fraction of the dose was received from either constituent completely negates the previous discussion of ^{226}Ra. (Again the implication is that the "one river" being discussed is the Animas River although the implication is far from clear. This is typical of the author's unscientific use of scientific information.)

The author's description of the reason nuclear reactors need to be refueled reveals a real want of technical understanding. His description from Chap. 6 is,

> "The fragments of fissioned atoms, radioactive wastes, slowly accumulate in reactor fuel. After a period of time, enough wastes accumulate to extinguish the chain reaction going on in the fuel, as ashes may smother a fire. Before this point is reached, the fuel must be removed from the reactor and the radioactive ashes extracted."

The only correct statement is the first sentence; the others represent an incorrect analogy for fuel burnup. The fuel is reprocessed because the cumulative radiation exposure of the fuel element causes sufficient structural changes to warrant it. Only a few percent of the fissionable fuel atoms have been "used up" at this time. Thus, the author's interpretation that fission products are strong poisons, i.e., absorb many neutrons and thus make it impossible to maintain a critical reaction with this fuel is a gross technical error. In fact, a selected few of the fission products are strong neutron absorbers but this poison effect is quite small during continuous reactor operation and does not significantly affect criticality.

Some confusing statements are made in Chap. 7 where Novick is discussing the operation of a fast reactor. One of these is "the fast reactor seems to be the sort of mechanism in which the devices employed to forestall one sort of accident simply precipitates another." This gross oversimplification of technical considerations is typical of Novick's extrapolation of one single event into a general statement that has little technical meaning. Another statement is, "because it is so much more compact, the fast reactor must be cooled by a more efficient cooling medium than water; liquid sodium is usually used." This situation is an incomplete interpretation of technical information since, in actuality, the reason for using sodium as a coolant is to use a material that will degrade the neutron energy spectrum as little as possible in order to keep the reactor in the fast neutron energy range. Naturally, heat transfer characteristics are also important as are low operating pressure considerations, an important point the author does not even mention.

Another glaring omission of this book is the subject of modern gas-cooled reactors and the various advantages they have in regard to high thermal efficiency and the consequent reduction in "thermal pollution." In addition, their advantage in not having water present is important as far as possible metal-water chemical reactions are concerned, a subject the author continually brings up about water reactors.

In reading this book for the first time voluminous notes were recorded concerning individual statements; however, in rereading these notes, the reviewer obtained the overall impression that Novick had recorded a history of the nuclear industry with an accent upon the difficult problems it has had to overcome. Thus, if certain passages in the book were reworded it could document to a reasonable degree how nuclear technology has met the many problems inherent in the emergence of a new technology. In this regard the book has some merit as a historical treatment.

This discussion of examples from *The Careless Atom* could go on almost indefinitely but those noted give a cross section of the type of writing Novick has produced. In summary, the quote from the last sentence of the book, "We can hope that advancing science has not left democracy behind," is an important statement but one that requires the public to be fully informed about nuclear power—a task that still remains to be accomplished as Mr. Novick's book has definitely not *fully* informed the public.

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Title Methods in Subnuclear Physics, Vol. III (Proceedings of the International School of Elementary Particle Physics, Herceg-Novi)

Editor M. Nikolić

Publisher Gordon & Breach Science Publishers Inc.

Pages 862

Price \$69.50 Clothbound
\$38.00 Paperbound

Reviewer Thomas H. Fields

This book is based on lectures delivered at the 1967 Herceg-Novi (Yugoslavia) Summer School on the physics of elementary particles. The 26 lecturers whose articles are included are active research workers whose summaries of various topics, mainly in electromagnetic and weak interactions, are well suited for the summer school participants (themselves mainly young experimental workers in this field).

It can be correctly inferred that this book is likely to find an appreciative audience among persons with an active involvement in particle physics research, and among some workers in closely related fields. There is, of course, a lack of overall continuity and completeness, and a noticeable but not severe obsolescence of the experimental data since 1967. But such are the shortcomings of most volumes of review articles. As compensation, one finds a diversity in style and content among the articles which is a good reflection of the instantaneous state of the art. Many of the articles include extensive bibliographies.

Topics in weak interactions form the largest group in the book (10 lectures). They range in approach from phenomenological summaries of the experimental situation for particular decay processes to R.

Marshak's historical review of theoretical progress "towards a universal law of weak interactions." On electromagnetic interactions, two lectures which would be of interest to many physicists are "Experimental Tests of Quantum Electrodynamics," by E. Lohrmann, and "The Anomalous Magnetic Moment of the Electron and Muon," by E. Picasso.

It seems necessary to add a sour note concerning the price of this volume. This price is quite out of line with standard practice, even for books which are aimed at a rather limited audience.

Thomas H. Fields is director of the High Energy Physics Division at Argonne National Laboratory. His main research interests are centered on the reactions of elementary particles as observed in bubble chamber photographs, as well as on development of improved bubble chambers to allow the study of rare reactions. He and his colleagues at Argonne have studied new resonant states of elementary particles in their bubble chamber experiments, and have pioneered the application of superconductivity magnets for practical use in high energy physics.