

labs and universities provide instructors. Meanwhile, hotels, textbooks, renting and shipping equipment, and other costs of the academic sessions are rising. "We are not in danger, but it's not as lush as it was," says Barletta, who is trying to raise more money. He notes that the number of scholarships had risen with the increased attendance, but has now had to be cut back to the previous level of about 60 per session.

No one doubts the importance of the USPAS to accelerator science. "The USPAS has had a very high impact on the field in that it makes possible the gathering of a broad range of experts

that no single institution can pull together on its own," says Tigner. "Even Cornell"—one of the handful of US universities with a strong accelerator physics program—"does not have the breadth. We supply teachers. We send our graduate students, and sometimes outstanding undergraduates, to the schools."

The USPAS is "the organic result of that [lack of accelerator courses in universities]. We are supported by the labs so they get what they need," says Barletta. "A couple hundred of our former students are now intellectual leaders in the field."

Toni Feder

pected to get the final nod from Japan's Diet in March.

"What expense is this?"

"One of the most serious flaws I have noticed in the budget allocation process is that the evaluations of the projects in question were based on insufficient information," KEK director general Atsuto Suzuki wrote in an 8 December statement. He cited a discussion about a program within MEXT, during which a reviewer asked, "What expense is this?" A ministry official's answer was "It is a research expense for projects like Subaru [the telescope] and Super-Kamiokande [the neutrino observatory]," Suzuki wrote. "I saw the entire live stream on the Web on this issue, and know that there was only one question asked on the item during the interview with the ministry officials." Two of the reviewers voted to fund the program "as requested," six said to cut funding, and six said to cease funding, Suzuki continued.

In short order, the GRU working group recommended reducing funding by as much as 50% for the SPring-8 synchrotron light source, an ocean drilling project, a supercomputer, grants for young scientists, and the WPI, among other projects. Says Shig Okaya, a MEXT official, "It was a wide variety of people cutting the budget within a half hour. The public was fanatic about such a demonstrative, open-air debate. The screening process was very brutal, not very scientific, and focused heavily on cost and tangible return. It was like theater." Adds Murayama, "The fact

Cuts to science budget moderated in Japan

Even as it breathes a sigh of relief, Japan's research community worries about the negative message the government's attack on science conveyed to the country's young people.

Last August the Democratic Party of Japan defeated the Liberal Democratic Party, which had held power for most of the past half century. The new government rode to victory with promises to make high-school education free, pay families a monthly allowance per child to encourage a higher birth rate, reduce the gas tax, and abolish highway tolls, among other things. Already in the red, the new government, headed by Prime Minister Yukio Hatoyama, who holds a PhD in industrial engineering from Stanford University, then set out to find ways to keep those promises.

Unusual for Japan, the review process that ensued was open to the public. "I agree with the philosophy [of transparency], but it became a public torture," says Hitoshi Murayama, who splits his time between heading the Institute for the Physics and Mathematics of the Universe, a World Premier International Research Center Initiative (WPI) institute based in the Tokyo suburb of Kashiwa, and the University of California, Berkeley. In the fall, a working group of the so-called Government Revitalization Unit (GRU), a body created to carry out the review, heard presentations and then voted for termination, suspension, or reduction of funds for the next fiscal year, which begins on 1 April. "They are conducting public hearings on more than 400 government-funded programs, where a committee made up mostly of nonexperts judges the effectiveness of each program," Murayama said at the time.

Science and other funding lines in the Ministry of Education, Culture, Sports,

Science, and Technology (MEXT) got particular scrutiny, perhaps because that ministry has gained responsibility for funding high-school education and part of the child-allowance stipends. Paying for high school will cost about ¥390 billion (\$4.3 billion) a year, or about 7% of MEXT's budget. In the end, the budget proposal issued by the finance ministry on 25 December steers clear of the crippling cuts that threatened science last fall, and public construction takes the brunt—with, for example, abandonment of a dam that was decades in the works. The budget is ex-

Presidents of some 20 scientific societies held a press conference on 4 December to protest proposed budget cuts and defend science to the public and politicians.



MASAHARU OSHIMA



The next-generation supercomputer and a building for it under construction by RIKEN in Japan will get an increase in funding after proposals to cut its budget met with public outcry.

that they had to cut deeply, everyone understood. But the way it was handled was a surprise."

Protests

After the GRU had made its recommendations, the ministries hammered out compromises. Or, as Youhei Morita of KEK's public relations office put it, "Our funding agency [MEXT] is struggling with the ministry of finance to protect our science budget." Those struggles, plus protests by prominent scientists both within Japan and internationally, are probably to thank for science's softer-than-expected landing.

The country's university presidents, academic societies, KEK and other research organizations, and Nobel laureates held press conferences, knocked on the prime minister's door, and wrote letters. "I was the leader to protest against stupid budget cuts, especially for SPring-8 and KEK," says University of Tokyo's Masaharu Oshima, president of the Japanese Society for Synchrotron Radiation Research. "I collected 49 letters and submitted [them] to the MEXT minister. I strongly believe that our protests have made the difference. So far Japanese governments have never experienced this kind of strong protest from the science community and people through the Web."

Within a month MEXT received more than 150 000 e-mails. Some 1000 people, 40% from outside of Japan, sent e-mails in support of the WPI, Okaya says. "The big noise affected the negotiation process. We have fought, and we have gained support from politicians. At the end of the day, the prime minister

himself acknowledged the crucial importance of science. All those voices—both from abroad and domestic—rebutting against the screening process were very effective in balancing the cost against long-range national interests."

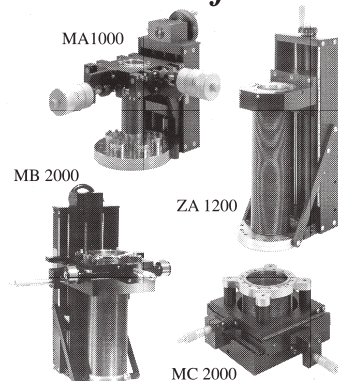
Not draconian

In the end, MEXT's total budget for the next fiscal year is ¥5.6 trillion, a 5.9% increase over the previous year. Science and technology funding cuts within MEXT will be around 2% and across ministries will total 3.3%. The government still plans to keep its promise to provide free secondary education, so many projects do face budget cuts, but for the most part they are not as draconian as the GRU had recommended.

Even before the full budget was announced, the science community counted as a victory the continuation of construction on a petaflop supercomputer, counter to the GRU's recommendation. "The supercomputer was very publicized," says Murayama. Its ¥23 billion budget is less than half of the requested amount, but still a 20% increase from last year. It is now expected to be completed in June 2012, seven months later than originally planned. The emphasis will be shifted from building it fast to expanding its utility, Okaya says. Also highly publicized was the cancellation of the GX rocket: Although development of its engine will go forward with close to a third of the full project's previous budget, plans to launch have been dropped.

The Japan Proton Accelerator Research Complex's overall fiscal year 2010 budget of ¥14.1 billion is down

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4.7% from last year. Within J-PARC, the combined budget for grants and for the Japan Atomic Energy Association will be nearly 11% lower, while KEK's budget will go up about 4.6%, to ¥6.8 billion.

SPRING-8's budget will shrink by 2%. The WPI's budget will go up a bit to facilitate starting a new institute focused on the environment. The five existing WPI institutes "get a marginal cut. It doesn't hurt much," Okaya says. (See PHYSICS TODAY, December 2008, page 28.) Funding for universities will be cut slightly less than the 1% a year decrease instituted a few years ago. As PHYSICS TODAY went to press, funding for some projects was still being clarified. But in general, says Okaya, the cuts will affect bricks and mortar more than jobs. "That's a new orientation we are pursuing."

Lessons learned

Despite science having to a large extent been spared, the process did do damage, says Hideo Ohno, a condensed-matter physicist at Tohoku University. "I believe the most serious part is the negative message that the suggested cuts on science and technology carries," he says. "I, along with many others, feel that the government needs to realize that higher education, in particular graduate-level education, is important for the future of Japanese science and technology. Without educated people, we cannot do anything."

In more than a suggestion, a key program for supporting graduate students was chopped 21%. More than a third of undergraduate science students at the University of Tokyo surveyed last December said that slashes to science funding might lead them to quit their plans to become researchers, and around the same number said they would now consider pursuing their careers abroad. Says Masaki Hoso, a postdoc in evolutionary biology at Tohoku University, Japanese students "have learned that the path for scientists is fragile. At least, just after the GRU decisions, most students felt so."

The reviews were a "wake-up call for Japan's science community and us bureaucrats," says MEXT's Okaya. "It was a lack of a long-range comprehensive plan blessed by the current administration that gave rise to the cutting without strategy. The government has embarked on such a plan. We will look at six areas of economic growth. One is science and technology." And, he says, "the lesson learned from the process is that we need to focus on how to reach out to taxpayers in their own language. It's difficult to explain to taxpayers why a black hole is important. That effort needs to be pursued more." Adds Hoso, "We scientists learned that we need to explain what we are doing and why [it] could increase human well-being. Or we lose funding and honor."

Toni Feder

"Astronomers in the UK are highly productive and deliver this excellence for a relatively low investment," he adds. "Research in astronomy is not an area where large 'efficiency savings' can be made without a detrimental impact on the quality of that work."

Nuclear physics is hit particularly hard, with a 52% budget cut and withdrawal scheduled from the Advanced Gamma Tracking Array, a European project to build a powerful spectrometer to look at the structure of atomic nuclei. The UK is also dropping out of PANDA, a project linked to the Facility for Antiproton and Ion Research particle accelerator under construction in Germany.

Long time coming

Keith Mason, who runs the STFC's day-to-day operations, blames the cuts on "the impact of the international financial situation" and the devaluation of the pound, which has led to about a 15% rise in the UK's dues to CERN and other international facilities, from £215 million in 2008–09 to £247 million this fiscal year. The budget gap is so significant that after transferring £14 million from other science budgets to put toward the STFC—compensated through extra time on facilities such as the Diamond synchrotron source for biology and chemistry—it still had a £6 million deficit for next year. "The funding of international subscriptions and major domestic research facilities clearly needs to be rethought," says Leslie.

The STFC was formed three years ago through the merger of two research councils, and it immediately found itself with an £80 million shortfall, about 12% of its budget, due to an accounting error. "It has underperformed in attracting funding ever since," says University College London physicist Mark Lancaster, who calls the cuts a "shameful waste of a decade's investment in new facilities across STFC science." The STFC has been planning the cuts for some months and had been surveying the physics community about which projects to prune.

Lancaster is concerned about the long-term impact of the cuts that the STFC is making: "The behavior of the UK is viewed with disbelief by countries which can now see that the UK is no longer to be trusted as an international partner in major scientific programs. The situation for UK scientists is made particularly bitter by the knowledge that competitor countries are making investment in science a strategic priority as their economies

UK slashes physics budget

The UK's Science and Technology Facilities Council (STFC) announced in mid-December a five-year plan that includes drastic cuts for physics. "This [plan] has involved tough choices affecting the entire program, including a managed withdrawal from some areas," says Michael Sterling, chairman of the STFC, which funds all major physics programs and facilities in the UK.

The £115 million (\$200 million) cuts to the STFC budget come on top of a £398 million reduction for the university education system, despite Prime Minister Gordon Brown stating in a speech a year ago that "the downturn is no time to slow down our investment in science but to build more vigorously for the future."

Over the next three years, the STFC will pull the UK out of several international projects, including CERN's Alice experiment, the Gemini telescopes, the New Light Source (NLS), and the UK Infrared Telescope; the complete list is

included with the online version of this report. Doctoral fellowships and student grants will be cut by 25% next year. Ian Leslie, pro vice chancellor for research at the University of Cambridge, says the cuts "will prove extremely damaging."

The move to terminate the NLS "was a regrettable outcome," says the project's leader, Jon Marangos. "If it is true that the UK cannot at the present time afford to build a FEL [free electron laser] of her own, it has also become abundantly clear to me over the last two years that she cannot afford not to play a major part in FEL science."

Also to be phased out is UK involvement in five space missions—Cassini, Cluster, the Solar and Heliospheric Observatory, Venus Express, and XMM-Newton. Andy Fabian, president of the Royal Astronomical Society, says, "With these cuts, UK-based researchers will struggle to retain their leading position in astronomy and space science."