Book Reviews

INFORMATION PROCESSING IN MEDICAL IMAGING. Proceedings of the 8th Conference, Brussels, August 29–September 2, 1983.
F. Deconinck, Ed. Boston, Martinus Nijhoff, 1984, 580 pp, $84.00

This book is very valuable for the medical imaging scientist and may serve several purposes: as a detailed and relatively complete introduction to a possibly unfamiliar area of medical imaging, and as a source of inspiration for one's own research.

True to the book's title, the papers address aspects of the information content of medical imaging: how to detect, measure, classify, and display it. Measurement may be subdivided into instrumentation for the acquisition of data, reconstruction of the raw data into an image, and pre- and postprocessing to enhance information in the images. Taking some liberties with the authors intentions, the papers may be classified by this scheme.

In the detection of information, Venot et al. discuss detecting changes in images whereas Geiser et al. concentrate on endocardial boundary detection.

The instrumentation aspect of measurement is considered in several papers. Bizais et al. and Barrett et al. discuss coded aperture tomography. Barber et al. describe applied potential tomography, and Clayton et al. describe the use of the uncollimated Compton profile in measuring osteoporotic changes in the vertebrae.

Reconstruction methods focus on single photon emission computed tomography (SPECT). Oppenheim and Appledorn compare algebraic and convolution algorithms while Tanaka and Toyama present a weighted back projection algorithm. Defrise and DeMol discuss more generally the problem of limited angle reconstruction.

The processing of data both before and after reconstruction is the largest part of measurement and of the book. Konstantinow et al. reduce crosstalk in first-pass angiocardiography, Todd-Pokropek et al. describe pre-processing steps to make SPECT attenuation correction object-independent. Leach et al. apply variable median filtering to projections prior to tomographic reconstruction. Houston and MacLeod compare a variety of temporal functional images derived from multigated cardiac studies while Brown et al. describe automatic functional imaging from such data. Bacharach et al. discuss the effects of sharp cutoff filters on time-activity curves, and Luypaert and Bossuyt consider the assessment of cardiac function from noisy data using synergy indices. Goris describes a single measure of regional wall motion based on normalization to global performance. Toet et al. discuss topological methods of image analysis and DeGraaf et al. apply several hierarchical image processing algorithms. Somer and Jongsma present an acusto-optical method of deconvolution for real-time echography. Ortendahl et al. describe a Bayesian resolution recovery algorithm. Sandor et al. create zonal parametric images applying the concepts of segmental analysis and functional imaging. Wagner and Brown present a unified analysis of the SNR characteristics of medical imaging systems.

The goal of many of these measurements techniques is to supply processed data from which a diagnosis or some other classification may be made. Several classification approaches are discussed. Nijran and Barber apply factor analysis to dynamic studies. Duvernoy et al. employ linear classifiers in recognizing the temporal behavior of the heart. Pavel et al. provide the normal data for several functional images computed from multigated heart studies. Schmidlin and Clorius use discriminant analysis on exercise venograms. Goris et al. describe the interpretation of thallium myocardial perfusion studies on a stochastic basis. Metz et al. examine the significance of ROC curve differences arising from correlated data. Ortendahl et al. discuss the fundamentals necessary for automating tissue characterization by nuclear magnetic resonance (NMR).

Two papers discuss aspects of the visual presentation of information. Pizer et al. describe an interactive three-dimensional image display while Baxter et al. discuss the visual performance of the observer.

The papers in the areas with which this reviewer is most familiar, temporal analysis of multigated cardiac studies and NMR, are up-to-date as of 1983, and make substantial contributions toward answering important questions. These papers remain significant 2 yr after they were first presented.

While this book is an excellent resource for the imaging scientist, the physician with a technical bent might also benefit from it. This reviewer eagerly awaits the proceedings of the ninth conference.

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MANUAL OF DIAGNOSTIC IMAGING. A CLINICIAN'S GUIDE TO CLINICAL PROBLEM SOLVING.
W. H. Straub, Ed. Boston, Little, Brown and Co., 1984, 298 pp, $16.95

This soft-cover paperback, one of the series of inexpensive spiral-bound manuals produced by Little, Brown and Co., meets the editor's stated goal of producing an inexpensive manual for daily use, "superficial by intent" but providing an overview of an efficient approach to diagnostic imaging. The introductory section deals with economic and statistical aspects of modern medical practice, speculations on the effect of DRGs and the algorithmic, decision-tree approach to medical problem solving. The sections which follow present concise discussions of clinical problems as varied as scrotal masses, dementia, and renal transplant rejection. These discussions follow an effective and logical fixed format: the overview of the role of imaging studies, one or several decision trees, and a commented bibliography of key references. The approach to imaging is genuinely coherent and humane and the use of interventional techniques is presented with reasoned enthusiasm. The chapters on staging of tumors are particularly good. Discussions are well presented and easy to find by flipping pages. However, it should be emphasized that some of the

algorithms could be hotly disputed, and many will need revison in the future to incorporate new techniques, so that they should not be followed blindly.

Unfortunately, the book suffers from sloppy proofreading. The well-chosen references would be significantly more useful if they were verified. Finding "Bosnak" for Bosniak, "Kazan" for Kazam, "hematura" for hematuria, etc., makes one suspect that the page and volume numbers will be similarly garbled. This vitiates the very considerable effort that has gone into preparation of the bibliography.

All of the authors come from the University of Pittsburgh School of Medicine, leading to a "single institution" approach. The orientation is towards a classical "radiology" which may reflect the strengths and weaknesses of the departments involved in elaborating the various sections. It is probable that specialists in nuclear medicine and ultrasonography will find much to object to. As standard a technique as correlation of HCG titers with ultrasound images in the evaluation of possible ectopic pregnancy is completely ignored. Similarly, it is astonishing to find statements such as "nuclear medicine has shown relatively little growth recently" or "ejection fraction determination will probably be replaced by digital (?) NMR or cine-CT in the near future." These suggest either a real limitation in the understanding of "non x-ray" imaging on the part of the authors, or a regrettable institutional bias.

It is to be hoped that a second edition will remedy some of the weaknesses signaled above. There is still much to recommend this book for the clinician in practice encountering an unfamiliar problem or wishing to review recent developments. This handy and inexpensive volume is appropriate and helpful for medical student teaching, and we use it for the third year elective in radiology at Harvard. It should also be invaluable in the emergency room.

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RADIATION PROTECTION IN THE RADIOLOGIC AND HEALTH SCIENCES, SECOND EDITION.

M. E. Noz, G. Q. Maguire, Jr., Philadelphia, Lea & Febiger, 1985, softcover, 277 pp, $24.50

Radiation protection training is an important and integral part of all physician, scientist, and technologist training programs in nuclear medicine. This book offers itself as a textbook "... for courses in an academic or training program-...directed primarily toward students preparing for a career as radiologic technologists, medical physicists, or health physicists and toward radiology residents." Its length and depth of coverage are just about right for a one-semester course. There are 12 chapters, four appendices, an excellent glossary, a good index, and questions and references at the end of each chapter.

This book is unusual in that it is one of the first American books on radiation protection which uses SI units consistently throughout. I have been resistant about changing to the SI system for radiation protection purposes, but by the end of the book I found myself reasonably comfortable with grays and sieverts and kerma. The quality of the proofreading and printing is excellent, but the hand-drawn line drawings are occasionally amateurish and, in at least one case, misleading. The figure supporting the discussion of low-level radiation effects models does not actually show the preferred linear-quadratic model accurately. And the diagram of the MIRD phantom is out-of-date. Although the authors state that their focus is ionizing radiation, they should consider adding brief discussions of the radiation protection implications of diagnostic and diathermy ultrasound, radiofrequency radiation (diathermy and NMR), medical lasers, and high intensity optical sources used in dermatology. There also needs to be a discussion of mammography.

All things considered, I recommend this book as a textbook, but not for the broad audience suggested by the authors. Health physicists and medical physicists at the undergraduate level could use it as an introductory text, but there is not sufficient depth for those training at the graduate level. Comparable material is available in other accepted technologist books; although this book is good, I cannot recommend its purchase over and above these others. Finally, it seems well-suited for radiology and nuclear medicine residents.

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A HANDBOOK OF RADIOACTIVITY MEASUREMENTS PROCEDURES, SECOND EDITION.

National Council on Radiation Protection and Measurements, Bethesda, MD 20814, February 1, 1985, 592 pp, $22.00

Anybody who thinks that a committee cannot produce a good book will be confounded to read this manual. It is largely to do with the physics of radioactivity measurements, it covers theoretical and practical aspects of all the common methods of measurement. This book will serve as a reference manual to all needing an authoritative guide to radioactivity measurements and procedures. The book is written concisely, but covers all the principle methods of radioactivity measurement including absolute and indirect methods, techniques for the preparation of standard sources and the assay of radionuclides in environmental, medical and industrial laboratories. It also has two chapters on the statistics of radioactivity measurements. Some of the methods discussed include solid and liquid scintillators, solid state detectors, ion chambers, proportional counters, the measurement of alpha, beta and gamma radiations, and the use of multichannel analyzers and scalars.

The appendix contains an up-to-date compilation of the atomic and nuclear radiations emitted by some 200 radioactive nuclides. Listed in tabular form are recommended values for half-lives, energies, intensities, and equilibrium absorbed-dose constants for each of the emitted radiations. The latter information is needed in order to estimate the absorbed dose from internally administered radionuclides.