and control," the auditors claim. Responsibility is fragmented among the Argonne, Brookhaven, and Los Alamos labs. DOE admits that safeguards for reprocessing have had a low priority since Carter decided to defer plans for a domestic plant. Chambers comments that "a lot of external pressures for research and development disappeared when the end product was deferred."

With a high priority and adequate management, the scientists say, reprocessing plant safeguards will evolve to the point where a total system can detect a short-term diversion of enough plutonium to make a bomb. The catch is that detection of a trickle diversion may never be possible: "We can't meet the safeguards requirements on long-term diversion, and we may never be able to," says G. Robert Keepin, a Los Alamos engineer who developed many of the nondestructive assay devices. The GAO notes that in commercial-sized plants, even a 1 percent measurement uncertainty "could result in as much as 150 kilograms of plutonium being unaccounted for per year," or enough for numerous weapons.

Should the technical obstacles eventually be overcome, political problems will remain. Advanced safeguards devices will continue to be resisted by nations considered most likely to build a bomb. Numerous suspect states have failed to ratify the international nonproliferation treaties by which safeguards are imposed; these states include India, Pakistan, Israel, and South Africa. No major developing nations except Mexico and Iran have agreed to the safeguards. Harry Rowen, a Stanford economist who opposes reprocessing, says this situation is not likely to change. "Are we really going to have a bunch of people sitting around watching plutonium in Iraq, Pakistan, Taiwan, and South Africa? The safeguards people must be joking. Just think of the political realities." Even the developed countries have resisted the notion of a permanent international inspector in residence at a nuclear facility.

In an attempt to broaden the appeal of safeguards, U.S. experts have recently deemphasized the political implications and promoted their value to internal accounting, which enhances efficiency, reduces radiation hazard, and facilitates quality control. The Los Alamos laboratory sponsored a safeguards training course in May for representatives of the Third World that was presented on this theme. Taiwan, South Korea, and Pakistan, each considered a potential weapons-builder, sent delegates.

But it is obvious that such sales efforts have a long way to go in the world community. Even with wider acceptance, safeguards will not prevent reprocessing plants from posing a proliferation risk.

—R. JEFFREY SMITH

Storm Warnings for R & D Funding

AAAS symposium speakers see short-term pressure, longer term threat to federal science budget

This year's AAAS R & D colloquium was a time for second guessing a "confused and confusing" budget process and for sober second thoughts on longer term prospects for science funding.

"Chaos and disaster" were prophesied for some sectors of the science budget if present tendencies on Capitol Hill persist. In the longer run, R & D was seen as being forced into direct competition with other claims on federal funds and on terms disadvantageous to science.

The theme of the 2-day meeting in Washington was "R & D in an Inflationary Environment" and most speakers subscribed to the view that as a result of inflation and other developments in the economy and of changes in the budget process itself the barriers that previously protected the science budget have been breached.

The background for the discussion was the unfavorable turn in the fortunes of R & D early this year. President Carter's original budget submitted in January provided modest increases in spending on research (*Science*, 8 February). When the surge of double-digit inflation continued, Carter took the unusual step of submitting a revised budget in late March as an anti-inflation measure.

The Administration's revised version shielded R & D from heavy cuts. In the ensuing sharp clash between the White House and Congress over where to make cuts necessary to bring the budget into balance, Congress has been much harder on R & D. The issue is now very much up in the air.

> The old system of congressional committee territoriality, under which science was protected, has broken down.

From House budget committee chairman Robert N. Giaimo (D-Conn.) the colloquium heard a situation report on the budget and a lecture in practical politics. According to Giaimo, a main result of reforming the budget process in Congress has been to break down the old system of committee territoriality under which science and other special-purpose budgets were insulated.

Giaimo acknowledged that the balanced budget was likely to be upset by federal spending in response to the recession, but argued that a balanced budget was not seen as a "cure for inflation," but rather "as a way to get some form of control on federal spending."

The upshot for science was that "When you work within the constraints of a budget in balance you have to compete with other people fighting for their programs."

Inside Congress, said Giaimo, "When we are faced with competition, as we are today, there is a temptation to shortchange the programs where the pressures are more bearable. There's always

0036-8075/80/0711-0252$00.50/0

a disposition to take it out of foreign aid or R & D, which isn't going to affect society for 20 or 30 years," and not to take it out of things like trade adjustment funds (which provide payments to workers displaced as a result of foreign competition).

Giaimo several times expressed a conviction that scientists should be much more directly engaged in the general contest for funds, even to the extent that "You've got to help knock down the other programs." Said Giaimo, "I believe that the scientific and engineering community has to take a broader view of their interests. I invite you to get into the fight."

He went on to observe, "You may have a pretty good lobby. You're all articulate. But you don't have the numbers." And he noted that scientists haven't developed the propensity to "scream like hell" as have other interest groups.

Representative Robert N. Giaimo: "Make arguments for basic research in terms Congress can understand."

What is required, said Giaimo, is that scientists "make arguments for basic research in terms Congress can understand." In addition he warned against a "business as usual attitude." In view of a "nonexpanding pie" scientists will "have to distinguish between research which is useful. What research is really important."

An even bleaker appraisal of the future prospects for R & D funding came from Office of Management and Budget (OMB) top echelon official W. Bowman Cutter. He noted that the Administration had managed to provide a measure of real growth for R & D since Carter took office, but said that growth "will be difficult to protect over the next few years."

R & D falls into the category of discretionary or, in budget jargon, "controllable" expenditures. These form a relatively small portion of the budget, compared with the "uncontrollables," which are those expenditures required by law without regard to spending ceilings—Social Security and unemployment insurance, for example.

Of R & D, Cutter said that because of "uncertainty as to the specific nature of the return it is always easy, in any given period of shortage, to trade off R & D against other competing programs."

Cutter went on to say that the squeeze on R & D funding is likely to grow tighter because the federal budget is expected to consume a rising percentage of the gross national product in coming years, "driven by the uncontrollable side of the budget."

This will certainly increase pressure on the budget and could "drive taxes to the highest point in history." However, a move to restrain taxes is probable. As a result, Cutter thinks "discretionary programs will be eroded year by year."

Basic research, Cutter says, is "necessary in the long run, vulnerable in the short run." To come to terms with new circumstances, Cutter thinks that scientists will "have to look with increasing rigor at basic research, and meaningfully relate R & D we do to sectors important to us."

For universities, where most basic research is done, Cutter believes it will be necessary to take steps to increase institutional cooperation and improve ties with industry to maximize research efforts.

President Carter's science adviser, Frank Press, spoke at the opening session of the colloquium, devoting most of his remarks to a review of the initiatives, domestic and international, taken by his office. He did sketch the budget situation in spare detail, winding up that portion of his talk with a cryptic, "The new budget is now in the hands of Congress."

What Congress has done to one portion of the budget was related by Edward A. Frieman, director of the Department of Energy's office of energy research. At the time of the symposium, some $155 million had been cut by a House appropriations subcommittee from the billion-plus allotted energy research in Carter's March budget. Main casualties were high-energy physics, nuclear physics, and life sciences research, but the so-called energy sciences programs also suffered. If the cuts stood, Frieman saw them translated into a loss of 1500 jobs in national laboratories and a serious blow to university research. It was this prospect which prompted the allusion to "chaos and disaster" by Frieman. Subsequently $60 million of the $155 million cutback was restored on the floor of the House, but it is by no means certain even that small blessing will survive Senate action on energy R & D.

Gloom did not reign unconfined at the colloquium. The meeting was organized around the fifth AAAS budget analysis.* This year there were colloquium sessions to discuss the topics covered in special sections of the report—R & D in industry, universities, and state and local governments—and there was a sprinkling of good news amid the bad.

Attention at the meeting, however, did center on the vicissitudes of the federal science budget. Some seasoned observers felt that the analysis was accurate in holding that science is more exposed to competition than at any time within memory, but that R & D will do relatively well under the new dispensation as it did under the old.

Certainly, scientists will be uncomfortable with both the diagnosis and prescription for all out activism put forward by the major speakers. This year at any rate, it is too late for any rush to activism to have much effect on the new budget. So, as Congress and the Administration thrash out the final version amid inflation, recession, and the added hazard of an election year, scientists must hope that R & D gets some help from its friends in Congress and that ex-Navy man Carter and his crew are effective at damage control.—JOHN WALSH

**Research and Development AAAS Report V*, by Willis Shapley, Albert Teich, Gail J. Breslow, Charles V. Kidd, AAAS, Washington, D.C. $6.50.