found that "there is too much reliance on a limited number of known individuals," and too few women and minorities are tapped early in their careers. Yet only eight of 128 people who responded to a question about expanding participation in NRC studies suggested adding minorities, women, or young researchers to council bodies. Despite some carping, volunteers seem pleased with how the NRC operates. A survey of nearly 1500 people found that 87% would serve again, and 92% were satisfied or very satisfied with the quality of the NRC work.

With regard to staff, Alberts says he will emphasize professional development and improving communication "so that help can be provided before things go wrong." The initial reaction to the proposals by staff seems positive. "People aren't jumping up and down," says one staffer who requested anonymity, "but we're optimistic." Colglazier says the plan will be finalized in November and implemented by the end of the year.

–ANDREW LAWLER

SCIENTIFIC PUBLISHING

Chemists Toy With the Preprint Future

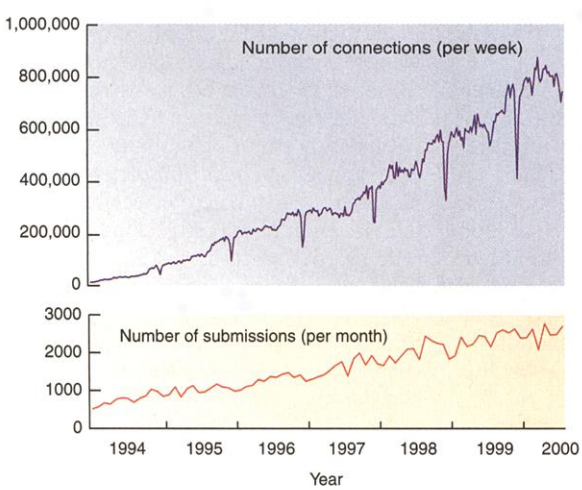
After watching their physics colleagues explore the digital landscape of electronic preprints over the past decade, chemists are sending out a survey party of their own. Last week, the giant publishing house Elsevier Science launched the first electronic archive for chemistry preprints through its ChemWeb subsidiary. The new site (http://preprint.chemweb.com) will be a common repository for reports on a wide range of chemistry topics and a forum for authors and readers to discuss the results. But ChemWeb could face an uphill battle in convincing authors to post their papers on the site, as many of the field's premier journals decline to accept papers that have already been posted on the Web.

ChemWeb's new preprint service is modeled closely on the physics preprint archive started in 1991 by Paul Ginsparg at Los Alamos National Laboratory in New Mexico, which today serves as a storehouse for some 146,000 articles. Although readers of the new chemistry preprints will be able to rank the papers, there will be no formal peer review, says ChemWeb's preprint manager James Weeks. The service is free to both authors and readers. (They need only register with ChemWeb, which is also free.) ChemWeb, says Weeks, hopes that its new service will generate enough Internet traffic to lure advertisers to fund the site.

For now, about all the site is attracting is heated debate. "A preprint server is highly controversial among chemists," said Daryle Busch, president of the American Chemical Society (ACS), speaking at the society's national meeting in Washington, D.C., last week. Busch, a chemist at the University of Kansas, Lawrence, says he and his colleagues are lured by the Web's speed, wide dissemination, and low cost of publishing new scientific results. But many researchers fear that the absence of peer review will reduce the quality of submissions and force readers to wade through electronic mounds of poor-quality results in search of tidbits of worthwhile science. Says Peter Stang, a chemist at the University of Utah, Salt Lake City, "It's a dilemma."

Apparently, it's one that a broad cross section of chemists are struggling with. According to Robert Bovenschulte, head of ACS publications, the association conducted a survey of some 8000 of its members last summer on the question of non–peer-reviewed electronic preprints. The results "are a very mixed bag," Bovenschulte says. "A lot of people were in favor of it. A lot of people were against it."

Nevertheless, the new preprint archive likely faces a tough future, because ACS journal editors themselves are lined up against it. ACS, the world's largest scientific membership organization, with 161,000 members, also publishes many of the premiere journals in the field including the flagship *Journal of the American Chemical Society*. But nearly all ACS journal editors consider posting results on the Web to constitute "prior publication," says Bovenschulte. (*Science* maintains the same policy.) As a result, Boven-



CREDITS: (LEFT TO RIGHT) ARXIV.ORG; L. KOSSOFF/AP

Physics envy. Elsevier is hoping its chemistry preprint archive will prove as popular as the Los Alamos physics archive, use of which by U.S.-based users is shown above.

ScienceScope

Animal Outrage A prominent biomedical research group wants to derail a possible agreement between the government and an animal rights group that it says would hamper research. The National Association for Biomedical Research (NABR) of Washington, D.C., this week said it will go to court to oppose a U.S. Department of Agriculture (USDA) bid to reach a settlement with groups pushing to have the agency regulate the use of laboratory mice, rats, and birds.

Mice, rats, and birds—which make up 95% of lab animals—are now exempt from the agency's Animal Welfare Act rules, which set caging and care practices. But in July the Alternatives Research & Development Foundation of Eden Prairie, Minnesota, won a key preliminary ruling in its suit to overturn the exemption (*Science*, 21 July, p. 377). On 25 August the two parties asked a federal judge for a 30-day time-out to reach a deal to phase in regulation of the animals.

NABR, however, "is absolutely opposed to these negotiations—it's an unacceptable way to make policy," says executive vice president Barbara Rich. The group, which represents more than 300 universities and hospitals, is worried that the new rules will burden researchers and that USDA doesn't have the budget to enforce them properly. USDA "is pandering to activists who oppose the use of lab animals," says Rich. "It's unbelievable."

Taking the Helm After nearly 6 weeks without a director-general, France's $2.2 billion basic research agency will apparently be led by a researcher with a taste for technology. Geneviève Berger, currently the research ministry's director of technology, was expected this week to be named to replace former CNRS chief Catherine Bréchignac, whose mandate expired in mid-July. A squabble between President Jacques Chirac and Prime Minister Lionel Jospin over whether Bréchignac should stay or go was apparently responsible for the delay (*Science*, 28 July, p. 523).

Berger, 45, has advanced degrees in physical sciences, human biology, and medicine. She is known for her work in applied medical research, especially new techniques for imaging. Such practical accomplishments made her attractive to the French government, which is pushing to make basic research serve the economy. Understanding science's impact on the bottom line is now "an essential qualification for being CNRS head," says one researcher.

cholesterol and other lipids in the gut, thus facilitating the absorption of these otherwise water-insoluble materials. Bile acids and cholesterol that fail to be absorbed or reabsorbed by the gut are excreted in the feces.

Despite the cholesterol-lowering potential of the rexinoids, drug researchers caution that the current drugs may not be usable because of their side effects. For example, a rexinoid derived from LG268 is approved for treating certain types of late-stage cancer and is being tested on others, but it raises levels of lipids called triglycerides in the blood, which could worsen obesity and cardiovascular disease. That may be acceptable for people with late-stage cancer who "have no other choice," says Vincent Giguère, a molecular biologist at McGill University Health Centre in Montreal. But "side effects become a big issue" for otherwise healthy people who may take cholesterol-lowering drugs for decades. Drugs that target LXR rather than RXR might be safer, because they would activate a smaller group of genes, Giguère suggests. Still, he adds, "these findings augur well for the future of cholesterol-controlling drugs."

–DAN FERBER

Dan Ferber is a writer in Urbana, Illinois.

INFORMATION THEORY

'Ultimate PC' Would Be A Hot Little Number

If gigahertz speeds on a personal computer are still too slow, cheer up. Seth Lloyd, a physicist at the Massachusetts Institute of Technology, has calculated how to make PCs almost unimaginably faster—if you don't mind working on a black hole.

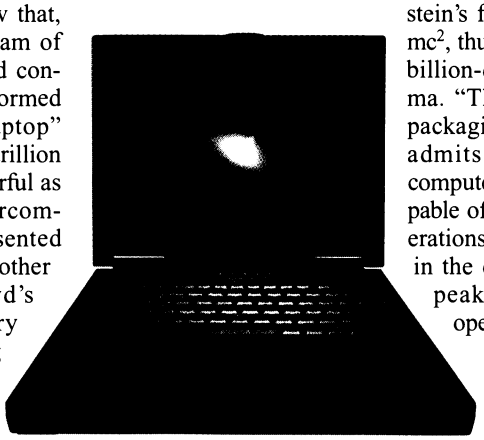
Lloyd has used the laws of thermodynamics, information, relativity, and quantum mechanics to figure out the ultimate physical limits on the speed of a computer. His calculations show that, in principle, a kilogram of matter in a liter-sized container could be transformed into an "ultimate laptop" more than a trillion trillion trillion times as powerful as today's fastest supercomputer. Although presented in whimsical terms, other scientists say Lloyd's work marks a victory for those striving to figure out the laws of physics by investigating how nature deals with information.

"It's incredibly interesting—bold," says Raymond Laflamme, a physicist at the Los Alamos National Laboratory in New Mexico. In addition to its theoretical importance, Laflamme says, the study shows what lies ahead. "Right now we are on roller skates. [Lloyd] says, 'Let's get on a rocket.'"

Lloyd's unconventional calculations are based on the links between information theory and the laws of thermodynamics, specifically entropy, a measure of the disorder of a system. Imagine dumping four balls into a box divided into four compartments. Roughly speaking, entropy is a measure of the probabilities of how the balls can land. "Ordered" outcomes (such as all four balls landing in a single compartment) are rare and have low entropy, while "disordered" outcomes (such as two balls in one compartment and a single ball in each of two others) are more common and have higher entropy.

In 1948, Bell Labs scientist Claude Shannon realized that the thermodynamic principle of entropy could also apply in the realm of computers and information. In a sense, a system such as a box with balls in it or a container full of gas molecules can act like a computer, and the entropy is related to the amount of information that the "computer" can store. For instance, if you take your box and label the four compartments "00," "01," "10," and "11," then each ball can store two bits' worth of information. The total amount of information that a physical system can store is related to entropy.

In the 31 August issue of *Nature*, Lloyd uses this principle to show that a 1-kilogram, 1-liter laptop could store and process 10^{31} bits of information. (A nice-sized hard drive holds about 10^{11} bits.) Then he figures out how quickly it could manipulate those bits, invoking Heisenberg's Uncertainty Principle, which implies that the more energy a system has available, the faster it can flip bits. Lloyd's ultimate laptop would convert all of its 1-kilogram mass into energy via Einstein's famous equation $E = mc^2$, thus turning itself into a billion-degree blob of plasma. "This would present a packaging problem," Lloyd admits with a laugh. The computer would then be capable of performing 10^{51} operations per second, leaving in the dust today's planned peak performer of 10^{13} operations per second.



All-powerful. At 10^{51} operations per second, Seth Lloyd's black-hole laptop would be the last word in computing.

CREDIT: PHOTODISC (LAPTOP); AFP/CORBIS/NASA (BLACK HOLE)

But processing speed is only half of the story. If you *really* want to speed up your computer, Lloyd says, you must also slash the time it takes to

ScienceScope

GMO Scientists Unite! Hoping to bring a voice of reason to the debate over transgenic crops, a group of scientists is launching the first society and journal to specifically address their risks.

The idea grew out of a series of international meetings, held biannually since 1988, that brought together an ad hoc group of scientists to discuss science-based regulatory policy for genetically modified organisms (GMOs). At its July meeting, organizers decided to form a permanent International Society for Biosafety Research. After years of getting hammered by "both the Greens and industry people," explains Mark Tepfer, who studies virus transfer at INRA, France's national agronomy research institute, "we need a clearer voice for scientists in the field." He and others hope to exercise "complete neutrality" in studying such hot-button issues as Bt corn's impact on butterflies.

The group's journal, *Environmental Biosafety Research*, will be launched early next year by Elsevier. Alan McHughen, a plant geneticist at the University of Saskatchewan, says it will feature research that other journals often turn down—including "negative results" studies showing that a transgenic crop appears no different from its traditionally bred counterpart.

Microbial Month Now that it is nearly finished sequencing its share of the human genome, the Department of Energy's Joint Genome Institute (JGI) has decided to tackle as many as 17 microbes—all in 1 month.

Microbial genomes typically are less than 10 million bases long, so decoding the bugs should be a snap compared with assembling the 3-billion-base human genome, says JGI's Trevor Hawkins. He predicts the Walnut Creek, California, facility will have no trouble sequencing about 2 million bases a day, enabling his team to take six or eight passes through each microbe's DNA. JGI doesn't plan to "finish" the genomes, however. Instead, it will post the data on its new "Genome Portal" Web site.

On JGI's sequencing hit list are two plant pathogens and several bacteria that fix nitrogen or sequester carbon. Two others are magnetotactic—which means they sense and move toward sources of magnetism. Stuart Levy, a geneticist at Tufts University School of Medicine in Boston, hopes his bug, a soil-dwelling *Pseudomonas* with potential for breaking down pollutants, will be among the first sequenced. That information, he says, "will move the research along much more quickly."

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