

The second monograph is similar in format, evaluating the data on the formation of the aqueous ions in the various oxidation states. Thorium through berkelium are covered in detail, and californium through lawrencium more briefly.

The authors have been successful in their goal of providing a critical summary of thermodynamic data on the actinide elements that would be of use to "nuclear engineers and/or physical scientists concerned with problems in nuclear systems."

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### Uranium Ore Processing

(Proceedings of an International Atomic Energy Agency Symposium, November 1975)

*Publisher* International Atomic Energy Agency  
(Distributed by Unipub, Inc.)

*Pages* 238

*Price* \$19.00

*Reviewer* Arturo Bronson

The International Atomic Energy Agency (IAEA) organized this Proceedings to bring together new information on uranium ore processing. Eighteen papers were presented and 49 participants attended the symposium held in November 1975.

Three major subjects have been covered by the Proceedings: uranium ore processing, the problems associated with ore processing, and uranium recovery from seawater. The sessions containing papers on uranium ore processing are the following: uranium ore milling practice (five papers); known and partially engineered techniques that have not reached full application in milling of uranium ores (one paper); processing of low-grade resources (four papers); *in situ* leaching (one paper); uranium as a by-product and by-products from uranium ores (one paper). A valuable session containing three papers was held on the problems associated with uranium ore processing. A session containing two papers discusses the design considerations for the recovery of uranium from seawater.

In the appendix, the IAEA has classified several uranium plants according to extraction processes in tabular form. In addition, the tables present the following general information on each uranium plant: ore characteristics, type of milling, type of leaching, solid/liquid separation, and the type of concentration/purification systems. The appendix also contains a summary of the new uranium plants, their type of deposit, and the proposed extraction methods that are being investigated.

The symposium could have been better organized. For example, papers on ore processing are presented in five different sessions, although three sessions contain only one paper. Also, it appears that the text was not edited, because the micrographs lack magnification scales and some papers lack conclusions and summaries.

The text is intended for engineers in the uranium ore processing field and serves to bring the engineers up-to-date in the field. Although the technology presented is somewhat superficial, the papers bring together valuable information acquired since the IAEA's 1970 symposium.

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### Radiological Safety Aspects of the Operation of Neutron Generators

*Author* R. F. Boggs

*Publisher* International Atomic Energy Agency  
(Distributed by Unipub, Inc.)

*Pages* 42

*Price* \$3.50

*Reviewer* A. Keith Furr

This short book is intended for neutron generator operators who have had very little prior experience or training in health physics or radiation safety. As such, it does not attempt to cover any specific topic in detail.

The book is divided into four sections. The first is a brief but clear description of the major features of small neutron generators. The second section discusses the radiation hazards and preventive measures that should be employed to reduce or eliminate their effect. The third section deals with monitoring devices and instruments, and the fourth section covers the broadened aspects of an adequate radiation safety program. There are two appendixes, one dealing with nonradiation hazards and safety considerations and the other describing the desirable features of a neutron generator laboratory.

Although brief, as noted above, the second section on hazards is quite adequate for the purpose intended. It describes the hazards most likely to be encountered and gives typical values for the level of these hazards. A relatively untrained operator should be able to gain an appreciation of the dangers involved in normal operation of the generators.

In a few instances, one might wish more information. For example, when speaking of storing targets and used oil contaminated with tritium, the author suggests using containers made of material through which tritium will not

readily diffuse. He specifically does not recommend glass, but does not suggest an alternative. I also might have wished him to discuss the problem of drive-in targets for machines using the  $D(d,n)$  reaction.

I do not believe the omissions to be critical in view of the intended audience. Where the reader wishes to pursue a given topic, adequate references are provided. On the whole, I believe the book serves the purpose for which it was intended very well. However, a sophisticated researcher, as many of the readers of *Nuclear Technology* might well be expected to be, would probably wish for more depth.

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## Europe's Giant Accelerator

<i>Authors</i>	Maurice Goldsmith and Edwin Shaw
<i>Publisher</i>	Taylor & Francis Ltd., London (1977) (Distributed by Crane, Russak & Company, Inc.)
<i>Pages</i>	261
<i>Price</i>	\$27.50
<i>Reviewer</i>	Jacob Shapiro

This handsome volume is the story of the 400-GeV Super Proton Synchrotron (SPS), 2.2 km in diameter, which straddles the countries of France and Switzerland at the Conseil Européen pour la Recherche Nucléaire (CERN). It is a first-hand account by two authors who have been intimately concerned with the developments at CERN. The SPS was proposed by the European Committee for Future Accelerators under E. Amaldi in 1963. It was given a considerable stimulus by the decision of the U.S. Congress to authorize the construction of a 200-GeV (now 500-GeV) synchrotron at Batavia. (The effectiveness with politicians of arguments based on international rivalries appears to have

been demonstrated in the promotion of all types of projects.) Final agreement was reached by 10 of the 12 member states of CERN on a program for construction of the accelerator in 1971, and the maximum design energy of 400 GeV was reached on June 17, 1976.

The book takes us through the trials and tribulations accompanying the design, construction, and startup of the machine, and gives vivid portraits of the personnel connected with the project. There are clear explanations of the guiding and focusing methods, the systems for injecting, extracting, and controlling the circulating proton beams, and the accelerating systems. There is also background material, some philosophical in nature, covering the objectives of building accelerators and the techniques of machine builders. It is profusely illustrated with photographs of the progress of construction, of the components, and of the people who brought this giant project to fruition. The material can be readily digested by the nonmathematician, as there is not a single equation in the entire text.

The organization of CERN is spelled out in some detail, for the successful completion of a project under the aegis of 12 countries is no mean feat. CERN was successful in getting adequate funding not only to build the machine, but to design and build the most refined supporting experimental equipment. It learned how to "do its costing and it did not bargain away a position of realism by accepting cuts essentially imposed by the horse-dealing tendencies of politicians." High-energy scientists from the U.S. who have seen their budgets for experimental work decimated in recent years may envy the success of their peers at CERN.

Many nontechnical problems had to be faced because the machine was located in two countries. When the French introduced summer time while Switzerland remained on Continental time, the machine not only crossed a frontier but a time zone. The resolution was to leave the clocks on Swiss time over the entire center, but to advance the official hours of work half an hour.

The many illustrations provided are not coordinated with the text. This can be a bit confusing if one tries to alternate between the text and the photographs. Each must be examined more or less independently.

The feat of getting 12 western European countries to collaborate to build a machine that was beyond the capacity of any single nation is a credit to the participating countries. The significance is expressed very well in the foreword by E. Amaldi: "All of us hope that this extraordinary achievement may also help to convince the leaders of our society that advanced problems can be solved by a common effort. The success of European collaboration at CERN is not an accident, it is due to the structure of the organization which encourages the commitment of everyone to the pursuit of a common goal, but has room for understanding when an individual partner has special problems."

*As health physicist to the Harvard University Health Services, Dr. Jacob Shapiro directs the radiation protection program at Harvard University. He has been involved with a wide variety of problems in the accelerator, medical, industrial, and university areas. His research interests are in environmental and occupational contamination hazards and in the dosimetry and hazards of low-level radiation. He is the author of a widely used manual, Radiation Protection, A Guide for Scientists and Physicians, published by the Harvard University Press.*