we see are irreversible. Few of our patients can be restored to former states of normalcy and many turn out to have relentlessly progressive neurodegenerative disorders. However, the practitioner in this field needs to understand (and believe) that “incurable” diseases are nonetheless “treatable.” Characterizing the neurobehavioral parameters of the disease, specifying the chief deficit that undermines daily activities, educating the patient and family, identifying appropriate resources for rehabilitation, and the judicious use of pharmacotherapy are some of the modalities that allow the informed practitioner to make a real difference in patient care.

This volume covers key theoretical and practical topics in Behavioral Neurology & Neuropsychiatry. A special strength is the section on treatment. Edited by three leaders in this field, this volume will allow seasoned practitioners as well as novices to have a better understanding of this complex area of medicine and to take better care of their patients.

M.-Marsel Mesulam, MD
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Preface

The recent merger of behavioral neurology and neuropsychiatry into a single medical subspecialty, Behavioral Neurology & Neuropsychiatry (BN&NP), represents a substantive rapprochement between the parent disciplines from whence its trainees and practitioners hail. This event occasions an approach to brain–behavior relationships that transcends the traditional perspectives of neurology and psychiatry, and creates an enduring context for the combined study of the psychiatry of neurology and the neurology of psychiatry. Most importantly, it identifies a cadre of clinicians dedicated to caring for persons and families affected by all manner of brain disorders producing cognitive, emotional, behavioral, and sensorimotor disturbances.

The clinical approach of subspecialists in BN&NP reflects a materialist philosophy of mind that regards mental events as brain events and, by extension, mental disorders as brain disorders. Critical evaluation of the relationships between psychological and neurobiological phenomena is encouraged, as are revisions or elimination of concepts or theories that do not comport with modern neuroscience. Reciprocal interactions between neurobiological, psychological, social, and environmental factors and their influences on neuropsychiatric health are appreciated, and they are considered relevant to understanding brain–behavior disorders and their treatments to the extent that they affect brain structure and/or function. This philosophy precludes guild-based division of brain disorders into neurological and psychiatric types, and requires subspecialists in BN&NP to employ a comprehensive clinical approach that blends and adds to the historically distinct methods of neurology and psychiatry.

For more than a decade, our BN&NP faculty group at the University of Colorado School of Medicine has applied this philosophy and approach to our daily practice. As BN&NP clinicians, teachers, and educators, we are an integrated transdisciplinary faculty group who bring a uniform body of subspecialty knowledge and skills to the clinic and bedside despite differences in our primary training backgrounds. Our model informed the work of the Joint Advisory Committee on Subspecialty Certification of the American Neuropsychiatric Association and the Society for Behavioral and Cognitive Neurology, their creation of the BN&NP training curriculum adopted by the United Council for Neurologic Subspecialties [1], and that organization's development of BN&NP fellowship program accreditation standards and practitioner certification processes [2] – all endeavors to which the editors of this volume and many of its chapter authors contributed substantively.

This book complements and extends those efforts by translating the philosophy and clinical approach used in our clinical and teaching efforts into a compendium of the concepts and principles of BN&NP. It draws naturally from information presented in the many volumes in this field that we have studied, and it extends and complements the writings of the many great teachers from whom we have learned. It is unique, however, in its specific focus on BN&NP and its organization around a peer-reviewed and nationally accepted curriculum for training in this subspecialty as well as its development by editors and authors committed to the growth of this area of clinical practice and study. Where material offered in this book imitates or critiques prior works, our aim – both as editors and as contributors – has been to ensure that its presentation honors the sources from which it derives, reflects the best traditions of scholarship, and serves to advance our field.

Designed as a primer of concepts and principles in BN&NP, rather than an exhaustive survey of neurobehavioral disorders, the text divides into three parts: Structural and Functional Neuroanatomy (Section I), Clinical Assessment (Section II), and Treatment (Section III). Part I begins with an introduction to the history and current practice of BN&NP. Chapter 2 offers an overview of essential behavioral neuroanatomy, including brain–behavior
relationships associated with the brainstem, cerebellum, diencephalon, subcortical structures, limbic and paralimbic areas, white matter, and neocortex. The next several chapters provide detailed reviews of the neuroanatomy of frontal-subcortical and limbic-subcortical circuits, white matter, and the cerebellum and the neurobehavioral functions these systems support. Subsequent chapters in Section I discuss brain–behavior relationships from the vantage point of neurobehavioral functions (i.e., cognition, emotion, and behavior) and the neuroanatomy on which they are predicated. Given the importance of executive function and emotion in BN&NP, extended discussions of the history of ideas on these subjects and current views of their phenomenology and neuroanatomy are offered in Chapters 16 and 18.

The principles of clinical assessment presented in Section II draw on the brain–behavior relationships described in Section I, and their application to everyday practice facilitates construction of subspecialty-relevant clinical histories and examinations. Chapter 20 outlines an approach to obtaining a neuropsychiatric history that is complemented by the bedside examination techniques and standardized assessments presented in Chapters 21–25. Recognizing that neuropsychiatric problems sometimes result in civil and criminal legal entanglements, special consideration is given to forensic neuropsychiatric assessment in Chapter 25. Current and emerging uses of neuroimaging, electrophysiologic, and other laboratory measures that may inform clinical evaluation and/or treatment planning are considered in Chapters 26–31. Throughout Section II, emphasis is placed on interpreting clinical symptoms, signs, and syndromes in terms of the neural processes underlying them, considering but not relying upon conventional (i.e., Diagnostic and Statistical Manual of Mental Disorders-based) psychiatric diagnoses, and avoiding dichotomization of clinical conditions into strict “psychiatric” or “neurological” types.

The chapters comprising Section III of this volume describe treatments in BN&NP and the principles of their application to the care of patients and families affected by neurobehavioral disorders. The breadth of the clinical problems encompassed by BN&NP requires expertise in environmental, behavioral, rehabilitative, psychological, social, pharmacologic, and procedural interventions. The evidence base for the treatment of many neurobehavioral disorders is evolving rapidly, and their popularity often waxes and wanes in short order. Nonetheless, the principles of treatment remain relatively stable and consistently applicable across the many conditions for which subspecialists in BN&NP are consulted and the various settings in which they practice. We therefore have limited consideration of condition-specific treatment issues throughout this volume and offer such only when their discussion illustrates the application of, or an exception to, a principle of treatment in BN&NP.

We developed this volume over several years, constantly weighing the need to publish timely information against the necessity of producing a principles-focused, stylistically coherent, and enduringly useful volume. The carefully selected group of international experts contributing to this work made these tasks easier. Their diverse training and practice backgrounds provide readers with a broad set of perspectives on the subjects addressed and their collective effort on this volume exemplifies the type of transdisciplinary collaboration that defines BN&NP. For chapters focused on subjects within the externally acknowledged expertise of our faculty groups, as well as for those topics on which we wanted to contribute a novel perspective, we functioned as both editors and authors. Thoughtfully approached and deliberately completed, we anticipate that this book will contribute usefully to the continued growth and development of BN&NP and will equip its readers to apply its principles to the study of neurobehavioral disorders and to the care of the individuals and families they affect.

We appreciate deeply the time and effort offered by the authors who contributed the chapters comprising this volume as well as their patience and support during the editorial phase of its development. We also are grateful for the invaluable advice and consistent support for this project offered by the editorial group at Cambridge University Press, including Pauline Graham, Alison C. Evans, Katie James, Joanna Chamblerin, and Richard Marley, whose generosity and flexibility ensured that we were provided the time needed to develop this work according to its own requirements. We are thankful for the insights, feedback, and encouragement offered by colleagues, students, friends, family, and advisors who provided guidance on the development of this volume, including: Laura B. Arciniegas, JD, Marsha S. Anderson, MD, Richard L. Gallimore, PhD, Kimberly L. Frey, MS, Hal S. Wortzel, MD, Peter Wagner, MD, Donald C. Rojas, PhD, Jody Newman, MA, Jonathan M. Silver, MD, Thomas W. McAllister, MD, Stuart C. Yudofsky, MD, and Steven L.
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