

lution and image noise are outstanding and are recommended reading for all radiology residents. As befitting a text published in 1977, rare earth screens receive due consideration and sections on image intensification radiography and fluorography are well written.

The physics of CT and ultrasound have been included and in this respect this book is unique among radiology physics texts, most of which were written when these new offspring of medical imaging were mere embryos. Unfortunately, the treatment of CT physics is superficial. Important concepts such as the "partial volume effect" are not discussed, and the only reconstruction method mentioned is (unfiltered) back projection. Nonstandard notation is again used—e.g., "the CT number,  $N_m$ " instead of  $H$  (for Hounsfield units). The equation for calculation of CT number is given as  $N_m = C (\mu_m - \mu_{water})$ , rather than the standard

$$H = C \frac{\mu_m - \mu_{water}}{\mu_{water}}$$

The difference lies in Sprawls' constant, which includes the second  $\mu_{water}$  term, but the effect will be to confuse rather than edify.

The physics of ultrasound is covered in much greater depth than that of CT and is accordingly devoted three times the space. Real-time ultrasound, however, is barely mentioned.

While the writing is generally of a high standard, the "design" and quality control of the book leave something to be desired. The text presents a bland, uniform appearance which makes it difficult to pick out important statements. More use could be made of heavy type or italics. A summary of pertinent points at the end of each chapter would also be helpful. The diagnostic radiology resident studying for his written Board examination would also be assisted by a series of questions of the type used in the physics section of the Board examination. Some of the figures are little short of absurd: a figure entitled "Conceptual relationship of biological impact to absorbed dose" shows a box labeled "living tissue", with an arrow labeled "dose" entering it and a second arrow labeled "biological impact" leaving it. The proofreading is poor with many typographical and some factual errors (e.g., "contrast is directly related to the value of the scatter factor"—instead of inversely related.) The English is above average, but some phrases such as "more predominant than" and "minimized as much as possible" win the Redundancy Award for 1977. The curved lines on graphs have been drawn by a rather unsteady hand with a result that is unworthy of a professionally produced publication. There is a total of only eight references, most of them on radiation protection. One is left with a slightly uneasy feeling as to how well the material in the book was researched and, of course, further reading is made so much more difficult.

With the recent separation of diagnostic and therapeutic radiology training in the USA has come an increased emphasis on broad training in "Imaging" in diagnostic programs. Residents receive instruction in diagnostic roentgenology, CT scanning, ultrasound, and nuclear radiology. It would be not unreasonable therefore to expect that a physics text for residents that is described (on the fly-leaf) as "the only comprehensive textbook on the physics of diagnostic radiology" include a section on the physics of radionuclides. Surprisingly, while the physics of CT and ultrasound are well represented, the physics of radionuclides is conspicuously absent.

Finally, this seems an opportune occasion to raise again the question asked by Marvin Daves (1) (and no doubt by thousands of residents through the ages): "How important is detailed knowledge of radiation physics to the clinical radiologist?" Dr. Daves' answer is that it is "strictly for the Boards." The pun makes this answer a useful addition to the radiological literature, but most would agree that it represents an oversimplification. Few radiologists have, like Marvin Daves, a Bill Hendee to lean on. In fact, fewer than half the practicing radiologists in this country work in an institution large enough to support a radiation physicist. Maintaining adequate quality control and handling technical problems that arise during everyday practice, buying new equipment, answering patient's questions about radiation doses and effects, and adopting and overseeing personnel protection devices and practices all require active involvement of the radiologist when a radiation physicist is not available; and, to some extent, even when one is available. Accordingly, the radiologist *must* have a working knowledge of radiological physics and for this reason books like *The Physical Aspects of Diagnostic Radiology* will always perform a valuable service.

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#### REFERENCE

1. DAVES ML in *Medical Radiation Physics*, HENDEE WH. Chicago, Year Book Medical Publishers, 1972, pp 7-8

**ISOTOPE EFFECTS ON ENZYME-CATALYZED REACTIONS.** W. Wallace Cleland, Marion H. O'Leary, and Dexter B. Northrop. University Park Press, Baltimore, 1977, 303 pp, \$39.50.

The study of reaction mechanisms using isotope effects on reaction kinetics began in the 1930's and has now become an important basic tool in organic chemistry. The publication of this book moves this powerful scientific tool one significant step closer towards its application to the diagnosis and understanding of human disease.

This text is a collection of the papers given at a symposium held in 1976 which brought together individuals who have been making isotope effect measurements and those who have been studying enzymatic reactions. The papers presented and discussed at the conference form a basic reference. The mathematics of both primary and secondary kinetic isotope effects are derived for the reader. Examples cited from the literature illustrate how the technique can be used to study enzyme-catalyzed reactions. Also extensive bibliographies are presented.

Chapter topics are: computation of isotope effects on equilibria and rates; magnitude of primary hydrogen isotope effects; solvent isotope effects on enzymatic reactions; secondary kinetic isotope effects; determining the absolute magnitude of hydrogen isotope effects; measurements of isotope effects by the equilibrium perturbation method; isotope effects in hydride transfer reactions; hydrogen isotope effects in proton transfer to and from carbon; studies of enzyme reaction mechanisms by means of heavy-atom isotope effects; and derivation of an isotope effect from the proline racemase overshoot in  $D_2O$ . The four appendices further enhance the reference value of this book to those who use the technique.

Although this is an excellent book, it contains little of practical value for most of us in nuclear medicine, and thus it is directed primarily toward those who are exploring new techniques. It is also recommended, however, for those

who might use this technique to study some currently important reaction. For example, measurements of isotope effects could probably help to elucidate such reactions as hydrolysis of technetium complexes. We in radiopharmaceutical development have a keen interest in the binding of substrate to enzymes, and the study of enzymatic binding of radiolabeled substrates in the development of specific radiopharmaceuticals might well be approached with the use of some of the techniques discussed in this book. Furthermore, solid state enzyme columns will eventually be used for the

synthesis of  $^{13}\text{C}$ ,  $^{15}\text{N}$ , and  $^{18}\text{O}$  compounds, as the demand for these short-lived radiopharmaceuticals increases. Thus this book could become a valuable source to the student of radiopharmaceutical design who plans to prepare tracers for the evaluation of in vivo enzymatic reactions or who plans to use enzymes to catalyze the synthesis of radiopharmaceuticals.

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### Accepted Articles to Appear in Upcoming Issues

Bone Scan in Dental Diseases (Preliminary Note). Accepted 12/12/77.

Donald E. Tow, Daniel A. Garcia, Dace Jansons, Thomas M. Sullivan, and Richard Niederman

Preparation of Iodine-125-Labeled Insulin for Radioimmunoassay: Comparison of Lactoperoxidase and Chloramine-T Iodination. Accepted 12/12/77.

Bernardo Leo Wajchenberg, Heidi Pinto, Iracelia Torres de Toledo E Souza, Antonio Carlos Lerario, and Romulo Ribeiro Pieroni

A Field Procedure for the Quantitative Assessment of Nuclear Imaging Cameras (Technical Note). Accepted 1/25/78.

Thomas K. Lewellen, David L. Williams, Robert Murano, Glen W. Hamilton, and Wil B. Nelp

Comparison of In-111-Labeled Platelets and Iodinated Fibrinogen for the Detection of Deep-Vein Thrombosis. Accepted 1/31/78.

Linda C. Knight, Joan L. Primeau, Barry A. Siegel, and Michael J. Welch  
Catabolism and Protein Binding of Tc-99m Pyridoxylidene-glutamate. Accepted 2/2/78.

Anne-Line Jansholt, Kenneth A. Krohn, Robert C. Stadalnik, Nathaniel M. Matolo, and Gerald L. DeNardo

A Comparative Evaluation of Techniques for Rapid and Efficient in-vivo Labeling of Red Cells with [ $^{99m}\text{Tc}$ ] Perchnetate. (Letter to the Editor). Accepted 2/7/78.

Dan G. Pavel and A. Michael Zimmer

Reply. Accepted 2/7/78.

Robert G. Hamilton and Philip O. Alderson

Non-Invasive Determination of the Regional Distribution of Cardiac Output: Effect of Pharmacological Agents on the Distribution of Tl-201. (Letter to the Editor). Accepted 2/7/78.

A. Bossuyt and M. H. Jonckheer

Reply. Accepted 2/7/78.

H. William Strauss

Vocal Cord Paralysis After Radioiodine Therapy (Letter to the Editor). Accepted 2/7/78.

Steven Snyder

Performance Evaluations of Recent Wide-Field Scintillation Gamma Cameras. Accepted 2/7/78.

Chun Bin Lim, Paul B. Hoffer, F. David Rollo, and David L. Lilien  
Radioiodinated Derivatives of  $\beta$ -Adrenoceptor Blockers for Myocardial Imaging. Accepted 2/7/78.

Victor W. Jiang, Raymond E. Gibson, Waclaw J. Rzeszotarski, William C. Eckelman, Richard C. Reba, Frank Vieras, and Philip O. Alderson  
A New Germanium-68/Gallium-68 Generator. Accepted 2/10/78.

Gary J. Ehrhardt and Michael J. Welch

Clinical Comparison of Cardiac Blood Pool Visualization with Technetium-99m Red Blood Cells Labeled In Vivo and with Technetium-99m Human Serum Albumin. Accepted 2/10/78.

James H. Thrall, John E. Freitas, Dennis Swanson, W. Leslie Rogers, Jean M. Clare, Manuel L. Brown and Bertram Pitt

Measurement of Folates in Human Plasma and Erythrocytes by a Radiometric Microbiologic Method. Accepted 2/11/78.

Marianne F. Chen, Judith A. Kertcher, and Patricia A. McIntyre

Ejection Fraction by Count Rate from Gated Images. Accepted 2/17/78.

Michael V. Green, William R. Brody, Margaret A. Douglas, Jeffrey S. Borer, Harold G. Ostrow, Bruce R. Line, Stephen L. Bacharach, and Gerald S. Johnston

Rapid Assay for Total Unbound Tc-99m in Preparations of Tc-99m Macro-aggregated Albumin. Accepted 2/21/78.

J. R. McLean

Gallium-67 Scintigraphy in Untreated and Treated Non-Hodgkin Lymphomas. Accepted 2/21/78.

Manuel L. Brown, John B. O'Donnell, James H. Thrall, May L. Votaw, and John W. Keyes, Jr.

Improved Computer Definition of Regions of Interest by Using a Double-Cursor Method. Accepted 2/21/78.

Ernest Byrom and Dan G. Pavel

Pulmonary Physiology, Pathology, and Ventilation-Perfusion Studies. Accepted 3/1/78.

Roger H. Secker-Walker

Quality Control Procedures for Radiopharmaceuticals. Accepted 3/8/78.

J. R. McLean, L. J. Rocwell, and W. J. Welsh

A Rapid Method for the Labeling of Albumin Microspheres with In-113m and In-111

Phillip L. Hagan, Gary E. Krejcarek, Andrew Taylor, and Naomi Alazraki

Dynamic Renal Transplant Imaging with Tc-99m DTPA (Sn) Supplemented by a Transplant Perfusion Index in the Management of Renal Transplants. Accepted 3/8/78.

A. J. W. Hilson, M. N. Maisey, C. B. Brown, C. S. Ogg, and M. S. Bewick  
Sequential Myocardial Scintigraphy with Technetium-99m Stannous Pyrophosphate Following Myocardial Infarction. Accepted 3/8/78.

Fran R. Malin, F. David Rollo, and Edward W. Gertz

Demonstration of Improved Myocardial Perfusion Following Aortic Implantation of Anomalous Left Coronary Artery. Accepted 3/8/78.

Mario S. Verani, Melvin L. Marcus, James C. Ehrhardt, and Donald B. Doty

Use of I-123 in Early Radioiodide Uptake and Its Suppression in Children and Adolescents with Hyperthyroidism. Accepted 3/10/78.

Wai-Nang P. Lee, Pantelis D. Mpanias, Rodney J. Wimmer, Moses A. Greenfield, and Solomon A. Kaplan

Occlusion of Inferior Vena Cava—Features by Radionuclide Venography. Accepted 3/10/78.

Wilfrido M. Sy, Ramon S. Lao, Anthony Nissen, and Tay S. Kim

[ $^{99m}\text{Tc}$ ] Perchnetate Radionuclide Venography—Large-Volume Injection Without Tourniquet. Accepted 3/10/78.

Wilfrido M. Sy, Ramon S. Lao, Robert Bay, and Marvin Nash.

Airborne Concentration of I-131 in a Nuclear Medicine Laboratory. Accepted 3/15/78.

Ellsworth J. Browning, Krishnadas Banerjee, and William E. Reisinger, Jr.

Synthesis, Radiotechnetium Labeling, and Comparison of Biologic Behavior of Longer-Chain Analogs of Methylene Diphosphonate. Accepted 3/17/78.

Theodore S. T. Wang, Parvathi Hosain, Richard P. Spencer, K. Ahlquist, and Fazle Hosain

Splenic Uptake of Tc-99m Sulfur Colloid in Malignant Melanoma. (Letter to the Editor) Accepted 3/21/78.

Philip Braunstein, Anthony M. Passalacqua, Ramesh Chandra, and Carl M. Lieberman

Uptake of Tc-99m Monophosphate Complexes in Bone and Myocardial Necrosis in Animals. Accepted 4/10/78.

Hank F. Kung, Robert Ackerhalt, and Monte Blau