

Yet Zellars is worried about environmental constraints on phosphate mining and about loss of phosphate-bearing land to urbanization. He says that, in Florida, it could easily be documented that more phosphate is lost to urbanization and other preemptive surface uses each year than is actually mined.

It is clear that if a strong case is made for establishing a national phosphate policy, it will rest in no small part on the need for a better reconciliation of economic, social, and environmental values. For years, environmental considerations were given short shrift, and the accumulated abuses of the past have produced a reaction which, as Zellars indicates, puts accomplishment of many industry plans in doubt.

Any visitor to the Bone Valley area can see easily enough why this reaction has come about. Until the 1970's, state and local officials put little pressure on the phosphate companies to reclaim strip-mined lands. As a consequence, only about 30,000 of the some 150,000 acres that have been mined have been reclaimed.

Slime ponds, some of them a square mile or more in extent, cover some 41,000 acres, and even when dried out they offer a surface too unstable for much more than livestock grazing. And, up until about 1972, every few years a slime pond dike would fail and allow a devastating flood of clay slimes to pour into the headwaters of the beautiful Peace River or the Alafia River, killing nearly all fish and other aquatic life for scores of miles downstream.

For a time, back in the 1950's and 1960's, fluoride emissions from phosphate chemical manufacturing plants were poisoning cattle and killing citrus trees—and helping generate the first substantial and determined effort in Tallahassee, the state capital, to bring air and water pollution under control.

The upshot of the phosphate industry's manifold abuses and of the political response to them is that over the past decade a complex, multilayered regulatory structure has taken shape and become increasingly assertive. This is an important fact of life today for the phosphate industry here in Polk County as it seeks to extend its operations beyond the Bone Valley formation to the less rich but still promising deposits in counties lying to the south and east.

The phosphate companies—of whom more than a dozen are active here, including IMC, Mobil, W. R. Grace, Agrico, and Borden—must deal with regulators at all levels of government, federal, state, and local. Some of the county gov-

ernments have themselves become increasingly tough to deal with, and efforts to win local approval of mining plans for the new frontier areas have progressed slowly. In fact, wanting to reduce at least the number of hurdles that must be jumped to get plans approved, the industry earlier this year endorsed a demanding state comprehensive mining and reclamation law proposed by Governor Bob Graham (this measure was still bogged down in committee when the legislature adjourned recently).

Sarasota County, which has some phosphate in its northeast corner, is regarded by the companies as so antagonistic that none of them would think of trying to mount a mining operation there. Indeed, it was David B. Lindsay, Jr., publisher of the *Sarasota Herald-Tribune*, who, shortly before Florida's Republican presidential primary in 1976, prevailed upon President Ford to have the U.S. Environmental Protection Agency prepare a sweeping environmental impact study of all of the phosphate industry's plans to expand its operations in central Florida.

Published in 1978, this study includes some recommendations for new mining operations that are viewed by the industry as burdensome, if not impossible. One is to avoid more than a year's accumulation of clay slimes in above-grade settling ponds by finding ways to use these slimes earlier in reclamation—the motivation being to reduce the number and size of settling ponds and hence the possibility of dike breaks. Another is to avoid drying the phosphate concentrates at the beneficiation plant by shipping them wet to the chemical plants, thus avoiding dust problems. A third recommendation, aimed at precluding any possibility of groundwater contamination, is to line with an impervious material the bottom of the ponds or “stacks” used for the disposal of gypsum from the chemical plants.

All three of these EPA recommendations are related in one degree or another to the fact that phosphate ore contains uranium, indeed enough uranium that it can profitably be recovered as a by-product. The residues of phosphate processing and chemical manufacture—the slimes, the dust, the impure gypsum—all contain radium-226 and other radionuclides and give off radon gas, though not nearly so much as is given off by uranium mill tailings.

The presence of the radionuclides poses a low-level radiation hazard, but how significant it is and just what should be done about it are questions that re-

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## Congress May Veto Nuclear Fuel Shipment

An effort in Congress to overturn the Carter Administration's decision to ship nuclear fuel to India is rapidly gaining adherents. Chances of a veto in the House are considered strong, although the likely outcome in the Senate remains uncertain.

Lobbying on the issue is already fierce, even though the issue will not be put to a vote until August or September. Carter announced on 19 June his intention to ship the uranium as planned, ignoring signs that Congress might object because India has flouted the requirements of United States nonproliferation law (*Science*, 6 June).

Carter accepts all of the arguments advanced by the State Department in favor of the shipment, including the consideration of cultivating India's favor as a valuable ally in an unstable region, and avoiding what Carter terms “the risk of a claim” by India that a U.S. refusal releases it from agreements not to reprocess spent nuclear fuel it has on hand. India has recently made this threat explicit. Carter says his action “in no way indicates a change in the high priority I attach to preventing the spread of nuclear explosives. On the contrary, this action reflects my judgment that nonproliferation would be set back, not advanced, by withholding these exports [because they] . . . help us to maintain a dialogue with India in which we try to narrow differences.”

This stands in starkest contrast to the views of James Barnes and S. Jacob Scherr, who testified on behalf of five environmental groups during recent Senate hearings: “For over 20 years, we have heard the same arguments about the importance of maintaining U.S. leverage over the Indian nuclear program by providing them nuclear equipment, material, and technology. We have seen the State Department, time and time again, go to great lengths to avoid confrontation by relying on hair-splitting legalisms and ambiguities.”

Part of the dispute centers on whether a U.S. refusal to ship the fuel violates a 1963 agreement with India. Senator Alan Cranston (D-Calif.), who opposes the sale, says it does

not, even though India believes otherwise. "It is widely recognized that in taking its present position, the Indian government is attempting to blackmail the United States with its threat to extract plutonium from supplies of . . . spent fuel if we do not capitulate and send them still more. . . . We should assert our rights." Richard Betts, a policy analyst at the Brookings Institution, suggests that the question be put before the World Court. "If adjudication by the Court is infeasible, unrealistic, or undesirable, then I believe the United States should make the best of a bad situation and allow the shipment to proceed." Betts adds that refusal "will inflame Indian nationalism and enhance the appeal of arguments that India needs nuclear weapons to show it is not a pawn of arrogant superpowers."

Others are inclined to feel the time is ripe for a firm stand. Henry Rowen, a Stanford economist and non-proliferation expert, describes the State Department position as "a kind of nuclear appeasement." He dismisses its concern that the Soviet Union might fill U.S. shoes. "This might be a better alternative from our standpoint. The Soviet Union record, although spotty, has been better than ours in controlling its nuclear exports. For instance, it requires the return of spent fuel from its customers." Rowen suggests that the United States consider shipping the fuel only if the Indians agree to return the spent material they already have—what he calls "a return of the hostage."

Thus far, a resolution of disapproval has attracted 65 cosponsors in the House, including most members of the Foreign Affairs Committee.

## Soviet Anthrax Explanation Is Debunked

A House intelligence subcommittee says it has seen hard evidence that an outbreak of anthrax in Sverdlovsk, in the Soviet Union, last year was primarily due to inhalation of anthrax spores. The evidence supports U.S. suspicions that the Soviets were cultivating anthrax bacteria in violation of a treaty barring germ warfare production (*Science*, 4 April). The Soviets have claimed the epidemic was due to ingestion of anthrax-tainted meat, an explanation the subcommittee now

terms "incomplete at best, and at worst a fabrication."

The evidence, disclosed to the congressmen in private by U.S. intelligence agencies, is tied to the symptoms of the hundreds of Soviet citizens who fell ill in the Sverdlovsk region, or based on autopsy data from those who died. The subcommittee says the symptoms were those caused by inhalation of anthrax spores: general fatigue and a low-grade fever within a few days of exposure, followed by respiratory infection which improves slightly and then worsens to include swelling of the chest and neck, discoloration, and a rasping of the throat. Death occurs within a day after the symptoms become acute. Gastrointestinal anthrax, such as might be caused by infected meat, is characterized in contrast by nausea, vomiting, pain, and diarrhea.

U.S. intelligence agencies uncovered what the subcommittee calls "one last bit of decisive evidence" about the symptoms after more than 6 months of investigation. Previously there had been some dissension among the analysts over the seriousness of the incident or the sufficiency of the proof.

Subcommittee chairman Les Aspin (D-Wisc.) noted in releasing the report that inhalation anthrax can occur naturally only if spores are dislodged from sheep wool during shearing: "So when you have information that confirms numerous deaths in an urban area from inhalation anthrax, you know that . . . there was a man-made concentration of spores that got into the air—or else the Soviets have a well-camouflaged sheep-shearing operation." According to Mark Popovsky, a Soviet emigrant with friends in the immediate region, the anthrax spores were actually released after an explosion at Military Compound 19 in Sverdlovsk, long suspected by U.S. spies of being a germ warfare factory.

The subcommittee says the Soviets may be in violation of the treaty's provision on consultation and cooperation, simply because they are not being more frank. Congress has already passed a resolution saying that if the Soviets persist in their story about tainted meat the United States should protest at the United Nations.

The subcommittee suggests it is time to do this now, but the Arms Control and Disarmament Agency (ACDA) holds out hope for a better U.S.S.R. re-

sponse. "It was decidedly unhelpful to put out this report while we are still involved in negotiations," says an ACDA spokesman. The agency has expressed regret that the matter ever became public in the first place, claiming that the Soviets might be more contrite now if it had all been handled through private diplomatic channels. Aspin speculates it was the Carter Administration itself that organized the leaks in order "to make political capital out of the incident" in the wake of the Soviets' Afghanistan invasion.

ACDA holds out the possibility of further Soviet explanation, but in Congress it is the season to jump to conclusions. Representatives John Ashbrook (R-Ohio) and Bill Young (R-Fla.) say the episode "has revealed once again that the Soviet Union cannot be trusted to honor agreements or treaties." Even Aspin, who is usually a liberal on matters involving Soviet relations but who faces a tough reelection campaign, says that the evidence of cheating is "fairly good" and that "the future of arms control hangs in the balance until we get a full, accurate account." The SALT and underground nuclear test ban treaties both rely in part on Soviet goodwill, he notes, as did the germ warfare treaty. None can be independently verified in full. "It may be that the Soviets have a higher tolerance for risk than we thought," Aspin says. "It may be that our political system is unable to respond to incidents like Sverdlovsk in a way the Soviets take seriously."

## New NSF Directors

President Carter has nominated two experts in electrical engineering to serve as director and deputy director of the National Science Foundation (NSF). John B. Slaughter, 46, currently academic vice president and provost of Washington State University, has been nominated as director to succeed Richard C. Atkinson. Slaughter, who received his doctorate in engineering physics, will be the first black to head NSF. Previously he served as an NSF assistant director of astronomical, atmospheric, earth and ocean sciences.

Donald N. Langenberg, 48, formerly vice provost for graduate studies and research at the University of Pennsylvania, has been confirmed as deputy director.

—R. Jeffrey Smith—