EARMARKING

NSF Shivers at Senate Arctic Research Plan

When Congress earmarks federal funds for a specific institution or project, the process usually begins with the intended beneficiary bending the ear of a sympathetic legislator. But the 2000 budget for the National Science Foundation (NSF) that the Senate passed last week adds a new wrinkle to this already controversial practice: It allocates $25 million for arctic research logistics to an entity that did not request the money, doesn't want it, and says it isn't capable of administering it. NSF officials were also caught off guard by the earmark, which represents a direct assault on the agency's own activities.

The earmark comes courtesy of Senator Ted Stevens (R–AK), chair of the Senate Appropriations Committee and a longtime critic of NSF's commitment to research in the region, which includes his home state. Stevens believes that the Arctic takes a back seat to NSF's larger and more eye-catching Antarctic program within the agency's Office of Polar Programs, so last year he added $13 million to NSF's $9.5 million request for the transportation and equipment expenses needed to do science in the Arctic. This year he went a step further, proposing that the entire program, pumped up to $25 million, be turned over to the Arctic Research Commission (ARC). Never mind that ARC is a seven-member, part-time body that gets $700,000 a year to advise the government and runs on a staff of three, only one of whom works full-time. "We felt that ARC has a better handle on what is going on in the area than does NSF," says a Senate aide who follows the issue, "although we would expect them to cooperate fully with NSF in drawing up their plans."

Commission chair George Newton, a nuclear engineer with Fairfax, Virginia, consulting firm Management Support Technology, says the Senate report language was a huge surprise: "We certainly didn't ask for it." The commission runs no grants programs and has no mechanism to do so, he adds. It also has no intention of proceeding without NSF's support and guidance. "Whatever happens, we intend to stay linked to NSF," he says. "There isn't any other way to get things done in these remote regions."

Ironically, this week NSF awarded $2 million to four university-based researchers in the first installment of a 5-year, $17 million program to build environmental observatories in the Arctic. The initiative, which was heavily oversubscribed, is funded by the logistics program and could be jeopardized by a shift to the ARC.

NSF hopes to modify the Senate language when the spending bill comes up in conference with the House, whose bill contains no such provision. And there are signs that, having sent NSF a message, Stevens may be open to compromise. The ARC language is not meant to hamper the conduct of science, notes the Senate aide: "There's a lot of good work to be done there. We just want to make sure it gets the support it needs."

Digging in. NSF-funded scientists take soil samples and other measurements at a site in Council, Alaska.

—JEFFREY MERVIS

RICE GENOME

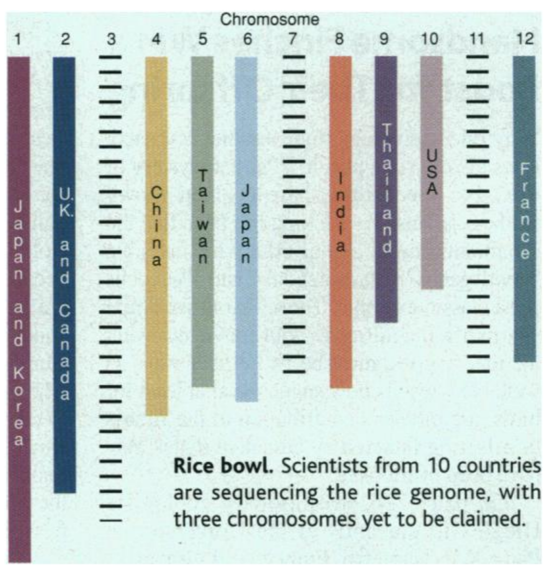
U.S. Adds $12 Million to Global Sequencing Push

PHUKET, THAILAND—Three U.S. agencies are preparing to announce grants totaling $12.3 million to help speed an international effort to sequence the rice genome. The new support, outlined last week by U.S. officials at a meeting here of collaborators from 10 countries and regions, will supplement a proposed big jump in spending by Japan, which is putting up the largest share of the overall funding for the project. But organizers acknowledge that some rough spots remain, and that the additional resources do not guarantee that the work will be finished by the target date of 2004.

The U.S. funds will be divided between The Institute for Genomic Research in Rockville, Maryland, which will receive $7.1 million; and a consortium including Clemson University in South Carolina, Cold Spring Harbor Laboratory in New York, and Washington University in St. Louis, Missouri, which will share $5.2 million. The Department of Agriculture and the National Science Foundation will each contribute $6 million, and the Department of Energy will kick in $300,000. "It's very nice news," says Takuji Sasaki, director of Japan's Rice Genome Research Program.

Last month Japan's Ministry of Agriculture, Forestry, and Fisheries requested $28 million for rice sequencing in next year's budget, double its current spending. "This [proposal] came not from the researchers but from the prime minister's office," says Sasaki, who sees it as part of a dramatic boost in all biotechnology-related spending (*Science*, 9 July, p. 183). The ramp-up is also a response to an announcement this past spring by Celera Genomics of Rockville that it could sequence the 430-megabase rice genome in 6 weeks if it received outside financing. Celera intends to use a yet-to-be-proven technique of breaking up the entire genome into small pieces, sequencing the pieces, and then using computers to sort it all out, while the consortium will proceed individually through all 12 chromosomes, a more painstaking but tested approach.

In addition to its scientific value, the project has enormous symbolic value for countries where rice is the most important cereal crop and an essential element of the region's culture. Being a participant is a point of national pride for these countries, as well as a chance to further their scientific capabilities. "In addition to funding rice sequencing, the government is about to launch an effort that will move on to functional genomics," says Apichart Vanavichit, a molecular biologist at Thailand's National Center for Genetic Engineering and Biotechnology in Nakorn Pathom, which is helping to sequence chromosome 9 (see graphic). "At the end of 5 years, Thailand will have a new [tool] for its rice-breeding programs."



Rice bowl. Scientists from 10 countries are sequencing the rice genome, with three chromosomes yet to be claimed.

CREDITS (TOP TO BOTTOM) LYNN R. EVERETT/THE OHIO STATE UNIVERSITY; RICE GENOME RESEARCH PROGRAM/JAPAN

Although the U.S. support is welcome, some say it falls short of the $20 million that scientists recommended last year as a minimum contribution (*Science*, 23 October 1998, p. 653). "The U.S. [financial] input is disproportionately small," says Benjamin Burr, a plant geneticist at Brookhaven National Laboratory in New York. "But it could have a disproportionate impact because the labs picked have high sequencing capacities." In addition, two other U.S. groups intend to continue sequencing efforts on their own. The University of Wisconsin, Madison, a finalist in the competition for the new grants, hopes to sequence portions of chromosome 11, in part to demonstrate the effectiveness of its optical mapping technique. A group at Rutgers University's Waksman Institute in Piscataway, New Jersey, will link up with other U.S. labs working on chromosome 10.

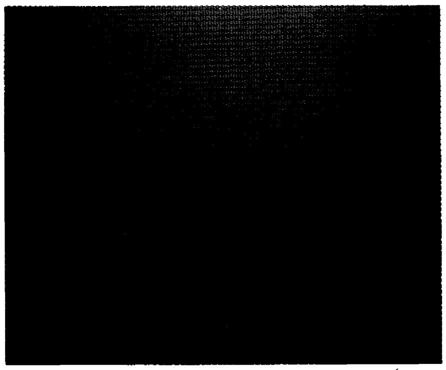
Even with the additional resources, though, Sasaki says "[he] can't promise" to complete the sequencing by 2004. For one, although groups in Canada and the United Kingdom have indicated an interest in sequencing, their governments have not yet committed money. And outside China and Japan, the other Asian groups are expected to contribute minimal amounts of sequence data because their genomics efforts are just getting off the ground. Even China's effort comes with a proviso: Its scientists are sequencing a different rice cultivar from the Nipponbare used by the rest of the international collaboration. —DENNIS NORMILE

PLANETARY SCIENCE

Neptune May Crush Methane Into Diamonds

Diamonds might become as cheap as coal if miners could ever plumb the hellish interiors of Neptune and Uranus. Laboratory researchers are now creating tiny bits of those interiors, where heat and pressure can be far more intense than in the depths of Earth. They are finding, among other surprises, tiny flecks of diamond.

On page 100 of this issue of *Science*, mineral physicist Robin Benedetti of the University of California, Berkeley, and her colleagues report that methane—a major constituent of Neptune and Uranus's deep interiors—decomposes far more easily than predicted when it is heated and squeezed in the laboratory. That decomposition, which produces diamonds and complex organic matter, could have altered the chemical composition and internal churning of those planets. "This is an exciting piece of work," says mineral physicist Russell Hemley of the Carnegie Institution of Washington's Geophysical Laboratory, "because it shows the promise of this sort of experiment in



Diamonds in the sky. Neptune's heat and pressure may forge them.

studying planetary interiors."

Experimentalists have only recently started exploring the highly fluid interiors of the gas giants—Jupiter, Saturn, Uranus, and Neptune. They first squeezed the hydrogen that makes up the bulk of such bodies to see when it might turn into a liquid metal (*Science*, 22 March 1996, p. 1667). Now they're working on methane, which becomes a prominent constituent of Neptune deeper than 4000 kilometers below the planet's visible cloud tops. Benedetti and her colleagues sealed liquid methane between the tips of two gem-quality diamond "anvils" and squeezed them together to raise the pressure as high as 50 gigapascals (GPa, equal to 500,000 atmospheres). Then they shot a laser through the diamonds and the sample until the temperature of the methane rose as high as 3000 kelvin. Under such extreme conditions, equivalent to those as deep as 7000 kilometers below Neptune's cloud tops, the methane decomposed into two identifiable forms of carbon—diamond crystals about 10 micrometers in size and complex, polymerized organic matter.

Theorists had suggested that diamonds might form in Uranus and Neptune, but only toward the center of the planets, above a pressure of 300 GPa. The shallower level for diamond formation is a surprise, says Hemley, and it means that far more of the interior could be producing a girl's best friend, with proportionately greater effects on the planet as a whole. Being denser than the fluid from which they formed, diamonds would sink, releasing heat from their store of potential energy. That heat would help churn the interior, perhaps boosting Neptune's magnetic field, which is driven by such convection. It might also add to the heat seen escaping the planet.

Methane might also be breaking down at depths even shallower than those at which diamond forms, producing byproducts such as light hydrocarbons that telescopes and spacecraft might detect. In other diamond-anvil experiments, mineral physicist Thomas Schindelbeck and his Geophysical Laboratory colleagues found that methane is unstable at just 7 GPa and 2000 kelvin. From such shallow depths, decomposition products such as ethane could waft up to the visible cloud tops—fumes from the hell a few thousand kilometers down.

The new diamond-anvil results are reminding researchers to take a critical look at the textbook picture of gas giants as being neatly subdivided into layers of unchanging composition. "One needs to take into account high-pressure chemistry in understanding the icy planets like Uranus and Neptune," says Hemley—not that the experiments so far give a complete chemical picture of the planets' innards. "The real Neptune is a more complicated soup of chemical molecules" than experimentalists have cooked up in their first tentative forays, says planetary scientist William Hubbard of the University of Arizona, Tucson. There's water mixed in with the methane, he notes, as well as hydrogen. Either one might affect reactions in the planet's interior. So recreating the depths of hell on Neptune and other planets will take a while longer. —RICHARD A. KERR

CREDITS: (TOP TO BOTTOM) JPL/NASA; P. BAGLA

NEUROSCIENCE

India Creates Novel Brain Research Center

NEW DELHI—India is hoping to break into the front ranks of neuroscience with a new National Brain Research Center (NBRC) that opens here this week. The venture hopes to capitalize on India's large population and on a pool of talent now scattered around the world: Indian researchers now working abroad are expected to fill most of the 12 new scientific slots, working in areas ranging from developmental and computational neurobiology to the effects of malnutrition on the brain.

Smart move. India's Manju Sharma announces "state-of-the-art" facility for brain science.

The center, funded by the Department of Biotechnology, will be devoted to basic research. "It will be a state-of-the-art institute ... and will have no clinical facilities attached to it," says Manju Sharma, a botanist and secretary of the biotechnology department, adding that the center will serve "as a national apex for brain research." In another unusual twist, half of its $4 million budget over the next 3 years will be earmarked for extramural research, including scientists at labs funded by other