Spectroscopy on Localized and Cooled Ions
Peter E. Toschek and Werner Neuhauser

Spin-Polarized Hydrogen
Thomas J. Greytak, Daniel Kleppner, Richard W. Cline, and David A. Smith

Of this latter group of papers, I especially enjoyed the last two. They describe new techniques that offer prospects for interesting experiments.

The paper by R. Klapisch is the only one that involves research on the atomic nucleus. The author describes ongoing work, carried out at the European Council for Nuclear Research, Geneva, in which an on-line mass separator is combined with an accelerator bombarded target to systematically produce and study many radioactive isotopes. The hyperfine structure and isotope shift of atomic spectra provide information on spins, moments, and nuclear charge radii. This paper should be of considerable interest to nuclear physicists.

In summary, *Atomic Physics 7* contains a wealth of information on current research in atomic physics. It is a very important and relevant source of information for atomic physicists. Some of the articles are likely to be of interest to physicists working in the area of elementary particle physics. In my opinion, the book would not be too relevant to a member of the American Nuclear Society, since, except for the article by R. Klapisch, there is very little discussion of contemporary nuclear physics or of nuclear technology.

Howard Grotch is a professor of physics at The Pennsylvania State University at University Park, Pennsylvania. He is a theoretical physicist whose research encompasses a variety of topics in atomic and elementary particle physics. He is also a co-author of a textbook, Physics for Science and Engineering.

The Necessity for Nuclear Power

Author	Geoffrey Greenhalgh
Publisher	Crane, Russak & Company, Inc., New York (1981)
Pages	260
Price	$19.00
Reviewer	Frederick G. Hammitt

This book, written by a prominent British consultant on nuclear affairs, is designed to strongly argue the case for nuclear power as an essential energy source, leading up to the year 2000. While the author commenced his technical career in an oil refinery at Abadan, Iran, during World War II, he joined the nuclear staff at Harwell in 1948, and has held various positions in the British nuclear establishment until 1977, when he became a private nuclear consultant. Hence, he is particularly familiar with the nuclear side, but is not unfamiliar with fossil fuels and oil. The author bases his study on numerous up-to-date energy demand and availability forecasts, including both the utility need and also the possible eventual full extent of the nuclear option. The plethora of health, environmental, and proliferation factors, which have been in the forefront of recent energy/safety discussions, are considered. Topics treated include methods of power generation, nuclear safeguards, waste disposal, and Three Mile Island. Each topic is considered in relation to developing countries, Communist states, and also the United States and Western Europe. The book includes 18 chapters (too numerous to list here) with 60 figures and 78 tables.

In the Foreword, written by Dr. Sigvard Eklund, director-general of the International Atomic Energy Agency, it is stated that the only significant choices we have, at least until the end of this century, for the production of electric power are coal, nuclear, and, in some places, hydropower. It is stated that in 1979, 6% of the world's generating capacity was nuclear. This should increase to 16% by 1985. The book concludes with the statement that the consequences, should nuclear not eventually be needed, are minimal, but the consequences of a world plunged into a severe and widespread energy shortage would be catastrophic.

I strongly recommend the book to the general scientific community interested in the needed solution for our overall energy problems.

Frederick G. Hammitt, presently professor of mechanical engineering at the University of Michigan, was for several years professor of nuclear engineering at the same institute, and his PhD was in fact in nuclear engineering at Michigan. Hence, he is well qualified to review this book concerning the necessity for nuclear power, both as a specialist in that field, and also in conventional engineering (particularly polyphase fluid flow and heat transfer). At present, he is teaching a graduate course on large power plants, which closely involves the material of the book reviewed. He is professor-in-charge, Cavitation and Multiphase Flow Laboratory at Michigan, and has authored more than 300 papers and articles in this field in addition to two books on the general subject of cavitation.

Fast Breeder Reactors
(An Engineering Introduction)

Author	A. M. Judd
Publisher	Pergamon Press, Inc., Elmsford, New York (1981)
Pages	161
Price	$12.50
Reviewer	Ronald J. Onega

The Preface of this book starts with the statement "This book is intended for the newcomer to the study of fast breeder reactors [FBRs], either as a student or at a later stage of his or her career." This book certainly is a good, brief introduction to liquid-metal fast breeder reactors (LMFBRs). Most of the chapters deal with LMFBRs rather than other fast reactor concepts, although other concepts are mentioned.

The level of the book is for the first-year graduate student although it can be understood by anyone who is familiar with the material covered in Glasstone and Sesonske.[1] Often equations are written down with no justification of their validity or range of applicability, so some previous training in nuclear engineering is a requirement for thoroughly understanding the book. The book has the same general topic sequence as Waltar and Reynolds.[2]

There are three major shortcomings of the book if it is to be used as the primary text in a course.

1. There are no problems in the book. A basic textbook should have a sampling of problems unless it's to be used as a reference. Since this book is intended for students as well as those more advanced in their understanding, it would be good for a sampling of problems to be included for solution.

2. The author's typescript is printed in its original form so that there is a lack of alignment of the right-hand margin and the book looks less professionally done. Also the type is very small.

3. There is no tabulation of typical parameters for meaningful calculations. No cross-section sets are provided although a good description of multigroup diffusion theory is provided. There are limited tabulations of reactor parameters within chapters but the compatibility of these parameters is often not stated.

Even though this book has these (and other minor) shortcomings as a text, it would be an excellent supplementary book for a course in FBRs. The author states concepts very clearly and there are smooth transitions from one thought to the next. The sequence of topics is also very good. After an introduction indicating some background material and a little history of breeders, five chapters follow.

The first chapter is on the physics of fast reactors. A contrast between thermal and fast reactor is often made, which is particularly beneficial to a person who is familiar with thermal systems. Chapter 2 is an excellent description of fuel considerations including thermal properties, design and manufacture, and behavior of the fuel during irradiation. The third chapter is entitled "Engineering" and is concerned with core heat transfer to the coolant; the thermal, irradiation, and neutronic characteristics of the structural materials; and the structure of the core including fuel assemblies and their behavior during reactor operation. The dynamics and instrumentation of the reactor is also included in Chap. 3. This section is very brief and is not treated to the same depth as are some other sections of this book.

Chapter 4 is concerned with global reactor concepts, namely, coolant circuits and the steam plant. The usual discussion on pool or loop design for the primary circuit is presented, followed by a discussion of the steam generators and heat transfer considerations. Finally a short section on control systems concludes the chapter.

The last chapter is one of the most interesting and is devoted to the important subject of safety. The multiple barrier concept approach to safety is briefly described and then the protective systems are enumerated. There is a discussion of hypothetical accidents possible in a fast reactor and risks.

One area the author does not develop to any extent is fuel management, fuel burnup, and fuel cost. The burnup equations are not written down or discussed, although a short section on the importance of burnup is included. The breeding process is, of course, discussed.

The book has numerous typographical errors but these do not cause undue distraction from the flow of ideas.

In summary, this book provides a very good quick and logical view of LMFBRs. The author gives a fairly balanced treatment of the various facets of fast reactors. The book is recommended as a supplement for a text used in an FBR course. The book is highly recommended to anyone who would like a "vicarious first encounter with fast reactors."

R. J. Onega received his PhD from Pennsylvania State University in 1964. He is currently associate professor of mechanical and nuclear engineering at the Virginia Polytechnic Institute and State University. Dr. Onega has taught courses for utilities and has been active in research in reactor theory. He is a member of the American Nuclear Society.

REFERENCES

1. S. GLASSTONE and A. SESONSKE, *Nuclear Reactor Engineering*, 3rd ed., Van Nostrand Reinhold Company, New York (1981).

2. A. E. WALTAR and A. B. REYNOLDS, *Fast Breeder Reactors*, Pergamon Press, Elmsford, New York (1981).