Magnetoencephalography : From Signals to Dynamic Cortical Networks

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Abstrak

Magnetoencephalography (MEG) is an invaluable functional brain imaging technique that provides direct, real-time monitoring of neuronal activity necessary for gaining insight into dynamic cortical networks. This handbook covers the rich and transdisciplinary nature of the MEG field. The underlying motivation for this book was to make this diverse and extensive collection of chapters available to both newcomers and experienced researchers with the hope of stimulating growth in the MEG area.

The book is a comprehensive knowledge base of MEG basics along with the latest developments in methodological, empirical and clinical research, directed toward masters and doctoral students, as well as researchers already in the field. The topics range from neuromagnetic measurements, signal processing and source localization techniques to dynamic functional networks underlying perception and cognition in both health and disease. Topical reviews cover, among others: development on SQUID-based and novel sensors, multi-modal integration (low field MRI and MEG; EEG and fMRI), Bayesian approaches to multi-modal integration, direct neuronal imaging, novel noise reduction methods, source-space functional analysis, decoding of brain states, dynamic brain connectivity, sensory-motor integration, MEG studies on perception and cognition, thalamocortical oscillations, fetal and neonatal MEG, pediatric MEG studies, cognitive development, clinical applications of MEG in epilepsy, pre-surgical mapping, stroke, schizophrenia, stuttering, traumatic brain injury, post-traumatic stress disorder, depression, autism, aging and neurodegeneration, MEG applications in cognitive neuropharmacology, along with an overview of major open-source analysis tools.

The 2nd edition, which is now presented as a Springer Reference, has 9 sections compared to 5 in the first edition and includes a total of 61 chapters. It provides more in-depth tutorials on MEG as an enabling tool in neuroscience and on linear source estimation and spatial filtering approaches. A set of 11 new chapters and 20 updated chapters cover, among others, new topics such as simultaneous MEG and intracerebral EEG recordings, MEG studies on time processing and temporal cognition, open source MNE software, presurgical localization of language, emerging zero helium boil-off MEG technologies and provides updates on novel multi-modal fusion and related modeling approaches, open source analysis packages, neural decoding and MEG Brain Computer Interface, organizational cognitive neuroscience as well as developmental studies and clinical applications. In the last two years significant advances have been made in the field of novel sensor development, particularly for optically pumped magnetometers (OPMs) which are leading the way to a new generation of wearable MEG systems. Included in this new edition is a new chapter covering the topic of “on-scalp” MEG and an updated chapter on OPMs.