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31. The HBsAg(+) category includes couples in which one parent was HBsAg(+):anti-HBs(−) regardless of the test results of the other parent.
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50. Most of these grafts were from cadaver donors, but the association of duration of graft survival with responses to HBV infection was independent of whether the donors were alive and related or whether the donors were cadavers. Although the early rejection of cadaver kidneys by anti-HBs(+) recipients has been observed by others, the specific association with grafts from male donors has not yet been confirmed.
51. All three studies involve populations in which the major HBsAg antigenic subtype is **ay** rather than **ad**. There is some indication from studies in the Solomon Islands (*17*) of a relation between the **ad** subtype and an alteration of secondary sex ratio in the opposite direction. In this way the genotypes of both the host and the infectious agent would be important in determining the expression of this sex ratio effect, as seen in the *Drosophila* "sex ratio" condition.
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NEWS AND COMMENT

Fuel Reprocessing Still the Focus of U.S. Nonproliferation Policy

While still a candidate seeking his party's presidential nomination, Jimmy Carter made nuclear nonproliferation a campaign issue by calling for U.S. initiatives to dissuade France and Germany from exporting nuclear reprocessing plants. Since he was elected to the presidency, Carter has continued to press a nonproliferation policy concentrated on preventing the spread of commercial nuclear technology which would make "weapons-usable" plutonium more readily available.

A major thrust of U.S. policy has been to delay the rise of a "plutonium economy" at least until safer international arrangements for the management of plutonium can be achieved. Carter set the major lines of his policy in April of 1977 when he announced his decision that the United States would defer development of the Clinch River breeder reactor and completion of the nuclear fuel reprocessing facility at Barnwell, South Carolina. Domestic nuclear energy policy would emphasize a "once through" cycle using enriched uranium in thermal reactors and the indefinite storage of reactor wastes. Administration policy is based on estimates that uranium supplies will be adequate to the year 2000 and beyond and that new technologies will improve the efficiency of the thermal reactors.

Carter also recognized the doubts of other countries about U.S. nuclear strategy and concerns about their own "energy security" and called for a 2-year cooperative study of ways to manage the nuclear fuel cycle that would minimize proliferation dangers. Carter won sup-

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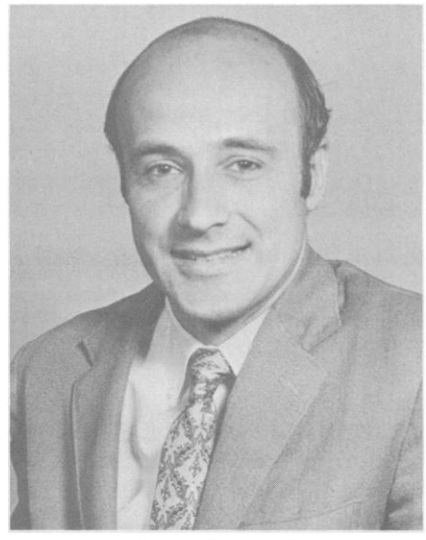
port for this International Fuel Cycle Evaluation (INFCE) which is now in progress. This gesture of cooperation, however, did not entirely banish the resentment in other countries which interpreted Administration strategy as a cavalier attempt to impose U.S. domestic policy on the world.

Now, in Carter's second summer as President, the policy has worked no miracles. It has been a source of tension between the United States and other nuclear supplier nations, notably Britain, France, and Germany, and a cause of resentment to nonnuclear nations seeking to acquire nuclear technology. Nor has it been popular with American nuclear industry or with some officials in U.S. government agencies. With Congress, Carter has had only mixed success with his policy. But in the last year or so the Administration appears to have overcome some initial diplomatic gaffes and adopted more flexible and more effective tactics. Domestic critics concede that the Administration is showing signs of greater technical sophistication than at the start. And other countries seem to feel that the U.S. is showing increased understanding of their energy problems. At a time, therefore, when the Administration is being criticized for a lack of consistency and competence in dealing with an array of foreign policy and domestic issues, Carter's midterm marks on the complex subject of nonproliferation are not bad.

The differences between the United States and Europe have by no means been resolved. In April the United States embargoed shipment of enriched uranium to the European Economic Community (EEC). The action was taken because the EEC countries had not agreed to renegotiate the Euratom treaty which sets the terms under which the United States acts as supplier. Such a renegotiation was mandated in the new U.S. Nonproliferation Act signed into law in March requiring that countries buying enriched uranium from the United States abide by a more stringent set of nuclear safeguards.

The embargo was lifted late in June after a formula was worked out under which the EEC agreed, in effect, to discuss a change in the terms. The embargo did not much affect the operation of nuclear plants in Europe because adequate supplies of nuclear fuel were on hand. The cutoff, however, dramatized the dependence of Europeans on the United States for supplies of fuel, a matter about which they are highly sensitive.

The U.S. action was triggered by the provision in the new law that no U.S.



Joseph S. Nye, Jr.

uranium be reprocessed without this country's permission. The United States sees this as a key component in the effort to control the world supply of weapons-usable plutonium. Reprocessing is a necessary step in the fuel cycle for the generation of breeder reactors now under development in Europe and elsewhere. Spent fuel from thermal reactors is chemically processed to separate plutonium for reuse as breeder fuel.

Reprocessing would also make possible the so-called "recycle" of plutonium which involves the addition of plutonium from reprocessing plants to fuel for thermal reactors. The Europeans have their own reprocessing facilities, but these are relatively small-scale plants. The EEC countries will not have the capacity to reprocess a commercially significant volume of fuel until the 1980's. It is emphasized that the embargo was not imposed because the Europeans were reprocessing U.S. uranium, but because they declined to discuss changes in the treaty with Euratom, the EEC atomic energy organization.

The embargo, or "moratorium" as it was more euphemistically termed, pointed up differences between U.S. and European views toward proliferation. The refusal to negotiate by the EEC countries was essentially in protest against the Americans changing the rules while the game was being played. Not only did the United States breach an agreement but also ignored an understanding that nothing major would be done on the nuclear export arrangements until the INCFE study was concluded and its recommendations acted on. The American action, however, was not quite a straight case of unilateral treaty abrogation. Nuclear agreements such as the one with Euratom are handled by the United States under executive agreement and are not subject to Senate ratification. There is an understanding, therefore, that arrangements are subject to the requirements of the governments, but the abrupt change in the ground rules was nevertheless politically irritating to the Europeans.

The EEC refusal to negotiate was reportedly fomented by the French. French governments have been particularly reluctant to toe the American line on nuclear policy in general and have been critical of U.S. nonproliferation policy (*Science*, 30 July 1976). After the point was made with the refusal to negotiate, however, the French were apparently willing to resolve the conflict. Press reports indicated that a compromise had been fashioned during a summit by Carter and French President Giscard d'Estaing, but the matter actually seems to have been thrashed out at the working level, with perhaps a fillip from the summit.

Fundamental reservations about U.S. nonproliferation policy, however, stem from the Europeans' very different endowments of energy resources. The United States has large reserves of coal, oil, and natural gas, as well as of uranium, which the major European countries, and particularly the French, Germans, and Italians, do not enjoy. Especially since the Arab oil embargo and price increases in 1973 to 1974, the Europeans have stressed the necessity of increased nuclear power capacity and an early shift to the breeder reactor. The European attitude has been tinged with suspicion that U.S. policy on nonproliferation coincides with the interests of U.S. nuclear industry in international markets. The Europeans also feel that the Americans have become obsessed with the danger of plutonium to the exclusion of a sufficient awareness of other proliferation dangers.

If there is an American fixation on the dangers of a plutonium economy it may be explained by the relatively recent alteration of American policy. Into the early 1970's, U.S. policy tacitly assumed that the Nuclear Proliferation Treaty (NPT) and the existing system of international controls would be adequate to restrain proliferation. The United States also declined to export fuel enrichment or reprocessing plants. But Secretary of State Henry Kissinger was regarded as holding a relatively relaxed attitude on the proliferation issue. Then in 1974, India's explosion of a nuclear device with materials from a Canadian-supplied reactor made nonproliferation a very live issue. And something of a crisis atmo-

sphere was generated in 1976 when West Germany concluded a multibillion dollar nuclear power deal with Brazil that included reprocessing facilities, and France signed contracts with Pakistan and South Korea which also called for reprocessing plants. Subsequently that year, both France and Germany announced nuclear export policies under which they forswore exports of sensitive technology-reprocessing and enrichment plants.*

*The French contract with South Korea was canceled; reportedly, heavy U.S. pressure was exerted on the Koreans. The Brazil and Pakistan deals still stand. In Brazil, economic and technical considerations are said to be slowing proceedings. In Pakistan, the overthrow of Premier Ali Bhutto resulted in a period of political tension. In recent talks the French made clear that they intended to go through with their commitment to provide the Pakistanis a capacity to meet their needs for irradiated fuel, but only under conditions which would not make weapons-grade plutonium available.

The Ford Administration in March of 1976 signaled a shift in policy by expressing the hope that nuclear suppliers would find alternatives to the export of "sensitive technologies." In late October, just before the election, the Administration adopted a domestic policy which, in effect, deferred both reprocessing and plutonium recycle. Both Carter and Ford, therefore, went into the election with strong and rather similar nonproliferation commitments.

Soon after Carter took office, his Administration launched a diplomatic frontal attack aimed at getting the German-Brazilian deal canceled. Deputy Secretary of State Warren Christopher was dispatched to Brazil and Vice President Mondale raised the question on a trip to Germany. In both countries the overtures were firmly rebuffed and the United States got the unmistakable message that its nonproliferation campaign was off on the wrong foot.

In April of 1977 Carter set forth his policy in fuller form. He sought to take a middle course, emphasizing that he was not antinuclear, but was opting to halt the commercialization of plutonium domestically by stopping work on the Clinch River breeder and the Barnwell reprocessing plant and proposing the INCFE study, which would take into account European fears about nuclear fuel supplies.

Congress has been divided on the Carter nuclear program. It has gone against him on the breeder and Barnwell, voting funds to continue both projects. At the same time, it has backed him in his concern about nuclear proliferation through the spread of nuclear technology. The

Briefing

Medical Marijuana Substitute Under Development

There is considerable medical interest in the potential of THC (tetrahydrocannabinol), the active ingredient in marijuana, for relief of the agonies of nausea and vomiting experienced by cancer patients undergoing chemotherapy. But research with THC has been slow going, what with the difficulties of working with an illegal drug whose properties have not been deeply explored.

Several drug companies have been working on synthetic analogs to THC. Farthest along is Eli Lilly and Co., which for several years has been doing research with a drug called Nabilone. Thus far it appears that Nabilone exerts effects very similar to THC—minus the euphoria—and is significantly more effective in relieving emesis than the phenothiazines (primarily Compazine) now in use.

Lilly has not wanted to publicize its work with Nabilone for fear of raising false hopes among victims of cancer and of glaucoma, the other medical condition for which THC has shown some promise. Also it wants to avoid any association with THC that might attract federal regulatory agencies.

The National Cancer Institute did not find out about Nabilone until last May, according to NCI's Brian Lewis. At that time the institute called together a conference in response to the Administration's new policy calling for reevaluation of the medical properties of controlled substances.

Nabilone, a white crystal that cannot be synthesized from THC, was first synthesized in 1972 when Lilly was looking for a new minor tranquilizer. Interest then shifted to its use as an antiemetic. Two years of clinical trials have been completed, and now Lilly is setting up a phase III study, which involves large number of patients. The company hopes that if all goes well it can apply for an NDA (new drug application) early next year.

At the NCI conference, two researchers reported findings comparing Nabilone with Compazine. Lawrence Einhorn of Indiana University found that with 85 patients, 81 percent experienced less vomiting with Nabilone, whereas only 15 percent were helped by Compazine. Terence Herman of the University of Arizona said that of 37 patients, 24 preferred Nabilone. The most common side effects noted were somnolence, dry mouth, dizziness, and loss of coordination.

Nabilone has not yet been compared with THC in clinical trials. Paul Stark of Eli Lilly says this should be done "somewhere down the line," but right now the need is to establish its efficacy in comparison with approved drugs now commonly in use. Nabilone does appear to have some advantages though: it is soluble in various substances and therefore potentially easier to administer intravenously or in capsule form. (Oral THC is absorbed erratically by the body.) Also, the absence of the euphoric effect may be an advantage not only legally but practically, because this can increase discomfort when experienced in the context of nausea and vomiting.

Nabilone, although a central nervous system depressant, acts differently on the mechanisms of vomiting than Compazine. Herbert Borison of Dartmouth College explains that Compazine, which does not work at all with many anticancer drugs, probably works on certain chemoreceptors for vomiting in the brain, whereas Nabilone (like THC) has a "more generalized influence involving more complex pathways . . . conceivably through some indirect action on opiate receptors."

The Lilly people are being cautious in their claims about Nabilone and emphasize that much testing remains to be done. But an effective antiemetic could be a great boon to cancer patients, not only in relieving nausea but in enabling them to keep themselves well nourished. So ghastly are the side effects of chemotherapy that many patients choose to forego it altogether. Borison, for example, heard of one case where the sight of his doctor on a television program caused a patient to start vomiting.

Research is also being done on the use of Nabilone to reduce intraocular pressure in glaucoma. Frank Newell at the University of Chicago has been conducting phase II studies with glaucoma patients and has found that a single oral dose reduced the pressure by an average of 34 percent. Lilly hopes eventually to get Nabilone approved for glaucoma treatment. Investigation of its use as a minor tranquilizer is still in the phase I stage.

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Nonproliferation Act, shepherded through Congress first by Senator Abraham Ribicoff (D–Conn.) and then by Senator John Glenn (D–Ohio), generally follows the lines of Administration policy, changing nuclear export laws to sharpen nuclear safeguards. The bill originally had stiffer restrictions on export of U.S. uranium which would almost certainly have caused a more serious confrontation with the Europeans. The Administration persuaded Congress to soften them and give the President greater discretionary powers, thus cushioning the collison.

The President has also had some difficulty in keeping order in his own house on the nonproliferation issue. Some officials in the Department of Energy have been wedded to the industry view that the technical and economic case for pressing ahead with the breeder is overwhelming and that the dangers of plutonium have been exaggerated. On the other flank, officials in the Arms Control and Disarmament Agency (ACDA) and Council on Environmental Quality have been seen as advocates of even tighter sanctions. These differences fostered the impression that there was really no Administration policy, but rather a variety of contending viewpoints.

This summer the U.S. position was stated in what can be regarded as definitive form since all the relevant agencies had "signed off" on it. The statement was delivered in early July at a meeting of the Uranium Institute in London, a major forum for nuclear suppliers, by State Department official Joseph S. Nye, Jr., who has become the Administration's anchor man in nonproliferation discussions.

Nye is not a career diplomat, but an academic on leave from Harvard where he is a professor at the Center for International Affairs. As deputy to Lucy Benson, Under Secretary of State for Security Assistance, Science and Technology, Nye has had a main role in developing nonproliferation policy and has been State's most visible advocate for that policy abroad and in this country.

The Administration's top official on nonproliferation is Gerard C. Smith who, in June of 1977, was named by Carter as special representative for nonproliferation matters, with the rank of ambassador at large, and as U.S. representative to the International Atomic Energy Agency. Smith was director of ACDA between 1969 and 1972 and was chief of the U.S. delegation to SALT in

Briefing

Senate Votes to Cancel NASA's Moon Rock Money

NASA is thinking "unprintable" thoughts (according to one official) about Senator William Proxmire (D-Wisc.) whose latest attack on what he regards as federal frivolities has come in the form of a move to eliminate NASA's moon rock study program.

On 7 August the Senate voted to eliminate the $5.7 million contained in the NASA budget for research on lunar samples. "We didn't even know it was there or we would have done it sooner," says an aide to Proxmire, who was joined in the cost-cutting amendment by Charles Mathias (R–Md.) when the bill was in the Appropriations Committee.

So far, about $30 million has been spent, allocated among 70 principal investigators in 37 institutions around the country, on analysis of the approximately 300 pounds of moon rocks that were obtained on six Apollo missions between 1969 and 1972.

The Proxmire aide contends that it is silly for NASA to have its own "little pot of money" set aside for this research. This is just normal basic geological research, he says, and the program should be overseen by the National Science Foundation (NSF), competing with the rest of the nation's geological research.

NASA and NSF both emphatically disagree. Noel Hinners of NASA told *Science* the Senate vote was "an absolute catastrophic mistake." "We are trying to conduct an integrated research program," he says, that fits with the international program on lunar sample study (the Soviet Union and several European countries regularly exchange samples with—or borrow them from—the United States) and with long-range planning for future planetary missions. Besides, much work remains to be done—"many of the core tubes haven't even been opened!" (The cut would not affect the Lunar Curatorial Facility in Houston.)

As for NSF, William Benson affirms that there are no plans to expand the agency's earth sciences budget to accommodate moon rock studies. NSF's earth sciences budget is $24.1 million. About $10 million of that goes for geochemistry, which is the category most moon research would go under. NASA "has a well run program," says Benson. "To suddenly turn it over to us now doesn't seem very sensible."

The House voted to retain the lunar research money, so it may well be restored by the House-Senate conference committee.

Work at Seabrook Resumed

The Nuclear Regulatory Commission on 10 August gave the Public Service Company of New Hampshire permission to continue its struggle to complete its heavily opposed nuclear power plant in Seabrook. Construction was halted on 21 July pending a review by the Environmental Protection Agency of the plant's cooling system. Eighteen protesters promptly showed up on the first day work resumed and were arrested for trespassing and disorderly conduct.

Members of New England's Clamshell Alliance are violently opposed to the plant, which some have been fighting for nearly a decade. Construction was halted for 5 months in 1977 when the EPA regional administrator revoked approval of the cooling system, a "once-through" system that relies on two tunnels reaching 7000 feet out into the ocean. EPA has now ruled twice that the system will not be harmful to marine life, but this carries no weight to foes of the plant who also contend that the NRC has failed to conduct a thorough examination of possible alternative plant sites.

Now two groups, the New Hampshire Audubon Society and New England Coalition on Nuclear Pollution are appealing the EPA decision to the first circuit court in Boston. There are also decisions pending from four prior appeals of NRC decisions. If all these challenges are beaten back, work on the $3.4 billion plant may continue uninterrupted until it comes time to apply for an operating license.

The Clamshell people are not giving up, though. They plan to continue posting small groups at the site to conduct acts of "nonviolent civil disobedience.'

Seabrook, one of 88 nuclear plants currently under construction, has become a classic case in that it demonstrates the delays, redundancies, and second-guessing inherent in the nuclear regulatory process as it now stands.

those years. Since he reentered government a year ago, Smith has been involved in a broad range of nonproliferation issues such as the effort to create a nuclear weapons–free zone in Latin America and negotiations over nuclear exports to specific countries such as Iran. Smith, however, has not taken much of a public role in the exposition of nonproliferation policy. That task has fallen mainly to Nye.

Nye's appointment seems traceable, at least in part, to his activities as a participant in a 1976 study sponsored by the Ford Foundation and carried out under the aegis of the MITRE Corporation. Published as *Nuclear Power: Issues and Choices*, the report is generally regarded as having contributed significantly to the intellectual foundation of the Administration's policy. Spurgeon M. Keeny, Jr., who was chairman of the study panel and a member of the MITRE Corporation staff at the time, is now deputy director of ACDA.

Nye and others caution that although the report had an impact on policy, it could not be regarded as a blueprint. First, uranium resource estimates in the study may have been too high. This is

Brain That Rocked Physics Rests in Cider Box

Einstein died in the early morning hours of 18 April 1955. His biographer, Ronald Clark, relates that before Einstein died he began muttering: "It was in German that the last thoughts of one of the greatest brains since Newton's came to the surface through the unconscious mind." Since the nurse in attendance did not understand German, Einstein's last words were lost. As for that great brain, Clark notes that Einstein had insisted it be used for research, although the rest of his body was to be cremated.

What became of Einstein's brain? Clark does not say, but by an unexpected set of circumstances two New Jersey reporters have furnished the world with the answer to this unimportant yet curious question.

Two years ago Michael Aron, then an editor at *Harper's*, prepared an article on the mechanisms of the brain, and came to wonder what had become of Einstein's. He learned that it had been removed for study by Thomas S. Harvey, the pathologist at the Princeton Hospital where Einstein died.

Aron was unable to pursue his inquiries further because he moved from *Harper's* to *Rolling Stone*, and the editors of that generally less cerebral journal were not interested in the story. Aron then became editor of the *New Jersey Monthly*, published in Princeton. Einstein's brain was undeniably a story of local interest. He assigned one of his reporters, Steven Levy, the task of finding it.

"Why may not imagination trace the noble dust of Alexander till he find it stopping a bunghole?" Hamlet inquires of Horatio. Levy traced Einstein's brain to a Mason jar packed in a cardboard box marked COSTA CIDER, in an office in Wichita, Kansas.

The office belonged to Thomas Harvey, now medical supervisor in a Wichita biological testing laboratory. Harvey had had most of the brain sectioned and distributed to various specialists. Nothing has yet been published about their findings, he explained to Levy, because there is still more work to be done. It has all taken so long because Harvey has had other things to do, but he hopes to be ready to publish in "perhaps a year."

The parts of Einstein's brain which remain unsectioned are the cerebellum and a piece of the cerebral cortex. It is these fragments, preserved in a jar of formaldehyde, that are kept in the cider box, under a beer cooler, in Harvey's office.

"Was this the face," Faust exclaims in amazement at the simulacrum of Helen of Troy, "that launched a thousand ships and burned the topless towers of Ilium?" The brain of Einstein should surely inspire no less awe than the face of Helen. Here, from the August 1978 issue of the *New Jersey Monthly*, is Levy's account of being shown the physicist's organ of intellect:

> I had risen up to look into the jar, but now I was sunk in my chair, speechless. My eyes were fixed upon that jar as I tried to comprehend that these pieces of gunk bobbing up and down had caused a revolution in physics and quite possibly changed the course of civilization. *There it was!*

At the death of Friedrich Gauss, one of the greatest mathematicians in history, his brain was bequeathed to a Dr. Rudolph Wagner, who undertook to compare it in weight, depth of fissures, and pattern of cerebral convolutions, with the brain of an "ordinary day laborer." The brains of Gauss and the laborer turned out to be identical in all respects. Even with contemporary methods, it would be more surprising than otherwise if the nature of Einstein's genius could be divined from dead tissue. "So far it's fallen within normal limits for a man his age," Harvey told the *New Jersey Monthly* of the savant's gray matter.

Like his last words, the physical basis of Einstein's mind has eluded understanding.—N.W.

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important because the feasibility of the "once-through" cycle depends on adequate supplies of fuel and on the level of reactor demand. And second, the focus of study was the United States and there are inevitable difficulties in transposing conditions relevant to the United States to an international context.

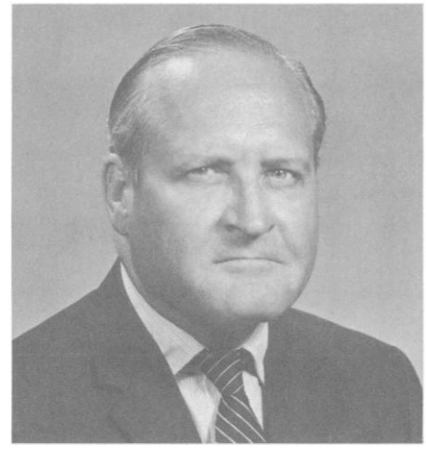
In the last year, U.S. officials have expended a good deal of effort in seeking acceptance for Administration policy internationally, especially in Europe. The French have been the leading skeptics about American views on the plutonium economy. That skepticism has been rooted in a feeling that reprocessing is a widely understood and relatively simple technology which virtually any nation with modest industrial resources could master to produce weapons-level materials if it were sufficiently determined.

The French, nevertheless, have been emphatic in saying there are ways of preventing or at least slowing proliferation. To do this, however, two conditions must be met. First, countries which renounce a military nuclear capacity must be given reliable guarantees of political and military security. Second, those countries which feel the need of expanding civilian nuclear power facilities must be able to do so. This means having access to technology and guaranteed supplies of nuclear fuel on reasonable terms.

The French also believe that countries with major nuclear power capacities will be compelled by the logic of fuel supply limitations to move rapidly to the breeder and its corollary, reprocessing. This does not mean, say the French, that reprocessing facilities should be everywhere, but rather that centralized facilities should be established and put under strict international supervision.

The British government's view is a variant of France's. A prominent spokesman on the subject for Britain has been Walter Marshall, deputy director of the United Kingdom Atomic Energy Authority. Marshall argues that a flaw in U.S. policy is encouraging storage of spent fuel by countries with thermal reactors on the assumption that the fuel's high radioactivity will deter those who might wish to divert it. The British suggest that radioactivity in spent fuel decays relatively rapidly and that long-term storage can create "plutonium mines" around the world.

The argument is that a policy accepting the breeder reactor is preferable because the breeder "incinerates" plutonium as well as creating it, limiting the total supply of plutonium extant and providing energy at the same time. The British also favor establishment of international reprocessing centers.



Gerald C. Smith

American critics of U.S. nonproliferation policy tend to concur with the Europeans on the case for the breeder. They are also aggressive in faulting the technical assumptions underlying the U.S. policy. Perhaps the best-known exponent of a technical answer to U.S. objections to reprocessing is Chauncey Starr, president of the Electric Power Research Institute. Starr notes that U.S. policy is founded on the assumption that chemical reprocessing of uranium fuel necessarily involves an end product which lends itself readily to "conversion." U.S. policy is valid, says Starr, for the so-called PUREX process which was developed during World War II to make plutonium for atomic bombs and has continued to be the basis of reprocessing technology in this country and elsewhere. The product of the present process is in fact containers of plutonium nitrate which could be fashioned "overnight" into nuclear devices. But Starr argues that there is an alternative to the PUREX process and advocates a move to a "CIVEX" (for civilian fuel cycle) process which would make weapons-grade material much less easily available.

The CIVEX process, in oversimplified terms, is distinguished from the PUREX mode by reprocessing fuel rapidly while radioactivity is high and dominated by the presence of short-lived and very radioactive isotopes. Conventional reprocessing plants are designed with several stages devoted to removing all fission products from reprocessed uranium and plutonium fuel. There is no technical reason why breeder fuel must be as purified of fission products as the fuel for thermal reactors. So if plutonium was accompanied by these fission products both going into and coming out of the reprocessing plant, it would be what Marshall terms "inaccessible" to potential diverters. Fabrication of fuel would unquestionably be more difficult with the CIVEX process, but its advocates insist that techniques now available could be developed to make the process practicable for large-scale use. Starr says that the Administration now has a better understanding of the technical options on reprocessing and has adopted a more flexible stance in the matter. Both Starr and Marshall caution that there is no "technical fix" which can ensure nonproliferation, but put the case that it would be as hard to divert plutonium from a CIVEX plant as it would be from spent fuel from a thermal reactor.

CIVEX will certainly be seriously discussed during the INFCE study, which is designed to be a broad review of the technologies relevant to nonproliferation problems. The feasibility of international centers for reprocessing will be an item of special interest on the agenda. But the bottom line for most of the 40 nations engaged in INFCE is the question of energy security for themselves, and if the U.S. is to win cooperation for stronger nonproliferation measures, a prerequisite will be the offer of convincing proposals for "fuel assurance" to the nuclear have-not's.

At this point there seems to be substantial agreement here and in Europe that the Administration has succeeded in sensitive technology. Suspicions that the United States may also have ulterior commercial motives, seem also to have been allayed. These gains may seem modest, but, as Nye wrote in a recent article on nonproliferation policy in *Foreign Affairs*,* public attention tended to focus on Carter's "initial highly visible actions and especially on their confrontational aspects. Both critics and sympathizers tended to score what they saw as the Administration's policy as if it were a football game with clear-cut winners and losers, and in the process the wider outlines of policy were somewhat obscured."

The Administration has managed to clarify these wider outlines in the past year, particularly its recognition that energy security and nonproliferation are closely linked. And what the Administration is arguing most urgently now is that nations which choose a course on the uses of plutonium different from that taken by the United States accept fully the responsibility for seeing that the choice does not open the way to proliferation.—JOHN WALSH

*"Non proliferation: A long term strategy" (April 1978).