Known as boronophenylalanine (BPA), the compound was developed in the late 1980s by Yutaka Mishima and his colleagues at Kobe University School of Medicine in Japan. When Coderre and other experimenters at Brookhaven transplanted aggressive cancers into rats, then injected them with BPA, they say the compound concentrated in the tumors better than did any of its predecessors. And when they bombarded the animals with neutrons, the tumors—which should have killed the rats within 14 days—often regressed. "The animal data are very, very convincing," says Coderre. "In small rodents we've seen 80% cured completely."

Last December, Coderre and his colleagues at Brookhaven moved on to studying the compound in humans. Five people with glioblastoma were given BPA before they had surgery to remove as much of their tumors as possible. During the operation, surgeons removed tissue samples and afterwards measured boron concentrations in tumor tissue, normal brain, and capillaries. So far, the results support BPA's promise, says Coderre. If the pattern holds up through studies of another five patients, Coderre and his colleagues think a new trial of the full regimen of boron plus neutrons will be warranted. They point out that besides the improved compound, Brookhaven has a more powerful neutron source than was used in any of the earlier trials. As a result, the treatments could be done without removing the skull and be completed in 45 minutes instead of hours.

The group has already applied for FDA approval to start safety trials of the full treatment, although they say as much as a year's work remains before they will be ready. Besides the BPA studies, says Richard Setlow, a biophysicist at Brookhaven, "we need a lot of work to figure out what doses to give and where to aim the beam and just how much radiation to give and so on."

Even a year is too soon for BNCT critics like Happer and Levin. And Ohio State University chemist Albert Soloway, who developed the boron compound used in Japan, recommends delaying human trials until the promise of other compounds that might home in on tumors even better than does BPA has been explored. "What we need is an integrated study among the chemists, physicists, radiation biologists, and neurosurgeons," he says. "I think you need to do this scientifically and not emotionally." But Darrel Joel, chair of the medical department at Brookhaven, says he is "cautiously optimistic" that BPA will prove to be good enough.

Stage fright. Joel acknowledges, however, that "when we treat the first patients there will be some jitters." And a major reason for his jitters is the wave of publicity being generated by a separate effort to promote BNCT (*Science*, 15 October 1993, p. 329). A group of nuclear engineers and patient advocates has been pressing DOE to convert a mothballed research reactor at the Idaho National Engineering Laboratory into a BNCT research facility. Although independent panels from DOE, NCI, and the Institute of Medicine have all advised against the plan, advocates have turned to Congress. A separate group is now seeking funding for BNCT research at a reactor at Georgia Tech.

These advocates persuaded the Senate Energy and Natural Resources Committee to hold a hearing in May at which they presented BNCT as a promising therapy. Several scientists testified that the Japanese studies show that the treatment worked, and witnesses brought in a single patient allegedly "cured" of glioblastoma after treatment at a reactor in Japan. Stoking the publicity was an Associated Press article that appeared shortly afterward in newspapers around the country under headlines such as "U.S. Impeded Effort to Treat Brain Tumors."

As a result of the attention, says Coderre, Brookhaven has received "hundreds of calls from people with brain tumors who want to know if they can be treated now. These people are desperate." One patient, he adds, is both persistent enough and well enough connected to have pressed her case to Energy Secretary Hazel O'Leary and others at the highest levels of government. Officials at DOE say they've convened a panel, including doctors, researchers, and an ethicist, to decide what to do about her case. When *Science* went to press, DOE officials and Brookhaven researchers were still negotiating over this case.

Coderre and his colleagues worry that the DOE will force the Brookhaven group to start administering the untried therapy under "compassionate use" rules, which allow the usual FDA approval steps to be bypassed for some terminal conditions. If it does, they fear that BNCT could become a victim of overoptimism. The first patients probably won't be cured, says Mahoney, and if they die in a glare of publicity, future research on BNCT might be jeopardized. And once treatments start, hundreds of others may seek treatment and "there go our controlled studies," says Coderre.

But in spite of their fears, Coderre and his colleagues think it's time for BNCT to show it can live up to its promise. NCI's Mahoney, among others, agrees. "You reach a point where you have to try it in humans," he says. "We are sort of reaching that point."

–Faye Flam

1995 R&D SPENDING

Mikulski Boosts NSF Budget

What a difference a year makes. Last fall, scientists were hurling imprecations at Senator Barbara Mikulski (D–MD), chair of the appropriations subcommittee that funds the National Science Foundation (NSF), for ordering NSF to support more "strategic research" likely to benefit industry (*Science*, 17 September 1993, p. 1512). They worried that such a move would come at the expense of NSF's funding of basic academic science. But now lobbyists for research universities are singing her praises. Why the turnaround? Last week, Mikulski's subcommittee approved a bill that—if it survives running the rest of the congressional funding gauntlet—would give NSF its biggest budget increase in 11 years, and a report accompanying the bill contains none of the threats or harsh rhetoric Mikulski used last year. Indeed, the senator even thanked NSF for paying more attention to strategic research in its overall budget.


RICK KOZAK

Three big ones. Senator Mikulski has proposed a $300-million academic facilities program at NSF.

"It's just amazing what has happened to her relationship with NSF and the scientific community," enthuses Jack Crowley, special assistant to the president of the Massachusetts Institute of Technology and director of its Washington office. "She is a remarkably strong supporter of research, and I think everybody is pulling in the same direction now."

Crowley is particularly impressed that Mikulski has managed to find enough money to boost NSF's budget in a year when funding prospects seemed bleak at best. "She went the extra mile for science," he says. Indeed, the subcommittee that Mikulski chairs started in a deep hole, since it was allocated $729 million less than it needed to meet the President's request for all the agencies it oversees, which include the Department of Housing and Urban Development, NSF, the National Aeronautics and Space Administration (NASA), and the Environmental Protection Agency. Mikulski and her House counterpart, Representative Louis Stokes (D–OH), got around the funding limit by working out a deal with the White House

HIGHLIGHTS OF NSF'S 1995 BUDGET
($ in millions)

Account	FY '94 level	FY '95 request	House level	Senate level	% change over 1994
Research	2164	2349	2217	2300	+6.3
Major equipment	NA	70	105	150	NA
Academic facilities	105	55	100	300	+186
Education	570	586	586	606	+6.3
TOTAL	**2983**	**3200**	**3141**	**3490**	**+17.0**

to delay payments on some housing programs and new national service awards. This will free up enough money this year to cover a big increase for NSF and the $2.1 billion NASA had requested for the space station.

The result is a pleasant summer surprise for NSF. The Mikulski subcommittee approved a 17% increase in the NSF budget, a $506-million rise that is $348 million more than the House approved and $290 million more than the $3.2 billion the Administration requested (see table). The biggest change from NSF's request would be the $200-million boost in its program to support major new instrumentation and renovate aging academic facilities. Mikulski chided the White House's Office of Science and Technology Policy for failing to come up with a comprehensive plan to deal with a problem that was identified in the mid-1980s. The new bill is intended to force the Administration's hand: It would rescind $190 million of the $300 million destined for NSF unless the President asks for the full amount in his 1996 budget and puts NSF at the helm of a multiagency program.

As for strategic research, the report accompanying the bill notes approvingly that NSF has "embraced" the ideas that Mikulski floated last fall, and it "commends" Neal Lane, NSF's director, for leading NSF and the scientific community "in a strategic planning process." NSF recently gave the panel status reports on eight such initiatives—in global change, high-performance computing, advanced manufacturing, advanced materials processing, civil infrastructure, biotechnology, environmental research, and science education. The Mikulski panel was so impressed that it proposed giving the director authority to spend up to 10% of the amount budgeted for each strategic initiative on "innovative cross-disciplinary research and education programs" chosen through competitive merit review. Speaking before the subcommittee marked up the bill, Mikulski said, "We believe that Neal Lane's efforts [in this area], and that of his associate directors, should therefore be rewarded."

This combination of budget increases and toned-down rhetoric has won over Mikulski's academic critics. Last year, for example, Cornelius Pings, president of the Association of American Universities (AAU), which represents most of the country's leading research universities, said Mikulski's advocacy of applied research was "definitely a mistake." But last week Howard Gobstein, AAU's vice president for research, told *Science* that "I don't think people recognize the extent of her fundamental support for basic research."

Mikulski's subcommittee approved the bill on 14 July and sent it to the full committee, which passed it 3 hours later. The Senate may vote on the legislation as early as this week, and few changes are expected. After that, a House-Senate conference committee must iron out differences between the House and Senate versions of the bill.

–Jeffrey Mervis

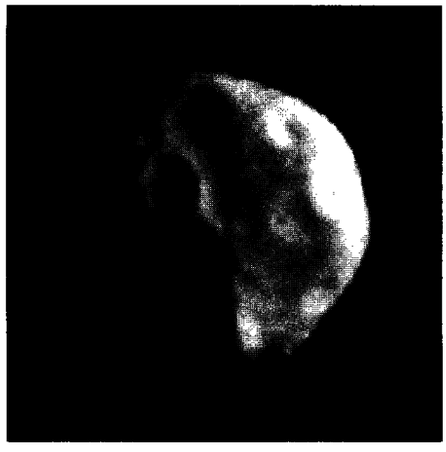
SPACE SCIENCE

A Rejuvenated Companion for Ida?

At first glance, it looked like an unlikely May-December marriage. From the pitted and scarred visage of the asteroid Ida revealed last year by the Galileo spacecraft, planetary scientists estimated the age of the 58-kilometer-long body at perhaps 1 to 2 billion years. But, at a diameter of 1.4 kilometers, Ida's tiny companion seemed too small to have survived battering by asteroid-belt debris for much more than 100 million years. And therein lay a paradox, since Ida's moon is widely assumed to have formed along with Ida, when an impact blew a larger parent body to bits.

But a close-up image of Ida's satellite, recently provided by Galileo, hints at a possible solution: Ida's companion may have had more than one life, having been blasted to smithereens and then reassembled, possibly several times. Indeed, it may still be in the process of rebirth after its latest demise, "sweeping up little bits around Ida—remnants of itself and maybe remnants [blasted from] Ida," says Clark Chapman of the Planetary Science Institute in Tucson, Arizona, a member of the Galileo science team.

To Chapman and other planetary scientists, the most important new information comes from the satellite's unexpectedly smooth shape. As a rule, the smaller a solar system body is, the more irregular its shape. The icy nucleus of Comet Halley, the tiny satellites of the giant planets, and small asteroids like Ida itself are all lumpy and misshapen—evidence that the gravity of bodies tens or even hundreds of kilometers across is too feeble to pull them into a smooth, spherical shape.



JPL/NASA

A gravel pile? The relatively smooth shape of Ida's satellite suggests that, rather than a chunk of rock, it is a loose aggregation of debris.

But Ida's satellite—the smallest solar system object imaged in such detail—is "as smooth as objects 100 kilometers across," notes Chapman. That suggests to him that, instead of being a single chunk of rock, it is a loose ball of boulders, gravel, and sand agglomerated by its own feeble gravity from debris left in orbit around Ida after a catastrophic impact destroyed a larger predecessor satellite.

To confirm this picture, researchers will have to get down to the details of the satellite's geology—sizes, depths, and ages of craters, for example—to tease out more clues to the satellite's history. A particularly intriguing feature is what Chapman thinks could be the track of a recent accretion event, a chain of small craters leading down and to the right from the image's largest crater. A blast of impact debris from Ida, he says, is the most likely source of such a crater chain.

If the tiny moon does prove to have been smashed to bits and then reassembled, it will join a list of Lazarus bodies that includes two of Saturn's moons, Janus and Epimetheus. The low density of these 100- to 200-kilometer satellites, which skirt the outer edge of Saturn's rings, suggests that they are loose aggregations of ring particles, which in turn may be the debris from an earlier moon destroyed by a giant impact. Destruction and rebirth may be the coming thing for the small bodies of the solar system.

–Richard A. Kerr