week that "we have to convince people we're not just [another mouth] at the funding trough."

Congress could avoid a fiscal train wreck by passing a budget resolution that gives appropriators more to spend in 1999, or it could negotiate with the White House to make use of the growing budget surplus. But the White House has said surpluses should be used to shore up Social Security, while key Republican leaders favor tax cuts. Both sides could also agree to budget gimmicks—such as one tried unsuccessfully last week to make spending on the year 2000 computer problem an emergency appropriation that wouldn't require cuts to other programs. Or they could use accounting changes to make more money available in 1999, as the House Appropriations Committee did last week in approving a funding bill that covers NSF, NASA, the Environmental Protection Agency, and several other programs. (The committee earmarked for science the additional revenue expected to be generated by raising a ceiling for federal housing loans—adding $70 million to a previously planned $200 million increase for NSF's $2.5 billion research program and $10 million for research at the Veterans Administration.)

Conservatives oppose such gimmicks, but even they may be desperate for a way out of the budget impasse by September as the November elections concentrate the minds of all politicians. "This is like a basketball game—it will all be decided in the last 4 minutes," says one White House aide. Referring to the president's power to veto any spending bill, the aide adds, "and Clinton holds the passes for these guys to go home."

–ELIOT MARSHALL AND ANDREW LAWLER



GLOBAL CHANGE

## Signs of Past Collapse Beneath Antarctic Ice

Glaciologists have long been casting a worried eye on the West Antarctic ice sheet (WAIS). Its bed is below sea level, which in theory makes it far less stable than the larger East Antarctic ice sheet. And the western sheet is plenty big. If it melted away in a greenhouse-warmed world, it would raise all the world's oceans by 5 meters. Your favorite beach would be underwater—as would New Orleans, Miami, and Bangkok. Now the worries may deepen. A paper in this issue of *Science* (p. 82) confirms suspicions that in the recent geologic past, at a time perhaps not much warmer than today, the WAIS wasted away to a scrap and flooded the world's coasts.

That implication comes from holes drilled through kilometer-thick ice near the edge of the ice sheet. Reed Scherer and his colleagues at Uppsala University in Sweden and Slawek Tulaczyk and his colleagues at the California Institute of Technology in Pasadena report that the muddy bed of the ice sheet yielded fossils of microscopic marine plants along with isotopes showing that the fossils were deposited under open waters. The age of the fossils shows that the ice was gone, making way for open ocean, sometime in the last 1.3 million years, presumably during a warm period between ice ages, like the present. "Can this ice sheet change a lot?" asks glaciologist Richard Alley of Pennsylvania State University, University Park. The answer, he says, is yes: "It is a high-impact, low-probability event, but it could happen."

Scherer's new analysis backs up a claim he made 8 years ago, after the first hole was drilled through the thin edge of the sheet 700 kilometers inland from the open sea. Scherer had sorted through the microscopic remains of diatoms—single-celled plants that grow in the ocean's sunlit surface waters—in the mud from beneath the ice. He found mostly diatoms that lived in the open sea more than 5 million years ago, when a cooling climate first fostered the growth of the WAIS. But there was also a smattering of species that appeared in Antarctic waters more recently, since 1.3 million years ago. Scherer took their presence as evidence that the ice had retreated at least 700 kilometers sometime within the past 1.3 million years. And as glaciologist Robert Bindschadler of NASA's Goddard Space Flight Center in Greenbelt, Maryland, points out, after a retreat of that scale, "there wouldn't be much room left for an ice sheet."


**Not long for this world?** Greenhouse warming could destroy the Ross Ice Shelf. The ice shelf may help buttress the West Antarctic ice sheet, whose bed is mainly below sea level (map).

Other researchers pointed out a loose end in the claim: The diatom fossils might have blown onto the ice sheet from marine sediments exposed on land and then—through crevasses and ice flow—gotten carried down to the base of the ice. To rule out that possibility, Scherer and his colleagues have now analyzed sediments from the bottom of nine holes spread over 10 kilometers of the ice sheet. Four of them had young, marine diatoms. These sediments had none of the Antarctic lake diatoms that would accompany marine diatoms if they had been carried to the base of Antarctic ice, which implies a different source for the marine diatoms.

The diatom-containing sediments were also the only ones that contained significant amounts of the radioactive isotope beryllium-10. Beryllium-10 is a hallmark of sediments recently deposited beneath an open sea, says Scherer. Made in the atmosphere by cosmic rays, it attaches to particles in seawater that sink to the bottom; far too little beryllium-10 was found in the overlying ice for windblown beryllium to have been the source. Scherer's analysis of the diatoms and beryllium make it "highly, highly unlikely there is any windblown" contribution to the samples, says Alley. "I feel that Scherer has addressed almost all the criticisms," adds diatom specialist John Barron of the U.S. Geological Survey in Menlo Park, California.

From the diatom species in the sediment, Scherer argues that the area was ice-free and underwater as recently as the last 600,000 years. The most likely time, he adds, might be the brief but exceptionally warm interval between ice ages 400,000 years ago. But Barron doesn't think the diatom species allow the retreat of the ice to be pinned down

any more precisely than sometime in the last 1.3 million years.

Whatever the exact date, the recent collapse of the WAIS is no longer in doubt. Now the question is when the WAIS might disintegrate again as the world warms—and how rapidly it might flood low-lying coasts.

Glaciologist Johannes Weertman of Northwestern University put a scare into the field 25 years ago when he argued that the ice sheet, sitting on a concave bed that is below sea level and fringed with floating ice shelves, should be prone to collapse rapidly if the climate warms. He explained that even a slight warming-induced retreat of the ice's grounding line—where it begins to float off the bottom—will move the grounding line into thicker ice. The thicker the ice, the faster it flows outward and therefore the faster it thins. The faster it thins, the sooner it floats and moves the grounding line even farther inward. Such an accelerating retreat could consume WAIS in a matter of a century or two, Weertman argued. The ice sheet retains a modicum of stability, researchers came to believe, only because its ice shelves are wedged into semi-enclosed embayments like the Ross Sea.

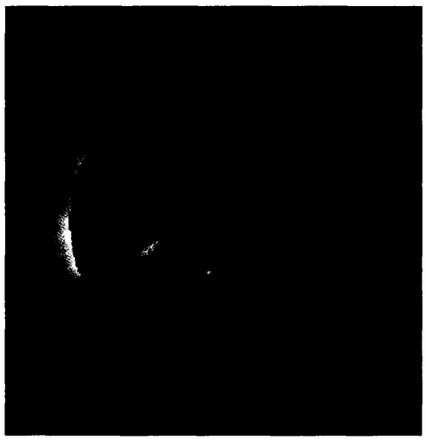
Researchers have relaxed a bit since then as they have come to appreciate that spotty resistance along the ice sheet's bed is also helping to hold it together. But Scherer's finding comes on top of some more alarming recent predictions. Staff scientist Michael Oppenheimer of the Environmental Defense Fund in New York City recently reviewed the question of WAIS stability (*Nature*, 28 May, p. 325) and concluded from the ice sheet's somewhat erratic behavior of late that its most likely fate is disintegration during the next 500 to 700 years, greatly accelerating sea-level rise beginning in the 22nd century. If that scenario comes to pass, it will be small consolation to Florida landowners to know that it has all happened before.

–RICHARD A. KERR

SOLAR PHYSICS

## Earth to SOHO, Come In Please

Controllers have lost contact with one of the most productive solar astronomy satellites ever. While controllers were putting SOHO—the Solar and Heliospheric Observatory—through routine maneuvers on Wednesday, 24 June, a safeguard program kicked in unexpectedly, apparently sending the craft into a spin. The craft's high-gain communications antenna is no longer pointed toward Earth. Although communication should still be possible through two omnidirectional low-gain antennas, "so far the baby does not talk back to us," says Franco Bonacina, a spokesperson for the European Space Agency (ESA) in Paris.



NASA/ESA

**Darkened sun.** SOHO is no longer capturing views of the sun such as this image of the corona.

SOHO, a joint NASA-ESA project, was launched in December 1995 and has since been monitoring the sun with 11 different instruments from a vantage point 1.5 million kilometers sunward from Earth. The $1 billion mission has gathered data on everything from the sun's internal structure (*Science*, 26 June, p. 2047) to outbursts of gas from the sun's atmosphere, called coronal mass ejections. SOHO's success persuaded planners to extend its operations—originally meant to end last spring—through 2003, to allow the spacecraft to observe the sun as its 11-year cycle of activity peaks.

"The next couple of years would have been a different mission, because the sun is a different sun," says Bernhard Flick, ESA Deputy Project Scientist for SOHO at NASA's Goddard Space Flight Center in Greenbelt, Maryland. As a result, last week's mishap is "potentially a tremendous loss," says Cambridge University's Douglas Gough, co-investigator on three experiments studying solar oscillations, which hold clues to the sun's structure and motions.

The crisis began when controllers at Goddard began a maintenance operation for the spacecraft's orientation system, which spins reaction wheels to rotate the craft. These reaction wheels often accumulate momentum during corrections, and NASA spokesperson Bill Steigerwald explains that the technicians fired thrusters to hold the craft steady while the reaction wheels were slowed. The craft then suddenly entered the "emergency sun reacquisition mode," which automatically fires thrusters to point SOHO back toward the sun if it loses its bearings. "The telemetry stopped before the thrusters stopped firing. The reason is not clear at this time," says Steigerwald.

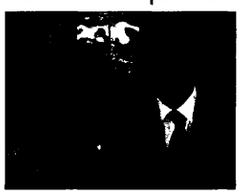
SOHO researchers now face a tense wait to see whether the mission can be saved. The satellite's solar panels are probably turned away from the sun now, draining the batteries and making communication impos-

## ScienceScope

### HENNEY NO SHOO-IN

Critics are urging caution as the Senate considers the nomination of Jane Henney, vice president for health sciences at the University of New Mexico, to head the Food and Drug Administration (FDA).

Henney—formerly number two at FDA under David Kessler—has been praised by many public health leaders. But some medical industry officials question her commitment to streamlining the FDA bureaucracy and speeding up the drug approval process as mandated by a law passed last year. Steve Northrup, director of the Medical Device Manufacturers Association of Washington, D.C., also worries about her ability to strike an "appropriate balance" between the interests of consumers and manufacturers. Henney co-chaired a panel that in 1992 persuaded the FDA to impose a moratorium on breast implants, a decision that, Northrup says, was based on a poor reading of the science. Some conservative members of Congress also look askance at Henney because of her ties to perceived archliberal Senator Edward Kennedy (D–MA). Her husband, Robert Graham, worked on the staff of the senator, who is her strong supporter.



Senator James Jeffords (R–VT), chair of the Labor and Human Resources Committee, has responded to critics by saying Henney's confirmation hearing, which will probably be held in August, "is not going to be a quick one."

### POPULISM AND PEER REVIEW

The old elitism-versus-populism conflict has popped up once again as the 1999 budget for the National Science Foundation (NSF) moves through Congress.

The Senate bill gives NSF $12 million to add three new science and technology centers (STCs), for applied molecular biology, to its existing roster of 24. But the nation's top research universities—defined as the 100 now getting the most NSF money—wouldn't be allowed to compete. The agency's peer-review system is "biased toward more established institutions," explains the report.

Nils Hasselmo, new president of the Association of American Universities, which represents most of those top schools, disagrees. Federal R&D funds should go where the expertise is, he says, and not be "a subsidy to universities." The House concurs: A spending panel last week voiced its support for peer review as the determinant in making STC awards, setting the stage for a compromise later this summer.