SCIENCE POLICY

Grim Budgets Spur Call to Action

Researchers, university administrators, and policy wonks converged in Washington last week to discuss federal support for R&D and argue about future funding for science and technology programs. Yet amid the fiscal uncertainty, participants at two events—the annual policy colloquium held by the American Association for the Advancement of Science (AAAS, which publishes *Science*) and the President's Council of Advisors on Science and Technology (PCAST)—did come up with a consensus of sorts on two points: R&D spending is almost certain to decline in the next few years, and science advocates must make their cause more visible if they hope to protect their programs.

RICK KOZAK

United front. Despite differences on the budget, Domenici and Gibbons agree that science needs a higher profile.

The problem is that unless the government is willing to clamp down on entitlement programs, the effort to eliminate the deficit will take a big bite out of domestic discretionary programs, which includes all civilian science. "That [domestic] pie is shrinking dramatically," says Senator Pete Domenici (R–NM), who chairs the Senate Budget Committee. "So even if we wanted to do more major science projects, we would have to free up money" from that shrinking account to pay for them. The president's science adviser paints an equally sober picture. "We face some real hard arithmetic," says Jack Gibbons. "The [budgetary] slope is going to be a negative on lots of R&D trends."

Policy-makers therefore are working overtime on ways to maintain federal support for science and technology. At last week's AAAS gathering, Domenici recommended regular meetings between senators and members of the R&D community to discuss the issue, while Gibbons endorsed a national summit on R&D funding. Senator Mark Hatfield (R–OR), the retiring chair of the Senate Appropriations Committee, has said he favors a special legislative panel for key senators involved in science and technology funding decisions. In recent months, studies on the future of U.S. R&D by the National Academy of Sciences and the Council on Competitiveness have proposed ways to raise the political profile of science and technology (*Science*, 1 December 1995, p. 1430; and 5 April, p. 25).

But there remains strong partisan disagreement over how to carve up the existing R&D pie. Gibbons and Domenici used part of their AAAS speeches to take aim at the other side's budget projections for R&D spending through 2002 while downplaying their own proposed cuts. Domenici noted that Republicans last year boosted civilian basic research by almost 3%, and added that he expects another boost in 1997. He accused President Bill Clinton of proposing a 1-year increase for science as a way to bolster his re-election bid while downplaying future R&D budget cuts that would be steeper than those proposed by Republicans. Gibbons, meanwhile, warned his audience that Congress "may be set to follow last year's drastic slashing of federal R&D funding." The first signs, he predicted, will appear in the House budget resolution now being drawn up.

While the rhetoric comes easily, measuring the extent of those cuts is a much more difficult task. A new AAAS analysis of the president's budget plan through 2002 finds that it projects a drop in civilian R&D of almost 12% after adjusting for inflation; the reduction actually reaches 18% in 2000 before rebounding in the final 2 years. Last year a widely cited AAAS analysis pegged proposed Republican cuts over the same period at 33%. Those two numbers are not comparable, however, says AAAS's Kei Koizumi, because many of the 1996 cuts were not enacted. In addition, he notes that the projected rate of inflation over the same period has changed.

Indeed, both sides agree that long-term budget projections have limited value. Gibbons, who in recent weeks has been upbeat about future science budgets, says the analyses border on "the meaningless in the realpolitik of day-to-day budget negotiations," and Domenici recommends taking the projections "with a grain of salt." But ignoring the future is not an option for institutions that depend heavily on federal funding, Charles Vest, a member of PCAST and president of the Massachusetts Institute of Technology, told *Science*. "With either the Administration or congressional viewpoint," he says, "you lose."

–Andrew Lawler

DATA SHARING

Genome Researchers Take the Pledge

When six U.S. genetics labs won multimillion-dollar grants this month to sequence the human genome on grand scale, they agreed to some novel conditions. The sequencers signed on to a set of rules drafted by the donor—the National Center for Human Genome Research (NCHGR) at the National Institutes of Health (NIH)—that will set a high standard of altruism, requiring almost immediate sharing of raw data. *Science* has learned, however, that some of them have qualms about the policy, regarding it as technically too ambitious. NCHGR is therefore likely to encounter further debate and perhaps resistance as it negotiates the policy's details with its grantees.

Francis Collins, NCHGR's director, sketched out the principles when he announced the grants (*Science*, 12 April, p. 188) and provided more specifics in a written statement last week. The 9 April document says that the new standards reflect "the spirit and philosophy of the Human Genome Project," based on recommendations from two panels in 1988—an NIH advisory committee and a National Academy of Sciences panel. These groups concluded that human DNA data should be made available to the public quickly, without legal strings attached. NCHGR also based its policy on a private meeting of top genome researchers and funding bodies, held in Bermuda in February. According to NCHGR, the Bermuda meeting, which was sponsored by the Wellcome Trust, a British philanthropy, "passed a unanimous resolution that 'all human genomic DNA sequence information generated by centers funded for large-scale human sequencing should be freely available and in the public domain in order to encourage research and development. ...'"

In that spirit, NCHGR is asking grantees to release new DNA information "as rapidly as possible." It also wants them to refrain from patenting preliminary data, because this might discourage companies from investing in "subsequent inventions resulting from real creative effort." NIH lacks legal authority to enforce a patenting ban because federal law currently allows grantees to seek patents as they see fit. But NCHGR is requiring grantees to notify NIH soon after they inform their own institutions of a discovery that may be patentable. This will allow NCHGR to "monitor grantee activity in this area to learn whether or not attempts are being made to patent large blocks of primary human genomic DNA sequence." And NCHGR may seek to "restrict or eliminate" the patent rights of any who do.

Although the six sequencing centers have all accepted this new policy in principle—indeed, the investigators all participated in the Bermuda meeting—some researchers concede they have doubts about it, especially the desirability of daily or weekly data release. Some say they're not geared up to hit that stride; others, that such a pace wouldn't leave time for qual-

ity control. For example, Maynard Olson of the University of Washington says he agrees with NCHGR's goals, but notes that "opinions vary greatly" about the details. Olson, in a "frustrating" experience, drafted his own pledge of compliance several times before NCHGR would accept it. Olson says he plans to hold data for "longer than a day" but "less than 3 months." Craig Venter of The Institute for Genomic Research says he's concerned about putting out flawed information, adding, "I would like the opportunity to do high-quality science." And asking scientists to publish raw data, Venter says, lowers them to the status of "a scintillation counter." Venter would like 3 months to analyze data, and notes that NIH normally allows 6 months.

Eric Lander of the Whitehead Institute–Massachusetts Institute of Technology Center for Genome Research in Cambridge, Massachusetts, says his qualms have to do with technical issues. To minimize the burden on public repositories, Lander says, it might be best to ask researchers to test their data with a gene-hunting program called BLAST before submitting the results. He worries that researchers may use the computing power of the repositories to run multiple BLAST scans on each day's fresh data. But Lander predicts that, once his group is geared up, "we will be making no less than weekly releases." Robert Waterston says his group at Washington University in St. Louis expects to release data daily.

Reactions to NCHGR's patent policy also vary, although most researchers seem to endorse it. So do several key university patent officials contacted by *Science*. But one experienced licensing expert, Lita Nelsen of MIT, says the policy could set "a bad precedent." Nelsen says another government administrator might cite this example to justify declaring some other field of research off-limits to patenting—perhaps for religious reasons.

NCHGR will now work with its grantees to reach agreements incorporating the principles of quick release and open access to DNA data. As David Cox of Stanford University notes, the "devil is in the details." And it may take months of negotiation to exorcise the demons.

–Eliot Marshall

SPACE STATION

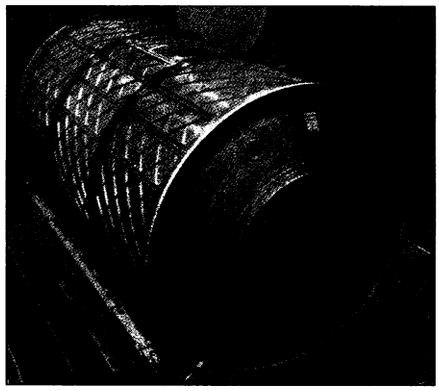
NASA Shuffle Seen as Harming Science

Researchers are up in arms about a reorganization at the National Aeronautics and Space Administration (NASA) that they say poses a threat to the research agenda of the international space station. They believe that the change, which transfers control of the $2.1 billion annual space station budget from NASA headquarters in Washington to the Johnson Space Center in Houston, could force science facilities and experiments to take a back seat to the station's engineering requirements, as well as undermine efforts to improve the credibility of the agency's life sciences research.

"There is no way that space station science can function well if it is not controlled by NASA headquarters," says Claude Canizares, a Massachusetts Institute of Technology astrophysicist who chairs the National Research Council's (NRC's) Space Studies Board. "To transfer the science to space station development and operations is exactly the wrong direction." Adds University of Michigan geophysicist Anthony England: "Our experience with NASA is that science often takes a beating when it is mixed in with hardware."

NASA managers say the change will have no appreciable effect on science and insist they must decentralize the agency. But researchers are sufficiently concerned that members of an NRC space biology panel briefly discussed resigning in protest during a recent meeting. The controversy also prompted a meeting on 16 April between Bruce Alberts, president of the National Academy of Sciences, and NASA Administrator Daniel Goldin. And England criticized the idea during a hearing on the space station held the following day before the House Science Committee.

The reorganization is part of Goldin's effort to shrink the agency's headquarters. A 6 March memo gives the space station program manager based at Johnson, currently Randy Brinkley, control over the science and technology portions of the U.S. effort to build a multinational laboratory in orbit starting next year. In the past, the money was controlled by NASA headquarters. Although most of the program's construction budget goes toward building the hardware and software for the station, about $2 billion of the station's $17.4 billion cost will be spent on preparing science facilities and experiments.



BOEING

Modular views. The space station's engineering requirements affect the research agenda.

Goldin's move effectively cedes power over the science portion of the station to a center dominated by engineers, non-NASA scientists say. And NRC members are concerned that efforts to bolster the quality of space life and microgravity sciences could suffer if station managers siphon off science money to pay for other portions of the program.

Life scientists are particularly upset. "It's alarming," says Mary Jane Osborn, a University of Connecticut microbiologist who chairs the NRC's space biology panel that advises NASA. "Not just for space biologists, but for the whole science community." Although Osborn says that talk of resignations by the panel is "overblown," she and others grumble that NASA is ignoring their advice.

Osborn and others are particularly worried about the effect of the decentralization on the large centrifuge, the centerpiece of biological research on the station. The facility—slated for launch in 2002—will allow researchers to examine the effects of partial gravity on animals and plants, vital data for missions to Mars or lunar settlement. A recent 90-day delay in awarding a construction contract has sparked concerns that NASA plans to funnel money to other station accounts, but NASA's life sciences and microgravity sciences chief, Harry Holloway, says it simply reflects the need to adjust to changes in the station's launch schedule.

Board members also worry that greater authority at Johnson will hamper efforts to revitalize space life sciences. Those efforts have centered on stronger headquarters control over peer review and program direction. "This looks like an about-face," says Canizares. NASA officials, however, insist that headquarters will retain control over peer review for now. And Holloway promises that shift in budget authority will not diminish the role of scientists in setting the station's research agenda: "There will be no sacrificing the station's capacity for science." If Brinkley wants to take money out of the science account, Holloway says, "he'll have to first come to the community and make his case."

So far the outcry seems to have had little effect. One day after meeting with Alberts, for example, Goldin announced that he would reduce the 1430-person work force at NASA headquarters by more than half in the next 18 months—a move that England denounces as "irresponsible." But while the advisers ponder their next move, NASA's trajectory toward more powerful centers and a leaner Washington operation seems unaltered.

–Andrew Lawler