

## Radwaste solutions pivot on politics

Mined geologic repositories remain the favored solution for disposing of high-level radioactive wastes. And the promise of a leading contender among competing mined-repository technologies — synthetic rock — has been bolstered by research just completed at Oak Ridge National Laboratory. However, one must look to politics, not technology, for resolution of the thorniest problems plaguing attempts to successfully manage the nation's growing buildup of radioactive wastes. In a report published this week, the congressional Office of Technology Assessment notes "[T]he failure to develop and license mined repositories [for high-level wastes produced by commercial power plants] stems mainly from such factors as inadequate and intermittent federal support and a reluctance to acknowledge and address major institutional problems."

The greatest obstacle to a successful waste-management program, the analysis says, is a "severe erosion of public confidence in the federal government" engendered by "the false starts, policy shifts and fluctuating support," which have defined the government's efforts over the past two decades in this area. Ultimately, the future of nuclear power may find itself in jeopardy, the OTA study suggests, if a federal policy isn't adopted that resolves waste issues to the mutual satisfaction of the public, regulators and nuclear-power industry.

There appear to be "no insurmountable technical obstacles" to developing safe permanent repositories, the study finds. Yet even technical issues ultimately pivot on political considerations—for example, how conservatively to design geological vaults or how to pace the research and development that will evaluate competing technologies.

The findings of research relating to one of those technologies appear in the April 16 *SCIENCE*. Performed by Robert Gentry (SN: 1/16/82, p. 44) and colleagues at ORNL, the analysis of elemental lead's mobility in granite-bound zircon crystals suggests that synthetic-rock burial indeed offers a feasible option for long-term radwaste storage.

One synthetic-rock concept, SYNROC (SN: 12/26/81, p. 397), calls for bonding atoms of radioactive waste into a crystalline structure composed primarily of three minerals. Encapsulated in metal canisters, SYNROC would be buried in granite (which reacts chemically in a manner similar to SYNROC) at depths of 1,000 meters to 3,000 m. Last year, a federal peer-review panel comparing 11 leading disposal concepts named SYNROC one of its two preferred options (SN: 12/26/81, p. 397).

There has been concern, however, that the geothermal temperature of rock at

depths contemplated for burial of synthetic-rock locked wastes might be high enough to promote migration of radionuclides from their graves. Gentry's work now suggests that isn't likely.

He studied lead — geologically a far more mobile element than nuclear-waste generated actinides such as uranium and thorium — occurring in natural deep-buried granite-bound zircon. And at depths optimal for synthetic-rock burial the lead was "highly retained," Gentry told *SCIENCE NEWS*. In fact, Gentry said, if the temperature profile defined by the Los Alamos drill-core samples he studied is indicative of other granite formations of similar depth, then at 3,000 m — and about 200°C — it would take an estimated  $5 \times 10^{10}$  years (ten thousand million years) for 1 percent of the lead to diffuse from a 50-micrometer zircon crystal. At lesser depths, the predicted rate of diffusion would be even longer.

"Since all these values greatly exceed

the  $10^5$  to  $10^6$  years estimated for waste activity to be reduced to a safe level, and since uranium and thorium are bound even more tightly than lead in zircons, our results appear to lend considerable support to the synthetic-rock concept of nuclear-waste containment in deep granite holes," Gentry says. While his findings are not directly applicable to SYNROC, which is expected to use zirconolite (like zircon, a zirconium-based substance) as one of its three base minerals, Gentry points out that it does identify at least one mineral and one geographical site (the granite deposits from which his samples were mined) "which we know have high retention properties" for radioactive waste materials.

Granite is not now among the three geological media—salt, welded tuff and basalt — under top consideration (SN: 1/2/82, p. 9). However, Sen. Thad Cochran (R-Miss.) plans to propose amending the radioactive-waste planning bill now before the Senate so that granite would be made one of the first three candidates tested for wastes.

—J. Raloff

## VIP: A gut reaction to tension

Vasoactive Intestinal Peptide, or VIP, is a chemical substance that delivers an important message to intestinal muscles from surrounding nerves. The message is: relax. While VIP was known to be contained in gut neurons and was associated with smooth muscle relaxation in other parts of the body, how it worked on intestinal muscles remained unclear. Did VIP act directly on muscles or indirectly by way of other nerves? To answer this question, physiologists Gabriel Makhoulouf and Khalil Bitar of the Medical College of Virginia in Richmond isolated gastric smooth muscle cells from nerves and applied VIP directly to them. They report, in the April 30 *SCIENCE*, a "prompt dose-dependent relaxation" of the muscle cells.

VIP was discovered just 10 years ago by another MCV researcher, Sami Said, now at the University of Oklahoma Health Services Center. At that time, however, "the idea of peptides in nerves hadn't caught on," says Makhoulouf, and VIP was assumed to be a hormone. VIP is now known to be a neurotransmitter, but is part of a family of gastrointestinal peptides made up of both hormones and neurotransmitters.

National Institutes of Health officials funding the MCV work hope that it may lead to better treatment of digestive diseases. In particular, sufferers of "irritable bowel syndrome" — a category of tension-induced problems like abdominal cramping and diarrhea — may be helped. Their symptoms are often a result of a malfunction in the normal contraction-relaxation sequence that moves food through the gut. "Gastroenterologists say that 80 percent of their patients come in for this problem," says Kirt Vener, a program di-

rector for esophageal, gastric and colonic diseases at NIH.

In addition to psychotherapy, treatment of irritable bowel syndrome includes prescription of one of several kinds of smooth muscle relaxants. But these drugs cause a number of side effects such as "dryness of the mouth and eyes, rapid heartbeat and even altered mental states in the aged," says Richard Johannes, a Johns Hopkins gastroenterologist temporarily at NIH.

—L. Tanglely

## One million Zeroers gather

Discussing the outlook for and consequences of nuclear war has suddenly become the vogue. And Ground Zero Week, which just ended, offered the most organized grassroots forum to date for those discussions. By week end, notes Roger Molander, Ground Zero's organizer (and a strategic nuclear-policy analyst under three Presidents), more than 600 communities coast-to-coast had participated with locally oriented teach-ins, rallies and town hall meetings. Estimates indicate at least one million Americans participated in at least one Ground Zero event.

But last week's activities are "only the beginning of what must become an even larger education campaign," Molander says. Reminiscent of the movement that launched Earth Day, the nonpartisan Ground Zero organization plans to sponsor political forums later this year "to ensure that candidates [for elected office] focus upon the nuclear-war issue and that accurate information to assess their position is readily available to the voters." □