PET: Molecular Imaging and Its Biological Applications

M.E. Phelps, ed.

New York, NY: Springer-Verlag, 2004, 621 pages, $169

Positron Emission Tomography: Basic Science and Clinical Practice

P.E. Valk, D.L. Bailey, D.W. Townsend, and M.N. Maisey, eds.

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PET, a functional imaging technique able to target specific biochemical pathways through radioactivity probes and to record the time course of activity uptake, is revolutionizing the study of disease biology in subjects ranging from mice to patients by providing molecular information. Interest in PET has increased tremendously as the technology has improved. PET/CT has been accepted by health professionals and industry as a major component of modern patient care and biomedical research. Synthetic radiochemistry is becoming more reliable, new reconstruction algorithms and processing methods are becoming more generally usable, and clinical applications are burgeoning as PET becomes more affordable.

Dr. Michael Phelps, one of the pioneers of PET development, selected 9 of his colleagues to write the book *PET: Molecular Imaging and Its Biological Applications*, who apparently labored for 2 y over the 7 chapters. Chapter 1 presents the fundamental physics of PET and the methods of producing PET images. Chapter 2 introduces molecular imaging assays for understanding molecular events constituting biologic processes. Chapter 3 describes PET probes, and chapter 4 discusses the molecular basis by which such probes give information on normal biologic and pathologic processes. Chapter 5 covers molecular imaging of cancer, combined PET/CT systems, and new tracers targeting specific biologic properties of cancer cells. Chapter 6 focuses on the principles, methods, and applications of PET for the study of cardiovascular diseases. Chapter 7 examines the use of PET to better elucidate neurologic disorders through neurobiologic and biochemical assessments. Also discussed are the future directions of PET for the evaluation of normal and abnormal brain. This comprehensive, updated work is written as both a textbook and a reference book and is clear and precise in its presentation. Enhancing it are 243 well-explained illustrations, 46 in full color, and integration of tables and problem examples into the text to reinforce key concepts. References are extensive and up to date. The book is intended for a broad audience interested in molecular imaging with PET, and thus certain chapters may be more useful to certain readers. Relatively less of the book is devoted to oncologic applications of PET than to cardiovascular or neurologic applications. However, nuclear physicians, radiologists, cardiologists, neurologists, oncologists, and biologic and physical scientists and their students interested in molecular, biochemical, or metabolic imaging will find this book indispensable.

Positron Emission Tomography: Basic Science and Clinical Practice was written by 82 prominent and experienced clinicians and researchers in the field of PET and describes the physical and chemical foundations of PET, how the procedures are performed, and how they are used in patient care and biochemical research. The book is organized into 10 parts, which cover basic sciences (282 pages) and current and future clinical applications (586 pages). The section on basic science discusses instrumentation, radiochemistry, dosimetry, reconstruction, registration, and kinetic modeling. Each part is written by a physical scientist or clinical investigator who has played a significant role in advancing a particular area of the PET field and provides the reader with insights. Chapters go into detail on PET applications in oncology (245 pages), the central nervous system (145 pages), cardiorespiratory systems (51 pages), infectious diseases, pediatrics, drug development, and monitoring of gene therapy. Also included are chapters written from the technologist's perspective, on technologic design and evaluation. There are 434 figures, some of which (in the clinical chapters) appear slightly blurred although readable. Relatively few PET/CT fused images are included. The references are fairly up to date, although none was published after 2001. This comprehensive text exploring all facets of PET, including the economic aspects, probably has more information than other books available and will serve as a contemporary reference for anyone dealing with PET, particularly practitioners and researchers.

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