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Preface to the Sixth Edition

Electrophysiologic techniques provide an important means of investigating the function of the nervous system in health and disease and of defining the pathophysiologic relevance of the anatomic abnormalities that are often defined so exquisitely by neuroimaging procedures. They also make it possible to distinguish between disorders that clinically may resemble each other, to recognize disorders at a preclinical or subclinical stage, and to monitor disease progression or the functional integrity of different parts of the nervous system during procedures that put them at risk. In addition, the electrophysiologic findings have been incorporated into a number of disease classifications. Both neurologists and clinical neurophysiologists therefore need to keep abreast of advances in the field to ensure that testing is used appropriately, interpreted correctly, and performed optimally, and that regulatory or recommended standards are met. This volume encompasses the latest advances in the field while providing details of the basic principles of the various electrophysiologic techniques in current use for neurologic purposes. The electrophysiologic findings are integrated with the clinical context in which they are obtained to ensure that their significance is appreciated. Common artifacts are described to ensure that they are not misinterpreted.

Over the last 50 years, electrodiagnosis has evolved from an obscure and somewhat erudite field into an established subspecialty (clinical neurophysiology) that is an integral part of clinical neurology, with its own journals, professional societies, national and international conferences, and testing organizations. It would be erroneous, however, to conclude that the specialty, with its established clinical role, is no longer at the forefront of medical advances, having yielded its place to neuroimaging, neuroimmunology, and molecular biology. Indeed, nothing could be further from the truth. New techniques such as nerve excitability studies using threshold tracking, microneurography, neuromuscular ultrasonography, and methods of studying cranial nerve reflexes have increased the scope of the electrodiagnostic examination and provided new insights into disease mechanisms, in some instances at the ionic level, and into treatment strategies. The refinement of evoked-potential techniques to study the function of small fibers in the peripheral nervous system and the development of a more comprehensive approach to the evaluation of the visual system, using multifocal as well as full-field visual evoked potentials, combined with various ancillary techniques, promise to extend the diagnostic scope, utility, and reliability of these electrophysiologic methods of evaluating portions of the nervous system. New surgical treatments for epilepsy and certain movement disorders have not only extended the role of clinical neurophysiologists in guiding operative intervention but have provided them with remarkable opportunities for gaining fresh insights into the operation of the nervous system by electrophysiologic studies. Magnetic stimulation, once a research technique, is developing not only an important diagnostic role but also a place for itself in the therapy of certain neurologic disorders. A number of other electrophysiologic techniques, previously regarded essentially as investigative tools with limited clinical relevance, have now gained importance in the evaluation and management of patients with neurologic disease.

These advances have prompted the production of a new—sixth—edition of this book, thirty-two years after the first edition was published. New chapters have been added, or existing ones expanded, to cover the methods or applications that have developed in recent years. The bibliography in most chapters has been limited to references published in the last 25 years or to classic older publications, but interested readers can refer to previous editions for other older references. More comprehensive bibliographies are provided in chapters dealing with developing topics, for the convenience of readers. The focus continues to be on the clinical application of various techniques for evaluating the nervous system, and methods that have little or no clinical utility are not discussed. The generous acceptance of previous editions has encouraged me to believe that this approach is the
correct one and that the book will remain useful for clinicians, clinical neurophysiologists, and trainees in these fields.

I am grateful to all the contributors to this new edition. They were generous with their time, tolerant of my requests, and went to a great deal of trouble either to update their chapters from the last edition or—in the case of new authors—to provide a summary of developments in their own particular field of interest. It was my pleasure and privilege to work with them. Some of the illustrations in the book are taken from previously published sources, as is acknowledged in the text, and I am grateful for permission to reproduce them here. Ms. Charlotta Kryhl, at Elsevier, was of enormous help to me in the preparation of this edition, and I appreciate all her assistance and kindness. I am grateful also to project manager Maggie Johnson and the production team at Elsevier for their efforts in bringing the volume to fruition.

My wife, Jan, supported and encouraged me without complaint as I worked on this book, and it is to her that the volume is again dedicated. Our three children have been a source of great pleasure and pride to us both over the years, and I thank them for the many ways in which they have enriched our lives. This book has grown with them. When the first edition was published in 1980, our daughter was a toddler and neither of our two sons had been born. Alexandra is now a pediatrician undergoing subspecialty training in rheumatology; Jonathan, an attorney, is a federal public defender in Los Angeles; and Anthony is a final-year law student at Harvard. I can but admire their energy, enthusiasm, intellectual curiosity, and professional focus, which I hope will bring them much satisfaction. My own parents, now dead, would have been pleased to see this new edition, for I recall the excitement with which they greeted earlier ones. Finally, as I contemplate the pages of this sixth edition, I recall with warmth and affection those who encouraged my own interest in clinical neurology and neurophysiology when I was training at University College Hospital, the National Hospitals for Nervous Diseases at Queen Square and Maida Vale, and the Middlesex Hospital in London, England. I would like to believe that they—my teachers—would have taken pride in this volume, and I thank them for all that they did for me.

Michael J. Aminoff,
San Francisco, 2011
Preface to the First Edition

Fifty years have passed since Hans Berger’s first paper on the human electroencephalogram. Over this time, electroencephalography has evolved into an investigative technique of undoubted practical value, and technologic advances have permitted the development of a number of new electrophysiologic approaches to neurologic diagnosis. These developments have led to certain difficulties for clinicians and neurophysiologists alike. On the one hand, the present-day physician is tempted to avail himself of investigative procedures that he does not entirely understand and that provide him with information which he is often unable to interpret. On the other hand, the neurophysiologist is commonly faced with clinical problems that he fails to appreciate or to which there is no ready solution by the means at his disposal. There is therefore a need for a conveniently sized monograph that provides a general introduction to the role of electrodiagnosis in neurology and is directed at the clinical relevance of the investigative procedures that are now within the province of the electrophysiologist. In preparing the present volume, it has therefore been my aim, and that of the other contributors, to provide in simple terms a comprehensive but concise account of the clinical application of various electrophysiologic methods of investigating the function of the central and peripheral nervous systems. Some of these methods, such as electroencephalography and electromyography, are admirably covered in encyclopedic detail in certain textbooks aimed at specialists or trainees in these fields. The chapters covering these topics in the present volume are in no way intended to take the place of such works; rather, they are directed at those who need to know the principles, uses and limitations of the methods, and who have to relate the information derived from such studies to the clinical context of individual cases. Certain quantitative aspects of these subjects have also been considered, however, because of their potential clinical utility. A number of the other electrophysiologic methods that are covered in this book—such as the various evoked potential techniques—have been developed comparatively recently, and their clinical applications are as yet incompletely defined. In view of the obvious interest shown by increasing numbers of clinicians and neurophysiologists in setting up facilities to undertake such studies for clinical purposes, the technical aspects of some of these subjects have been reviewed in somewhat greater detail, although the emphasis has remained on the practical relevance of the methods. Electrophysiologic techniques that are of more limited clinical utility at the present time, such as recording of the contingent negative variation, have deliberately not been considered.

I am greatly indebted to the contributors to this book, all of whom have taken much time and trouble to survey developments in their own particular fields of interest. I am grateful also to those authors, editors, and publishers who have allowed us to reproduce illustrations previously published elsewhere, and whose permission is acknowledged in the text. The advice and understanding that I received from Ms. Carole Baker and Mr. Bill Schmitt of Churchill Livingstone, the publishers, are greatly appreciated. Finally, it is a pleasure to acknowledge the help, encouragement, and support that my wife, Jan, gave me during all stages of the preparation of this book.

Michael J. Aminoff, M.D.
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