of the e-print server they wanted to build. It was ambitious.

The core of Lipman and Brown's scheme would be a Web-based arrangement like the one started by Ginsparg. The Los Alamos server accepts papers from all sources, stores them in categories, and makes them available freely over the Internet. Ginsparg does not review, edit, or correct the submissions. But the proposed biology server might differ from this model in one important way: It might include a "filter," perhaps a board of editors that would help sort papers according to subject, significance, and quality. Not all papers would go through the filter. But those that did, in this scenario, might be given to two reviewers, and their signed comments would be published alongside the original paper. This would help maintain standards and give the site some prestige.

Lipman informally presented his idea to the staff of HHMI in Chevy Chase, Maryland, in late January. One observer says the audience, including institute president Purnell Choppin, was enthusiastic; another, that the reception was "lukewarm." Officially, HHMI has no comment. Lipman and Brown then took a version of their plan to Varmus on 16 February, and Varmus and NIH staffers spent another day, 27 February, taking the proposal apart and putting it back together again. NIH officials are trying to come up with a plan that traditional journals might embrace.

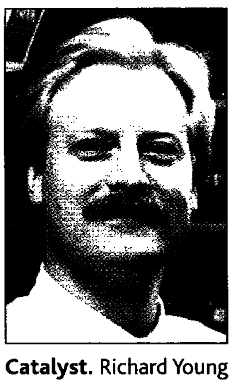
NIH continues to make revisions. In one recent version, the traditional print journals and scientific societies would be invited to team up with NIH in creating a universal biology research archive. In this scheme, journals might place their own stamp of approval on electronic papers deemed worthy of it. But the proposal may undergo further changes before it is released.

Varmus disclosed his interest in such a scheme on 4 March during the final day of a 2-week NIH budget review chaired by Representative John Porter (R–IL) in the House appropriations subcommittee for education, labor, and health and human services. Porter, raising a concern about the increasing cost of scientific journals, asked Varmus whether NIH was doing anything about it. "We are," Varmus replied, explaining that he and Lipman have been exploring ways to disseminate full-text scientific articles by grantees to other grantees, essentially as a government service. He later said that NIH could potentially save "millions of dollars" by distributing research results over the Internet, bypassing traditional journal subscription fees that eat up a lot of grant money.

"There's no such thing as a scientist who takes a journal and reads it from cover to cover."

—Patrick Brown

Journal editors who have heard of the proposal remain skeptical. For example, Tony Delamothe, an editor at the *British Medical Journal* in London, who organized an e-print experiment at the *BMJ*'s Web site, says he senses some "messianism" in schemes for reorganizing scientific publishing. He says he hasn't heard of a good way of conducting rigorous peer review online. And Ed Rekas, director of publications for the Federation of American Societies for Experimental Biology, sees a risk of "destroying the scholarly journal system that has served science so well for centuries." He wouldn't want to put a penny of public money into an e-print server.



Catalyst. Richard Young had been discussing a server for functional genomics.

Brown acknowledges that there are many "psychological barriers" to overcome. But he is convinced that the shift to Internet publishing is inevitable, and that it will increasingly be viewed as a good thing. Brown says he believes the current system is terribly inefficient. Traditional journals represent a "balkanized" form of science in which information is fragmented into literally thousands of publications, he says. And their methods of disseminating data and processing peer judgments are "klugey." At present, Brown says, "there's no such thing as a scientist who takes a journal and reads it from cover to cover." And "there's no single journal that satisfies the need of any scientist." Everyone puts together his or her own "virtual journal," Brown says, consisting of an article from one publication, a paragraph from another, a news item, 20 abstracts, 50 titles, and so on. "Some people actually Xerox these things and put them in a folder to take on a plane, so their virtual journal is almost a physical entity." Brown asks: Why not reorganize the data flow so that every biologist can get access to everything he or she needs "in a sensible way," from a single site on the Internet?

NIH will be weighing alternative proposals for an e-print server this spring. Varmus says he will pay close attention to the community's concerns. Although NIH can afford to move quickly if it wants to, he notes, the funding power "doesn't mean a thing if the scientific community doesn't want to play."

–ELIOT MARSHALL

ATOMIC PHYSICS

Atom Lasers Get More Laserlike

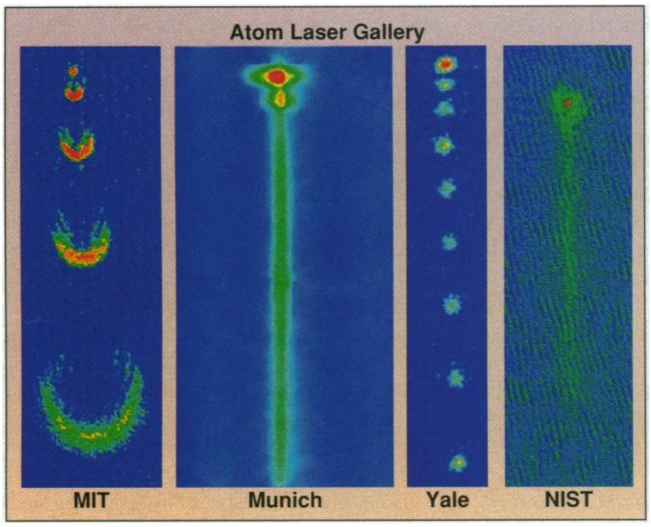
From high-tech weapons to rock-and-roll light shows, lasers are celebrated for their ability to shine a narrow, tightly focused beam of light exactly where you want it. Researchers around the world are working to give beams of atoms the same ability, essentially creating "atom lasers" that could make measurements of length and time with unprecedented accuracy or even build microscopic structures atom by atom. But the few atom lasers built so far produce an output that is more like a blob than a beam and is propelled out of the device by gravity, so it can only be directed straight down. Now a team of researchers in the United States and Japan reports on page 1706 that by carefully nudging the atom cloud at the heart of an atom laser with light, they have produced an atom beam that is far more like a laser beam.

"We're trying to do for atoms what the laser has done for optics," says team leader William Phillips of the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. The NIST approach has two advantages, notes Wolfgang Ketterle

CREDITS: (TOP) HHMI/BECKMAN CENTER/STANFORD; (BOTTOM) WHITEHEAD INSTITUTE of the Massachusetts Institute of Technology (MIT): "First, it reduces the spreading of the beam, and second, it means you can point the beam in any direction." With such a beam, says Keith Burnett of Oxford University, "you'd be able to have the same control over matter that you have over light."

The active ingredient in atom lasers is a Bose-Einstein condensate (BEC), a trapped vapor of atoms cooled down to a temperature near absolute zero. Without the jostling produced by thermal energy, the atoms all condense into the single lowest quantum mechanical state. Right after making the first BEC in 1995, physicists realized that BECs could, in theory, emit a laserlike beam of atoms whose wave properties were "coherent"—identical and in step, just like the light waves in a conventional laser. Ketterle and his MIT group produced the first atom laser in 1997 by tricking part of the atom vapor into leaving the pack (*Science*, 31 January 1997, p. 637). A BEC is held together by a magnetic field, but if the atoms are slightly tweaked with a pulse of radio waves, they ignore the field, and a burst of atoms in the same coherent quantum state drops out of the trap. More recently, in work to be reported in *Physical Review Letters*, Theodore Hänsch's group at the Max Planck Institute for Quantum Optics in Munich has coaxed a more laserlike, continuous atom beam from a BEC trap. But these atom lasers could still only point downward. "The MIT result was the landmark experiment," says Phillips, "and we now have the opportunity here to make a highly directional beam."

Phillips and his co-workers, from NIST, Georgia Southern University in Statesboro, and the University of Tokyo, were able to kick the atoms out in a real beam using a technique called Raman scattering. When a photon scatters off molecules in a fluid, it sometimes exits as a photon with a slightly longer wavelength, leaving behind a tiny bit of its energy. The team used this effect to give the atoms in their cooled vapor a slight kick of momentum to get them traveling in a beam.



Going down. Output from early atom lasers was intermittent and propelled by gravity. The new directional NIST laser is boosted by light.

One potential showstopper was that the photons used to induce Raman scattering might also get absorbed and destroy the ultracold BEC by heating it. So the researchers hit their atom cloud with two laser beams. One pumps the atoms to a higher energy level, and the second stimulates them to jump back down immediately. But the photons in the second beam, which define the size of the jump, have a slightly lower energy than those in the first, so a little bit of the photon momentum is left behind. This is just enough to produce a narrow, tightly focused atomic beam, as well defined as the laser beam from a laser pointer, spreading out with an angle of only about a tenth of a degree. And although the atom laser is not fully continuous—the Raman lasers are pulsed on and off—the emitted atom pulses overlap enough to form a nearly continuous beam.

Having an atomic ray gun with laserlike precision opens up a whole host of applications. With a beam of atoms all in the same well-defined state, better atomic clocks and high-tech meter sticks can be made. Researchers typically define such fundamental standards by counting wavelengths of optical light like the ticks of a clock or the marks on a ruler, but the quantum mechanical waves from atoms are much smaller, allowing far more precise counts. The longer term dream, however, is atomic holography. Just as a conventional hologram interferes beams of photons together to create a three-dimensional image, so an atom hologram could combine beams of atoms to build a 3D solid object. Such a technique could be used to grow nanostructures for integrated circuits or biotechnology.

Researchers caution that atom lasers won't be pumping out microprocessor chips in the near future, because the number of atoms in the laser beam is so small. "We are talking about femtograms coming out of the trap," says Ketterle. But some space-age measurement applications may not be far over the horizon. "The European Space Agency has shown interest in gravitational wave measurements with atom optics," says Burnett.

–DAVID VOSS

CREDITS: (TOP) W. KETTERLE/MIT; (BOTTOM) JEFF GREENBERG/VISUALS UNLIMITED

ScienceScope

Cash Crunch Studies at France's principal biomedical research agency could soon grind to a halt for lack of supplies. Researchers at INSERM have run afoul of controversial spending rules from the finance ministry, which require public labs to buy most of their supplies from companies chosen by competitive bidding at the beginning of each year. So far, however, INSERM has failed to designate its suppliers for 1999. As a consequence, researchers are exhausting limited funds set aside for purchases from "unofficial" suppliers. "I can't even buy food for my animals," says one.

INSERM researchers are protesting the buying restrictions and last week asked Prime Minister Lionel Jospin to delay proposed changes that would force scientists to make up their shopping lists a year in advance, which they say would make things even worse. A ministry adviser, however, disputed that notion, saying the changes would also widen buying choices and "take into account the special needs of researchers." Meanwhile, as an emergency measure, the ministry has doubled the amount researchers can spend with unofficial suppliers, but even these extra funds are running out fast.

Believe It or Not Newspapers in Canada and Britain are reporting that a soon-to-be-published study shows that microwave radiation from cell phone antennae messes with your short-term memory. They have even quoted British scientists who say they are limiting cell phone use based on the results. But sources familiar with the study have told *Science* that the findings are the opposite of what's been reported: that a brief, 10-minute stint on a cell phone appeared to enhance memory of a word list presented right after the call.

Researcher Alan Preece of Bristol University won't confirm either interpretation of his team's work, which is the first human trial designed to see if cell phone radiation influences brain function. The trial's results will appear in next month's *International Journal of Radiation Biology*, and Preece is planning to reveal the details at an 8 April press conference.