triode in the same way the potential bias of the grid alters the current in an electric triode.

This book is intended for the aeronautical and mechanical engineer working in areas of heat transfer in systems of advanced design or related fundamental heat transfer processes. This book is worth reading by persons interested in performing research in the relevant areas of heat transfer.

Samuel H. Levine is professor of nuclear engineering and director of the Breazeale Nuclear Reactor of The Pennsylvania State University. For the past 12 years, Professor Levine has been teaching courses on heat transfer and in-core fuel management at Penn State. His principal areas of research include fuel management and experiments performed using research reactors and critical facilities.

The Particle Play

Author J. C. Polkinghorne

Publisher W. H. Freeman and Company

Pages 138

Price $12.75

Reviewer Mark A. Samuel

What is the ultimate structure of matter? Is there a small number of elementary particles, out of which the tremendous variety of material objects in nature is constructed? These are questions that have been asked, in one form or another, since the days of the ancient Greeks. There is reason to believe, however, that today the answer may be very close at hand.

Polkinghorne has done a beautiful job in providing a remarkably complete and up-to-date description of our current understanding of the fundamental constituents of matter and their interactions. His style is extremely readable and this book should provide interesting reading for both the layman and the scientist.

This account also gives the reader a taste of the excitement of the discovery process itself, as well as its dead ends. The latter purpose is presumably fulfilled by inclusion of such topics as *S*-Matrix Theory and Bootstrap Theory, although the inclusion of so many subjects may be somewhat confusing for the nonexpert.

There are just a few minor corrections and criticisms I would like to mention. On p. 77, the anomalous magnetic moment of the muon (not μ-meson) should be $(g - 2)/2$. There are remarkably few typographical errors; however, there is one on the first line of p. 118 that may be very confusing. The phrase "a lepton column like (A) of p. 112" should be omitted. Finally, the author in the Epilogue permits himself the indulgence of presenting his view of the connection between science and religion, although he expresses his irritation at the previous attempts of others. The book would have been better had this brief Epilogue been omitted.

Mark A. Samuel received his BS and MS degrees in physics from McGill University and his PhD degree in physics from the University of Rochester. He is presently associate professor of physics at Oklahoma State University. Dr. Samuel was a visiting scientist at the Stanford Linear Accelerator Center during the summers of 1973 and 1975 (Theoretical Physics Group). He was also a visiting scientist at the Niels Bohr Institute, Copenhagen, in 1977. He is the co-author or author of some 25 professional papers in theoretical particle physics as well as a co-author of a book on group theory.

Fast Pulsed and Burst Reactors

Author E. P. Shabalin

Publisher Pergamon Press, Maxwell House

Pages 263

Price $59.00

Reviewer Noel R. Corngold

Early in 1945, before Alamogordo, separated ^{235}U began to arrive at Los Alamos. By April 13, O. R. Frisch's group had achieved the first critical assembly of metallic ^{235}U. However, the experimental kinetics of fast systems and bombs remained unknown territory. Frisch, later Jacksonian Professor of Natural Philosophy at Cambridge, "... thought it would be nice to go one step nearer to a real atomic explosion." He and his colleagues designed a simple experiment. They stacked tiny blocks of uranium hydride inside a box on a steel table, leaving space for a uranium slug that was hoisted above the assembly. With the slug in place, the system was "slightly" super-prompt-critical. But, the drop, in the derrick-like arrangement, would cause the slug to be in place for only a few milliseconds. As Richard Feynman phrased it, one was tickling the tail of a sleeping dragon. Thus, the DRAGON experiment was born and christened. The experiment was carried out, in fact, after Alamogordo. For a few weeks, drops were made, and the burst data were recorded and analyzed—to everyone's satisfaction.

The DRAGON's seed—IBR and SPR, VIPER and FRAN, and others—forms the subject of E. P. Shabalin's book, *Fast Pulsed and Burst Reactors*. Its subtitle, "A comprehensive account of the physics of both single burst and repetitively pulsed reactors," expresses the matter nicely.

The author, a Russian physicist, is a staff member at the Joint Institute for Nuclear Research in Moscow, and Pergamon's clumsy translation from the Russian, with its occasional howlers, cannot hide his enthusiasm for his subject. Shabalin knows well Dubna's pulsed period reactor, the IBR, and its progeny. The original IBR, which began operation in 1960, had its reactivity modulated through the rotation of a steel disk, which carried, in turn, a disk of enriched uranium, and passed between two fixed parts of a reactor core. In the next two decades, designs became much more complicated, with elaborate arrangements of moving parts. At the close of the book, Shabalin discusses an exotic "modern" version, pulsing a 10-mg pellet of fissile material that has been compressed strongly by laser light!

The book's ten chapters describe the physics of pulsed reactors and boosters at a comfortable level. There is adequate description of how the machines work, agreeable curves extracted from simple analytical models, and an adequate index and bibliography. I would guess that the manuscript was completed in 1973 or 1974. It was published in the Soviet Union in 1976.

It is hard to make a very strong case for these machines as indispensable research tools. For example, the "pure" pulsed reactor has too long a pulse width (microseconds) to compete with accelerator sources of neutrons for the affection of nuclear physicists. The pulsed reactor does produce fluxes of gamma rays and neutrons that differ from those characterizing the steady reactor, and so is a helpful tool in studies of radiation effects. The competition has not changed much since Shabalin closed his manuscript. The outstanding pulsed neutron facility of the 1980s will be the Los Alamos National Laboratory WNR facility. There, intense bursts of thermal and epithermal neutrons will be generated by spallation in heavy-metal targets. The primary particles will be protons drawn from a storage ring in nanosecond pulses. The ring, in turn, is fed by a linear accelerator.

But, though they may not win out in the end, the DRAGON's progeny possess a certain charm. The machines almost make us smile. One uses "jumping fuel elements" as a quenching mechanism, another features nylon "bullets," shot through the core, 15 per second. It is reported that students find working with pulsed reactors "exciting," and it is claimed that simple computation models do very nicely. Certainly, the small, pulsed reactor belongs to a simpler time of neutron research. Shabalin captures the flavor of that era very well.

Noel R. Corngold is professor of applied physics at The California Institute of Technology and fellow of the American Nuclear Society. He is a refugee from the east, having been educated at Columbia and Harvard, and having spent a happy 15 years at Brookhaven National Laboratory. He has struggled with reactor physics for some time and enjoys transport theory of all sorts.

Computer Techniques in Radiation Transport and Dosimetry

Editors	Walter R. Nelson and Theodore M. Jenkins
Publisher	Plenum Press (1980)
Pages	521
Price	$55.00
Reviewer	John W. Poston

This book presents the Proceedings of the Second International School of Radiation Damage and Protection, held in Erice, Sicily, on October 25–November 3, 1978. The text is organized into a series of lectures, presented by invited speakers, on low-energy neutron and gamma-ray programs and their applications; electromagnetic cascade shower programs and their applications; hadronic cascade programs and their applications; and unfolding methods and spectrum analysis. In addition, two introductory lectures and three papers by participants at the school are included.

In my opinion, this text is a very useful one for persons interested in a review of the field as it stood in 1978. The introductory lecture on the physics of radiation transport is excellent, as is the lecture on the physics of electromagnetic cascade (both presented, incidentally, by the same author). The speakers have attempted to discuss the existing programs and their application to specific problems. This discussion-application format is extremely useful to the reader in that similar applications immediately leap to mind. In addition, these presentations give the reader an idea of the limitations of each code.

There are, however, two criticisms of this text that must not escape mention. First, there is a time lag of about two years between the meeting and publication of the volume. This detracts somewhat from the attitude that the presentations are state-of-the-art. Second, several of the papers are only one-page summaries and one is simply a page of references. This was unfortunate, for some of these summaries were the papers in which I had the most interest.

With these two criticisms in mind, the book can still be recommended, especially for those who want a sophisticated survey of the field. The book was relatively free from typographical errors and it was extremely easy to read. I hope that additional publications on this subject will be forthcoming on a regular basis.

John W. Poston is associate professor at the School of Nuclear Engineering at the Georgia Institute of Technology. He has been at Georgia Tech since January 1977, teaching courses and supervising research in various aspects of radiation protection. Before coming to Georgia Tech, he was a staff member in the Health Physics Division at Oak Ridge National Laboratory. In this capacity, he was involved in research on both internal and external dosimetry. Dr. Poston is Chairman of American National Standards Institute Committee N-13 on Radiation Protection, is a member of three National Committee on Radiation Protection and Measurement Scientific Committees, serves as a member of the Society of Nuclear Medicine MIRD Committee, and is on the International Commission on Radiological Protection Task Group on Dose Calculations. He is coauthor of Principles of Nuclear Radiation Detection.

Commonsense in Nuclear Energy

Authors	Fred Hoyle and Geoffrey Hoyle
Publisher	W. H. Freeman and Company
Pages	88 pages, 15 illustrations
Price	$7.00 (Hardbound), $3.95 (Paperbound)
Reviewer	Harry W. Parker

The most certain way to bring nuclear disaster upon the world is not to continue efficient development of