waste, because of a new, time-consuming licensing procedure. "This change in the law brought about a situation in which, from the beginning of 1979 probably through the mid-80s, the Federal Republic has no possibility of disposing of the radioactive waste arising during operation of nuclear installations. Therefore these wastes have to be stored intermediately," reported A. Ziegler and H. Röthemeyer at the NWTS information meeting.

Because German utilities have to satisfy the government that they can safely dispose of nuclear wastes as a condition for construction and commissioning licenses for new reactors, the stalemate in Germany's nuclear program will continue until uncertainties in waste disposal are resolved.

Canada

The ancient crystalline rocks of the Canadian Shield, occupying almost half of Canada's area, provide numerous potential locations for disposal vaults. Field research and drilling is underway at five locations to provide scientists with information on rock properties and groundwater movement.

An important part of the program will be an underground research laboratory in Manitoba that will be the first test facility built below the water table in previously undisturbed granitic terrain, with construction to begin in mid-1983. The laboratory will consist of several small rooms at a depth of 300 to 500 meters. No nuclear waste will be used or disposed of in this laboratory.

Canada's waste immobilization program includes investigation of alternatives to glass, such as ceramics and glass-ceramic combinations, which are tailored specifically to Canadian disposal conditions. For immobilization of irradiated fuel, development work is currently directed toward relatively thin-walled metallic containers.

The governments of Canada and the province of Ontario agree there is no urgent need for early establishment of an operating disposal facility. During the research, evaluation and approval process, spent fuel, they expect, will continue to be stored safely at reactor sites.

France

This country has stood in the radwaste community's spotlight for some time now. As early as the late 1950s, France began extensive research on high-level waste solidification processes. By 1969, a pilot plant—the PIVER—was solidifying wastes into borosilicate glass. Then, in 1978, the PIVER was replaced by the AVM plant—a full-scale continuous vitrification plant at Marcoule. (The process that most probably will be used to convert U.S. high-level defense waste from the Savannah River Plant into borosilicate glass will be similar to the AVM process. For years, engineers at E.I. du Pont de Nemours & Co. have been working on the design of a borosilicate glass-making plant for those wastes.)

The vitrified wastes from the AVM plant now are stored in air-cooled wells. Eventually, they will be disposed of in deep geologic formations. At the NWTS meeting, J. M. Lavie and A. Barthoux of the National Radioactive Waste Management Agency (ANDRA) in France described the various disposal options that have been proposed in their country. One option is to "cool the packages completely on the surface for about 150 years and then bury them so as to consider them as merely cold packages, making it possible to have a compact storage unit." A second option is to cool them only partly on the surface—say, about 30 years—and then to bury packages "sufficiently distant from each other to prevent average heating from being prohibitive." A final option that has been proposed is to build a geological storage facility a few years after the fabrication of glasses, cool the packages in situ and eventually transform this storage facility into a permanent repository by sealing it. "All these solutions, and particularly the third one, are being investigated," Lavie and Barthoux reported. They do not expect disposal of any vitrified wastes before 1992.

Eyeing this international hodgepodge of nuclear waste activity from his home in Clinton, Tenn., is John G. Moore, formerly of Oak Ridge National Laboratory. Moore, who chaired the 1980 International Symposium on the Scientific Basis For Nuclear Waste Management in Boston, retired on New Year's Day from radwaste research to devote more time to a beloved hobby—cultivating flowers. But the international radwaste scene soon may bring him out of the greenhouse. "I've had several countries ask me if I'd be interested in consulting on the chemical process aspect of [radioactive waste management]," Moore explains. "I don't have to do it," he says, "I can get prestige staying at home and looking at these lovely flowers." But Moore is considering consulting because the radwaste community "has finally decided to get off its hump." Says Moore, international programs on the management of radioactive waste seem, in general, to be picking up speed.

"It appears to me that so far as high-level waste goes, the world has just about decided to go glass," Moore says. This puts the French — with the only full-scale glass-making plant in operation — "way ahead of us," he says. And this "jump" on the radwaste community has not gone unnoticed: Belgium, West Germany and the United Kingdom all have decided to buy the French vitrification process. "Even people in this country have asked, 'Why don't *we* buy it?'" says Moore.

If a major name of the international exchange game is to eliminate duplication of efforts and costs, then why doesn't the United States buy the process? Says Moore, "That's a good question." □

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DICTIONARY OF THE HISTORY OF SCIENCE — W.F. Bynum et al., Eds. This dictionary is organized thematically around the key ideas of science in the hope of explaining core features of recent Western science within the context of its development. Princeton U Pr, 1981, 494 p., illus., $40.

THE DNA STORY: A Documentary History of Gene Cloning — James D. Watson and John Tooze. A history of the recombinant DNA regulation debate. Expresses the concerns of scientists researching in the field, the public's and the press's reaction to a science area that evokes both hope and fear and governments' reactions—federal, state and local. W H Freeman, 1981, 605 p., color/b&w illus., $19.95.

THE GRAND TOUR: A Traveler's Guide to the Solar System — Ron Miller and William K. Hartmann. Presents our planetary system as a new visitor might see it, not centered around earth, but with earth as only one planet out of many. Spectacular color paintings by space artist Miller plus photographs, text, diagrams and maps take the reader to 36 different objects in our solar system. Workman Pub, 1981, 192 p., color/b&w illus., $19.95, paper, $9.95.

KENNEDY, KHRUSHCHEV, AND THE TEST BAN — Glenn T. Seaborg with Benjamin S. Loeb, foreword by W. Averell Harriman. Harriman in the foreword says, "It is important that the story of the Limited Test Ban Treaty be told, not only for its value as history but also for the guidance this experience can provide for the conduct of future East-West relations." Atomic Energy Commission Chairman Seaborg's detailed daily journal was the basis for this dramatic account of the delicate diplomacy that made the treaty possible. U of Cal Pr, 1981, 320 p., illus., $16.95.

NEW DIRECTIONS IN OPHTHALMIC RESEARCH — Marvin L. Sears, Ed. Papers by leading experts in vision science presented at an international symposium in May 1980. Yale U Pr, 1981, 358 p., illus., $30.

OUTLOOK FOR SCIENCE AND TECHNOLOGY: The Next Five Years — National Research Council. Builds on the first outlook report (1979). Prepared for the National Science Foundation, this report considers topics ranging from ecology to nutrition, chemical synthesis to fuel science, mathematics to industrial research. W H Freeman, 1982, 788 p., illus., $24.95, paper, $15.95.

UNIVERSE — Don Dixon. A magnificent trip through the universe. Illustrations include both photographs, and drawings by the author, a leading space illustrator. The text, written for the general reader, describes the unique character of each planet, our own and other suns, galaxies, quasars and the search for extraterrestrial life in the universe. HM, 1981, 240 p., color/b&w illus., $35.