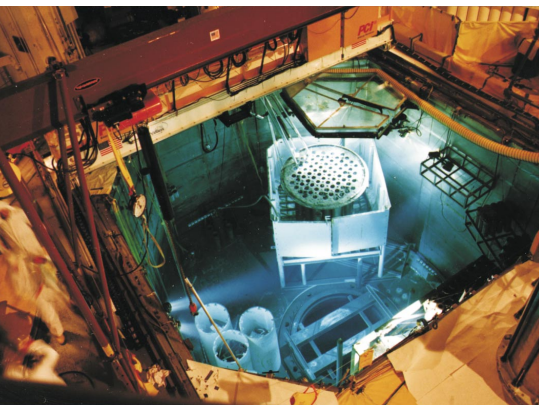




CAN MINATOM turn a profit by storing spent fuel rods?

list of potential customers to the Duma," says Thomas Cochran from the Natural Resources Defense Council in Washington, DC, "and if you look at these customers, most of their fuel is of US origin, so that fuel can't be moved without US consent." In fact, more than 90% of the spent fuel that Minatom has identified would need that consent. To get it, Russia would need to introduce tighter security, establish better controls over the distribution of funds, and sign a peaceful nuclear cooperation agreement with the US, none of which is likely. The main US concern centers around reprocessing the waste into MOX fuel, a known proliferation hazard, says a

spokesman from the US State Department. "I don't support the Minatom proposal," adds Cochran, "and I don't think it's feasible."

Another waste solution

"There are always alternatives to importing waste to Russia," says John Ahearne, an expert on nuclear waste management at Duke University in Durham, North Carolina. "You could continue to store spent fuel at the reactor sites, as is happening in the US. Japan has been examining the possibility of constructing a repository, and the Pangea group [a cooperative venture involving several Asian companies] has been trying to develop a site in Australia. However, I'm not sure whether any of these are any farther along than that in Russia." In fact, apart from the Waste Isolation Pilot Plant in New Mexico, only Finland is close to developing a repository, according to a US National Academy of Science report that came out in June.

Given the objections to Minatom's plan, a variation on it put forth by the international US-led group called the Nonproliferation Trust International may have a better chance of implementation. The NPTI proposal stipulates that the waste be sent to Russia, but that the spent fuel be stored, not reprocessed. Most of the money would go toward building a geological repository, cleaning up the environment,

providing alternative jobs for nuclear workers, and supporting the groups hardest hit by Russia's change to a market economy—pensioners and orphans. The strict controls on finance and the involvement of highly experienced groups such as Sandia National Laboratories, Duke Engineering Services, and the Society for Nuclear-Container Ltd make it likely that the US would go along with the NPTI proposal. "It will take a few years before spent fuel can move under the NPTI proposal," says Cochran, one of the promoters of the scheme, "but there are no showstoppers as there are under the Minatom proposal." In fact, he says, NPTI could sign a deal with a representative of the Russian government within the next few months.

"The principle behind sending the spent fuel to Russia to get money for cleanup is good," agrees Ahearne. "The Russians can handle the fuel, as they have some highly competent people."

But the Russian public opposes the NPTI plan almost as much as Minatom's proposal, according to Slivyak. And scientists in the US also have reservations. "A permanent repository would be very difficult for the Russians, seeing how they've made no progress on this for their own waste at all," says Macfarlane. **PAUL GUINNESSY**

New NIH Institute Seeks to Serve Physicists and Engineers in Medicine

Medical physicists and bioengineers aim to gain visibility, funding, and clout with the creation of the National Institute of Biomedical Imaging and Bioengineering (NIBIB), which became the latest addition to the National Institutes of Health family when it was signed into law in the waning hours of the Clinton presidency.

NIBIB was born of frustration: "People who work in engineering and imaging have major difficulties selling their projects to NIH," says Ferenc Jolesz. He should know. As head of magnetic resonance imaging and image-guided therapy programs at Harvard Medical School's Brigham and Women's Hospital, Jolesz oversees about 100 researchers and an annual budget of \$10 million. "We have physicians, engineers, mathematicians, physicists, computer scientists. Our projects can be good for many things—the brain, the heart, the lungs. It's very difficult to fit into the culture of NIH, which is driv-

Now that medical imagers and bioengineers have succeeded in getting their own NIH institute, they have to fill its coffers and define its role both at NIH and in the wider scientific community.

en by organ- or disease-oriented research. You have to fake it and say you are doing something for a specific disorder."

"Say you are developing a new detector material that may be used for imaging the breast or the leg bone. Because it's a detector, it may not be disease specific," adds Maryellen Giger, head of graduate programs in medical physics at the University of Chicago. "One needs funding to get a system up to the point where its uses can be determined. That's a role the new institute might fill."

It boils down to gaining recognition for bioengineering and imaging science

as fundamental disciplines in their own right, says William Hendee, vice president of the Medical College of Wisconsin in Milwaukee. "They are not just tools. They need their own identity and funding authority within NIH."

Lobbying for NIBIB

As an independent institute, NIBIB will be funded directly through Congressional appropriations. It will be NIH's clearinghouse for nationwide research grants involving development of imaging techniques for detection and diagnosis of disease; molecular imaging; image-guided surgical, chemical, and radiation therapies; and image interpretation. On the bioengineering side, it will encompass molecular diagnostics, genomics, proteomics, and development of robotic body parts, among other things.

NIBIB's leaders will be able to tag grant money for specific fields. Possible hot areas, says acting director

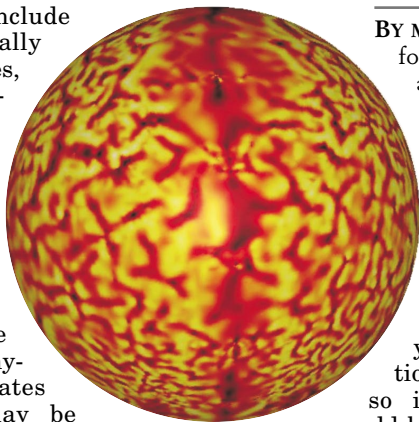
Donna Dean, include biosensors, minimally invasive technologies, contrast agents, development of imaging devices, nanotechnology, biomaterials and tissue engineering, implant science, and image processing and analysis. "Any time there is a new entity anywhere, it stimulates activity. There may be physicists and engineers who had not before thought of potential biomedical implications—this institute represents a new venue and opportunity for funding," says Dean.

Until now, grants relating to the burgeoning fields of medical imaging and bioengineering have been scattered across NIH's nearly two dozen institutes. Radiologists have been agitating with varying vigor for their own home at NIH since the mid-1970s. In 1995, they ramped up their efforts, founding the Academy of Radiology Research. An umbrella organization with 24 member societies, including the American Association of Physicists in Medicine (AAPM), ARR's sole purpose has been to lobby for the creation of a new institute at NIH.

To up their chances, in 1999 ARR joined forces with the American Institute for Medical and Biological Engineering. Hendee, who has served as president of both AAPM and AIMBE, says it's a natural match. "Bioengineering and imaging have a very large common ground. These disciplines will occupy more and more of a pivotal role in biomedicine, which is rapidly moving from being a descriptive science to a quantitative science."

The alliance paid off: On 27 September 2000, the House passed a bill to establish NIBIB. The Senate gave its nod on 15 December, and President Clinton signed the new institute into law on 29 December. (The American Institute of Physics, the publisher of *PHYSICS TODAY*, was among those weighing in at the White House with support for establishing NIBIB.) The bill was freestanding, which first bred fear that it would be vetoed, but is now cited as evidence for the seriousness of Congress's commitment to NIBIB.

But there's a snag: The bill, which was sponsored in the Senate by Trent Lott (R-Miss.) and in the House by Richard Burr (R-N.C.) and Anna Eshoo (D-Calif.), calls for the creation of NIBIB, but doesn't fund it. President Bush's budget request includes



BY MAPPING THE BRAIN onto a sphere, scientists get to peek into its folds and even—in tandem with other imaging techniques—at brain activity. The spherical map was derived from the magnetic resonance image shown on the cover of this issue using Riemann surface geometry. Red corresponds to concave regions, or sulci, and yellow corresponds to convex regions, or gyri. (Courtesy of Steven Haker and Ferenc Jolesz of Brigham and Women's Hospital, Harvard Medical School.)

\$40 million for NIBIB in fiscal year 2002. An additional \$60 million or so in existing grants would be moved from other NIH institutes to NIBIB. But other standing NIH grants—which, for bioimaging and bioengineering combined exceeded \$1 billion in FY 1999—would stay put, either because they are disease- or organ-specific or because they involve implementation, rather than development, of techniques.

"NIH has taken the position that we can responsibly get started with about \$100 million," says Dean. Nevertheless, ARR, AIMBE, and individual scientists are busy lobbying to swell the startup money three- or fourfold.

The work begins

In addition to funding research, NIBIB will train young scientists and coordinate bioimaging and bioengineering research both within NIH and across government agencies, including DOE, the Department of Defense, NSF, and NASA. Magnifying the potential importance of NIBIB is the planned closure in 2006 of the Whitaker Foundation, a key, private funder of bio-

engineering and imaging research.

Not everyone is thrilled about NIBIB, however. Some scientists argue that the institute's creation was driven by politics and they fear that it will stifle, rather than stimulate, creativity in bioimaging and bioengineering. It would have been better to support the innovations in these fields that were already blossoming across NIH, they say. Among the critics is former NIH director Harold Varmus, who, in *Science* (9 March 2001), argued for a complete organizational revamping of NIH. Indeed, NIH management tends to be wary that new institutes—which pop up at a rate of about five per decade—mean more bureaucracy and less money.

Dean admits that NIH wasn't keen on starting NIBIB. But, she says, "we look forward, not back. NIH's position was that when the bill passed, and the president signed it into law, we had a new institute, and we proceeded to implement it in good faith." Adds Hendee, "We are working hard on appropriations, on finding a new director, and on developing a strategic plan for deploying the new institute. We breathed a sigh of relief when the bill passed. But now the work begins."

TONI FEDER

Ginsparg Takes Electronic Preprint Archive to Cornell

The electronic preprint server that revolutionized communication among physicists moved in late summer from Los Alamos National Laboratory (LANL) to Cornell University, along with its creator, string theorist Paul Ginsparg, who has taken a joint position in physics and computer information science.

Physicists in every corner of the world can start their day by checking postings on the e-print arXiv (arXiv.org), which has made new results rapidly accessible to everyone, not just, as in earlier times, to a select circle of researchers and large labs that sent each other preprints. "The tempo of research has been accelerat-

ed by the archive, and it's democratized physics," says Peter Lepage, chair of Cornell's physics department. Ginsparg predicts postings this year will reach 35 000—roughly 135 per weekday.

The move—which coincided with the e-print arXiv's 10th anniversary—is a good thing, says Martin Blume, editor of the American Physical Society (APS) journals. "I won't say Paul was unappreciated at Los Alamos, but what he did was peripheral, whereas now he'll be at the center of things." Adds Ed Witten of the Institute for Advanced Study in Princeton, New Jersey, "I hope that the move will put the archive's existence on a stable