BOOK REVIEWS

IMAGE RECONSTRUCTION FROM PROJECTIONS—IMPLEMENTATION AND APPLICATIONS. Volume 32 in Topics in Applied Physics. G. T. Herman, Ed. 1979, Berlin, Springer-Verlag, 284 pp, illustrated, $49.00.

The development of x-ray and radioisotope systems for computed tomographic imaging is based on reconstruction from projections. This book provides a timely selection of contributed review articles on the mathematical fundamentals of image reconstruction and several applications of them. It includes an overview and five additional sections describing computer implementation of reconstructions, applications in radio-astronomy, solar corona studies, emission computed tomography, and advanced subsecond x-ray scanning. The article by S. H. Rowland on computer implementation of reconstruction techniques is a detailed mathematical exposition, beginning with fundamental assumptions. Based on his Ph.D. dissertation, he describes the results of several computational experiments that demonstrate the properties of the convolution and rho-filtered layergram reconstruction methods. The distinguished radio-astronomer, R. N. Bracewell, contributed a section on image reconstruction in radio-astronomy. Many of us do not appreciate the role of radio-astronomy in the development of techniques for reconstruction from projections and the fact that much of that work predates even the earliest interest in medical applications. The use of fan-beam reconstructions with radio telescopes is described, and the techniques are compared with computed x-ray tomography. Three-dimensional image reconstruction techniques have found application in solar physics, as described by M. D. Altschuler in the chapter on solar corona studies. Strictly speaking, the magnetic field data from the solar corona is not in the form of projections, but the mathematical formulations used may be extended to other applications, including medical computed tomography.

Readers in nuclear medicine will find the chapter by T. F. Budinger et al. on emission computed tomography most valuable. Single emission and positron scanners are treated in a remarkably lucid and complete description. The physical and operational characteristics of the major scanning instruments in present use are reviewed, and algorithms developed for emission tomography, including Fourier convolution methods, iterative methods, and compensation for tissue attenuation, are explained. This section alone should be justification enough to add this volume to the library of any worker in nuclear medicine with the necessary physical and mathematical background and an interest in emission tomography. The final chapter by E. H. Wood and his associates at the Mayo Clinic outlines the significant results of their work with advanced x-ray computed tomographic scanning techniques applied to the study of the heart and lungs.

This book is a welcome overview of the previous advances in image reconstruction from projections, and is highly recommended for those concerned with the mathematical and physical details of emission computed tomography.

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RADIOPHARMACEUTICALS II: Proceedings of the 2nd International Symposium on Radiopharmaceuticals. New York, Society of Nuclear Medicine, 1979, 867 pp, $40.00, plus $2.50 for postage and handling.

This work is the collection of invited and contributed papers from a symposium held in Seattle, Washington, in March, 1979. The meeting was called because members of the Society of Nuclear Medicine felt this to be a pertinent time for an overall look at the half-decade's progress in radiopharmaceutical science since the conference in Atlanta, which produced the premier book in this series. The members of the program planning committee for the present meeting were Vincent J. Sodd, David R. Allen, Dennis M. Hoogland, and Rodney D. Ice.

The book includes chapters on Quality Control, Organic Radiopharmaceuticals, Inorganic Radiopharmaceuticals, Functional Imaging, Central Nervous System, Radioimmunoassay, Oncology, Hematology, Pharmacokinetics, Renal, Cardiopulmonary System, Reticuloendothelial System/Biliary, Skeletal, Thyroid, Pancreas-Prostate-and-Adrenals, and Radionuclide Production. Each chapter is introduced by an invited paper written by a recognized authority in the discipline that presents the most up-to-date information available. The chapters also include 53 contributed papers on topics related to the main subjects.

The scientific advances reported are often striking. Among these are the newer analytic techniques or applications (e.g., high-pressure liquid chromatography, electrochemistry, and more appropriate gels for filtration chromatography) that permit more rapid and/or precise characterization of radiopharmaceutical components than heretofore possible. Syntheses of radiopharmaceuticals that contain ultra-short-lived radionuclides and are logistically efficient are described. Also presented are radiopharmacokinetic studies in animals and man that permit rapid selection from a series of homologous chemical ligands of the particular one that forms the most diagnostically useful radionuclide chelate.

A unique addition to this volume is the section containing the comments from a panel of world-wide governmental regulators who license or control radiopharmaceutical manufacture. They have been given a forum to clarify their responsibilities and, probably most important, to answer the many criticisms directed their way by users of radiopharmaceuticals. For example, members from the U.S. Food and Drug Administration report that of all radiopharmaceutical new drug applications they have approved, only eight of 129 (6%) provided an important diagnostic or therapeutic advance, whereas 19% produced a "modest" advance. Three-fourths of all approvals were judged to be for "me-too" and other products that provide little or no benefit! That assessment should be a challenge to all of us to strive for innovation and less duplication in radiopharmaceutical research and development.

The publisher is to be commended for rapidly providing the proceedings to a wide audience; however, some of the references that accompany papers are incomplete and will be an impediment to the reader who seeks additional information. There is, unfortunately, no index.

The few drawbacks of this book are far outweighed by the multitude of well-written papers that furnish up-to-date infor-

G. T. Herman (ed.), Image reconstruction from projections: Implementation and application, Topics in Appl. Phys., 32, Springer-Verlag, New York., 1979. [5]. F. Natterer, The mathematics of computerized tomography, Wiley, Chichester, 1986; Russian transl. Mir, Moscow, 1990. [6]. G. T. Herman and F. Natterer (eds.), "Mathematical aspects of computerized tomography", Proc. of Meeting held at the Mathematical Research Center (Oberwolfach 1980), Lecture Notes in Med. Inform 8, Springer-Verlag, Berlin-New York, 1981. [7]. L. A. Shepp (ed.), Computed tomography, Proc. of Symposia in Applied Mathematics 27, Cincinnati, Ohio, 1982; Computed tomography, Amer. Math. Soc., Providence, RI., 1982. [8]. 1. S. W. Rowland "Computer implementation of image reconstruction formulas" in Image Reconstruction from Projections: Implementation and Applications New York:Springer-Verlag vol. 32 1979. 2. P. Edholm G. T. Herman D. A. Roberts "Image reconstruction from linograms: Implementation and evaluation" IEEE Trans. Medical Imaging vol. 7 pp. 239-246 1988. 3. Z. H. Cho C. M. Chen S.-Y. Lee "Incremental algorithm: A new fast backprojection scheme for parallel beam geometries" IEEE Trans. Medical Imaging vol. 9 pp. 207-217 1990. 4. M. Tabei M. Ueda "Backprojection by u Image reconstruction from projections: implementation and applications. New York: Springer-Verlag, 1979 (cit. on p. 0.4). G. T. Herman. Image reconstruction from projections: The fundamentals of computerized tomography. New York: Academic, 1980 (cit. on p. 0.4). A. C. Kak and M. Slaney.Â MRI: physics, image reconstruction, and analysis. CRC, 2015. ISBN: 9781482298871 (cit. on p. 0.4).Â â€œOverview of methods for image reconstruction from projections in emission computed tomography.â€ In: Proc. IEEE 91.10 (Oct.