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Reviewer Gregory R. Choppin

In this relatively small book, the authors attempt to discuss the issues involved in nuclear power. They admit in the Preface to a pronuclear bias and avoid "merely listing without critical comment the familiar pros and cons of this well-worn debate." They present the issues through scientific analysis, aiming at an open-minded layperson.

The fundamentals of reactors, fuel cycles, risk analyses, waste disposal, and advanced systems such as breeder and fusion reactors are described at about the level of *Scientific American*. In each case a discussion and analysis of the objections related to each aspect of nuclear power is then presented. Several times the authors express their conviction that many of the nuclear opponents are more broadly anti-technology and wish "to force our society back to a simpler way of life in which dependence on technology is minimized."

A remarkable amount of relevant scientific data is offered to refute seemingly all the antinuclear arguments, large and small. In general, the style, the order of presentation and the technical level are consistent and easy to follow. Certainly, there is a great deal of value in this book for anyone seeking to refute the antinuclear arguments. Sometimes the authors seem to assume only bad faith by nuclear opponents but, for the most part, they are successful in their attempt to present unemotional scientific analyses. Obviously, as one jury in the trial of the technology of nuclear power, they return a clear verdict of not guilty.

Gregory R. Choppin received his PhD from the University of Texas and after a post-doctoral period at the Lawrence Radiation Laboratory, Berkeley, joined the faculty of Florida State University where he is professor of inorganic and nuclear chemistry. He has spent a year at the Center of Nuclear Research, Mol, Belgium (1963) and at the Institute for Transuranium Elements, Karlsruhe, Federal Republic of Germany (1980). He is the author of approximately 100 articles in nuclear and radiochemistry and of three books. At present he is a member of the technical review committee for the Chemistry Technology Division of Oak Ridge National Laboratory. He has served as chairman of the Division of Nuclear Chemistry and Technology of the American Chemical Society and is chairman of the Subcommittee on Radiochemistry of the National Research Council.

The Technology of Controlled Nuclear Fusion

Editors J. R. Powell and C. T. Eterno

Publisher U.S. National Technical Information Service (1978)

Pages 1928 (2 volumes)

Price Printed $19.00; Microfiche $3.00 each volume

Reviewer Mark A. Prelas

The *Proceedings of the Third Topical Meeting on the Technology of Controlled Nuclear Fusion* is a two-volume text that is ideal for the expert and student alike. Since the text was derived from the meeting of the same title, it consists of many papers, written by some of the world's foremost experts, which review specific areas in fusion technology. (Altogether, there are 141 papers.) The text is divided into 13 chapters, each dealing with a general subject (i.e., national programs, advanced fusion concepts, nonelectric applications, blanket engineering, fusion reactor design, economics and system studies, fusion materials, engineering technology development, tritium handling and fuel cycle technology, plasma engineering, environment and safety, operation and maintenance, and fusion reactor engineering and technology). One must commend the editors, J. R. Powell and C. T. Eterno, for organizing the 141 papers in this manner. Additionally, the authors of the papers must be congratulated for the generally excellent presentation of the subject matter.

Perhaps the most impressive feature of the text is the sheer volume of fusion research discussed. Despite the complexity of the technology, one must feel content with the progress made thus far. Indeed, one clear message from the text is that much of the effort, which thus far has been involved with the physics of the problem, will soon be shifting toward engineering and technical development. In light of the many engineering problems that must be addressed (e.g., blanket engineering, materials, tritium handling, safety, and operation and maintenance), the text is able to pinpoint specific issues that researchers may find valuable in the developing programs to take advantage of this shift in emphasis.

Particular sections that should be noted are Non-Electric Applications; Blanket Engineering; Panel on Fusion Materials; Tritium Handling and Fuel Cycle Technology; Environment and Safety; and Operation and Maintenance. In these chapters, many of the engineering problems that require further research are discussed. For instance, how does one design the reactor so that it can breed tritium [from ^{6}Li$(n,t)\alpha$ or ^{7}Li$(n,n't)\alpha$] to replenish the atoms consumed in the deuterium-tritium (D-T) reaction, survive a wall loading of $\sim$1 MW/m^2, possibly breed fissile materials (e.g., ^{233}U$^-$ or ^{239}Pu) from fertile materials (e.g., ^{232}Th or ^{238}U), and produce a useful energy source (chemical or electrical). In order to accomplish these tasks, many issues must be explored in more detail. This list includes the short- and long-term material problems (in the areas of alloy development for irradiation, performance, damage analysis and fundamental studies, plasma material interaction, and special purpose materials) discussed by Zwilaky et al.; techniques for handling the 6- to 12-kg tritium inventory envisioned in a commercial D-T fusion power plant; environmental and safety issues with the tritium, superconducting fusion magnets (in magnetic confinement systems), lithium handling, etc.; and the operation and maintenance problems associated with blanket replacement, magnet servicing, disconnecting the coolant lines, etc. In addition to the excellent presentation on engineering and technical problems, a valuable discussion on nonelectric applications of fusion power is given. Due to the condition of the world's fossil fuel supplies, the papers on hydrogen production using a fusion source by L. A. Booth et al. and synfuels production from fusion reactors by J. A. Fillo et al. are very timely. Also, since many people feel that the steam cycle may not be the best method of energy conversion, the article "Direct Energy Conversion Systems" by G. H. Miley is worthy of note.

All in all *The Technology of Controlled Nuclear Fusion* is an excellent text. It is specifically valuable in clarifying this complex technology and in pinpointing areas in which research is needed.

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Proliferation, Plutonium and Policy/Institutional and Technological Impediments to Nuclear Weapons Propagation

Author	Alexander DeVolpi
Publisher	Pergamon Press Incorporated, Maxwell House, Fairview Park, Elmsford, New York (1979)
Pages	359
Price	$39.50
Reviewer	C. Heising-Goodman

DeVolpi has performed a detailed analysis of the use of denatured plutonium in the light water reactor fuel cycle as a technical means of reducing the safeguards and proliferation risk associated with the conventional fuel cycle. Although the book is printed using computer typesetting, making it difficult to read, the material itself is presented in a fashion that facilitates the reader's understanding of both the technical aspects of the plutonium denaturing scheme and the political-social motivations for its introduction. Although himself not an advocate of the Carter Administration's anti-reprocessing/breeder policy, which is based on a fear of weapons proliferation, DeVolpi adopts the perspective of the technologist faced with regulatory design basis requirements that must be met through the design process. DeVolpi presents a convincing argument for the legitimacy of the denatured plutonium technical fix, performing many calculations of critical mass size required, heat and temperature effects of the ^{238}Pu additive, and the effects on the likely yield expected from crude devices that, in projected experiment, might be constructed with the denatured plutonium. The book should be of interest to nuclear technologists in the fuel cycle area, safeguards-nuclear materials management, nuclear chemical engineering, and military-related applications. It should also provide food for thought for political scientists and others involved in the policy-making surrounding safeguarding the nuclear fuel cycle.

Carolyn D. Heising-Goodman received her BS degree (1974) in applied physics from the University of California at San Diego, and her MS (1975) and PhD (1978) degrees in nuclear engineering from the Department of Mechanical Engineering at Stanford University. She also holds a PhD minor in operations research from Stanford University. Currently, she is an assistant professor of nuclear engineering at Massachusetts Institute of Technology in the areas of reliability and nuclear safety analysis. She is working on contract to the Nuclear Safety Analysis Center with Professor Norman C. Rasmussen on class IX accident mitigation system analysis and methods for resolution of generic nuclear safety issues.