would exploit the vast engineering conservatism in the original design by cutting the shielding even further. Like ice cubes left out in the sun, the chilled magnet coils would take some time to warm up; they could still take at least a 300-second fusion pulse before slipping out of the superconducting state, explained Schultz.

In spite of the more modest scope of these machines, Kikuchi said they would be enough to gauge the performance of a demonstration power plant. The reason, he said, is that the fusion would still outweigh external heat sources as the major supplier of heat to the plasma, just as in a demo plant.

"They're all coming out with about the same answer" on size, cost, and performance, said Baker, the U.S. ITER leader, who characterized his reaction to the proposals as "very positive." But although some researchers at the forum shared Baker's assessment, others feared that a smaller ITER may prove to be a scientific dead end. Instead of seeking innovative ways to approach ignition, the concepts still rely heavily on simply scaling up current knowledge, said Michael Bell of the Princeton Plasma Physics Laboratory. Consequently, he said, "you're stuck with these horrendously large reactors. The conclusion is they're no good."

Mark Haynes, vice president for Washington operations at General Atomics, fears that ITER Lite may be a dead end politically as well. "My view is that most people in Congress are not going to view a half-price ITER substantially more favorably than a full-price ITER," he said to the forum. Or, as one U.S. plasma physicist said about the likely political outcome of backing the ITER Lites: "We're dead."

Baker argues, however, that U.S. domestic politics are beside the point, because the Japanese and Europeans would be the major funders of any ITER machine. "The real push to build it won't come from the U.S.," he says. The non–U.S. partners, agrees Anne Davies, head of the DOE's office of fusion energy sciences, "are in the driver's seat." But in a time of flat or declining budgets for fusion, nervous American fusion researchers are likely to view their next move as a critical chance to redirect their own program—whether or not an ITER remains on the world scene.

–James Glanz

With reporting by Dennis Normile in Tokyo.

U.S. R&D BUDGET

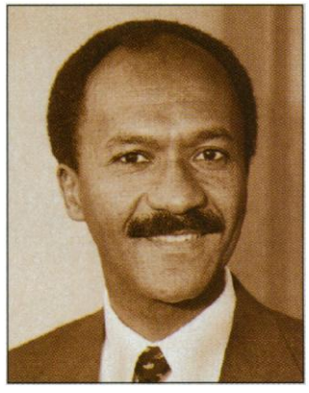
Euphoria Fades as Threats Emerge

David Goldston is not a psychiatrist, but he suspects that the scientific community may be suffering from bipolar disorder. As Representative Sherwood Boehlert's (R–NY) legislative director, Goldston watched researchers panic 3 years ago when cuts were projected in federal R&D spending and then grow euphoric this year as politicians spoke in support of R&D, all while overall spending patterns remained relatively constant. "Very little has changed," says Goldston, "but the mood swings are enormous."

Goldston delivered his diagnosis at last week's annual R&D colloquium sponsored by the American Association for the Advancement of Science (AAAS, which publishes *Science*). He was one of several speakers who warned that federal R&D agencies—with the exception of the National Institutes of Health (NIH)—face an uphill battle despite a favorable 1999 budget request from the president and a bipartisan coalition in Congress backing basic research. "It's going to be a very long struggle over domestic resources ... and it's not going to be pretty," warned Franklin Raines, outgoing director of the White House Office of Management and Budget.

That sobering view is based on the projected outcome of three current battles on Capitol Hill. The first is tobacco legislation, which the White House hopes will provide billions in new revenues to fund increases in R&D over the next 5 years. Although Raines sees a bipartisan Senate bill as evidence that the legislation remains alive, many Democratic and Republican lawmakers and their staffs are skeptical that a deal can be worked out this year. Even with a deal, there is intense disagreement over how to spend any windfall.

The second battle is over how to pay for a pending boost in highway spending. Raines and congressional sources estimate that the measure could cost $34 billion a year during the next 6 years. Legislators have several options: They could use the projected budget surplus, break the cost caps imposed under a previous deficit-reduction agreement between Congress and the Administration, or remove the highway bill from the general budget and, in essence, make it an entitlement. But Raines says the Administration opposes each of these approaches—as do plenty of Republicans. The only option may be to squeeze other domestic programs. "It's a real threat ... that could crowd out the R&D budget," said Kerri-Ann Jones, acting chief of the White House Office of Science and Technology Policy (OSTP), at the AAAS meeting. "We could be looking at a very significant reduction."



"It's going to be a very long struggle ... and it's not going to be pretty."
—Franklin Raines

The third wild card is a pending resolution by the House Budget Committee to slice $100 billion out of federal spending—mostly out of domestic programs—during the next 5 years and abolish the Commerce and Energy departments. If its contents were transformed into spending bills, "you can forget about any kind of increase ... even for NIH," said Raines. Although the resolution's hard line, authored by panel chair Representative John Kasich (R–OH), is unlikely to win broad support, it could still poison the political atmosphere against any increases in domestic spending programs.

None of these battles is likely to prevent a hefty NIH increase, say lawmakers and their aides, although Senator Arlen Specter (R–PA) warned at a hearing last week that the appropriations panel he chairs, which handles NIH's budget, likely will not receive any more money than last year. That means any increases for NIH would have to be carved from other programs under the panel's jurisdiction, such as labor and education. More threatened are the boosts requested by other agencies such as the National Science Foundation (NSF). "All those on the Hill who talked about big increases for R&D may not be able to deliver for anyone except NIH," says one White House official.

For Goldston, the message is not that Congress is unwilling to back R&D but that research is being eclipsed by larger issues. "The science budget isn't being driven by science. So get out there and lobby," he counsels.

How well researchers are lobbying is a matter of debate. NSF director Neal Lane, awaiting confirmation as OSTP chief, praised scientists for their "terrific" lobbying efforts to date. A few hours earlier, Raines had scolded researchers for their response to the president's request. "I'm somewhat surprised by the relative lack of comment on this initiative from the scientific community," said Raines. "Even though the president made this a major priority,

there is very little in the way of concrete support." Raines also warned the R&D community to avoid seeking special earmarks for particular projects, lest researchers create "a high-tech version of old-fashioned pork barrel politics."

Michael Lubell, public affairs director at the American Physical Society, says researchers have been low-key in their praise of the Democratic Administration to avoid alienating the Republican Congress. But he adds that more than 30 scientific societies have endorsed an upcoming letter to President Bill Clinton commending him for his spending proposals. Raines, Lubell notes, "had to be dragged kicking and screaming" into supporting those increases.

Lubell and other science supporters say that overall R&D has a sturdy foothold in Congress. At an unusual 28 April hearing on the future of R&D before a Senate Commerce subcommittee, four senators testified on behalf of a proposal, S. 1305, to double spending over the next decade. Senator William Frist (R–TN), who chairs the Commerce panel with science oversight, promised his own version of the bill but declined to offer details. Some lawmakers, however, say that neither measure is likely to influence next year's spending levels. "To the degree that it creates a more favorable atmosphere for R&D, it's a worthy goal," says Representative George Brown (D–CA), ranking minority member of the House Science Committee. "But with or without it, we may see a reduction in all civilian R&D except NIH."

–Andrew Lawler

NATIONAL SCIENCE FOUNDATION

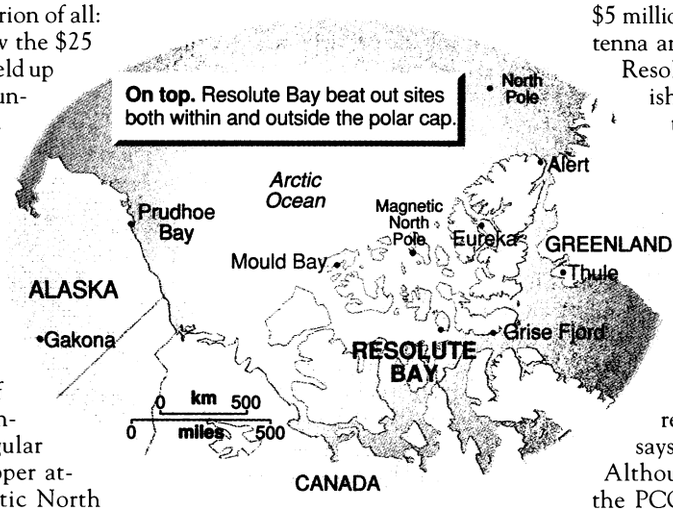
Location Dispute Freezes Arctic Facility

When the National Science Foundation (NSF) chose a site in Canada near the magnetic North Pole to build a radar facility that would study the impact of the sun on Earth's upper atmosphere, it took into account logistics, topography, and weather. But when NSF asked for money to build the Polar Cap Observatory (PCO), it discovered that it had left out of its calculations perhaps the most important criterion of all: the political lay of the land. Now the $25 million PCO remains in limbo, held up by a powerful Alaskan senator unhappy about having a major U.S. research facility built on Canadian soil. This week, after twice failing to win money for PCO in its current budget, NSF officials urged a Senate spending panel to fund PCO in the 1999 budget, which begins on 1 October.

PCO would deploy incoherent scatter radar—consisting of a transmitter and a steerable antenna made up of 4000 rectangular elements—to study how the upper atmosphere above the geomagnetic North Pole responds as particles and energy from the sun are funneled inward along Earth's magnetic field lines. It would be the fifth in a line of similar, existing facilities stretching south to the equator that collect data over a poorly understood region of intense electromagnetic activity that affects global communications, weather patterns, and climate.

A 1990 report, which presents the scientific justification for the project, identified Resolute Bay, in Cornwallis Island in Canada's Northwest Territories, as the preferred site (see map). Its proximity to the geomagnetic pole, existing infrastructure and air-sea links, and relatively favorable weather—although bone-chillingly cold, the area is less prone to violent winds and storms than other arctic sites—make it clearly superior to a half-dozen other potential sites, according to the report. After slowly wending its way to the top of the queue of new facilities, PCO was included in NSF's 1998 budget request that went to Congress in February 1997.

That's when geography overtook science in the decision-making process. Senator Ted Stevens (R–AK), chair of the Senate Appropriations Committee and its defense subcommittee, objected to the choice of a Canadian site, especially with 100% U.S. funding, and wondered if the PCO instead could become part of an ionospheric radar facility being built by the Defense Department (DOD) in southern Alaska (*Science*, 21 February 1997, p. 1060). Although Stevens later backed off from that idea, Congress omitted PCO from NSF's budget and asked the agency for a fuller explanation of the site-selection process and its scientific value.



NSF officials responded quickly to Congress's request. By December they had produced two reports that detailed the scientific merits of Resolute Bay versus the other sites and concluded, again, that Resolute Bay was the right place for PCO. The report served to highlight the weaknesses of an Alaskan site. "[I]t was clear that you couldn't serve both NSF's and DOD's objectives [from a joint site in Alaska]," says an aide who has followed the issue. But other sites, including Thule Air Force Base in Greenland, remain possibilities.

Assuming that its case had been made, NSF then submitted its operating plan for the 1998 budget that included spending $5 million to work on a prototype of the antenna and on engineering designs for the Resolute Bay site. NSF is anxious to finish the project before 2001–2, when the sun will reach its next activity peak, generating major disturbances in the upper atmosphere. But the move irked congressional aides, who saw it as a bureaucratic end run around last year's decision not to fund PCO, as well as a last-minute change in the agency's research priorities. "The decision was made to wait a year on PCO, and the reprogramming goes against that," says a Senate appropriations staffer. Although the spending panel excluded the PCO funding when it informally approved NSF's operating plan in February, NSF officials have continued to push for a reversal of that decision.

With only 4 months remaining in the current fiscal year, however, next year seems a better bet. NSF officials testified before the Senate this week on the agency's 1999 budget request, which includes $21 million to complete work on the observatory. A panel staffer says the issue "is open for FY '99" but notes that the competition for funding among agencies, as always, will be stiff. "It's up to NSF to make its case and to explain why it's a priority" for next year. Then it will be up to Stevens and his colleagues to decide where, when, and whether the observatory should be built.

–Jeffrey Mervis