
Diagnostic Ultrasound: Physics and Equipment

P.R. Hoskins, K. Martin, and A. Thrush, eds.

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This second edition of *Diagnostic Ultrasound: Physics and Equipment* provides a comprehensive introduction to the principles of ultrasound physics, instrumentation, and applications used in modern clinical practice. This edition has been expanded to include discussion of technologies that have become commonly available on commercial ultrasound systems since publication of the first edition. Review questions are provided at the end of each chapter, along with references for further reading. The book also includes a glossary and an index.

The book consists of 14 chapters and 5 appendices. Chapters 1 through 4 cover the basic physics and instrumentation of B-mode imaging, including transducer design, beam formation, focusing and steering, and basic signal processing. Current technologies such as harmonic imaging and coded excitation are also introduced.

Chapter 5 discusses system performance measures and the origin of artifacts encountered in B-mode imaging, including speed-of-sound artifacts such as phase aberration. Chapter 6 covers B-mode measurements and potential sources of measurement error.

Doppler ultrasound principles, including power, color and spectral Doppler, properties of blood flow, and Doppler tissue imaging, are described in chapters 7 through 10.

Chapter 11, on quality assurance, covers equipment quality control tests and performance measures and includes description of a variety of different phantoms for assessing ultrasound system performance. The topic of ultrasound safety receives excellent coverage in chapter 12 and in the appendix on British Medical Ultrasound Society (BMUS) guidelines for the safe use of diagnostic ultrasound equipment. Through-

out the book, reference to both European and U.S. standards and guidance are provided when relevant to the topic of discussion.

Three new chapters (13–15), covering 3- and 4-dimensional ultrasound, contrast agents and contrast-specific imaging techniques, and elastography, have been added to this second edition. Elastography concepts are nicely illustrated in the diagrams and effectively demonstrated in both phantom and clinical images.

The 5 appendices provide additional information: an explanation of the decibel scale and the binary system, BMUS safety guidelines, a list of relevant standards committees, and a description of acoustic output parameters used to characterize ultrasound fields.

This book is an excellent introductory textbook that covers the basic principles of ultrasound physics and instrumentation of diagnostic medical ultrasound. The book is well written, with clear explanations and plentiful, good-quality illustrations. The book can serve as a reference for clinical users of ultrasound, such as sonographers and radiologists, or as a textbook for students and residents in those disciplines. Although the book is intentionally not mathematically rigorous, it can provide an excellent introduction to diagnostic ultrasound technology for medical physicists and engineers.

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