

## BOOK REVIEWS

**ESSENTIALS OF NUCLEAR MEDICINE.** F. A. Mettler, M. J. Guiberteau. New York, Grune & Stratton, 1983, 338 pp, \$44.50

In general, texts in nuclear medicine may be divided into two large categories. The first are those that deal with extensive pathophysiology, the relationship of disease states to scintigram appearance and the theoretical aspects of imaging. The second large group deals rather mechanistically with how images are obtained, protocols for imaging procedures, and the interpretation of the images. This text falls into the latter category. If you wish detailed knowledge of the pathophysiology of various disease states or the theoretical considerations that determine why certain procedures are performed as they are, you will not find this text satisfying. On the other hand, if you wish to know how imaging is performed in specific situations, how to derive protocols for imaging and to be able to view representative images of various types of studies, then this work is a quite reasonable guide. In the approximately 300 pages of material, the authors present chapters on radioactivity and radionuclides, instrumentation, quality assurance, computers, and the various organ systems. There is also a concluding chapter on legal requirements and radiation safety. In general this is the type of book that one places on the shelf and pulls down when one is called upon to do a procedure that is not an everyday part of laboratory routine—it is a reference text.

The appendices contain a glossary of common and useful terms in nuclear medicine, a table of the characteristics of radionuclides for imaging and therapy, and for those of us who have been in practice for several years a particularly useful table to convert becquerels to curies. A very extensive appendix contains sample techniques for nuclear imaging that may be quite useful in many laboratories. Appendix F is one of those rare documents that provides a study guide for individuals interested in furthering their education in nuclear medicine. I suspect this section as well as the entire text would be quite helpful in preparing for Board examinations. The book should be used for reference rather than as a primary teaching tool for medical students or residents.

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**COMPARTMENTAL MODELS AND THEIR APPLICATION.** K. Godfrey. New York: Academic Press, 1983, 293 pp

The scientific basis for many nuclear medicine procedures involves tracer kinetics. In particular the determination of regional perfusion rates depends upon the relationships between the physiological parameters and certain observable quantities such as the rates of uptake and disappearance of radionuclides in areas of interest. One of the principal methods used for analyzing these relationships is compartmental modeling. This book provides an excellent exposition of the mathematical principles involved in compartmental modeling. These principles, however, are not uniquely applicable to radionuclide tracers; the mathematics are formally the same for other tracers or for other systems, such as electrical circuits, and compartmental models are discussed with only incidental mention of isotopes or radioactivity.

It is difficult to treat compartmented systems in depth without getting into some fairly sophisticated mathematics. The book passes quite rapidly into the convolution integral, Laplace transforms, and matrix algebra as the basic mathematical tools used in the analyses. The reader who does not feel quite comfortable at this mathematical level will find help in several appendices that provide elementary explanations of Laplace transforms and matrix algebra, but some familiarity with at least the notation used in differential and integral calculus is assumed. A large number of figures, consisting of diagrams of models and graphs of the responses of these models to unit impulses and to other input functions, are provided throughout the book. Also, rather than assuming that mathematical expressions are self-explanatory, the author has done a very good job of translating them into English.

The first chapter gives a definition of compartments and nonlinear, time invariant models. Chapters 3 and 4 give a detailed analysis of the "direct" problem (the response of the system to an external perturbation, given the structure of the system) for one-, two-, and three-compartment systems, followed by several examples of systems with more than three compartments. Chapters 5 to 7 present an excellent consideration of the more difficult inverse problem of determining the system parameters from measurements of one or more of the states (such as the distribution of a tracer as a function of time). This is also called the identifiability problem. The first emphasis is on deterministic identifiability, which requires ideal observations. This is followed in Chapter 8 by a discussion of some practical problems involving measurement accuracy, the effects of noise, limited time range of the data, and the effects of poorly spaced samples. Nonlinear compartmental models are discussed in Chapter 9, and time-varying and stochastic models in Chapter 10. The final chapters cover applications and unsolved problems.

Throughout the book the discussion emphasizes the mathematical basis and techniques that are applicable to compartmental analysis. It is perhaps obvious that the use of computers would at least be very helpful, if not essential, in some steps of the analysis, but this aspect of the problem is not explicitly addressed.

Although this book relates to nuclear medicine only rather abstractly, it is pertinent because of its bearing on the fundamental physiological kinetics, with potential applications in radiation dosimetry and other quantitative aspects of nuclear medicine. This reviewer recommends it highly for the more serious study of compartmental systems, but those inexperienced in compartmental analysis may find it difficult to use as an introduction to the field.

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**NUCLEAR MAGNETIC RESONANCE IMAGING: BASIC PRINCIPLES.** S. W. Young. New York, Raven Press, 1983, 175 pp, \$19.00

The field of nuclear magnetic resonance imaging has experienced tremendous growth over the last several years with numerous

textbooks having been written in this area. Since most of the publications on magnetic resonance imaging cover the basic principles, this reviewer initially thought that Dr. Young's book was an unnecessary addition to the field. After reading the lucid and succinct work of 175 pages, I have changed my mind and would strongly recommend it as one of the books on MRI that should be placed in medical libraries (institutional, departmental, and individual). I would also recommend that it be used as an introductory textbook to magnetic resonance imaging.

The book is composed of 11 chapters, with the first five chapters dedicated totally to basic principles of nuclear magnetic resonance. The next four chapters concentrate on magnetic resonance imaging systems, and the last two contain an introduction to site planning and a short quiz on nuclear magnetic resonance, respectively. There are numerous high quality, quite readable figures, and the author uses a series of analogies that help transmit the basic knowledge in an enjoyable fashion. As is typical of introductory texts, the book's greatest strength (its succinctness) is also its greatest weakness—areas outside the introductory principles are covered only superficially.

In conclusion, this book can serve as an introduction to the fundamentals of nuclear magnetic resonance, but it should be supplemented by additional reading in the areas of actual clinical imaging, equipment requirements, and spectroscopy. The \$19.00 recommended price is a bargain when one sees the quality of the content, printing, and figures.

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**EXERCISES IN DIAGNOSTIC ULTRASONOGRAPHY OF THE ABDOMEN** F. S. Weill, A. Le Mouél. New York/Heidelberg/Berlin/Tokyo, Springer-Verlag, 1983, 125 pp

*Exercises in Diagnostic Ultrasonography of the Abdomen* consists of an informal presentation of cases grouped together to form nine chapters. Each chapter consists of somewhat related clinical situations (shades of DRG!). The choice of cases in this series of exercises reflects common problems one would encounter in a hospital practice and in which ultrasound can provide diagnostic clues; e.g., entities such as jaundice, pancreatic disease, liver metastases, and fluid collections of varying consistencies are well represented. A series of images are initially presented in the form of a "gentle quiz", then the reader is led to the pertinent findings by a series of repeated images with arrows delineating the points to be recognized. In this manner the authors hope to sharpen the observer's skill and general diagnostic acumen. The style is informal and somewhat entertaining.

The exercises are directed to persons with previous knowledge and experience in ultrasound, since a number of ultrasound signs and features are pointed out but not explained. One disappointing feature is the fair-to-poor quality of some of the contact scans, which detracts from their teaching value. Unfortunately, the amount of correlation with other imaging modalities is minimal, and for this reason, it is not felt that these exercises in abdominal sonography can be recommended as routine reading for most nuclear medicine physicians.

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**BODY CT—A HANDBOOK.** A. K. Dixon. Naperville, Illinois, Churchill Livingstone, 1983, 167 pp; \$24.00

This softbound handbook on the use of computed tomography in the body covers all regions from the neck to the extremities, including the spine. It is meant to serve primarily as a practical

manual for obtaining adequate studies in these regions. To a lesser extent, it provides useful information regarding the diagnosis of various entities, but it is not meant to be a text of anatomy or pathology. With these limited goals in mind, this reviewer feels that the author achieves them quite admirably.

The content includes much more than essential basic information, and one of the nicest aspects is that the author assumes the reader will have little or no knowledge of computed tomography. One can comfortably read through the entire text. The first chapter deals with the language of CT scanning and defines terms in common use. The second chapter discusses the referral of patients and the selection of those most appropriate for this imaging modality. There is a nice discussion of initial considerations regarding such things as presenting complaint and body habitus, and there are even sections that deal with the organization of the request form and the handling of referrals from other hospitals. Chapter Three, concerning the preparation of the patient, illustrates the careful attention to detail by the author, for the discussion covers not only the use of contrast medium, but also mode of patient dress, reduction of patient anxiety, and special pediatric considerations.

The main body of this text, Chapters Four through Eight, deals with the examination of the various body regions. There are separate chapters on the lymph nodes of the abdomen, the abdomen exclusive of lymph nodes, the chest, the spine, and miscellaneous areas. Several of these chapters are further subdivided by organ system. Each section is organized in a similar manner and contains an introduction, a section on technique, and a section dealing with special problems in that particular body area, which favors very rapid and convenient reference. The introduction primarily contains indications for studying that body region; the technique section outlines considerations for obtaining the images, such as section thickness and interval; the problem section covers the myriad of difficulties that arise in the process of attempting to obtain an adequate examination. The reader is warned of virtually every pitfall one may encounter, and solutions are provided for each problem situation.

Chapters Nine and Ten pertain to the special subjects of radiotherapy planning and interventional procedures. The former is mainly a discussion of the different approach to obtaining images when one's goal is therapy planning and not diagnosis. The latter is a limited, albeit detailed, presentation of biopsy procedures using CT guidance.

Chapter Eleven presents a pragmatic approach to the viewing of images at the console, the recording of images on film, followed by a useful summary of the author's method of reporting and distributing reports. The final chapter considers the physical layout of the department itself and provides helpful information regarding the staffing of various duties in the division.

The shortcomings of this text are minor, with the primary drawback centering around the technique descriptions. The information is not based on the use of state-of-the-art equipment but rather on an older CT scanner with a slow scanning time (10 sec per slice in most cases). Certainly there are many slow scanners in operation today, but the trend is towards fast acquisition times. In addition, emphasis on patient motion, intravenous glucagon to slow bowel peristalsis, and general anesthesia to sedate children is unnecessary with the use of a faster scanner. Although the author admits that inconsistencies among equipment manufacturers and the use of a faster scanner will change the technique approach, this reviewer feels that differences as compared with modern scanners will make the entire technique chart essentially inapplicable.

A more detailed discussion of the dosages, concentrations, and administration techniques of IV contrast would have been desirable. Finally, it was surprising to find that the use of CT equipment to guide drainage catheter placement had been omitted from the interventional section.