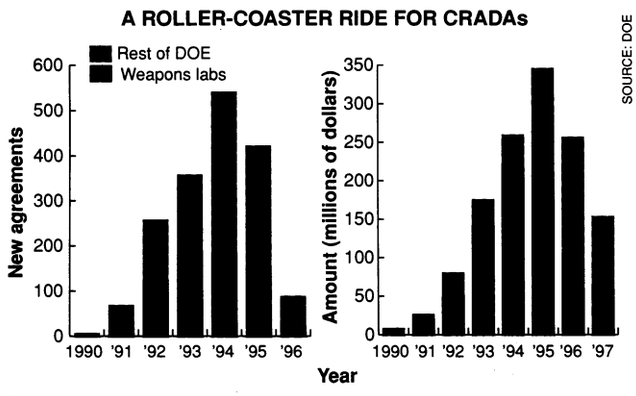
labs from the 1994 peak of $218 million to $150 million.

To the chagrin of program supporters, however, DOE headquarters decided to take $50 million more from that budget to cover a broader general reduction imposed by Congress. And the Administration asked for only $49 million in 1997. "DOE caved in," says one angry lab manager. Department officials, however, say they had to find the 1996 savings somewhere—and the CRADA account had money left over from the previous year. The 1997 request, they add, is low because funding for major CRADAs like Amtex was shifted to other DOE programs.



Fading away. Less money has meant fewer partnerships.

This summer congressional supporters won $59 million for the program in 1997. But out of that amount, Congress has told the DOE to spend up to $10 million each on only two projects—Amtex, and an effort to build advanced computing systems with a consortium of computer companies.

The brunt of the cuts is falling on smaller consortia and businesses like Miller's that don't have much lobbying clout. Sandia is terminating nearly 50 of its 65 cooperative agreements, says Siemens. Budget cuts have forced Livermore to end four CRADAs, halt negotiations with 19 potential partners, and curb collaborations with 33 companies by 20% to 40%. Los Alamos officials, meanwhile, are mulling over a host of terminations.

Did it work?

Measuring the success of the CRADA effort is difficult, in part because its heyday was so brief. Researchers like Roessner say that there are not enough data on resulting commercial products and technologies. David Cheney, acting executive director of the Secretary of Energy's advisory board, argues that CRADAs should be measured in terms of institutional change rather than products sold. "There had been a lot of criticism in the past that the labs did not interact with industry," he says. "That's no longer so."

Others express skepticism that the brief flow of cash has altered a system so removed from the rough and tumble of the private sector. "I don't want to whitewash this," adds Siemens. "It's a really tough culture change, and it's going to take a while to recover from this." Karena McKinley, acting head of industry partnerships and commercial programs at Livermore, agrees that "we've exposed a lot of [lab] people who haven't been involved with industry before. But I am not sure there is enough momentum for this to carry through on its own."

Back in Washington, the man who helped lead the charge against the special CRADA funding remains dubious. "These are two very different cultures—labs and business—and I don't think they have figured out a way to work together," says Walker. The weapons labs continue to operate like "black boxes," while industry is repelled by DOE bureaucracy, he adds.

Despite that grim picture, senior lab and DOE officials insist that CRADAs are down but not out. Los Alamos director Sig Hecker says that specific programs can pick up the tab for future CRADAs. "I just won't get any extra money from Washington," adds Hecker, who is retiring next fall. "I feel burned, but we haven't lost the war yet," says Sandia's director, Paul Robinson. Livermore officials say that they will soon announce a major new CRADA with industry.

In the months ahead, lab officials are looking at a mix of approaches to keep the technology-transfer dream alive. Robinson, for example, envisions teams of "hunter-gatherers of technology" who can provide a critical link between the labs and industry. He would also like to boost ties with universities, a sector largely ignored in the CRADA rush. Sandia already allows employees to take leave to start their own businesses based on lab technology, and Siemens hopes to increase sharply revenue from industry for using Sandia's facilities.

Los Alamos and Livermore are similarly seeking other ways to connect with the outside world. Those alternatives range from straightforward licensing of technology to simple contracts for specific services. New CRADAs, meanwhile, are likely to be driven more by industry and less by the labs.

In retrospect, however, DOE officials admit that the department may have gone overboard in promoting partnerships with industry and fixating on CRADAs. "What has changed is any thought of industrial competitiveness as a stand-alone mission," says Cheney. "All partners should be focused on a mission, and industrial productivity is not the driver."

But any successful formula for closer lab-industry ties will have to overcome the recent unhappy legacy of the CRADA program. Concedes Hecker: "There is going to be a lot of bitterness on industry's part that will come back to hurt us in trying to craft future relationships."

–Andrew Lawler

JAPAN

New Funding Helps MITI Reform Labs

TSUKUBA, JAPAN—Japan's Ministry of International Trade and Industry (MITI) may be best known for setting the nation's industrial policy, but it is also an important player in Japan's research enterprise, with 15 national labs that are part of its Agency of Industrial Science and Technology (AIST). And MITI's influence is about to grow: AIST's research budget is scheduled to double next year, and it will implement major changes in how scientists are hired and grants are awarded.


D. NORMILE

Speedy reform. Oishi says MITI labs can change more quickly than universities can.

The work at AIST's labs stretches from basic research in such fields as biosciences and computer science to applied work and the setting of industrial standards. Next year the agency hopes to boost total spending on research at its 15 institutes to $64.5 million (excluding salaries), more than double this year's budget of $30.9 million. Although the Ministry of Finance is likely to insist on a smaller increase, the agency is poised to wipe out a decade of stagnation in research funding. "In 1996 we had the same budget as in 1986," says Takeo Hirata, deputy director of AIST's general coordination division.

However, AIST's growing visibility is not based solely on a fatter budget. The agency is preparing a slew of reforms that seek, in Hirata's words, to "cultivate a spirit of competitiveness." The most significant is a retreat from the practice of lifetime employment.

Over the next several years, AIST's institutes will introduce fixed-term contracts for at least some newly hired researchers. The National Institute of Bioscience and Human Technology (NIBH) in Tsukuba, for example, plans next year to offer 5-year contracts

to all new researchers, while those who receive a positive evaluation when their contract expires will be eligible for a 5-year renewal. The Electrotechnical Laboratories (ETL), also in Tsukuba, plan to offer researchers a choice of a permanent track or a 5-year contract. Researchers opting for contracts are likely to get higher salaries and other perquisites.

Reformers think these changes are the key to improving the quality of research. "We have to have some kind of selection of scientists," says Michio Oishi, NIBH's director. ETL Director-General Koichiro Tamura notes that greater fluidity should create career options for scientists who previously would have had to stay "buried" in a single institute.

Limited-term appointments have been discussed for several years, but none of the national universities or national labs under other ministries has moved away from lifetime employment (*Science*, 15 March, p. 1492). Oishi, previously a professor of molecular biology at the University of Tokyo, has long urged the university to introduce some sort of tenurelike system. But the need for consensus among the faculty, he says, is a hindrance to innovation.

In contrast, he says, the lines of authority at AIST are drawn more clearly. "I just gathered a few other [institute officials], and we decided," Oishi says. AIST's Hirata admits that not all of the institute heads are as enthusiastic about limited terms as Oishi is. But Hirata expects all 15 institutes to adopt some form of limited-term employment within the next few years after "strong encouragement" from AIST.

A second major change is to make funding more competitive. Each AIST researcher now gets a nominal budget for his or her own research, and a lump sum goes to each institute to distribute as it sees fit. Hirata says the agency is now planning a third budget category for competitive proposals, to be judged by a committee of leading researchers. AIST hopes to fund 20 or so projects at an average of $1 million each. "If one institute takes everything, that's OK," says Hirata. "It depends on their proposals."

AIST is studying a number of other reforms. One suggestion, in line with moves at other ministries, would allow AIST labs to hire sorely needed technicians and assistants. The agency also plans to give researchers a greater share of the fruits of their labor. Currently, individual researchers may receive only 10% of intellectual property income, to a maximum of $55,000. AIST hopes to increase this percentage to 50% and to scrap the ceiling. Another significant policy change under consideration would allow researchers to form venture businesses or to advise private companies. The goal of all these reforms, says Hirata, is a desire "to stimulate the environment for research."

–Dennis Normile

GOVERNMENT FUNDING

Congress: Biomedical Research Wins Big

Biomedical research scored a "100% win" on Capitol Hill, as one lobbyist says, in the massive 1997 appropriation bill that passed Congress last week. A few other research agencies also did fairly well in the last-minute scramble for funds, as members of Congress bundled all their unfinished business into one piece of legislation and rushed home to campaign for re-election.

The new law gives the National Institutes of Health (NIH) an increase of 6.9% in 1997—nearly double the growth rate the Administration requested—and launches a new prostate cancer research effort in the Department of Defense. It also provides more money than initially expected for two key research agencies in the Commerce Department, the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA). NIST officials are happy that their fund for innovative industrial R&D known as the Advanced Technology Program (ATP) not only survived Republican attacks but won a $4 million increase to a budget of $221 million.

Winning plaudits. NIH supporter Representative John Porter.

Congress wrapped all these decisions into a jumbo omnibus appropriation bill on 30 September, the last day of fiscal 1996. (Other science budgets were approved earlier.) Long before that deadline, though, Republican leaders had bowed to White House demands on some of the main issues. Most importantly, they had approved $6.5 billion in spending on education and social programs sought by President Bill Clinton. That took the pressure off the NIH budget, which might otherwise have been squeezed to help pay for those programs. The president dropped his threat of a veto.

The bill gives NIH everything it could reasonably hope for—and more. Congress increased NIH's budget from $11.9 billion in 1996 to $12.7 billion in 1997, to a level that is more than $330 million higher than what the Clinton Administration or the Senate had proposed. Congressional aides and biomedical lobbyists give much of the credit for this remarkable increase to Representative John Porter (R–IL), chair of the House appropriations subcommittee that oversees NIH's budget.

After consulting biomedical groups such as the Federation of American Societies for Experimental Biology (FASEB), Porter set a target to achieve a 6.5% rate of growth for "core research" at NIH. That is the goal the House adopted and Congress finally approved. This reflects the "strong bipartisan support in Congress for biomedicine," says FASEB President John Suttie, chair of biochemistry at the University of Wisconsin, Madison. And "the fact that [Porter] was able to maintain the House number in the conference committee illustrates his tremendous support for this cause—which we're very appreciative of," says Suttie. He adds: "I don't think that many people 6 months ago would have thought it possible."

In addition to a record level of research funding, the bill contains another major milestone for NIH: Congress voted $90 million as a first-year installment on the $310 million cost of renovating NIH's hospital, which will include a new building named after Mark O. Hatfield (R–OR), chair of the Senate appropriations committee. (Hatfield, a longtime backer of biomedical research, is retiring this year.)

And it was not just NIH that emerged with a big increase in funds for biomedical research. Congress expanded a research program on breast cancer in the Department of Defense budget, increasing it from $70 million to $100 million, while setting aside another $45 million to start a new program of prostate cancer research.

Porter was partially successful in stripping the law of "earmarks" for targeted programs at NIH. He failed, however, to reduce a set-aside for small business grants (see *Science*, 17 May, p. 942). And he settled for a compromise on earmarked funds for AIDS research. Porter and some conservative legislators wanted to reverse a policy that gave the NIH Office of AIDS Research (OAR) authority to direct NIH spending in this area. The new bill goes partway in that direction: It creates no "line item" for AIDS research. But it uses language in a committee report to give OAR most of the control over AIDS funding it would have received under the previous law, and an "estimated" budget of $1.5 billion. The OAR director and NIH director get joint authority to shift up to 3% of this money from one institute to another. This face-saving remedy placated all parties.

No other science agency came close to