and other academic fusion work. But with all fusion funding now coming out of a single bureaucratic pot, some researchers worry that paying up to 60% of ITER's overall cost could squeeze out other research.

"It would really be a shame if Japan does not maintain its current position at the forefront of a broad range of approaches to fusion," says Atsuo Iiyoshi, former director-general of NIFS and now president of the private Chubu University in Nagoya. He notes that NIFS's Large Helical Device has been closing the technological gap with tokamaks, and that Osaka University's Institute of Laser Engineering is making steady progress in using lasers to crush fuel pellets to the point of igniting fusion. These and other university-based research facilities, he says, could define the characteristics of a power-producing reactor.

Adding to concerns, Iiyoshi notes, was the government's decision to eliminate a Monbusho advisory council that had staunchly supported university-based fusion research. "We're in a transition period, and it's hard for researchers to see where decisions are being made," he says.

Where the discussion will lead is not clear. Shuichi Takamura, a Nagoya University electrical engineer and a key organizer of last week's meeting, says research leaders hope to issue some sort of report. "We're still discussing what the next step should be," he says. Iiyoshi suggests that any decision on ITER be delayed for half a year or so to allow the Japanese government to work out a comprehensive strategy for fusion research.

But with the government still firmly backing ITER, further delays are unlikely. Miyamoto predicts that the situation "will be resolved within a couple of months." That means Japan's fusion science community must act quickly if it wants its voice to be heard. **–DENNIS NORMILE**

2002 SPENDING

First Bush Budget May Put Science on Diet

The Bush Administration's first budget request to Congress may leave many scientists feeling a little flat. White House officials will release a preliminary spending proposal next week for the 2002 budget year that is expected to boost biomedical and military science but hold down new spending at the National Science Foundation (NSF), NASA, and the Department of Energy (DOE). Rumors about the plan, which White House officials were still assembling as *Science* went to press, have alarmed some science groups and members of Congress, who were expecting spending hikes for nonbiomedical science as well.

CREDIT: (TOP) M. PELLEGRINI *ET AL.*

"It looks like the budget's starting point is not going to mean boom times for science," says David Goldston, staff director for House Science Committee chair Sherwood Boehlert (R–NY). "The way [the proposal] is unfolding raises concern," adds Senate aide Cheh Kim, who works for the appropriations subcommittee that oversees the budgets of NSF and NASA. That panel is led by Senators Kit Bond (R–MO) and Barbara Mikulski (D–MD), who last year launched a campaign to help others catch up to recent increases in biomedical research spending by doubling NSF's budget, now $4.4 billion, by 2006. The 2002 budget covers the fiscal year that begins on 1 October.

The NSF doubling effort, however, is expected to get little support in the plan that will be released on 28 February. Knowledgeable sources say that the White House whittled down NSF's initial double-digit request to 1%, which the agency then countered with an appeal for a boost of 6% to 7%. The final request will probably fall below the predicted inflationary rate of 3% to 4%, sources predict.

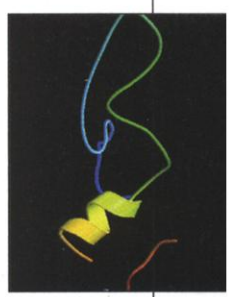
At the same time, NSF director Rita Colwell seems to have salvaged at least a chunk of her plan for a fivefold increase over 5 years in mathematics research. Sources say that the mathematics division may garner up to one-third of the agency's total projected increase for research. "The budget is a disaster for NSF as a whole, but she stood up for mathematics," says one NSF official.

NSF is also expected to benefit from a slice of the president's education initiative. Although most of the media's attention has focused on proposals for testing and accountability for elementary and secondary schools, NSF officials and members of Congress have also lobbied hard for a component that would involve higher education, in particular teacher training, as well as programs to strengthen the country's technological workforce.

Other nonbiomedical science agencies also face stagnant spending. NASA's $14 billion budget will reportedly barely keep pace with inflation. DOE's $3.2 billion Office of Science could get squeezed by an even smaller overall agency increase, as officials channel funds to other Bush Administration priorities, such as weapons technology and improving security at national laboratories. Department of Interior officials are also said to be mulling significant cuts in science programs—such as those run by the U.S. Geolog-

ScienceScope

Going 3D A French biotech start-up plans to launch an international consortium aimed at revealing the three-dimensional crystal structures of 100 cell membrane proteins, many of which could be promising drug targets. The 3-year, $9.3 million project, led by Bio-Xtal in Roubaix, France, will include a bevy of drug companies and four academic labs in France, Germany, and the Netherlands.



Several "structural genomics" efforts are already attempting to automate the atomic mapping of proteins, but this is the first to focus on membrane proteins. The targets will be "G protein–coupled receptors," which help cells sense everything from hormones to energy signals. The receptors are notoriously difficult to study, however, because removing them from the membrane destroys their normal 3D shape. In April, the consortium plans to begin searching for new ways to express, crystallize, and image the proteins. Funding will come from private firms and—if all goes as planned—the European Union.

Structural biologist Aled Edwards of the University of Toronto says the effort is "an excellent idea"—but is certain to be slow.

Bowing Out Biologist Hubert Markl last week said he will not seek a second term as president of Germany's most prestigious basic-science research organization, the Max Planck Society. Markl—a respected administrator who has led the society since 1996 and had been invited by the society's governors to seek a second term—reportedly cited his age (63) in declining to run for another 6-year term. A new president will be selected later this year and will take office in June 2002.

Cottage Industry Hoping to build new bridges between academia and industry, the European Union will help some aspiring postdocs work for 2 years in industrial research labs outside their homeland.

European scientists have excelled at basic research but have done a poor job of reaping profits from innovations, says Sabine Herlitschka of the Austrian Bureau for International Research and Technology Transfer. To bridge the gap, over the next 2 years the Fellows for Industry initiative plans to place a total of 140 postdocs in companies with fewer than 250 employees. Their stipends will be paid by another European fund, and Herlitschka promises the companies will get "access to cutting-edge scientists."

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As the society gets its act together, the U.S.-based Open Archives Initiative (www.openarchives.org) will hold a meeting in Berlin next week on creating the architecture necessary to link emerging European preprint archives, including the one at Max Planck, with those in the United States. CERN, the European laboratory for particle physics near Geneva, will get in on the action too next month with a meeting, co-sponsored by Open Archives, on archive melding. A decade late, perhaps, but the e-publishing revolution is finally crossing the Atlantic.

–VIVIEN MARX

Vivien Marx is a science writer who lives in Boston and Cologne, Germany.

NEUROBIOLOGY

A Discriminating Taste for Bitter

Life has many bitter moments—sometimes of the culinary kind. Now, a new study suggests that our taste cells are much better at distinguishing between bitter flavors than some researchers have thought. On page 1557, University of Miami biologists Alejandro Caicedo and Stephen Roper report that—contrary to one popular theory—taste buds recognize the many unique bitter flavors that land on your tongue. Your mouth, they say, knows the bitter of beer from a bitter pill any day.

"In terms of evolution, this work makes good sense," says Sue Kinnamon, a neurobiologist at Colorado State University in Fort Collins. "It suggests that bitter taste perception involves multiple cells and mechanisms." This could be important, she adds, in a world with many different toxic compounds, which tend to taste bitter. Indeed, a well-developed system for recognizing bitters could enhance survival.

Flavor detectors. Taste cells, shown here labeled in green, may be able to tell one bitter flavor from another.

CREDIT: (BOTTOM) ALEJANDRO CAICEDO AND STEPHEN ROPER/UNIVERSITY OF MIAMI

Although there are five basic tastes—sweet, sour, salty, bitter, and umami (MSG)—researchers so far have identified the receptors for only umami and bitter. Taste has been tricky to study, because scientists don't know how to grow taste cells in the lab. Indeed, the bitter receptors were discovered just last year by two groups, one led by Nicholas Ryba at the National Institute of Dental and Craniofacial Research in Bethesda, Maryland, and Charles Zuker at the University of California, San Diego, and the other by Linda Buck of Harvard Medical School in Boston.

That work showed that the bitter receptor family consists of 50 to 100 related proteins, each of which seems to respond to a different bitter flavor. Because Ryba and Zuker's group found that individual taste bud cells express the genes for most of the receptors, they concluded that the cells couldn't discriminate between the many different bitter compounds they encounter. In this scenario, cells would send the same "bitter" signal up to the brain no matter what.

But Caicedo and Roper weren't so sure that all bitters taste the same. To pursue their hunch, they decided to catch the taste cells in action. When a receptor is activated by a bitter compound or other stimulus, it triggers a spike in calcium concentrations inside the cell, which in turn causes the cell to release its neurotransmitter. So first the researchers injected a fluorescent marker of calcium activity into taste cells taken from a rat's tongue. They reasoned that if the cells could distinguish between bitter flavors, some bitters would cause the telltale calcium boost—and an accompanying rise in fluorescence—while others would not.

Then, one at a time, Caicedo and Roper added five common bitter compounds—cycloheximide, denatonium benzoate, quinine hydrochloride, sucrose octaacetate, and phenylthiocarbamide—to the solution bathing the marked taste cells. Sure enough, 65% of the cells fluoresced strongly in response to just one of the bitter compounds. About 25% of the cells responded to two compounds, whereas just 7% reacted to three or more of the bitters. Cell responses to the different bitters also varied in amplitude, length, and sensitivity. "It appears that different taste cells are tuned to different bitter compounds," says Roper. "These cells are not generalists, as some suggest." At this point, however, the researchers can't explain the specificity of the taste cells' responses, given that each one makes so many different bitter receptors.

Even so, says David Smith, a neurobiologist at the University of Maryland, Baltimore, the study moves the field of bitter taste perception past molecular guesswork

ScienceScope

Young Blood The French government has tapped a leading hepatitis C expert, Christian Bréchot, to head its biomedical research agency, INSERM. The decision to appoint a clinician to the post is in line with the government's urge to spur life scientists into producing more new therapies and products.

Bréchot—who heads the liver unit at the Necker Hospital and a hepatitis research center at the Pasteur Institute, both in Paris—takes the reins of the $450 million INSERM at a time when the agency's star is on the rise. It is believed that Bréchot's predecessor, clinician Claude Griscelli, who at 65 had reached the mandatory retirement age, last year won INSERM a 16% budget increase by beefing up research in government priority areas such as gene therapy. Bréchot, however, is eager to quell fears that he will favor clinical over basic research. "My major concern ... is to arrive at a better balance," he told *Science*.

The government is hoping that the relatively young director—Bréchot is 48—can infuse fresh blood into INSERM, in which the average age of researchers has risen from 43 to 47 in the past decade. That won't be easy, says Gérard Orth, director of a papillomavirus unit at the Pasteur Institute. "He will have to be convincing" to persuade the government to create new jobs.

Reaching Out Sandwiched between Russia and the rest of Scandinavia, Finland and its scientists often feel isolated from the scientific mainstream. That could soon change. On 1 April, the Academy of Finland will get a new research director whose top priority is to forge stronger ties with the world's scientific community.

Finland is no science lightweight: It spends a higher percentage of its gross domestic product on R&D—3.1%—than any other country, amounting to $3.5 billion in 1999. But many fields "could clearly benefit" from more international collaboration, says physicist Mikko Paalanen of Helsinki Technical University, who praises the appointment of agricultural scientist Anneli Pauli to a 5-year term as research director. "Internationally coordinated research will add a new dimension" to Finnish science, says Pauli, who also plans to add up to 12 institutes to a "Centers of Excellence" program that now provides extra funds for 26 centers deemed globally competitive.

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