

# Neuroimaging II

## Clinical Applications

# HUMAN BRAIN FUNCTION

## Assessment and Rehabilitation

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### NEUROIMAGING I: Basic Science

Edited by Erin D. Bigler

### NEUROIMAGING II: Clinical Applications

Edited by Erin D. Bigler

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# Neuroimaging II

## Clinical Applications

Edited by

Erin D. Bigler

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# Preface

The focus of Volume I of the *Handbook of Human Brain Function* was on basic scientific principles of brain imaging as it relates to the study of human brain function. Once the scientific bases for a particular discipline are established, clinical applications follow. Such is the status of brain imaging in the study of human brain function. It is of interest to note that the 1952 Nobel Prize for Physics was awarded to Felix Bloch and Edward Purcell, who discovered that nuclei precessing in the radiofrequency range could emit a radiofrequency signal detected by a radio receiver. Their findings initiated a series of very basic research studies on the characteristics of nuclear magnetic resonance. It would take over 25 years of basic research before findings began to point toward truly biomedical applications. However, once realized, clinical applications became standard fare for nuclear magnetic resonance. The example of Bloch and Purcell's work in an area of very basic science expanding to clinical application has been repeated throughout the medical and neurological sciences. This type of progress is what drives science. As a benefit from these scientific advances, research, clinical, and diagnostic imaging from a variety of modalities, not just computerized tomography or magnetic resonance imaging, can be performed. This volume focuses on the clinical applications of various neuroimaging methods.

Chapter 1 introduces the topic of clinical neuroimaging in the study of human brain function. In Chapter 2, Cullum and Harris discuss the integration of neuroimaging with neurophysiological and neurobehavioral methods. With regard to contemporary clinical application, Chapter 3 by Newberg and Alavi reviews common neurological disorders and their typical clinical imaging presentation. As a counterpart, Marsh and colleagues review neuroimaging findings by general psychiatric classification in Chapter 4. Farace and Turkheimer address the issue of gender differences assessed by neuroimaging in Chapter 5, followed by Raz's discussion of aging in Chapter 6. Chapters 1–6 deal with general issues in clinical neuroimaging. Chapters 7–13 deal either with specific clinical syndromes or with the application of a most exciting new technique—



functional magnetic resonance imaging (fMRI). Chapter 7 by Welsh-Bohmer and Hoffman deals with positron emission tomography (PET) imaging and dementia. Memory is addressed in Chapter 8 by Naugle and colleagues and in Chapter 11 by Kapur. Brain injury is reviewed in Chapter 9 by Wheeler and in Chapter 10 by myself. Chapter 12 and 13 deal with fMRI. The volume concludes with Chapter 14, an integration chapter and a look toward the future by Yeo.

*Erin D. Bigler*

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The assistance of Tracy Abildskov in preparation of various aspects of both volumes I and II of this series is gratefully acknowledged. Likewise, several of the illustrations in both volumes and in parts of the Appendix in Volume I have relied significantly on the ANALYZE™ software program, Biomedical Imaging Resource, Mayo Foundation.

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