The authors obviously intended their work to be a guide to radioisotope applications rather than a primary text, and in this respect they have been eminently successful. The reader will find a wealth of applications mentioned; scarcely any topic or use is cited without a reference to a paper on the subject. It is virtually impossible to read this book without being impressed by the power and scope of radioisotope applications.

H. R. Lukens is responsible for several research projects and for TRIGA reactor-based analyses in GA's Activation Analysis Service group. With an AB in biochemistry (1945, U. of Cal.) he entered radiochemistry in 1948. He has contributed to activation analysis, liquid scintillation counting, and radiotracer studies in organic, physical, and petroleum chemistry at Tracerlab, Shell Development, and, since 1962, at General Atomics.

TIMELY HANDBOOK

Title Fast Reactor Technology: Plant Design

Editor John G. Yevick; (A. Amorosi, Associate Editor)

Publisher The MIT Press, 1967

Pages xviii + 754

Price $35.00

Reviewer Leon Green

This timely book, a compilation of information covering 15 years of fast-reactor technical development, comes at a crucial time and will be of most interest to those actively engaged in fast-reactor programs. Because of the large body of information presented in this book, it will also be of general interest to almost everyone in the nuclear reactor field. Broad coverage is clearly indicated by the listing of 12 authors and 68 contributors who represent practically every organization that has been active in the fast-reactor program. The subject (Fast Reactor Plant Design) has been divided into 11 almost independent chapters. The text is arranged handbook style with each chapter well sectionalized and preceded by a table of contents. In addition, each chapter is followed by a comprehensive list of references. Because of the multi-author approach, the chapters are somewhat uneven in style, some sections being only descriptive and some very detailed, containing many charts, tables, and illustrative examples. However, this heterogeneity detracts very little from the value and purpose of the book.

Chapter II, which deals with coolant properties, heat transfer, and fluid flow, and Chap. IV, which considers heat-transport system design, give complete coverage of the use of liquid sodium as a fast-reactor coolant. Little mention is made of alternate coolants such as helium or steam. This omission is probably due to the editors' decision to limit the coverage to operating reactors or reactors under construction.

Chapter III covers structural analysis in a more or less descriptive manner so that the reader will have to look to the extensive reference list at the end of the chapter for more detailed information. Reactor designers will find Chap. VII, Fuel Handling, and Chap. VIII, Shielding, particularly comprehensive since these two subjects are well covered in a detailed handbook style. Chapter X on Economics presents information based on costs of experimental and prototype reactors, but unhappily it will be difficult to use this information to extrapolate costs of commercial-size plants.

Chapter I, the Introduction, and Chap. XI, Description of Fast Reactors, give a concise resumé of the fast-reactor programs up to the present time. The editors chose to omit any detailed description of fuel elements and core design since it was felt that coverage of this subject would require a separate volume.

Except for some minor editorial errors, this volume is a well-presented and illustrated reference book that covers an important subject in great detail.

Leon Green (BS, Che, Drexel Institute of Technology) is a Senior Officer in the Division of Nuclear Power and Reactors in the International Atomic Energy Agency, Vienna. In 1956 he joined Brookhaven National Laboratory (Nuclear Engineering Department), and for ten years was involved with design and analysis of a number of advanced reactor concepts. Before taking his two-year appointment with IAEA, he headed the Evaluation and Technical Assistance Group at BNL.

CONVENTIONAL BUT EXPENSIVE

Title Radioisotope Measurement Applications in Engineering

Authors Robin P. Gardner and Ralph L. Ely, Jr.

Publisher Reinhold Publishing Corp., 1967

Pages xii + 483

Price $16.00

Reviewer V. Lawrence Parsegian

A major byproduct of the atomic age has been the large increase in man-made radioactive isotopes of the conventional elements. These radioactive forms of elements, which number over a thousand, offer unique advantages for many industrial and research applications. When incorporated in chemical, metallurgical, and biochemical systems, radioactive isotopes usually behave much the same way as do their corresponding stable cousins. But because they emit ionizing radiation, even minute quantities of radioactive isotopes can be detected or *traced* by the tracer technique. These same isotopes can also become sources of penetrating, ionizing radiation which can be utilized for gauging the thickness of materials or used in place of x-ray sources for making radiographs of parts. These uses are discussed in this volume.

Although tracer research, gauging, and radiography have assumed considerable importance in many industries and laboratories, with few exceptions graduates from science

and engineering curricula lack knowledge of these techniques. The reasons are that college faculties are not very interested or informed in the subject, and curricula are already quite full in terms of credit hours, if not in substantial content.

According to the authors, the present volume is intended to serve as a text for a two-semester course for engineering students. There is awareness on their part that not many curricula can be that liberal with time, and so the possibility is held out that portions of the book can be useful for a one-semester course, or even to be a source of topics to incorporate in other courses.

The book brings together considerable information of value to a research worker in this field. Judged on the basis of its stated objectives, however, it lacks organization and content of the kind that most engineering students would find palatable. It is not an engineering text, or designed to offer topics in a way that can be easily assimilated in other courses. One does not gain the impression that it represents the distillation of engineering experience in the field. Possibly one weakness of the book (still having in mind the typical engineering or science student) is that it contains much material of a kind that is better given in less-detailed form.

About a third of the book is devoted to topics that acquaint the reader with atomic and nuclear physics, properties and sources of radiation, radiation detection systems, and problems of safe use of radioactive materials. The treatment is quite conventional. Radiotracer principles, techniques and application to engineering research and applications take up nearly another fourth of the book. Gauging by use of radiation penetration and radiation scattering take up most of the remainder of the volume, with one chapter devoted to radiography. In most cases, the reader must turn for details of techniques to other books the authors list as references. I hope my impression that not too many engineers will take advantage of the book is in error, because some text material for their use is sorely needed, especially if it could be made available at half the cost of this volume. (A question that puzzles me is why a book written at the expense of the USAEC, with all royalties going to the government, should be so expensive. Can this be due to the excessive red tape that becomes involved when government agencies take over the publication business?)

Dr. V. Lawrence Parsegian of Rensselaer Polytechnic holds the distinguished Chair of Rensselaer Professor, to which he was appointed in 1961 following seven years as Dean of Engineering at that institution. His earlier experience included 13 years in industry and nearly 5 years with the USAEC. While his efforts are devoted largely to developing new approaches for teaching science, he remains sensitive and responsive to questions of atomic energy policy affecting the role of government agencies, universities, and industry.

ISOTOPE RECIPES

Title Manual of Radioisotope Production

Editors C. C. Evans, C. Holley, and R. Hara

Publisher International Atomic Energy Agency, Vienna, 1966

Pages 446

Price $9.50

Reviewer J. C. Charlton

Possibly no one, other than reviewers, will attempt to read this book from cover to cover. Essentially it is a cookery book of radioisotope production written by a committee of expert radioisotope chefs. It can be dipped into for general advice on radioisotope production or for specific advice on an individual production problem.

To the newcomer to the field, there is much sound advice in the first part of the book (about 100 pages). Special attention is paid to the questions of what radioisotope production should be attempted at a new center, what buildings and facilities are necessary, and how the staff should be trained. There are detailed accounts of many individual techniques, such as dispensing, assaying, and quality control, all evidently written against a background of practical experience.

The second and larger part of the book, about 350 pages, is concerned with procedures for the production of 15 major radioisotopes. In some cases there are a dozen or more procedures, each contributed by a different laboratory, for the same radionuclide. As might be expected, there is much duplication, indeed multiplication. It is difficult to justify this, and one sympathizes with the editors in an international effort of this type. However, with patience, a great deal of interest emerges from this treatment. Why, for example, do some producers prepare their ^{51}Cr from enriched ^{50}Cr, while others employ the Szilard-Chalmers process on natural potassium chromate? The answer evidently lies in the neutron flux available. The higher the flux, the lower are the target costs per millicurie produced, while at the same time the smaller target volume lowers the irradiation costs. Other differences are due possibly to a combination of chance and tradition. Thus, in the processing of irradiated potassium chloride for ^{35}S, about half of the users favor removal of potassium ion on a cation exchange column followed by removal of hydrochloric acid by distillation, while the others favor the direct separation on an alumina column.

An interesting handling technique is provided by the Israeli method for large-scale ^{24}Na production, in which a lead-shielded processing vessel of plastic is lowered into the swimming-pool reactor and the irradiated ampoule dropped in. After removal from the reactor, the water is pumped out and dilute acid added to dissolve the irradiation unit, giving the product solution directly in its transport container.

Each individual radionuclide section is provided with an excellent collection of general information on nuclear properties, applications, radiological protection, assay, and survey of production processes. These can be warmly recommended to readers at all levels of experience.

As in so many publications in this field, insufficient attention has been