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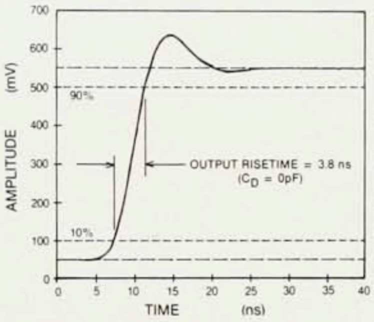
A250



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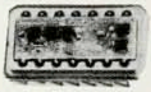

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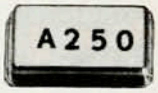

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One will not find in this book a discussion of very-high-speed or very-low-speed flow, nor much about turbulence. On the other hand one will find a discussion of swimming and flying in nature, topics not found in other texts. More importantly, however, one will find throughout what we have come to expect from Lighthill's writings—enormously insightful comments and an instructive discussion of every topic treated. The author is a master, and takes delight in using simple dimensional and scaling arguments to extract estimates of the size and importance of various fluid mechanical phenomena. Less informal and less introductory than the title suggests, the text does fulfill the promise of the series. One could not hope for a more succinct and illuminating initiation into some of the most important and fundamental ideas of theoretical fluid mechanics.

Stanley A. Berger
University of California, Berkeley

Nuclear Imperatives and Public Trust: Dealing with Radioactive Waste

Luther J. Carter
Resources for the Future,
Washington, D. C.
(dist. by Johns Hopkins U. P.,
Baltimore, Md.), 1987. 473 pp.
$28.00 hc ISBN 0-915707-29-2

Nuclear Imperatives and Public Trust is an unbalanced historical account of rambling governmental efforts to bury radioactive wastes. Luther Carter, formerly with *Science*, was supported in its publication by an independent nonprofit nature-conservation organization, Resources for the Future. Based largely on interviews and Congressional testimony, the book does not have a strong technical basis, nor is it free of Carter's biases against fuel reprocessing in particular and nuclear power in general. Despite these limitations, it provides a useful consolidated history of nuclear waste disposal endeavors and draws some important lessons for policymakers.

The theme of the book is drawn from Carter's hypothesis that nuclear power is "subject to two indisputable imperatives": safeguarding potential nuclear explosives and containing radioactivity. However, he dwells on these two imperatives as though nuclear power and other power sources were not subject to additional imperatives. For example, nuclear power must entail less environmental degradation then competing sources, and it must be economically competitive.

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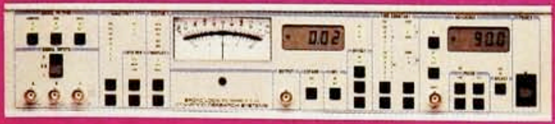

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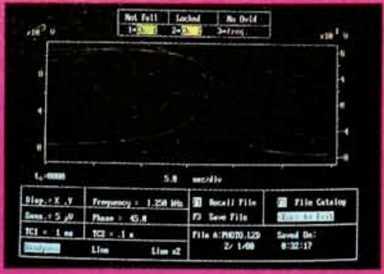

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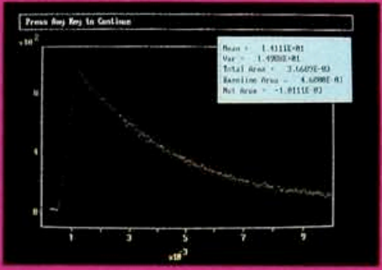

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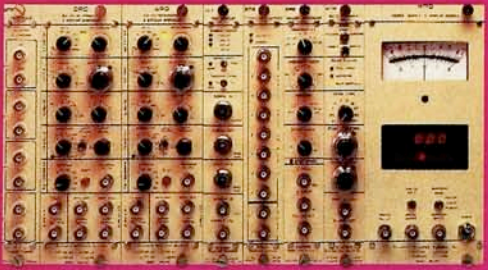

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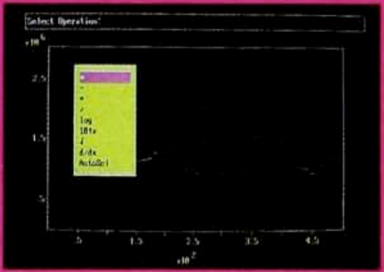

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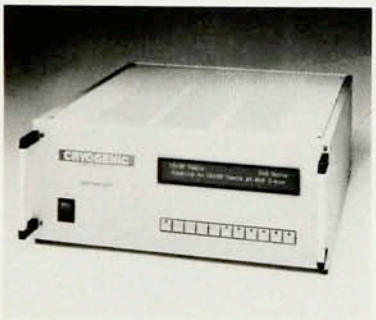

Nuclear power has also been attended by the imperatives of high visibility, technical complexity and public focus.

Another factor that journalist Carter does not address is the role of the media, which tend to magnify and exploit dramatic situations, especially when negative. Carter blames worldwide public opposition for the "fading" of nuclear power. Despite the Windscale, Three Mile Island and Chernobyl incidents, the primary factors have been depressed economic conditions, regulatory ratcheting, lower oil prices and some energy conservation.

Carter writes that the need for plutonium fuel and breeder reactors might never be enough to outweigh the risks of nuclear proliferation and terrorism associated with reprocessing. He states baldly, "For plutonium fuel to enter routine use and commercial traffic . . . presents risks that are quite beyond our powers to assess." Granted, Carter's insight into public perceptions of nuclear hazards is helpful in understanding this problem. But where he enters the technical world and posits that "waste management and disposal are not made easier by fuel reprocessing," he is on weak ground.

Carter's "essential argument" is that "the safeguards and containment imperatives are more likely to be satisfied in an effective and convincing manner if spent fuel is disposed of as waste." Although his case is strong for monitored retrievable storage, he fails to prove that what must be stored is spent fuel rather than processed waste.

Carter implies that because of 1% "discrepancies" in plant inventory, reactor plutonium not yet processed could be stolen and fabricated into an atomic bomb. Though strictly true, this is journalistic hype. The material is so intensely radioactive that stealing it would be very dangerous; it would be necessary to process it by complex means into a form suitable for an explosive; and this subgrade material would have to be configured into a fission explosive, which itself is a highly complex task. Technical experts now tend to back off from overstated claims that a band of terrorists could easily fabricate a workable nuclear explosive.

Carter calls proper attention to the public and political dangers of a plutonium explosive hoax, yet he ignores the experience gained in 40 years of routine plutonium shipments: Fifty thousand nuclear weapons are spread around the world. The plutonium shipped in nuclear commerce is much less of a weapons hazard. In fact, Carter later acknowledges that proper transport of spent fuel can be less of a public risk than shipment of "materials ubiquitous in ordinary commerce (such as gasoline, propane and liquid chlorine)."

An escape from much of the "not in my backyard" syndrome is sub-seabed disposal. Its importance in resolving the international dilemma is not given enough space in the book (nor in governmental funding).

Carter observes that site selection has a direct bearing on many sectors of the public, who should be included in the process. Just because public-interest and environmental-interest organizations have had varying degrees of opposition to nuclear power, they should not be disenfranchised from site selection. For these reasons, a better audience for this book would be policymakers, who have to balance conflicting interests.

One of the book's more helpful conclusions is that Yucca Mountain, Nevada, might qualify as a potential site for permanent but retrievable nuclear waste storage, subject to participation of independent and respected experts and affected parties—including nuclear-control groups, states that accumulate spent fuel, ratepayers and public utility commissions, utilities and the nuclear industry, and environmental and antinuclear groups. Through this process, the US has a "common ground for consensus on progress in establishing a geologic repository," one for which the risks to the public from storage of radioactive waste can be made "very low."

ALEXANDER DEVOLPI
Argonne National Laboratory

Search for a Super-Theory: From Atoms to Superstrings

Barry Parker
Plenum, New York, 1987.
292 pp. $21.95 hc
ISBN 0-306-42702-8

Albert Einstein defined for all time the limits of theoretical physics when he wrote: "Pure logical thinking cannot yield us any knowledge of the empirical world. All knowledge of reality starts from experience and ends in it." The casual reader of Barry Parker's new book may be forgiven if he loses sight of Einstein's important dictum. The general reader is probably not interested in wrong turns and blind alleys, but Parker's emphasis on current theories rather than experimental history does make the development of elementary-particle physics seem