

## BOOK REVIEWS

**COMPUTER-ASSISTED CARDIAC NUCLEAR MEDICINE.** B. L. Holman, J. A. Parker. Boston, Little, Brown and Company, 1981, 546 pp, \$45.00

Halfway through this book the authors state: "The intelligent application of the computer to cardiac nuclear medicine requires a knowledge of the computer and an understanding of the clinical tasks to be performed. Thus far we have concentrated on the computer and on software. We will now describe the techniques themselves as well as their physiologic basis, their efficacy, and their clinical indication." They are true to their word. The first half of the book, dealing with computer technology, is divided into three parts. Part 1 is an introduction to basic computer terminology, numbers, and logic. The chapter on numbers is a concise description of different methods of counting and compares binary and octal systems with the decimal. The chapter on logic describes how electronic circuits handle numbers and basic logic functions. Part 2 covers hardware considerations including the role of central processing units, memory systems, various types of peripheral devices, display options, and interfacing. The treatment of each of these elements is brief, but clear and to the point. Part 3 describes software and how it is created and used. Two chapters within this section provide excellent introductions to the elements of BASIC and FORTRAN programming.

The second half of the book deals with the clinical applications of nuclear cardiology and how the computer is used to collect and analyze data in order to facilitate interpretation. The material is quite technical and reasonably comprehensive. There is a good description of cardiac imaging including gated blood-pool studies, myocardial perfusion scintigraphy, and infarct-avid scintigraphy. Detailed discussions of data collection and analysis follow. Special computer techniques include ejection-fraction calculation, edge detection, background subtraction, shunt calculations, cardiac output and volume determinations, and functional imaging. There is also a fairly comprehensive discussion of cardiac tomography including instrumentation and reconstruction algorithms.

This book is timely, for many practicing nuclear physicians are now organizing nuclear cardiology laboratories. They need a comprehensive reference for these studies and will profit from a thorough understanding of this book. For the cardiology resident who needs an introduction to basic nuclear medicine and computer terminology, this is essential reading. Although it is a good beginning reference for nuclear medicine residents, they might be expected to eventually go beyond the level of discussion contained herein. In short, this is a most useful book: well organized, clearly and authoritatively presented, and well researched.

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**RECENT ADVANCES IN NUCLEAR MEDICINE.** J. H. Lawrence, T. F. Budinger, Eds. New York, Grune & Stratton, Inc., 1978, 143 pp, \$31.25

This volume is the fifth in a series that began in 1948. The subjects covered in this book are limited to instrumentation in positron emission tomography (PET), positron-emitting radiopharmaceuticals, heavy-ion radiography, fast-neutron teletherapy, and heavy-ion radiotherapy. The volume is intended as both a

historical document and a presentation of the current status of instrumentation in radiopharmaceuticals and positron emission tomography and of the use of neutrons and heavy ions for radiography and tumor therapy. It is designed for investigators in nuclear medicine, medical physics, and radiotherapy.

The first chapter by Dr. Gordon L. Brownell is on PET instrumentation and is subdivided into the history of positron imaging, basic principles of positron imaging, and PET instrumentation. The advantages of PET in physiologic imaging, availability of attractive short-lived positron-emitting radioisotopes, efficiency of detection of annihilation radiation, and ability to produce transfer section images are discussed. The chapter provides a very useful and concise overview of the history of positron imaging and the current status of PET instrumentation.

Chapter two, by Dr. Michael J. Welch, is on the preparation of positron-emitting radiopharmaceuticals. It is subdivided into two sections, one on radiopharmaceuticals requiring an in-house cyclotron, and one on positron-emitting radiopharmaceuticals not requiring an in-house cyclotron. The first section deals primarily with radiopharmaceuticals labeled with  $^{15}\text{O}$ ,  $^{13}\text{N}$ ,  $^{11}\text{C}$ , and  $^{18}\text{F}$ . These isotopes are receiving particular interest because of the feasibility of labeling metabolites or analogs of metabolites with these isotopes. The second section describes the Ga-68, Rb-82, Cu-62, and I-122 generators, all of which do not require an in-house cyclotron. This chapter summarizes the large numbers of compounds that have been synthesized with these short-lived positron-emitting radionuclides and discusses the need for the in vivo study of many of these compounds. It is a valuable and brief overview of PET radiopharmaceuticals.

Chapter three, by Dr. Cornelius A. Tobias, is "Heavy Ion Radiography." It includes a section on scanned-beam radiography, heavy-ion radiography (presenting several human images), heavy-ion microscopy, and the discussion of future direction. The historical background and current status of these techniques are summarized. Compared with routine x-ray exposures, heavy-ion radiography has the advantages of visualization of new patterns in soft tissues, greater sensitivity and accuracy of density measurements, the ability to obtain a complete set of pictures with one fast-beam pulse, and reduced radiation dose. The potential feasibility of building a "diagnostic" heavy-ion accelerator or of designing diagnostic features into a therapeutic accelerator are discussed.

In the fourth chapter, Dr. Robert G. Parker presents the current status of fast-neutron teletherapy. He presents the physical and biological bases for fast-neutron teletherapy and the results of clinical trials. The clinical studies include cancers of the oral cavity and pharynx, metastatic cervical adenopathy, cancer of the cervix, and glioblastoma multiforme. He concludes that: fast-neutron radiotherapy techniques have less precision in comparison with the current use of megavoltage photon teletherapy units; the dosimetry, although complicated, is accurate; most tumors respond and many of these responses are remarkable; and normal tissue tolerances permit clinical application.

In Chapter five, Dr. Joseph R. Castro presents the "state of the art" in heavy-ion radiotherapy. This chapter includes a discussion of accelerators capable of producing heavy particles, clinical studies with acromegaly, and a discussion of advantages and limitations of the technique. Heavy-ion radiography offers the advantage of a physical dose distribution with charged particles

that should be improved over exponentially diminishing radiotherapy beams such as photons and neutrons, and, in addition, a high LET deposition by charged particle beams providing an increased biological effect on tumor cells.

In summary, this volume is rather limited in scope. Basically it covers two different topics. However, it serves as a very useful introduction to positron emission tomography, radiopharmaceuticals, and heavy-ion radiography and radiotherapy.

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**INFORMATION PROCESSING IN MEDICAL IMAGING.** R. Di Paola, E. Kahn, Eds. Paris, Institut National de la Sante et de la Recherche Médicale, 1979, 671 pp, \$40.00

This soft-cover book consists of the texts of 42 papers presented at the International Conference on Information Processing in Medical Imaging held in Paris in July, 1979. Each article is followed by a discussion that has been thoughtfully edited by the discussion chairmen, rather than merely presented verbatim as is so often done. The edited discussions form a valuable adjunct to the presented papers. All articles but one are in English, with summaries in English and French. Even though English is clearly a second language for some authors, all the text is readily understandable and clearly presented. Two-thirds of the papers relate directly to nuclear medicine; the remainder deal with ultrasound, NMR, CT, and other forms of imaging. There are articles on improving image acquisition on conventional equipment, improving images acquired previously, extending the capabilities of computers in image manipulation and in the analysis of quantitative data, and on novel imaging techniques including high-purity germanium detectors, positron emission tomography, proton imaging, scatter imaging, and nuclear magnetic resonance. Other articles deal with ROC curves, computer-assisted diagnosis, displays, "networking" a nuclear medicine facility, dynamic function studies, and functional imaging.

This book has something for everybody. Several clinical articles discuss kidney, biliary tree, heart, and brain-imaging studies. The chapters are brief, averaging about 16 pages each, and every chapter includes references the reader may use for background information. Many chapters will require some familiarity with mathematics and computer technology, though not necessarily at a high level. The paper and illustrations are of moderate quality to keep the price in a reasonable range.

This book is highly recommended reading for those in nuclear medicine who are concerned with computer-image analysis. There are many useful, practical ideas for improving image collection and analysis as well as articles that help the reader to understand some of the complexities of modern imaging. Some material presented in this book is unique and has not been presented elsewhere.

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**EARLY DETECTION OF TESTICULAR CANCER.** N. E. Skakkebaek, J. G. Berthelsen, K. M. Grigor, J. Visfeldt, Eds. Copenhagen, Scriptor, 1981, 239 pp, \$20.00

This publication is a compilation of papers presented at a workshop in Copenhagen, Denmark, November, 1980, on early detection of testicular cancer. As such, it is not a review of testicular cancer but rather concentrates on several aspects of the early detection of this disease. Particular attention is paid to the phenomenon of carcinoma in situ of germ cells. Work done by Skak-

kebaek, Sigg, and Hedinger is presented, and these studies, reviewing testicular biopsies from sterile Danish and Swiss men, have shown an incidence ranging from 0.46 to 1.1% of atypical germ cells or carcinoma in situ in these patients. Follow-up of these patients with carcinoma in situ is presented. Of the nine patients in Skakkebaek's series, two patients developed seminoma and two developed teratocarcinoma on follow-up. Two additional patients developed invasive atypical germ cells into the interstitium. This significant correlation of carcinoma in situ with the development of subsequent testicular tumors has led these investigators to believe that there is approximately a 50% chance of the development of testicular tumors within five years of the discovery of carcinoma in situ in patients. They therefore recommend orchiectomy in infertile men with carcinoma in situ. The significance of carcinoma in situ in patients with undescended testes, in the contralateral testes of patients with testicular cancer, and in patients with sematosexual ambiguity remains to be determined.

Studies of the distribution of carcinoma in situ in a small series of patients have shown that 1.4-59% of the entire testicular volume of seminiferous tubules contain carcinoma in situ. Furthermore, if approximately 10% of the tubules contain carcinoma in situ, biopsies measuring 3 mm in size would diagnose the lesion nearly 100% of the time.

In addition to discussions of carcinoma in situ in testes, various other topics, including epidemiologic data, diagnostic techniques (ultrasound), serum and tissue markers of testicular cancer, and immunohistochemical demonstrations of tumor antigens are discussed. An excellent article by Dr. Lange discusses assays of alpha fetoprotein and beta subunit hCG, including newer applications of these markers during induction of chemotherapy to predict ultimate response. In their experience patients with a relatively fast rate of decline of serum markers (short actual half-life) showed 87% favorable response to chemotherapy as opposed to an 11% favorable response to chemotherapy in patients with slow actual half-life of serum markers.

Recent developments in immunodetection are also reviewed. These include the approach to radiolabeling of antitumor and antimarker antibodies and external scintillation scanning as used by Goldenberg et al. Radioimmunodetection of diverse cancers using anticarcinoembryonic antigen labeled with iodine-131 has been reported. Specific and sensitive antisera to hCG and AFP also labeled with iodine-131 have localized tumors producing these markers.

This book presents the results of a series of recent experimental studies in the area of early detection of testicular cancer. In addition to the articles themselves, a useful discussion of each is also included. The text would be of special interest to physicians and researchers interested in testicular cancer and particularly in the new techniques used to achieve early diagnosis and accurate monitoring of these tumors.

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**CLINICAL NUCLEAR MEDICINE.** P. Matin, Ed. Garden City, Med Exam Publ Co., Inc., 1981, 346 pp, \$21.50

This is a welcome update to Matin's previously well-received *Handbook of Clinical Nuclear Medicine*, especially helpful, popular for residents and those preparing for their specialty Board examinations.

When this sequel is compared with the original book, some change and lack of change are immediately apparent. The cost has predictably risen (\$21.50), whereas the size has changed very little. The tables with indications for each procedure have been retained and are very useful. The section on placental imaging has