

**It's a gas.** Most hard x-rays (blue) from the galaxy's disk stream from a smooth plasma, not from point sources (crosses).

energy in Chandra's field of view—formed a hazy fog. “We finally obtained an ability to see almost all of the sources of x-rays in the galaxy. The ridge emission is diffuse,” Ebisawa says.

The details of Chandra's images leave little doubt, most reviewers say. “Their claim is clear and convincing,” says astrophysicist Yasuo Tanaka of the Max Planck Institute for Astrophysics in Garching, Germany. However, astrophysicist Koji Mukai of NASA Goddard holds out hope that some of the emission may stream from quiescent dwarf novae: dim white dwarf stars that periodically flare in x-rays. “The debate will continue until we know more about the luminosities of dwarf novae,” Mukai says.

Still, most researchers agree that the focus will shift to figuring out why the rarefied matter drifting among the stars glows so brightly in x-rays. “This component of the interstellar medium is not just a little thing,” says astrophysicist Richard Mushotzky of NASA Goddard. “It dominates the pressure and the energy balance, and it's been completely ignored.”

Several explanations have been proposed, each with its adherents and its problems. Makishima thinks the galaxy's rotation spawns magnetic fields in the interstellar medium that twist, snap, and reconnect in a large-scale, tenuous process akin to flares on the sun. If so, such magnetic torquings could heat plasma to tens of millions of degrees, the temperatures needed to produce hard x-rays. Astrophysicist Kotsuji Koyama of Kyoto University in Japan thinks frequent supernova explosions may suffice to heat the gas. However, other theorists say that the hot plasma would disperse too quickly to stay in the galaxy under either model.

Astrophysicist Azita Valinia of NASA headquarters in Washington, D.C., has another idea: low-energy cosmic rays. Electrons launched by supernovae may zing through the interstellar medium and ionize

## NEWS OF THE WEEK

heavy atoms. Those interactions would spit out the right mix of energetic x-rays, Valinia believes. “You don't have to have strong magnetic fields or a very hot gas, which we don't know how to produce,” she notes. Still, no one knows whether enough such cosmic rays exist, as the solar wind keeps them away from Earth.

Longer exposures might favor one model by unveiling patterns in the galaxy's x-ray haze, although it will be tough to get that much time on Chandra or its European counterpart, XMM-Newton. Meanwhile, expect theorists to have a field day. Says Mushotzky: “This raises all sorts of issues about the interstellar medium that people had been trying to suppress.”

—ROBERT IRION

## 2002 BUDGET

### Fall Fight Looms Over Space Science Funding

Congressional lawmakers are at odds with each other and with the new Administration over which U.S. space science efforts should be funded—or cut—in 2002. The high-stakes legislative game affects plans for several important space projects, from Mars exploration to a successor for the Hubble Space Telescope. The politicians also want to shunt hundreds of millions of dollars into pork programs—a move likely to increase the pressure on NASA's strained budget.

The opening bids are laid out in vastly different 2002 spending plans that the House and Senate approved before leaving town last week for a monthlong break. Legislators will try to reach a compromise when they return, in time for the 1 October start of the 2002 fiscal year. “There are very dramatic differences, and there won't be a lot of money added in the end” to give both sides what they want, says Representative James Walsh (R-NY), who chairs the panel that funds NASA and the National Science Foundation. The sluggish economy and vanishing surpluses, he adds, are putting the screws on government spending for next year.

In the meantime, lawmakers have stacked up their NASA bargaining chips. The House chopped funding for programs such as the Next Generation Space Telescope favored by the Senate; the Senate, in turn, slashed spending for efforts such as Mars exploration backed by the House. And both chambers have their own beefs with the White House: The House wants to spend more money for re-

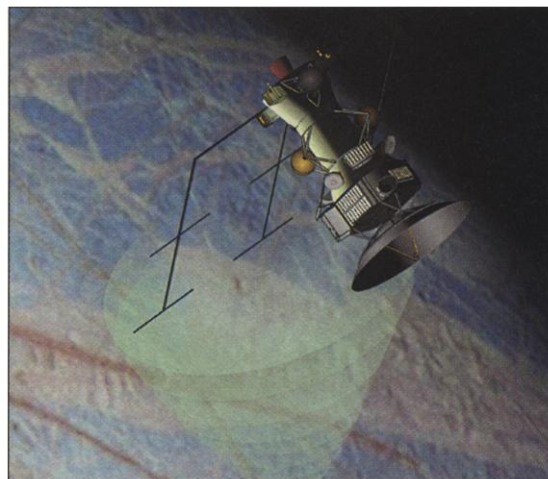
search on the space station (*Science*, 20 July, p. 408), while the Senate approved \$25 million to keep a Pluto mission on track that NASA canceled last year due to budget constraints (*Science*, 17 November 2000, p. 1270).

The Senate figure for Pluto isn't enough, says NASA space science chief Ed Weiler, who estimates that a 2004 launch will cost at least \$75 million. Weiler also must contend with the Senate's decision to cut \$49 million from NASA's request for an orbiter to visit Jupiter's moon Europa and put most of that money into a comprehensive outer planets program which would include a competed Europa mission.

The Europa effort currently is being handled by NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California, which has been under fire for its Mars failures and high program costs. “We've already spent a lot of money on [Europa] planning,” complains one NASA official, who adds that the technical challenges make JPL the best choice to build the necessarily complex craft. But competitors like such as Applied Physics Laboratory (APL) in Laurel, Maryland—in the home state of Senate spending subcommittee chair Barbara Mikulski—are eager for a shot at such a big endeavor.

Mikulski's panel also added \$20 million to NASA's request for \$40 million to develop a series of spacecraft to monitor the sun—which APL will have a significant hand in developing—and cut \$50 million from the requested \$431 million for Mars exploration. The Senate also wants NASA to move more of its spacecraft operations to contractors—a move that the Senate bets will save money but which could cost JPL hundreds of jobs. “I don't like it,” says Weiler about the proposed transfer.

Despite their differences, the Walsh and Mikulski panels agree that NASA's budget is a good mechanism to fund unrelated pro-



**Target.** Senate wants labs to compete for a mission to Jupiter's moon Europa, under scrutiny here by proposed JPL orbiter.

CREDITS: (TOP TO BOTTOM) K. EBISAWA ET AL./CHANDRA X-RAY OBSERVATORY CENTER; JPL/NASA

jects in their members' states and districts. The space science portion of the House bill, for example, includes \$1.5 million for the planetarium at the University of North Carolina, Chapel Hill; Virginia Commonwealth University in Richmond would receive \$1 million for battery research in the Senate bill. Overall, each bill would add approximately \$200 million in such earmarks to NASA's budget—and steal money from core programs if the agency's total budget isn't well above the \$14.6 billion request.

—ANDREW LAWLER

## MARINE SCIENCE

### Mideast Pirates Give Oceanographers Pause

Oceanographers now have something else to worry about besides getting grants and battling rough seas: pirates. Two U.S. research institutions have confirmed to *Science* that they are stepping up security aboard research vessels plying certain Middle Eastern waters in response to growing piracy and terrorism.

Officials at the Woods Hole Oceanographic Institution (WHOI) in Massachusetts and Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, say they have hired shipboard "security consultants" to deter high-seas attacks. The unarmed experts "aren't going to shoot anybody or engage in hand-to-hand combat. ... The idea is to make people aware of how to

just as shippers reported a spate of attacks off the coasts of Yemen and Somalia. In the past year alone, pirates have tried to board at least 13 vessels in the Red Sea, up from none in 1999, according to the International Chamber of Commerce in London. The surge helped push the worldwide number of pirate attacks up 57%, the group says, with 72 seafarers killed in nearly 500 incidents.

Seeking smooth sailing, Pittenger hired a private firm to put two security experts aboard the *Knorr*. The duo—reportedly ex-military specialists—stood watches and taught the crew and scientists how to keep an eye out for suspicious vessels and how to respond if boarded. (A captain familiar with such training says using water hoses to repel boarders is one option.) Lamont-Doherty will also have security help aboard its vessel, the *Maurice Ewing*, when it cruises the Gulf of Aden and Red Sea later this month, according to officials at the National Science Foundation (NSF), which funded both cruises.

NSF says it is happy to help pay for the security, which cost about \$80,000 for the *Knorr* cruise. And Pittenger says the precautions make sense, "because research vessels have a modus operandi that makes them vulnerable. They stop a lot to collect data, have bright lights, and carry attractive-looking equipment" such as computers. Female scientists can also be targets for sexual assaults. What research vessels don't have, he adds, are safes stuffed with payroll cash—a magnet for pirates.

The chief scientist on the *Knorr* cruise is all for the extra help, saying the security team didn't hamper science and made the researchers feel safer. "We ran drills and learned to look around pretty carefully before we stopped to put an instrument in the water," says physical oceanographer William Johns of the University of Miami, Florida. If boarded, the researchers were instructed to gather in a predetermined area to avoid confusion and stay out of danger. "Luckily, we never had to do it," he says.

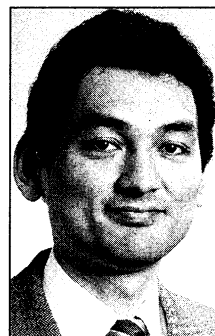
Although Pittenger fears that providing protection for science cruises may be "the wave of the future," he predicts that WHOI won't need the antipiracy consultants again anytime soon. "The crews are now pretty thoroughly trained and have plans in place," he says. That should help keep researchers focused on their work and not fretting about walking the plank.

—DAVID MALAKOFF

## INTELLECTUAL PROPERTY

### RIKEN Scientist Quits; Lab Says It's Clean

TOKYO—A Japanese research institute says that it did not do anything improper in a case of alleged economic espionage against the United States. Last week the Institute of Physical and Chemical Research (RIKEN)



**Gone.** Takashi Okamoto faces U.S. charges of economic espionage.

released a report denying that it directed Takashi Okamoto to steal biological materials from the Cleveland Clinic Foundation in Ohio and then hired him to gain access to trade secrets. RIKEN also announced that Okamoto has resigned as of 31 July.

This spring the U.S. Justice Department charged

Okamoto and Hiroaki Serizawa, a researcher at the University of Kansas Medical Center in Kansas City, with conspiring to steal trade secrets for the benefit of a foreign government. Okamoto is suspected of taking cell lines and DNA samples from the Cleveland Clinic, where he worked for 2 years before joining RIKEN's Brain Science Institute in 1999 (*Science*, 18 May, p. 1274).

A previous investigation by a team of scientists found that Okamoto had sent biological samples from the United States to a Japanese colleague, who later brought them to RIKEN when he joined Okamoto's lab (*Science*, 15 June, p. 1984). The materials then mysteriously disappeared. The team concluded, however, that the materials were never used in experiments at RIKEN.

RIKEN's latest report, prepared by a team of lawyers, investigated Okamoto's recruitment and hiring. RIKEN president Shun-ichi Kobayashi says that the two investigations show "that in no manner was RIKEN involved intentionally" in actions that violate the Economic Espionage Act of 1996 ([www.riken.go.jp](http://www.riken.go.jp)). But RIKEN officials admit they are still puzzled by Okamoto's actions and do not know what happened to the materials stored at RIKEN. Okamoto, who could not be reached for comment, refused to answer the investigators' questions.

Even so, some scientists are worried that the act could stifle scientific interaction. "[The act] has a very broad definition of a trade secret," says Masao Ito, president of the Brain Science Institute. "It could become difficult to freely exchange young people across borders." —DENNIS NORMILE



**Secure science.** U.S. oceanographers hope that they won't need help from Navy SEALs, above, in plying waters in the Middle East.

reduce a ship's vulnerability," says Richard Pittenger, who manages Woods Hole's research fleet.

Pittenger, a former Navy admiral, first hired security help in February for a month-long water-sampling cruise by the WHOI vessel *Knorr* in the western Gulf of Aden at the mouth of the Red Sea. The move came 3 months after saboteurs bombed the U.S. warship *Cole* in the nearby port of Aden and

CREDIT (BOTTOM) LEIF SKOGGORS/CORBIS