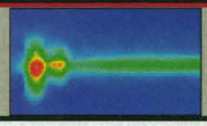
PAGE 1611



Progress toward an atom laser

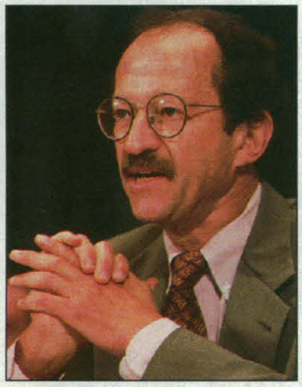
1615

How an embryo sorts out its limbs

SCIENTIFIC PUBLICATIONS

NIH Weighs Bold Plan for Online Preprint Publishing

The National Institutes of Health (NIH) is considering throwing its weight—and money—behind an ambitious Web-based publishing venture that could radically change the way biology papers are disseminated. Harold Varmus, director of the NIH, revealed at a congressional hearing last week that he likes the idea of building a one-stop, public source for biomedical research papers, and he's been exploring ways of doing it. NIH leaders are not ready to discuss specifics because their proposal is still in its infancy. They want to avoid false steps, knowing that almost anything they propose will be seen as a threat to traditional journals. But they are drawing up plans this spring.



> **NIH's funding power "doesn't mean a thing if the scientific community doesn't want to play."**
>
> **—Harold Varmus**

The news that Varmus openly supports this idea—at least in principle—has cheered a small group of researchers and database experts who have been trying to foment a revolution in scientific publishing. Led by genetics researcher Patrick Brown of Stanford University and David Lipman, director of NIH's National Center for Biotechnology Information (NCBI), they've drawn up several proposals for an electronic preprint or "e-print" repository for biology papers, modeled loosely on the e-print archives at Los Alamos National Laboratory in New Mexico, which has become a major forum for results in many areas of physics and astronomy. The proposed venture would include methods for conducting a "streamlined" version of traditional peer review of submitted papers. The details are in flux, but they're likely to be defined and released "in a relatively short time," according to Brown. Lipman discussed their plans with the Howard Hughes Medical Institute (HHMI), and now he and his colleagues are also turning to the NIH. Backed by its deep pockets, this dream could quickly become a reality.

Varmus met twice in February with proponents and has already discussed the project with, among others, Richard Klausner, director of the National Cancer Institute, and Steven Hyman, director of the National Institute of Mental Health. Both, he said, seemed favorable. Ari Patrinos, director of the Department of Energy research program that funds genome research, is supportive as well. Lipman says: "I've been impressed by the amount of discussion and careful thought given to the idea by [NIH] directors" and other leaders. "It's very exciting."

But the concept is likely to run into some heavy fire. Varmus acknowledges that some scientific societies depend entirely on their journals for income, and that a public electronic publishing center might destroy their budgets by siphoning off subscribers. These societies might object to a government agency taking over the service they now provide. Journal editors, who are likely to see such a venture as a threat, are also expected to raise substantive objections. And postdocs might be concerned that an e-print publication would lack the prestige of a paper in a traditional journal, making it less valuable on a curriculum vitae.

Prime mover. NCBI's David Lipman floated a proposal before Hughes and NIH.

Brown and Lipman had been discussing the idea of building a Web preprint site for all of biology for more than a year. But the idea gained new impetus in December at the Cold Spring Harbor Laboratory on Long Island, when biologists and database specialists got together for discussions that originally had a narrower focus. Brown had organized a session to discuss a new repository for gene expression data. He and Richard Young of the Whitehead Institute for Biomedical Research at the Massachusetts Institute of Technology told how their research has already led them to do their own electronic publishing of sorts. In what is known as functional genomics, they use microarrays of DNA sensors to monitor the simultaneous functioning of thousands of genes, producing huge sets of data. The only way to make sense of the information, Young says, is to visualize it in a dynamic computer display. For that reason, he and Brown began publishing results on their Web pages and sharing new data over the Internet, and they were ready to spread the gospel. "We realized that what we need is a centralized mechanism," Young says, to serve the functional genomics community.

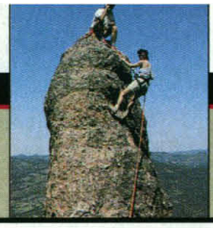
Members of the European Molecular Biology Laboratory (EMBL) also have been talking about building such a facility, Young says. And Alvis Brazma of the European Bioinformatics Institute at the Wellcome Trust's campus at Hinxton near Cambridge, U.K., is attempting to put together a group to support a new EMBL functional genomics data center in Europe. He's organizing a planning session in Europe later this year.

But at the Cold Spring Harbor meeting, Paul Ginsparg, the physicist who started the Los Alamos e-print server, described his project and urged biologists to broaden their efforts. According to attendees, Brown's idea for a broad-spectrum biology site has won support from other scientists, including Gerald Rubin of the University of California, Berkeley, Leland Hartwell of the Fred Hutchinson Cancer Research Center in Seattle, and David Botstein of Stanford. By January, Brown and Lipman had put together a rough description

CREDITS: (TOP) RICK KOZAK; (BOTTOM) KARLTON JACKSON/NLM

FOCUS

LEAD STORY 1620
Eastern Europe's social sciences slowly emerge from the dark days of Soviet subjugation



1623
Diverse cliff ecosystems at risk

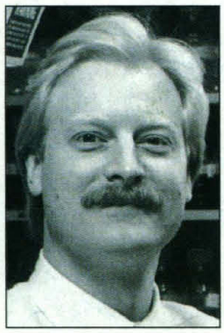
1626
A final burial ground for radwastes?

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.

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

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.



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

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.

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.

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