

Quantitative MRI of the brain: measuring changes caused by disease.
By P Tofts, pp. xvi+633, 2003 (John Wiley & Sons Ltd, Chichester, UK) £175.00
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This is a large multi-author book with over 600 pages in total which covers effectively all the advanced image analysis techniques currently in clinical research use in cerebral magnetic resonance. The contributors will be well known to workers in the field and the whole thing has been pulled together by Paul Tofts into a well integrated, well written and extremely informative reference book.

There are in total 18 chapters split into 3 sections. The first section talks about basic concepts of the measurement process related to the acquisition of magnetic resonance images covering potential sources of variations or unexpected errors in acquired images and potential corrections amongst others. Section B concerns techniques that are designed to try and measure independent parameters within the brain. These range from the direct measurement of proton density, T₁ and T₂ (chapters 4, 5 and 6) through measurement of diffusion and magnetization transfer (chapter 7 and 8), but also include the more biologically directly appropriate methods of spectroscopy, T₁ and T₂ dynamic contrast enhanced MR, functional MRI and arterial spin labelling (chapters 10–13). Section C is a single chapter that reviews the biological significance of measured MR parameters in multiple sclerosis. This chapter stands alone and it might have been nice to see other specific disease-related chapters although I do not think the book suffers significantly for their lack. Finally section D deals with pure “image analysis” techniques including spatial registration of images, measurement of structural volume and detection of atrophy, measurement of shape and texture and statistical methods for measuring subtle changes in diffuse disease.

It should be said that each of these chapters is extraordinarily well written. They are, by the nature of the book, rather technical but despite that are highly accessible even to the relatively non-technical reader in most cases. Each of the chapters starts with a basic conceptual introduction to the technique and then deals in a highly principled way with factors affecting accuracy, precision, reproducibility and potential problems associated with analysis models etc.

I think many of the people who would benefit from this book are those involved in doing MR-based research on the brain in disease and a large number of them will already have the book on the bookshelf. It is quite clear that this is one of the most comprehensive and up to date textbooks of quantitative methodology in cerebral MRI currently available. I would strongly recommend that anybody intending to use one of these quantitative MR techniques who is not already highly familiar in its application should review the appropriate chapters in this book at an early stage to help them avoid making easily avoidable errors which is all too common with the applications of this type of technical methodology.

A JACKSON
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