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Gore unveils computer initiative

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Why water is so strange

ACADEMIC RESEARCH

Genomic, Nanotech Centers Open $200 Million Push by Harvard

Harvard University has embarked on a science spending spree intended to keep it at the forefront of several hot areas of academic research. Officials today announced plans to spend up to $200 million over the next 5 years, using money in hand to jump-start about five new interdisciplinary research initiatives. Two centers—focusing on genomics and nanotechnology—are the first across the starting line (see box), and other efforts in neuroscience, computer research, and the links between evolution and global climate change may be launched in the coming year.

The new spending is fueled by the sharp growth this decade in Harvard's endowment, which represents funds raised by the university's 10 schools. The total has more than doubled since 1994 to $13 billion (see graphic), the nation's largest. Also contributing is a successful $2.1 billion fund-raising campaign winding down this year. The money will be used to revitalize the 363-year-old university's approach to science, which has already earned its faculty 29 Nobel Prizes and top rankings for publishing widely cited technical papers. Administrators hope to build on that success by providing an array of expensive machines and specialized laboratories that are beyond the financial reach of most individual investigators. They also see the shared facilities as magnets for teachers and students from different disciplines.

"Spending will be driven by scientific needs," says chemist Jeremy Knowles, dean of the Faculty of Arts and Sciences (FAS), which is the largest of Harvard's nine faculties. In addition to hiring new professors and providing new facilities, Knowles says, "we want to be able to expose our students to colleagues working together across the landscape of science." The FAS's 650 professors—including more than 150 scientists—teach all of Harvard's 6600 undergraduates and most of the school's graduate students.

The initiative also represents an aggressive bid to attract top-notch students and scientists. "There is a sense that we cannot afford not to do this," says Knowles, noting that "a number of distinguished peer institutions have already taken steps to deepen their infrastructures." Princeton University in New Jersey, for instance, is in the midst of a $60 million fund-raising campaign for a new Institute for Genomic Analysis, while the California Institute of Technology (Caltech) in Pasadena is asking individual, corporate, and foundation donors to fund a $100 million Biological Sciences Initiative to cover new faculty and facilities. The Massachusetts Institute of Technology in Cambridge and Stanford University in Palo Alto, California, have also pumped hundreds of millions into the sciences over the last decade.

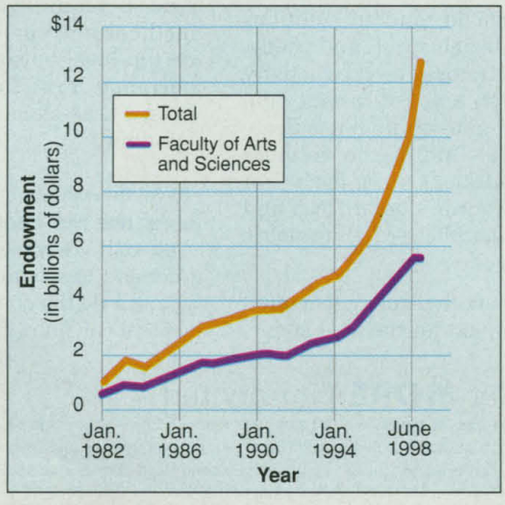
The new Center for Genomics and Proteomics will team chemists, biologists, engineers, and computer scientists to mine genome data from a variety of organisms for clues to the genetics of behavior, evolution, and the origins of disease. Center researchers will draw on—and hope to develop—a wide range of new technologies, including DNA chips that allow scientists to tell at a glance how hundreds of genes respond to drugs and computer algorithms that can discover meaningful patterns in reams of seemingly chaotic genetic data. They will also pursue "chemical genetics"—the use of millions of small molecules to "perturb" proteins and expose hints about their functions. A draft proposal calls for the center to eventually have about a dozen faculty members and dozens of staff and students, housed in up to 1500 square meters of laboratory space. At that size, it would compare favorably with Princeton's planned genomics center and other facilities on the drawing board elsewhere.

The new Center for Imaging and Mesoscale Structures also will take an interdisciplinary approach to attacking big scientific problems involving very small objects. Chemists, physicists, and engineers will study, image, and fabricate extremely small structures, ranging from 1 to 100 nanometers—or from about the size of a single molecule to multimolecule materials. Potential research areas in-

CENTERING IN ON SCIENCE

Harvard will spend $70 million for a Center for Genomics and Proteomics and a Center for Imaging and Mesoscale Structures. They could be followed by others concentrating on neuroscience, computer science, and the links between evolution and global climate change.

The Center for Genomics and Proteomics	Center for Imaging and Mesoscale Structures
Faculty organizers: Stuart Schreiber, Douglas Melton, and Daniel Hartl.	**Faculty organizers:** David Nelson, Charles Lieber, and Robert Westervelt.
Focus: Apply new technologies to large sets of genes and proteins to reveal cellular and physiological functions.	**Focus:** Investigate mesoscopic electronics and mechanical devices, nanoscale materials, and the structure of biological materials.
Structure: Interdisciplinary teams from biology, chemistry, statistics, computation, and engineering/design. Proposed 1500 square meters of lab and office space.	**Structure:** Interdisciplinary teams from physics, chemistry, and engineering. Proposed 4500-square-meter, ultraclean, low-vibration facility for imaging, nanofabrication, and materials synthesis.



Taking stock. Harvard's surging endowment is helping it to spend more on science.

SOURCE: HARVARD UNIVERSITY

clude manufacturing tiny electronic and mechanical devices, creating nanoscale materials such as tubes built from carbon molecules, and exploring the laws of physics at miniature scales. Researchers will also ponder a host of biological puzzles, such as how to image cell structures and proteins.

Organizers of the mesoscale center have proposed a new 4500-square-meter building that, because of the need for special clean rooms and vibration-free labs, could cost $30 million. That money will probably be raised separately. And in a move that is both symbolic and practical, they want to put it between buildings housing the physics, chemistry, and engineering departments. "Our hope is that we will get students [from different departments] lining up to use the machines and finding out what their counterparts across the street are doing," says theoretical physicist David Nelson.

Nelson also believes the new center will help Harvard beat the competition in signing up faculty and graduate students. Already, he says, news of the center has "attracted the attention of people we might try to recruit." He calls setting up the center, which will join similar new centers being completed at Rice University in Houston, Texas, and smaller facilities at several other schools, "the kind of opportunity that comes maybe once in an academic career."

Planning for the initiatives began last summer, when Knowles, urged on by scientists serving on Harvard's Board of Overseers, assembled half a dozen researchers to discuss how to expand the FAS's science programs. The discussions were aided by a decision last month to increase the payout from the school's overall endowment by 28%, to about $500 million a year. Although much of the new money will go to scholarships and other uses, some funds from FAS's $5.6 billion portion of the endowment were earmarked for science.

Harvard's expenditures don't surprise academics at other elite research institutions. "They are making downpayments in excellent areas that their peer institutions are also looking at," says Jeremiah Ostriker, provost at Princeton. Still, the size of Harvard's investment and the school's cachet have academics talking. "It's timely, and it's brilliant," says materials chemist Tom Mallouk, of Pennsylvania State University in State College, of the nanotech center and its interdisciplinary focus. The genome center "is a wonderful idea," adds Ung-Jin Kim, director of Caltech's Genome Research Laboratory, noting that investments in the field are likely to produce useful results.

But the promise of tangible gains won't necessarily lure other elite institutions to follow in Harvard's footsteps. "We're not obligated to do a 'me too,' " George Rupp, president of Columbia University in New York City, told *Science* last fall as rumors spread of the Harvard initiative. "We'll find the niches where we have an advantage. There is more scientific talent around than Harvard can use." –DAVID MALAKOFF

TERRORISM

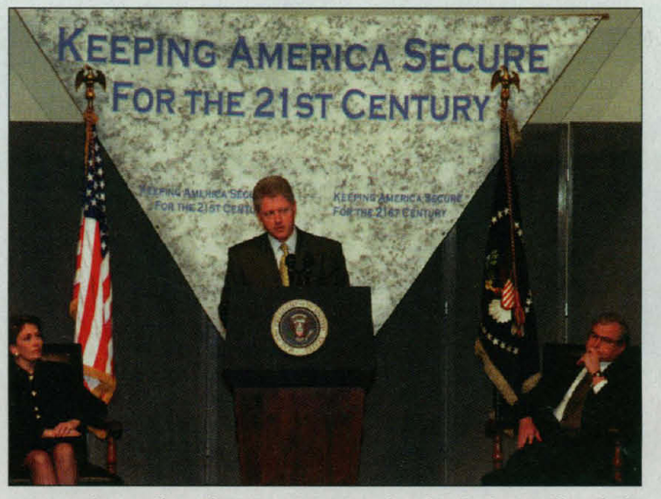
Defending Against Bugs and Bytes

Flanked by Nobel Prize–winner Joshua Lederberg and four Cabinet members, President Clinton announced on 22 January at the National Academy of Sciences in Washington, D.C., that he intends to ask Congress for about $2.85 billion to fight terrorist threats to the U.S. civilian population. If approved, the antiterrorism package could provide significant support for a few areas of biomedical research, including vaccine development, genetic studies of human pathogens, and development of high-speed medical diagnostics. It would also give a boost to applied computer science.

Clinton's plan is part of his year 2000 budget, which will be spelled out in detail next week. The Administration has been trotting out the budget highlights in a series of statements, including a speech by Vice President Al Gore last week laying out details of a major new computer research initiative (see p. 613).

Clinton said that he has been "nagging" his staff about bioterrorism "for the better part of 6 years," and that Lederberg—a molecular biologist and former president of The Rockefeller University in New York City—helped give credibility to his worries. Lederberg assembled a panel of experts last year to advise the Administration, Clinton said, and "then I had experts to cite on my concern, and nobody thought I was just reading too many novels late at night." Other advisers have persuaded him of the need to step up protection against attacks on military and civilian computer systems, Clinton said. He mentioned several frightening events—such as the nerve gas attack on Tokyo subway riders by the Aum Shinrikyo cult in 1995—which convinced him that "we have to be ready to detect and address a biological attack promptly, before the disease spreads."

The new budget will call for $1.385 billion for "domestic preparedness" projects aimed at protecting civilians against weapons of mass destruction—a broad category that includes nuclear, chemical, and biological attack. The proposed increase amounts to a raise of about 8%. Some areas targeted in this initiative are the development of new vaccines for anthrax and cholera ($30 million); research on faster diagnostics, antimicrobial agents, and genomic studies of potential bioterrorism agents, such as the organisms that cause anthrax, tularemia, and plague, at the National Institutes of Health ($24 million); new product regulatory review at the Food and Drug Administration ($13.4 million); and public health



Preemptive strike. Clinton announces that his budget will include $2.85 billion to combat bio- and cyber-terrorism.

SOURCE: THE WHITE HOUSE