"HENDEE'S PHYSICS OF MEDICAL IMAGING" 5TH EDITION BY EHSAN SAMEI AND DONALD J PECK

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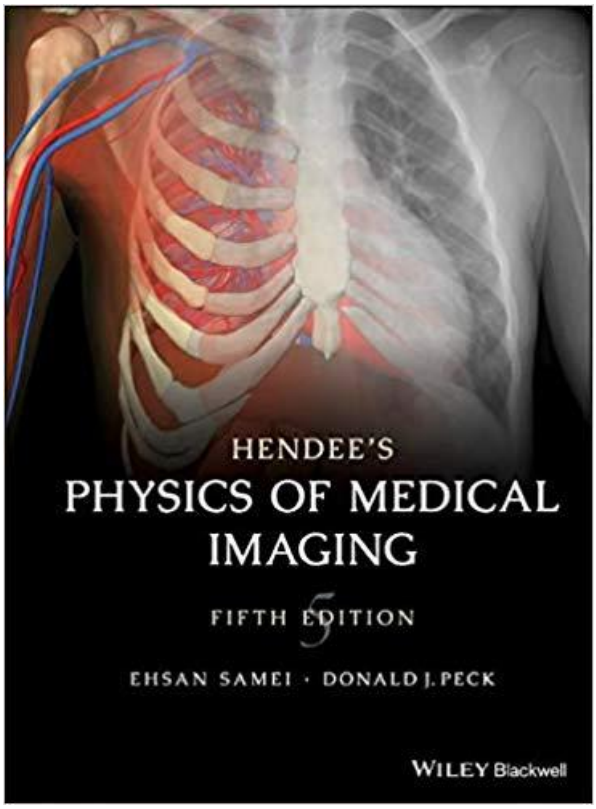
Abstract— **This article is a brief review of the textbook "Hendee's Physics of Medical Imaging" 5th Edition, by Ehsan Samei and Donald J Peck, 2019, Wiley-Blackwell, USA, ISBN-13 9780470552209**



The book "Hendee's Physics of Medical Imaging" – 5th Edition continues the update of the classic textbook of Prof. William Hendee "Physics of Medical Imaging", whose 4th Edition (W Hendee and R Ritenour) currently is one of the most often used textbooks in the profession. The new book (5th Edition) is written by the well-known specialists Ehsan Samei and Donald J Peck. I can only congratulate the authors for naming their book after Prof. Hendee, thus enhancing the great tradition of continuity in our profession.

The new book of Ehsan Samei and Donald J Peck has different look and presentation (compared with the 4th edition), it covers the newest development of medical imaging physics, supported with high quality colour diagrams and very good explanations. This is one of the few textbooks on the subject with plenty of colour figures distributed inside the text. The layout is in two equal columns. Total volume of the book is 468 pages (close to the number of pages of the previous edition – 512). The book has an Introduction and 10 Chapters. Each chapter includes a list with main References. The book assumes some initial background knowledge in physics, what these days is valid also for medical specialists.

The book starts with a brief Introduction to the subject, which takes 7 pages with 5 main parts, supported with 9 figures. It presents the historical foundation and advances of medical imaging physics.

Chapter one "Physics of Radiation and Matter" has the following main parts: Electromagnetic Radiation; Radioactivity; Radiation Interactions with Matter; Production of X-rays; Radiation Detectors. The chapter is 53 pages long with 70 sub-divisions, supported with 67 figures. The explanations are both academic and easy to read without heavy mathematics.

Chapter two "Anatomy, Physiology, and Pathology in Imaging" has the following main parts: Interaction of Radiation with Tissue; Structure and Function. The chapter is 30 pages long with 54 sub-divisions, supported with 27 figures. The chapter is a useful inclusion in such a type of textbook, as it will be very useful for the young medical physics readers, presenting the needs and challenges in imaging various anatomical structures.

Chapter three "Imaging Science" has the following main parts: Basic Statistics; Modeling Radiation Interactions; Image Quality; Image Processing. The chapter is 49 pages long with 77 sub-divisions, supported with 52 figures. The chapter presents very well the physical parameters of an image and thus sets the background for the following description of various image modalities. Again, mathematics is sufficient, well explained, and not heavy.

Chapter four "Radiobiology, Dosimetry, and Protection" has the following main parts: Radiation Quantity and Quality; Radiation Effects in Cells; Radiation Effects in Animal Systems; Determination of Dose in Humans; Protection from Radiation. The chapter is 33 pages long with 64 sub-divisions, supported with 19

figures. This is another background chapter linking general imaging sciences with the specific way images are acquired in medicine, underlying the main principles of Radiation Protection.

Chapter five "Imaging Operation and Infrastructure" has the following main parts: Image Perception; Medical Displays; Imaging Informatics; Clinical Imaging Operation. The chapter is 33 pages long with 45 sub-divisions, supported with 30 figures. This is the final background chapter with excellent descriptions of various medical displays and hospital information systems dealing with digital images.

Chapter six "Projection X-ray Imaging" has the following main parts: Projection X-ray Setup; X-ray Projection Modalities; Key Components of Projection X-ray Systems; Exposure Control. The chapter is 24 pages long with 29 sub-divisions, supported with 32 figures. This is a classical chapter for X-ray radiography and fluoroscopy, which is based on digital detectors, but also includes information on films and Image Intensifiers.

Chapter seven "Volumetric X-ray Imaging" has the following main parts: Tomosynthesis; Computed Tomography; Volumetric X-ray Reconstruction. The chapter is 23 pages long with 44 sub-divisions, supported with 21 figures. This is another classical chapter for X-ray imaging using reconstruction. It is easy to read and is very well explained with minimal mathematics.

Chapter eight "Nuclear Medicine" has the following main parts: Radionuclides; Counting Systems; Principles of Scintillation Camera; Emission Computed Tomography; Single-Photon Emission Computed Tomography (SPECT); Positron Emission Tomography (PET). The chapter is 32 pages long with 60 sub-divisions, supported with 32 figures. This is also a very well explained classical chapter, which will be useful both for medical physicists and related medical specialists.

Chapter nine "Ultrasonography" has the following main parts: Sound Properties; Transducers; Ultrasound Beam; Ultrasound Imaging; Doppler; Artifacts; Therapeutic Use and Bioeffects. The chapter is 31 pages long with 41 sub-divisions, supported with 34 figures. As the other classical chapters, this one includes all parts to make it standalone. The colour figures used in this and the following chapter are a real asset not only for the students, but also for the lecturers in medical physics.

Chapter ten "Magnetic Resonance Imaging" has the following main parts: Fundamentals of Magnetic Resonance; Magnetic Resonance Imaging as a Probe of the Body; Magnetic Resonance Image Contrast; Magnetic Resonance Imaging and Flow; k Space; Additional MRI Contrast Mechanisms; Spectroscopy; Chemical Shift Imaging; MRI Artifacts; Bioeffects and MR Safety. The chapter is 106 pages long with 64 sub-divisions, supported with 113 figures. Understandably, this last chapter is the largest one and, as in the previous ones, provides a very smooth learning curve for the reader.

The book concludes with an extensive Index over 15 pages, which makes it a good reference.

The "Hendee's Physics of Medical Imaging" – 5th Edition is written with clear and focused academic language. As mentioned above, it will be very useful both for students and lecturers on the subject. The audience of the book will also expand in the field of relevant medical specialists.

This brief review does not intend to compare the 4th and 5th editions of the book, but if one makes a comparison, one will find the same paedagogical values of both. At first sight the new book has different structure and layout, but it carries the same educational components through a slightly different pedagogical paradigm.

I would like to conclude this brief review with a congratulation to both authors for the excellent textbook. Being myself involved in medical physics lecturing and textbooks writing, I know very well how difficult it is to write a good textbook, which to guide the student through his/her way of gradual knowledge built up. These days many Universities undervalue textbook writing, what dissuades some colleagues from such endeavor, what directly affects the preparation of the future generation specialists. This, added to the fact that producing clear explanations of complex processes is a very difficult task, creates a steep path for the authors. It is excellent to see that this has not stopped Dr Samei and Dr Peck in creating a long lasting textbook in Medical Imaging Physics, which will continue the tradition set up by Dr Hendee. I shall not be surprised to see in near future this book translated to other languages.