The Fifth Edition of *The Physics of Clinical MR Taught Through Images*

Key Words: physics, fifth edition, magnetic resonance, textbook

Radiology is driven by technical and digital progress, unlike any other discipline in medicine. In particular for cross-sectional imaging, the development of more powerful computer processors has contributed to a significant acceleration of image acquisition and reconstruction. Especially in magnetic resonance (MR), the handling of large digital data sets and the integration of artificial intelligence make it possible to generate images with previously unimagined resolution, excellent quality, and at the same time within very short examination times.

However, it is becoming increasingly difficult to stay up-to-date with these rapidly evolving innovations. This holds true for younger colleagues in residency as well as for the experienced radiologist who both are confronted with an increasing complexity in MR imaging procedures. Nevertheless, the in-depth understanding of the technology is indispensable for successful application and clinical use of MR in patient care.

Without a doubt, standard books on MR physics provide a lot of comprehensive information, but the clinical radiologist may get lost in the details referring to these standard texts. On the other hand, it is very challenging to publish a book addressing precisely the most important technical aspects, while at the same time being linked to their clinical application in an understandable way. With a new publisher, Val M. Runge and Johannes T. Heverhagen again successfully meet this major challenge in the fifth edition of *The Physics of Clinical MR Taught Through Images.*

In line with previous editions, the main objective of this fifth edition of the book is to give a practical guide to MR physics based on clinically acquired images highlighting the impact of hardware and technical parameters on image quality and image artifacts. With over 360 pages subdivided into 9 logical sections and a total of 160 chapters, this text provides an introduction to basic MR imaging concepts, explains advanced MRI techniques, and highlights the latest innovations in the field. As with the former editions, the sections and chapters are arranged in a practical and logical order; however, they also represent completed documents, which can stand alone. Thus, this book can be considered a concise educational textbook or may serve as a quick reference guide for the more experienced reader in the field.

In the first 3 sections, the authors explain basic MR hardware components including different magnetic field strengths and scanner designs, as well as innovative technologies such as multichannel receiver coils and multidimensional radiofrequency transmissions. In addition, k-space sampling, spatial architecture of an MR data set, and significance of signal-to-noise and contrast-to-noise ratios on image quality are discussed. Special focus lies on basic MR image acquisition including the concept of tissue relaxation times, basic pulse sequence schemes, as well as the concepts of signal suppression and signal separation. In addition, the concept of contrast-enhanced MRI even including the latest developments in Gd-based contrast agents is addressed.

More sophisticated MR techniques are covered in sections 4 and 5, which highlight the further development of scan sequences allowing for a marked improvement in temporal and spatial resolution as well as the acquisition of 3-dimensional data sets with isotropic resolution. The background and application of echo planar, diffusion-weighted, diffusion tensor, blood oxygen level–dependent imaging, and MR spectroscopy are also discussed. In particular, the implementation and measurement of blood flow, a real game changer in clinical MR imaging, including both unenhanced and contrast-enhanced, as well as dynamic 4-dimensional MR angiography techniques, highlight this part of the book.

Section 6 addresses tissue and organ-specific techniques applied for brain imaging, as well as cardiac MRI including the evaluation of cardiac function, morphology, myocardial perfusion, and viability, as well as myocardial mapping. This section also includes MR mammography, fat and iron quantification of the liver, and cartilage mapping techniques. Very interesting are sections 7 and 8 where the origin of MRI artifacts, and in particular, the resolution of MR images, is discussed in a very illustrative way differing between field strength and focusing on different body locations and types of sequences.

A dedicated highlight of the book is the totally new section 9 dealing with recent innovations in MR. Here, the authors provide insights into new techniques such as low-field MRI systems operating at 0.55 T, compressed sensing, spiral imaging, simultaneous multislice acquisition, as well as the innovative, hardware-free detection of respiratory and cardiac motion, and their implementation into sequence acquisition. This section alone warrants the acquisition of the new edition, even if you already own an older version. The book finally closes by giving an overview on dedicated advantages of different field strengths for clinical MR application.

This fifth edition of *The Physics of Clinical MR Taught Through Images* is the missing link between detailed MR physics references and purely clinical MR textbooks. It represents a valuable resource for every radiologist, physicist, or technologist, who wants to comprehend or deepen their knowledge of MR imaging techniques in a unique, interesting, and effective way.

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