

Functional Magnetic Resonance Imaging: An Introduction to Methods

Peter Jezzard, Head of MR Physics, FMRIB Centre, Dept of Clinical Neurology, University of Oxford, **Paul M Matthews**, Director, FMRIB Centre, Dept of Clinical Neurology, University of Oxford, and **Stephen M Smith**, Head of Image Analysis, FMRIB Centre, Dept of Clinical Neurology, University of Oxford

This book provides a comprehensive introduction to functional magnetic resonance imaging (fMRI), the scanning technique which allows the mapping of active processes within the brain.

There are six sections to the book with chapters from an expert international team. Part I provides a broad overview of the field and sets the context. Part II describes the physiological and physical background to fMRI, including coverage of the hardware required and pulse sequence selection. Practical issues involving experimental design of the paradigms, psycho-physical stimulus delivery and subject response are covered in Part III, followed by a comprehensive treatment of data analysis in Part IV. Part V deals with practical applications of the technique in the field of neuroscience and in clinical practice. The final section describes how fMRI can be integrated with other neuro-electromagnetic functional mapping techniques.

Functional Magnetic Resonance Imaging: An Introduction to Methods is written to be accessible to a wide-ranging audience of research scientists interested in studying how the normal brain works, and clinicians interested in monitoring disease states and processes.

Contents: Part I: Introduction, Matthews: An introduction to fMRI of the brain; Part II: Physics and Physiology, Gjedde: Brain energy metabolism and the physiological basis of the haemodynamic response; Jezzard & Clare: Principles of nuclear magnetic resonance and MRI; Jones, Brookes & Moonen: Ultra-fast MRI; Glover: Hardware for functional MRI; Bandettini: Selection of the optimal pulse sequence for functional MRI; Menon & Goodyear: Spatial and temporal resolution in fMRI; Hoge & Pike: Quantitative measurement using fMRI; Part III: Experimental Design, Donaldson & Buckner: Effective paradigm design; Savoy: The scanner as a psychophysical laboratory; Part IV: Analysis of Functional Imaging Data, Smith: Overview of fMRI analysis; Smith: Preparing fMRI data for statistical analysis; Brammer: Head motion and its correction; Worsley: Statistical analysis of activation images; Jenkinson & Smith: Registration, brain atlases and cortical flattening; Buchel & Friston: Extracting brain connectivity; Part V: fMRI Applications, Owen, Epstein & Johnsrude: fMRI: applications in cognitive neuroscience; Thulborn & Gisbert: Clinical applications of mapping neurocognitive processes in the human brain with fMRI; Part VI: Integrating Technologies, George, Schmidt, Rector & Wood: Dynamic functional neuroimaging integrating multiple modalities.

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