

Biomagnetics

Principles and Applications of Biomagnetic Stimulation and Imaging

Editors/Affiliations

Shoogo Ueno, University of Tokyo, Japan

Masaki Sekino, University of Tokyo, Japan

Co-edited by a leader in the biomagnetics field for over 40 years, this book explains the physical principles of biomagnetic stimulation and imaging and explores applications of the latest techniques in neuroscience, clinical medicine, and healthcare. The book shows how the techniques are used in hospitals and why they are so promising. A brief overview of recent research trends in biomagnetics provides graduate students, young scientists, and engineers with an up-to-date, informative guide to explore further in this field.

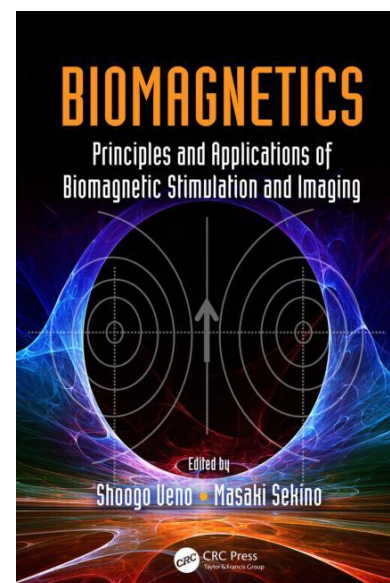
Key Features

- Presents step-by-step explanations of physical principles in biomagnetic stimulation and imaging
- Describes theory with mathematical formulae, making the book an ideal mathematical reference for engineers
- Covers state-of-the-art equipment and methodologies in biomagnetics
- Provides a balanced review of the biological effects of magnetic fields
- Offers an accessible introduction to the history of biomagnetics

Selected Contents

Introduction. Principles of Biomagnetic Stimulation. Applications of Biomagnetic Stimulation for Medical Treatments and Brain Research. Biomagnetic Measurements. Principles of Magnetic Resonance Imaging. Prospects of Magnetic Resonance Imaging of Impedance and Electric Currents. Magnetic Control of Biological Cell Growth. Effects of Radio Frequency Magnetic Fields on Iron Release and Uptake from and into Cage Proteins. Safety Aspects of Magnetic and Electromagnetic Fields. New Horizons in Biomagnetics and Bioimaging.

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Praise for Biomagnetics: Principles and Applications of Biomagnetic Stimulation and Imaging

"**Biomagnetics** to a large extent reflects the extraordinary scientific accomplishments of Dr. Shoogo Ueno. At the same time, this book is so well organized that it could be used as a textbook for a senior or graduate course in biomagnetics. Unlike most other books in this field, the focus here is a mechanistic understanding of the fundamental phenomena, which are then harnessed for important applications. In a clear and pedagogical approach, Professors Ueno and Sekino introduce you to the extraordinary discoveries made in Dr. Ueno's laboratory ... For students, this book introduces them to all the major areas of biomagnetics; for teachers, it suggests a novel syllabus and for researchers, it gives a perspective on the leading edges of biomagnetics."

—Dr. Frank S. Prato, PhD, FCCPM, FCOMP, Imaging Program Leader and Assistant Scientific Director, Lawson Health Research Institute, and Professor, Departments of Medical Imaging and Medical Biophysics, University of Western Ontario

"This book provides a very good review of a large amount of information on the use of magnetic fields for the stimulation of the brain and imaging. It is particularly strong in the area of transcranial magnetic stimulation (TMS) of the brain, where the authors have made important contributions to the field. The parameters ... are well described, along with some of the current limitations of this technique. The discussion of magnetoencephalography (MEG) includes a good description of the inverse problem in locating the signal generating nerves and the need to detect very weak magnetic signals that are generated by the firing of small nerve bundles. ... The treatment of nuclear magnetic resonance is quite complete. ... a good starting point for students and workers in the field who are interested in both MRI imaging systems and those who are interested in exploring the effects of magnetic fields on biological systems."

—Frank S. Barnes, Professor Emeritus of Electrical Computer and Energy Engineering, University of Colorado at Boulder

"Ueno and Sekino's book on biomagnetism offers comprehensive coverage of this increasingly important field of physics applied to biology and medicine. The authors, who are well-known contributors to this area's state of knowledge, present an in-depth but highly readable account of the way magnetic fields are used both to influence biological systems and measure body function. In addition, the book covers the way magnetic fields produced by the body itself can be measured. Highly recommended to all students and researchers who are looking for an authoritative treatise on this expanding topic."

—Andrew Wood, Professor and Chair of Biomedical and Health Sciences, Swinburne University of Technology, Melbourne, Australia

"In his long and successful academic career, Professor Shoogo Ueno has contributed significantly to the scientific and technological development of the biomagnetics field. ... **Biomagnetics: Principles and Applications of Biomagnetic Stimulation and Imaging** covers the whole range of the field as would be expected from the editors' past work. Many observable phenomena induced by the interaction of magnetic fields with biological materials are described here together with the underlying basic physics of magnetism and/or electromagnetics so that readers can better understand these phenomena."

—From the Foreword by Dr. Seiji Ogawa, Professor, Tohoku Fukushi University, Sendai, Japan, and Distinguished Visiting Professor and Director of fMRI Research, Neuroscience Research Institute, Gachon University of Medicine and Science, South Korea

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