Book Reviews

NMR IN MEDICINE: THE INSTRUMENTATION AND CLINICAL APPLICATIONS. AAPM Monograph No. 14.

S.R. Thomas, R.L. Dixon, Eds. New York, American Institute of Physics, 1986, 595 pp, $60.00

This book is a collection of lectures presented at the American Association of Physicists in Medicine Summer School held at the University of Portland, Portland, Oregon, August 4–9, 1985. The lectures are divided into two categories: (a) instrumentation, engineering and scientific principles; and (b) clinical applications. The book presents an "intermediate level" survey of the concepts and techniques pertinent to NMR in the medical field. However, since the lectures were presented to AAPM members some sections dealing with instrumentation, engineering or scientific principles may appear to be "high level."

The first two lectures "Physical Foundations of Proton NMR: Part I & II" provide a physical and mathematical description of NMR from a classical (Part I) and a quantum mechanical (Part II) point-of-view. The next seven lectures present, in a much less mathematical way, information dealing with the methods and equipment used for NMR imaging and spectrometry. Topics such as magnet design, gradient coil technology, RF coils, and data acquisition/computer requirements are covered in great detail. These first nine lectures cover approximately 200 pages.

The next 12 lectures are primarily concerned with clinical implications of NMR. Topics include, chemical shift imaging, fluorine imaging, in vivo spectroscopy, paramagnetic pharmaceuticals, flow effects, signal-to-noise ratio and contrast, and NMR relaxation in tissue. Lectures are included on imaging methods specific to anatomic locations such as brain, spine, heart, abdomen, pelvis, chest, and breast. The final lecture in this group of 12 deals with relationships between magnetic resonance imaging and three major conventional forms of diagnostic imaging: nuclear medicine, ultrasound, and x-ray computed tomography. These clinical papers comprise approximately 170 pages.

The next four lectures cover site planning, quality assurance, acceptance testing, and economic considerations involved with magnetic resonance imaging. For the neophyte, this section of the book is a jewel. The information presented in these articles is timely and should be very useful to those contemplating purchase, monitoring, and managing of a magnetic resonance imager.

The last lecture presents the current state of knowledge concerning the mechanisms of interactions of static and time-varying fields associated with NMR devices. Included is a summary of the general conclusions which can be made regarding biologic effects of these fields.

The book has two appendices. Appendix A is a review of the basic concepts of electricity and magnetism. This appendix may be very helpful for those desiring to delve into the more mathematical sections of the book. Appendix B is the American College of Radiology Glossary of NMR Terms which is included here for completeness.

Because these lectures were prepared for a target audience of physicists in medicine, much of the material might be overwelming for a first time venturer into NMR as applied to imaging and spectroscopy. We feel, however, that this book is an excellent reference for those seeking to learn more about the theory, engineering, and instrumentation associated with NMR. Authors with diverse backgrounds and experiences ranging from research scientist for major manufacturing companies to clinicians in University Hospitals provide a broad scope approach to many of the topics presented.

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MAGNETIC RESONANCE IMAGING OF THE CENTRAL NERVOUS SYSTEM.

M. Brant-Zawadzki, D. Norman, Eds. New York, Raven Press, 1986, 416 pp, $89.50

The editors envisioned this text as an introduction to clinical magnetic resonance imaging of the central nervous system. The physician about to use this modality will find the book contains a wealth of images that illustrate a broad array of anatomic, pathologic and technical points. These are often accompanied by roentgenograms or pictures of cadaveric sections to clarify the points under discussion.

This text is more than an atlas, however. Chapters explaining nuclear magnetic resonance and its role in identifying pathophysiology are clear and well illustrated. This aspect of the book would also interest a clinician who may be confused about how he might best use this modality in his practice. Practical considerations of imaging strategies are provided as is a broad consideration of resulting technical limitations. Technical artifacts are discussed along with the potential interpretive problems that might result. Diagnostics algorithms are considered and multiple references to computed tomography, but not nuclear medicine, are provided.

The material presented is quite timely with topical diagnostic situations, such as AIDS, well covered. Recent insights into both acquisition strategies and the diagnostic limitations of some patterns are included. A general, introductory text must, however, limit its scope, a fact recognized by the authors who made good use of references to direct the interested reader toward more complete information. The editors also acknowledged this limitation and appropriately warned the reader that this text provided a pragmatic rather than comprehensive approach. Some specialized terms such as "T2" are not defined and many controversial points are either avoided or left unresolved for the reader. Nevertheless, the material presented is accurate within the scope of the book.

This handsome text is well made with good quality materials, clearly legible type and appropriate diagrams. Labeling of structures within the illustrations was particularly well done in most of this book. The authors' various styles are evident in the chapters, detracting somewhat from the evenness of the presentation, however, the material was fairly uniform in scope. Overall, the editors succeeded in producing an excellent

introductory work which would serve anyone concerned with this subspecialty.

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NUCLEAR MEDICINE THERAPY.

J.C. Harbert, New York, Thieme Medical Publishers, 1987, 356 pp, $79.95

Books devoted to radionuclide therapy are scarce. *Nuclear Medicine Therapy* by John C. Harbert is a new contribution to this field. This book is intended, as stated in the preface, to be "a comprehensive source of practical information" about therapy with radiopharmaceuticals. Specific clinical indications for radionuclide therapy are presented in 16 chapters by Dr. Harbert. Radiobiologic principles are summarized in a chapter by Kathryn D. Held and radiopharmaceutical dosimetry is summarized in a chapter by James S. Robertson. Nine appendices provide useful information in tabular form. The index is adequate. References, at the end of each chapter, are abundant. The quality of the paper, print, and illustrations is excellent.

Organization of the material is logical and conventional. Divisions within each chapter are clearly identified. Five of the 18 chapters contain brief summaries or conclusions. Subjects discussed include radioiodine therapy of hyperthyroidism and thyroid carcinoma; radiocolloid therapy of peritoneal metastases, malignant ascites, pleural and pericardial effusions; intra-arterial, intra-articular, and intrathecal uses of radiocolloids; and radionuclide therapy of myeloproliferative disorders, bone pain, ocular melanoma, and craniopharyngioma. The current status of iodine-131 (^{131}I) metaiodobenzylguanidine for the treatment of pheochromocytoma and other neuroendocrine tumors, and the potential therapeutic uses of radiolabeled antibodies are described.

The discussion of thyroid physiology contains some confusing statements. For example, "the effect [of iodine administration] appears to be one of inhibition of organification" but in the same paragraph "iodine administration does not inhibit hormone synthesis."

Methods for the administration of ^{131}I therapy for hyperthyroidism are thoroughly described but criteria for the selection of patients for therapy are ambiguous. In some instances the stated rationale for ^{131}I therapy is obscure: "Primary ablation is also recommended for patients in whom for any reason it is appropriate to reduce the number of tests" (page 14). The author's bias in favor of ^{131}I therapy is inadequately balanced by consideration of views that favor antithyroid drug therapy. The chapter on ^{131}I therapy for differentiated thyroid carcinoma gives appropriate recognition to the controversial aspects of this subject. Various criteria and methods for the administration of ^{131}I therapy are described in detail.

Some of the therapeutic uses of radionuclides that are discussed are mainly of historical interest; others are timely. There is little to indicate which procedures are well accepted or widely used and which procedures are experimental or obsolete. Information about the availability of certain radiopharmaceuticals and the status of their approval by the Nuclear Regulatory Commission and the Food and Drug Administration would be helpful but is not provided. The frequent use of mixed traditional and Systeme Internationale (SI) units is a minor annoyance (for example, mCi and cGy instead of mCi and rad or MBq and cGy).

In general the author has succeeded in his stated purpose. The book is recommended for general medical libraries and nuclear medicine departmental libraries, and for physicians interested in the practical aspects of radionuclide therapy.

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RADIATION RISKS TO THE DEVELOPING NERVOUS SYSTEM.

H. Kriegel, W. Schmahl, G.B. Gerber, F.E. Stieve, Eds. Stuttgart, Gustav Fischer, 1986, 435 pp, $58.00

This volume is the Proceedings of an International Symposium of the same name organized by the Radiation Protection Programme of the Commission of the European Communities and the Gesellschaft für Strahlen- und Umweltforschung mbH. in Neuherberg, Germany in June 1985. The participants were mostly from Europe and Japan, with a sprinkling from England, Scandinavia, and the United States.

The book opens with an excellent historical overview and current perspective of our knowledge of radiation effects on the developing nervous system presented by R.H. Mole, of Oxford, England. This review revealed that "sensitivity is maximal in the first two months of the fetal stage, not in the earlier embryonic stage of general organogenesis, and is well correlated with rapid proliferation of neuroblasts in the telencephalon." Recent analysis of the Hiroshima and Nagasaki data indicates clearly that "severe mental retardation was much the most important kind of damage to appear in bomb survivors exposed in utero," and the "frequency of severe mental retardation in the combined populations from Hiroshima and Nagasaki exposed in utero is linearly related to fetal tissue dose with extraordinary statistical precision."

The remaining papers were divided into five topical areas: morphological and biochemical differentiation of the central nervous system; experimental studies on the effects of radiation on the developing nervous system (morphology); experimental studies on the effects of radiation on the developing nervous system (biochemistry); combinations effects on the developing nervous system (i.e., interaction of radiation and drugs); and, human studies. Questions and answers from the audience after oral presentations are presented. A roundtable discussion at the conclusion of the Symposium was recorded and is included at the close of the book.

Without prejudice to the excellent quality of the other papers, the following observations from human studies are of special interest. There appears to be a practical threshold of ~20 cGy (rad) below which CNS effects are not seen, except that the preimplanted embryo seems to begin exhibiting sensitivity at about 10–15 cGy. "Peak sensitivity to major malformations occurs between the 18th and 30th days, falling rapidly over the next ten days." (Brent et al., p. 372). Severe