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Hendee's physics of medical imaging, fifth edition, by Ehsan Samei and Donald J. Peck

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This book on "Hendee's Physics of Medical Imaging" (16,415 yen) was published by Wiley-Blackwell in 2019. The name "Hendee" in the title of the book is Dr. William Hendee who was one of the most influential physicists in the world affecting medical physics including the physics of diagnostic radiology and radiation therapy over the last 60 years. Dr. Hendee was the president of several societies including the American Association of Physicists in Medicine (AAPM), the Society of Nuclear Medicine (SNM), the American Institute of Medical and Biological Engineers (AIMBE), and the American Board of Radiology (ABR). Also he was Chairman of the Department of Radiology at the University of Colorado. All of this indicates his broad and deep knowledge and insightful views in the field of Medical Physics. In addition, it is well known that Dr. Hendee served for many years as Editor-in-Chief of the journal *Medical Physics*, which is the official journal of the AAPM.

His first book entitled "Medical Radiation Physics" was written and published in 1971, which included the physics of diagnostic radiology and radiation therapy. This book was followed by Dr. Hendee in two different publications "Medical Imaging Physics" in 2002 and "Radiation Therapy Physics" in 2004. After the retirement of Dr. Hendee in medical physics, Dr. Ehsan Samei and Dr. Donald J. Peck, each of whom has contributed significantly in the field of medical physics, have undertaken major task for substantial edition of the book, which resulted in this book as 5th edition published in 2019. The other edited book on "Hendee's Radiation Therapy Physics" by Dr. Todd Pawlicki, Dr. George Startschall, and Dr. Daniel Scanderberg is a counterpart of this book.

This book is written for students, radiological technologists, medical physicists and radiologists for studying medical physics in medical imaging, and includes the ten chapters as listed below:

1. Physics of radiation and matter
2. Anatomy, physiology, and pathology in imaging
3. Image science
4. Radiobiology, dosimetry, and protection
5. Imaging operation and infrastructure
6. Projection X-ray imaging
7. Volumetric X-ray imaging
8. Nuclear medicine
9. Ultrasonography
10. Magnetic resonance imaging

In Chapters 1–5, subjects common to all of medical imaging are described in detail in plain, easily understandable words. In Chapter 1, the physical properties of radiation, interactions with matter, generation of radiation, and the basic concept of radiation detectors are described with use of many figures and tables to assist the reader's understandings.

In Chapter 2, actual medical images and many organs are described concisely with the use of colorful illustrations, which may be useful to students who has no medical background and, thus, researchers in medical physics will be able to learn basic aspects of anatomy, physiology and pathology in a short period of time.

In Chapter 3, basic principles together with advanced concepts related to statistics, ROC analysis, image quality evaluation, and image processing are described in detail. For image quality evaluation, metrics related to contrast, sharpness and noise are clearly defined, and the variations in actual X-ray images are demonstrated as each metric

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is changed, which would be useful to students and young researchers. For image processing, processing of X-ray images commonly used in routine clinical situations and reconstruction of CT images are explained intelligently using many figures and actual images without equations, which may be one of the unique features of this book.

In Chapter 4, important concepts related to radiation measurements and radiation protection are presented with many illustrations with figures and tables.

In Chapter 5, detection and recognition of lesions as well as diagnostic decision making are discussed in detail together with visual search, visual system performance and the importance of professional medical knowledge about diagnosis, which is a very important subject carefully covered in this book but is not covered in many other books. For image display systems, DICOM file format and quality control of medical images, detailed explanations are given concisely with many illustrations with figures and tables.

From Chapters 6–10, each modality for projection X-ray images, volume images for tomography and CT, nuclear medicine images, ultrasonographic images, and MRI images is described visually in terms of principle, image acquisition systems, and advanced techniques using clinical images and figures and tables. In particular, the complex imaging theory of MRI is explained by the use of many colorful figures, which will be helpful to new researchers to understand it intuitively. For MR images acquired with many different pulse sequences, specific features of those images are explained with the use of actual images, which will be helpful for understanding of the basic approach and of advanced imaging methods.

A subject that is not included in this book, which is of some concern, is the quantitative analysis of medical images and computer-aided diagnosis (CAD). Quantitative analysis in medical imaging is expected to become important in medical physics and diagnostic radiology in the future. With the advent of recent introduction of artificial intelligence (AI) and machine learning into CAD, the performance of CAD has been shown to be improved substantially. It is expected that the next edition of this book will include these subjects in the future.

This book is suitable as a textbook for students who are studying medical physics, because this book includes important subjects related to medical physics and techniques for all medical images currently used in routine clinical studies. For persons who are involved with clinical medical images as radiological technologists, medical physicists and radiologists, this book will be a useful guide and a reference for acquiring new knowledge beyond the reader's specialty and/or for confirming specific knowledge. The unique feature of this book that it provides is many colorful illustrations and images, which may not be available in other books, in order to help readers understand difficult basic theory. It would be useful just to look at these figures and images provided in the book. We expect that many readers will enjoy reading this book as a textbook or as a reference.