presentation of the many different and complicated results that have been achieved by the cooperation of physics, material sciences, and technological development in the past 20 years. Many tables and pictures are provided. For the first time, the production of nuclear energy by fission is described in its entirety in a reliable and understandable way. No evaluations, at least no direct ones, are tried. For instance, one does not find judgments about the values of the pool or loop type of sodium breeders, but there are reliable presentations of their technical designs.

The important role of the nuclear fuel cycle is discussed as are its principal options, the technical aspects of reprocessing, the conditioning of waste and its final disposal in repositories, as well as radioactive releases during normal operation and possible accidents. The final chapter deals with the risk of nuclear proliferation and related safeguards. In all cases the book gives a clear picture of the problems and refers the reader to the original literature.

The book is certainly not written for laymen, but addresses itself to all the many people with a technical background who want to be informed. The whole field of nuclear energy in all its complexities but with its logical structure is clearly and simply presented. It is the first comprehensive presentation of nuclear energy and its problems known to the reviewer who has read it with much pleasure and gain and can recommend it to the entire nuclear community.

Karl Wirtz (PhD, University of Breslau, 1934) has been a professor of reactor engineering at the University of Karlsruhe since 1957. At the same time he was head of the Institute for Neutron Physics and Reactor Engineering at the Nuclear Research Center, Karlsruhe. During World War II he participated in the early nuclear energy research in Germany under Professor Heisenberg. He is now an emeritus but still active as the European associate editor for Nuclear Technology.

The Synthesis of Carbon-11, Fluorine-18, and Nitrogen-13 Labeled Radiotracers for Biomedical Applications

Authors	Joanna S. Fowler and Alfred P. Wolf
Publisher	Technical Information Center/ U.S. Department of Energy (Sep. 1982)
Pages	124
Price	$11.25
Reviewer	James M. Woolfenden

The field of nuclear medicine uses radiotracers for functional imaging studies of the human body. Radionuclides with suitable emission characteristics are linked to compounds that follow physiological pathways to the organ being evaluated. The past decade has seen the development of new radiotracers for the brain, heart, liver and biliary system, and certain types of cancer, to name only a few. An exciting development has been the ability to image and measure regional metabolic activity in the brain and heart using positron-emitting radiotracers. The synthesis of such positron-emitting tracers poses numerous challenges to the synthetic radiochemist, toward whom this volume is directed.

The book is a monograph on the synthetic organic chemistry of radiotracers labeled with C-11, F-18, and N-13. After a general eight-page introduction to radiotracer design and synthesis, the authors provide an extensive list of compounds and precursors labeled with these radionuclides, along with 300 references. The authors next present a section on synthetic strategy and tactics, which contains many practical points that have been distilled from the authors' wealth of experience in rapid radiochemical synthesis. Specific synthetic methods are presented for C-11 (10 pages), F-18 (14 pages), and N-13 (3 pages). The final section on experimental design includes useful suggestions on topics such as well counter calibration, as well as specific detailed examples of radiochemical syntheses using C-11 and F-18.

The bibliography is a major part of the book. It covers 35 pages and includes 496 entries. Most of the references are for the past ten years; the most recent publication date is 1981.

The prose of the book is serviceable if undistinguished. The text would have benefited from editing to remove grammatical errors, such as a frequent disagreement in number between subject and verb. The line drawings that accompany the text are of generally good quality, but the few black-and-white photographs are poorly reproduced.

Since access to C-11 and N-13 requires an accelerator close at hand, and since there are few accelerator facilities for medical radionuclide production, this book is likely to have limited appeal. However, for those involved in rapid radiochemical synthesis using C-11, F-18, and N-13, the book presents many practical ideas and suggestions for further work. The extensive bibliography alone is worth the bargain price of this book.

James M. Woolfenden is professor of radiology in the Division of Nuclear Medicine, University of Arizona College of Medicine, Tucson, where he has served on the faculty since 1974. He received his undergraduate degree from Stanford University and his MD from the University of Washington. He is a fellow of the American College of Nuclear Physicians. His primary research work is in the field of tumor-seeking radiotracers.