and Minnesota have taken, for instance, in arranging this center. The University of Minnesota, on its own, has organized a theoretical physics institute with private funding and is lining up five Soviet theoreticians to work there. The University of South Carolina provides another example of initiative in a joint collaboration for a new Soviet environmental institute to study the pollution of Lake Baikal. South Carolina certainly will apply to NSF, or other appropriate agencies here, for funding that will allow them to participate. They've already raised a significant fraction of the entry fee of $500 000 that the Soviets have decided is appropriate for that institute. I think we're going to see much, much more of this private-sector initiative between the two countries that will go a long way toward making cooperation much more normal.

Q. On the subject of public versus private support of R&D, what are the Administration's specific objectives regarding new technologies and industrial competitiveness? DARPA has been involved in this and . . .

A. Is still very much involved.

Q. . . . and there are some good examples in DARPA of the precompetitive generic technologies: VSHIC, parallel computers . . .

A. . . . High-resolution imaging, Sematech and so on.

Q. Indeed, the Pentagon has been generating new technologies for decades by funding light-water reactors for submarines, cargo aircraft, telecommunications and so forth. What is the future of government support for new technologies?

A. Well, the President gave the most succinct statement of it in his speech on 7 March to the American Electronics Association. He simply said this Administration recognizes its responsibility in supporting the development of generic technologies where you go from the basic discovery up to the point of production and marketing. He looks on that as leveling the playing field for our industrial firms to compete against some of the foreign high-tech companies. So do I. And I think it's an area in which the government has a very important role.

It's an area where we in the Office of Science and Technology Policy are cooperating with the Department of Commerce, the Department of Defense, the Council on Competitiveness and a number of other organizations to try to develop a coherent US position. We're not attempting to produce an industrial policy. It is a technology policy. And we think it's very important.

Q. Is there something in the works similar to the Agricultural Extension Service for new technology?

A. Yes. To the extent, for example, that we're funding what are really pilot programs—the Advanced Technology Program, the Manufacturing Research Centers— through the Commerce Department. If those are as successful as I think they're going to be, then they will be expanded substantially in the coming years.

Q. Will the National Institute of Standards and Technology—the agency in the Commerce Department that used to be called the National Bureau of Standards—have a greater role in the Administration's technology program?

A. Both of those programs—Advanced Technology and Manufacturing Research Centers—are in NIST, and I would expect that they will be of increased significance.

Q. Is NIST going to become, in effect, a civilian DARPA?

A. No. The reason DARPA has been as successful as it has been, in my view, is because it always had a clearly defined customer, and its decisions were based within that framework. One of the reasons that programs at NIST at the moment are in a pilot stage is because we want to avoid what could otherwise happen to a civilian DARPA—that it could very rapidly turn into a system where the funding decisions were under great pressure from the Congress and from external sources in favor of pet projects. That situation is to be avoided.

> The exciting development . . . is that DOE has invited Japan and South Korea . . . to take an equity position in the SSC . . . We have reached the stage of establishing a new basis for international collaboration in megaprojects

GETTING EVEN: DEPARTING NSF DIRECTOR OUSTS EDUCATION HEAD AND REORGANIZES

With only three months to go before he departs at the end of his six-year term as director of the National Science Foundation, Erich Bloch on 31 May deposed the person in the agency who had presided over the reconstruction of science education from the Reagan ruins of the early 1980s. The action removing Bassam Z. Shakhashiri, a chemist on leave to the agency from the University of Wisconsin, was viewed on Capitol Hill and in some education and science circles in Washington as maladroit, mischievous and mistaken. Even after dozens of members of Congress and leaders in science education complained about the unseating of Shakhashiri, Bloch claimed he was too busy to answer directly and sent his legislative aide, Raymond Bye Jr, to calm the ruckus.

At a news conference hurriedly called on 1 June, only hours after *The Washington Post* reported that Shakhashiri had been removed from his post, Bye said Bloch wanted to consolidate many of the agency's education activities and decided to change the program's leadership. "The new directorate will help the foundation respond to the President's challenge to move the US into first place in mathematics and science education," Bloch was quoted as saying in a news release handed out at the meeting with reporters. Bloch also noted in the statement that NSF's education and other human resources programs now account for more than 20% of the agency's budget. "They are a large and important responsibility."

It hasn't always been so. Shakhashiri arrived at NSF a few months before Bloch in 1984, after the agency's education directorate was virtually dismantled for ideological reasons by the Reagan Administration in 1981. The following year, spending for education was cut to $16 million, mainly for graduate fellowships. Until the fiscal 1986 budget was prepared by Bloch and Shakhashiri, education programs relied on

Congress to funnel money into them. Congress's benevolence was in reaction to the public clamor for Washington to respond to the Department of Education report "A Nation at Risk" (PHYSICS TODAY, June 1983, page 44), in which a national commission concluded that "the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a nation and a people." Shortly thereafter, NSF's governing body, the National Science Board, called for reinvigorating the agency's pre-college and undergraduate programs.

An energetic and enthusiastic advocate of science education who usually sports a large blue button bearing the motto "Science is Fun," Shakhashiri was the only assistant director that Bloch did not appoint. Selected for the job in March 1984 by Edward A. Knapp, then NSF director, Shakhashiri was sworn in three months later as a member of the government's senior executive service, a status that prevents his firing without just cause. At the end of August that year, Knapp resigned, to be succeeded on 1 September by Bloch, who had been the IBM vice president who managed the development of the System 360 mainframe computer.

Shakhashiri immediately began mending fences on Capitol Hill. His success is a variation on the Cinderella story. His first budget request in fiscal 1986 was $55.5 million, with the expectation that another $31.5 million left unspent for pre-college programs at Bloch's insistence would be available for education. Instead, Bloch redirected the deferred appropriation to the research directorates. In the end, Congress gave the agency's education directorate $82 million in 1986, which included the deferred amount. The next year NSF asked for $89 million for education and got $99 million from Congress. From then on Congress persisted in doling out more than Bloch asked for, providing $139 million in 1988, when the agency requested $115 million; $171 million in 1989, though NSF asked for $156 million; and $210 million (reduced to $204 million by the Gramm–Rudman–Hollings budget deficit law) after NSF had requested $190 million in 1990. When it came to making the 1991 budget, Bloch finally understood Congress's message and asked for $251 million—a figure that almost certainly will be increased by between $35 million and $50 million before the fiscal year begins on 1 October.

Shakhashiri wanted more. On Capitol Hill, he extolled his education program in attempts to get as much as $300 million next year. He sometimes appeared to be running his own agency within NSF. Bloch bristled at the mere suggestion of that. At hearings before House and Senate committees, Bloch did not accept Shakhashiri's sums—though he now boasts about program features that he accepted only grudgingly in previous years. Even so, he was battered last March in a hearing of the Senate appropriations subcommittee by

Shakhashiri: Left out in NSF's reshuffle.

Wyche Fowler Jr, a Georgia Democrat, and Bob Kerrey, a freshman Nebraska Democrat, who accused the NSF director as well as President Bush of lackluster support of education. It is ironic that at that hearing Bloch spoke proudly of the way minority education programs were spread among the research directorates. Under the reorganization, those programs will be taken from the directorates and consolidated. At the same hearing, Bloch told Barbara Mikulski, the Maryland Democrat who chairs the Senate subcommittee, that he prefers to keep science education "decentralized" and not concentrated in one unit, so that the programs are coupled with the research disciplines.

Education, in fact, is the only real growth sector of NSF's budget. Many at NSF and on Capitol Hill credit Shakhashiri for his tenacious skills in assembling programs that seemed calculated to respond to national concerns about science education and research leadership. In public testimony and in private meetings in Congress, Shakhashiri spoke about $600 million as a "proper" budget for education to have when the agency's total budget finally reaches Bloch's sought-after doubling by 1993. Such statements infuriated Bloch and others at NSF. Notwithstanding, Shakhashiri figured as a symbol among many members of Congress, their staffs and the education community. He was the second most conspicuous figure at the agency. Indeed, some members of the House Science Committee argue that if it weren't for Shakhashiri's efforts, they might have backed the idea their former chairman, Don Fuqua of Florida, put forward in his 1987 valedictory message: to "think the unthinkable"—moving NSF's education program into the Department of Education, where it wouldn't be shortchanged by the "ravenous mavens of research.

Six months ago, Bloch asked all seven assistant directors whether he ought to reorganize science education so as to consolidate several programs for recruiting more women and underrepresented minority students into science and engineering and to coordinate NSF's programs with those at other agencies—particularly at Department of Energy and NASA laboratories and at the Education Department. Not surprisingly, the vote in favor was 6 to 1—Shakhashiri dissenting because he worried that many programs would simply be dismantled. Like Bloch, the research directors view NSF budgets as a zero-sum game, believing that in their struggle to stay ahead of inflation and avoid Gramm–Rudman–Hollings deficit limits, larger budgets for education come at the expense of their programs.

Last spring, plans for reorganizing education at the agency were drawn up by Luther S. Williams, a former president of the historically black University of Atlanta. At NSF he has been science adviser to Bloch and executive secretary of a newly formed interagency committee on education within the orbit of the White House Office of Science and Technology Policy. Williams, who received a PhD in microbial physiology from Purdue University in 1968 and has held teaching positions at MIT, Purdue, Washington University and the University of Colorado, presented a blueprint in early May that was ripped apart by Shakhashiri as, in effect, change for the sake of change.

Shakhashiri's opposition impelled Bloch to make his move. Williams was installed as assistant director in a restyled Directorate for Education

and Human Resources. Bloch's action was described by an NSF official as "a swift surgical procedure. But it was heavy-handed and left bloodstains that will be hard to remove. That's not the way the foundation normally operates."

The reaction was not long in coming. On 6 June, at a previously scheduled hearing on NSF's education program before the House science research subcommittee, Representative Doug Walgren, the Pennsylvania Democrat who has been a devoted friend of the agency, told Bloch, "Your tenure has seen very good things and much of it the result of leadership you have given the agency." As for the Shakhashiri ouster, said Walgren, "I think we will look back on this as a last dismal chapter in the events surrounding science education efforts by NSF." In response to additional questions about his decision, Bloch stated: "There's never a good time to make a change.... It was my conclusion that this was the time to do it, rather than wait 6 months, 12 months, before the next director is in place.... In the last analysis, it has to be a management decision. That's the only way you can administer a complex organization like the NSF."

Bloch has urged Shakhashiri to return to the University of Wisconsin, but for now Shakhashiri is assigned to Bloch's office and talking with allies in Congress about the reorganization plan and about Bloch's "top-down model of management." The Bloch era, the longest since the first NSF director, Alan Waterman, completed a full six years, will close on 30 August.

—IRWIN GOODWIN

A YEAR AFTER TIANANMEN SQUARE, SCIENTISTS PROPOSE CHINA BOYCOTT

The same week that President Bush restored "most favored nation" trade status to China, more than 200 scientists vowed not to take part in normal scientific relations with China or attend scientific conferences there until Fang Lizhi and his family are free to emigrate. The scientists, who include five Nobel laureates, urged the Bush Administration to put more pressure on China to allow the Fangs to leave their sanctuary at the US Embassy in Beijing without threat of reprisal. The announcement of the scientists' statement was made at the National Press Club in Washington on 21 May, in anticipation of the anniversary of the massacre of prodemocracy demonstrators around Tiananmen Square in Beijing on 3–4 June 1989 when thousands of students and workers were either killed or arrested and imprisoned.

The statement signed by the scientists was generated by the Robert F. Kennedy Memorial Center for Human Rights, headed by the late senator's daughter Kerry Kennedy. Beside her to discuss the boycott was Yuri Orlov, the former Soviet dissident who spent eight years in gulags for demonstrating against official repression. The petition was sent to China's Prime Minister Li Peng as well as to the Chinese Academy of Science, and Kennedy delivered it by hand to Secretary of State James A. Baker III.

The opening line of the statement says, "We cannot remain silent when our colleagues in the People's Republic of China are held captive." It calls on the Chinese government to provide information about Chinese scientists and students who have not been seen since last summer. In addition, the petition seeks amnesty for political prisoners and safe passage out of China for Fang Lizhi, China's preeminent astrophysicist and foremost human rights activist, who took refuge on 4 June last year in the US Embassy compound with his wife, Li Shuxian, a physicist, and their youngest son, Fang Zhe. At the news conference, Perry Link, a China expert at Princeton University, noted that Chinese officials have stated the government will not free Fang until he has submitted a written admission of guilt for inciting last year's turmoil.

By official Chinese standards, Fang is an inveterate offender. As far back as 1957 he was jailed and "reeducated" for his allegedly "counterrevolutionary" actions on behalf of human rights and social reform. In January 1989 he wrote an open letter to Deng Xiaoping, China's senior leader, urging release of political prisoners. A month later, he was run off the grounds in front of the US Embassy in Beijing when he attempted to attend, at Bush's invitation, a state dinner in honor of Chinese officials.

Soon after the Tiananmen Square massacre, rumors persisted in the West that Fang would be allowed to leave for Australia or France. The rumors proved untrue. On the anniversary of the event, a Reuters dispatch stated that Fang would be allowed to go to Italy. This, too, was erroneous.

Orlov described a possible plan of action. For those scientists who must go to China, Orlov proposed adopting the same tactics he and other dissidents in the Soviet Union used during the 1970s—namely, to read aloud the names of Chinese scientists who are political prisoners at the start of their talks and to write letters addressed to them in prison. Scientists also should use formal contacts with China's officials at home and abroad to tell them what a bad idea it is to keep Fang under virtual house arrest. "It was a long, long process, but the Soviet experience shows it is not a hopeless task to change their minds," said Orlov, now at Cornell University. His message: Political pressure works!

The petition was supported by The American Physical Society and the American Astronomical Society, both expressing their opposition to China's actions in violation of human rights and political freedom.

In the repressive aftermath of Tiananmen Square, among the hardest hit, without doubt, were Chinese students and scholars living abroad. Of some 38 000 of these now in the US, about 30 000 hold J-1 visas that require them to go back to China for at least two years after completing their studies before they can apply to return to the US. The requirement was China's attempt to stop its brain drain—or at least slow it down.

Immediately following the crackdown in China, the Bush Administration extended all student visas due to expire within a year (PHYSICS TODAY, August 1989, page 39). During that period, Chinese students would be allowed to continue their studies or to work. The snag in this arrangement was that the rules applied for 12 months only, until 4 June 1990. Few students went back to China. Most stayed on their campuses or took temporary jobs and looked to Congress for help.

President Bush, in vetoing legislation last year that would have protected Chinese students against enforced return, gave assurances of safe haven for them in the US. It turned out, however, that despite his promise the President had not issued an executive order to that end. His neglect was criticized by Congress and civil libertarian groups who were sensitized to the anxieties of the Chinese. In April, he signed an order enabling Chinese students to remain in the US until the White House determines that they are safe to return home.

—IRWIN GOODWIN ■