Functional imaging, most commonly using functional MRI (fMRI) or PET, is an enormously powerful tool in neuroscience research. It allows the non-invasive and in vivo study of brain functions in health and disease. In the last two to three decades (for fMRI, the last decade) these techniques have revolutionized neuroscience research and have generated a wealth of new knowledge. It is therefore timely that an up-to-date book such as Imaging Neuroscience: Clinical Frontiers for Diagnosis and Management has been published to provide an overview of recent advances in imaging in neuroscience. This book, which is part of a British Medical Bulletin series, is edited by Richard Frackowiak and Terry Jones, who are both leading researchers in functional imaging, with contributions from recognized authors in the relevant fields. The focus of the book is on how knowledge acquired using brain imaging furthers our understanding of brain functions and disease pathogenesis, and how this in turn translates into the development of new therapeutic options and diagnostic tests in clinical neurology.

The chapters are organized according to neurological systems, with an opening chapter by Robert Turner and Terry Jones reviewing the technical aspects of fMRI and PET. The vast amount of information on this topic, which could easily be expanded to a two-volume textbook, is succinctly presented by the authors, with particular emphasis on the aspects relevant to neurologists and neuroscientists. The remainder of the book deals with the latest imaging findings, predominantly from fMRI and PET. Chapters by Darren Gitelman, Hugo Critchley, Rebecca Elliott and Richard Wise discuss the neural networks governing attention, emotion, executive functions and language, and the imaging findings in related diseased states. The main section of the book covers imaging in the subspecialty fields of neurology, such as pain, stroke, epilepsy, headaches, dementia and other memory disorders. The chapters on multiple sclerosis and stroke discuss recent advancements in understanding of these diseases using MRI-based technology, including diffusion-weighted MRI, magnetization transfer MRI and MR spectroscopy. Richard Banati’s chapter on neuropathological imaging talks about detecting microglial activation in vivo using ¹¹C-(R)-PK11195 PET, a ligand which binds selectively to activated microglia in the brain. This can be employed to understand the role of microglia in the pathogenesis of various neurodegenerative disorders, such as Alzheimer’s disease and Parkinson’s disease. The chapter on dementia by Catriona Good reviews neuroanatomical changes in ageing and dementia as revealed by voxel-based morphometry. Mark Richardson’s chapter on epilepsy places particular emphasis on the use of brain imaging in identifying the source of seizures and surgical targets in patients with drug-resistant epilepsy of focal origin. Psychiatric topics such as addiction and depression, as contributed by Lingford-Hughes and colleagues and Helen Mayberg, are also included.

Several chapters in the book are devoted to translational medicine, detailing the contribution of basic science research...
to further understanding and advancement of functional imaging in humans, and vice versa. The chapter on neuropharmacology and drug development by Antony Gee describes the use of PET in the development of novel therapeutic agents. Information obtained from the recent human genome project has resulted in the discovery of a plethora of novel receptors and enzymes, many of which could be potential therapeutic targets in various diseases. PET enables researchers to investigate the distribution of these receptors, the drug–receptor interaction and the pharmacokinetics of these novel agents. ‘Imaging genomics’, by Ahmad Hariri and Daniel Weinberger, studies the effects of functional genetic polymorphism on brain functions and pathology state. This enables one to study the genotype–phenotype relationship, and may even identify subjects who are at risk of certain neurological conditions. One example cited is the study of cortical information processing using fMRI in asymptomatic carriers of the apolipoprotein E gene, which is associated with late-onset familial Alzheimer’s disease.

Animal models are fundamental to the understanding of the pathology and development of treatments for the corresponding human diseases. The chapter on the neuroimaging of animal models of brain disease by Lythgoe and colleagues shows how the development of small animal scanners has greatly facilitated the understanding of various types of animal models available and the screening of potential therapeutic agents before they are applied to human subjects.

This book provides fairly comprehensive coverage of major neuroscience topics. However, one notable omission is movement disorders, an area which has otherwise featured prominently in the neuroscience imaging literature, particularly with regard to PET. Some of the chapters are also relatively short for the complexity of the topics, and hence are able to provide only a brief account of the subject matter.

Overall, this book provides a useful and up-to-date overview, albeit slightly succinct in certain topics, of recent advances in brain imaging, and is a valuable addition to the neuroscience literature. The chapters on the role of imaging in translational medicine reflect the evolving indications of functional imaging in keeping with other new biotechnology. The liberal use of coloured brain images, the clear layout of the book and the bullet-point summary at the end of most chapters will appeal to many readers. It provides a good introduction to neuroscience imaging for researchers who are less familiar with this diverse area of research. The book’s emphasis on the impact of imaging on the diagnosis and management of neurological disorders makes it relevant reading for most neurologists and neuroscientists.

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