Volume 51 – Number 7
Wednesday – November 1, 2006

TechTalk

SERVING THE MIT COMMUNITY

Lander named one of America's 'best leaders'

U.S. News list of 20 includes Stata architect Frank Gehry

Sasha Brown
News Office

Professor Eric Lander, founder and director of the Eli and Edythe L. Broad Institute, is featured as one of America's 20 best leaders in the Oct. 30, 2006, issue of U.S. News and World Report.

Eric Lander

America's Best Leaders is a special section of the weekly magazine, jointly produced by U.S. News and World Report and the Center for Public Leadership at Harvard University's John F. Kennedy School of Government. A committee of government, community and private sector leaders convened by the center selected the honorees. U.S. News does not have a vote.

Lander, 49, is founding director of the Broad Institute of MIT and Harvard and a

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PHOTO / **NIKOLA KOJIC**

MIT researchers hope the golden silk spider will help them figure out how to produce strong, durable silk artificially.

Researchers probe spiders' polymer art

Deborah Halber
News Office Correspondent

A team of MIT engineers has identified two key physical processes that lend spider silk its unrivaled strength and durability, bringing closer to reality the long-sought goal of spinning artificial spider silk.

Manufactured spider silk could be used for artificial tendons and ligaments, sutures, parachutes and bulletproof vests. But engineers have not managed to do what spiders do effortlessly.

In a study published in the November issue of the Journal of Experimental Biology, Gareth H. McKinley, professor of mechanical engineering, and colleagues examined how spiders spin their native silk fibers, with hopes of ultimately reproducing the process artificially.

McKinley heads the Non-Newtonian Fluid Dynamics research group in MIT's Department of Mechanical Engineering. Non-Newtonian fluids behave in strange and unexpected ways because their viscosity, or consistency, changes with both the rate and the total amount of strain applied to them.

Spider silk is a protein solution that undergoes pronounced changes as part of the spinning process. Egg whites, another non-Newtonian fluid, change from a watery gel to a rubbery solid when heated. Spider silk, it turns out, undergoes similar irreversible physical changes.

Stickiness and flow

McKinley and Nikola Kojic, a graduate student in the Harvard-MIT Division of Health Sciences and Technology, studied the silk of Nephila clavipes, the golden silk

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Engineer launches review of energy use in manufacturing

Deborah Halber
News Office Correspondent

Timothy G. Gutowski's mission is to help the manufacturing industry lighten up, energy-wise.

With a grant from the National Science Foundation, the MIT professor of mechanical engineering is reviewing energy use in manufacturing processes such as machining, grinding, injection molding, advanced machining methods and microelectronics fabrication methods. The goal is to compare the environmental performance of traditional methods to alternative processes, alternative product designs and proposed new processes.

The work is important because manufacturing plays a big role in U.S. energy use. Industry accounts for around 30 percent of the total, and manufacturing is responsible for around 80 percent of industrial use. In addition, the manufacturing industry designs and builds all of the equipment used in the other major energy use sectors.

"Manufacturing processes can be thought of as products with a huge energy appetite," he said. This contributes to global warming but is not as visible to the public as gas-guzzling SUVs or images of melting polar ice caps. "Many people are not aware of the energy requirements for many manufacturing processes," said Gutowski, who, after extensive work in aerospace materials and composites, switched fields seven years ago to satisfy a need "to contribute to society in a bigger way."

The problem isn't that industry isn't

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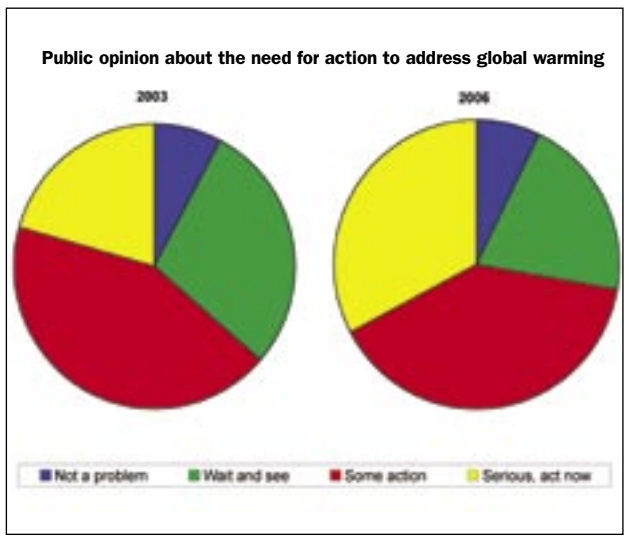
MIT survey: Climate change tops Americans' environmental concerns



GRAPHIC COURTESY / **THOMAS E. CURRY**

The graphic above shows how American attitudes have changed from doubt to acceptance of global warming.

Nancy Stauffer
Laboratory for Energy and the Environment

According to a recent MIT survey, Americans now rank climate change as the country's most pressing environmental problem—a dramatic shift from three years ago, when they ranked climate change sixth out of 10 environmental concerns.

Almost three-quarters of the respondents felt the government should do more to deal with global warming, and individuals were willing to spend their own money to help.

"While terrorism and the war in Iraq are the main issues of national concern, there's been a remarkable increase in the American public's recognition of global warming and their willingness to do something about it," said Stephen Ansolabehere, MIT's Elting R. Morison Professor of Political Science.

The survey results were released Oct. 31 at the seventh annual Carbon Sequestration Forum, an international meeting held at MIT that focuses on methods of capturing and storing emissions of carbon dioxide—a major contributor to climate change.

Ansolabehere's colleagues on the work are Howard Herzog, principal research engineer in MIT's Laboratory for Energy and the Environment (LFEE), LFEE research associates Thomas E. Curry and Mark de Figueiredo, and Professor David M. Reiner of the University of Cambridge.

The findings are a result of two surveys, the first administered in September 2003 and the follow-up in September 2006. Each survey included about 20 questions focusing on the environment, global warming and a variety of climate-change-mitigation technologies.

In designing and administering the surveys, the research team collaborated with Knowledge Networks, a company that specializes in Internet-based public opinion surveys. More than 1,200 people answered each survey (with no overlap between the two groups of respondents).

Comparing results from the two surveys provides insights into how public awareness, concern and understanding have changed—or not changed—during the past three years.

The environment continues to rank in the middle of the list of "most important issues facing the U.S. today." How-

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Housing Group panelists compare cost, quality of stock with 'ideology of home ownership.'
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Energy experts predict new fuels will mimic nature instead of mine it.
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CMS' Machinima Group harnesses 3-D game engines to create 'in-world' movie characters and action.
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Fred Sanders, pioneer storm forecaster, dies

Frederick Sanders, professor emeritus of meteorology and mentor and friend to an entire generation of weather researchers, died on Oct. 6 after a long illness. He was 83 and had been a longtime resident of Marblehead.

Sanders was pre-eminent in the field of synoptic meteorology, which seeks to understand weather systems such as fronts and cyclones by careful analysis and interpretation of weather observations. He made important contributions to the analysis, understanding, and prediction of fronts, low pressure systems, hurricanes, squall lines, and flood-producing storms, and he coined the term "bomb" to describe explosively intensifying winter storms.

Sanders helped develop one of the first successful computer models for forecasting hurricane tracks, as well as new techniques for forecasting rain and snow amounts. He pioneered methods for evaluating the skill of both human and computer weather forecasts, stressing the need for quantifying the uncertainty of the forecasts; this work also led to improvements in numerical weather prediction models.

Together with his colleague, Richard Reed, he elevated the field of synoptic meteorology to the status of a respected science, to the benefit of the field and to generations of students. He was the recipient of many awards and was a fellow of the American Meteorological Society as well as the American Association for the Advancement of Science. In 2004, the American Meteorological Society held a scientific colloquium in his honor.

Born in Detroit on May 17, 1923, Sanders spent much of his childhood in Bloomfield Hills, Mich. After attending Amherst College, where he studied mathematics, economics and music, Sanders enlisted in 1941 in the Army Air Corps, which was recruiting math and physics students to be trained as weather forecasters. He spent 15 months at MIT studying math, physics and meteorology and graduated as a second lieutenant shortly after D-Day in Normandy. He was assigned to Greenland, where he made weather predictions to assist flight crews.

After World War II ended, Sanders worked briefly as an air inspector at Headquarters Eight Weather Group at Grenier Air Force Base in New Hampshire. In 1946, he decided to become a professional weather forecaster rather than join his father's candy manufacturing business. He spent two years as a transatlantic aviation forecaster for the U.S. Weather Bureau at La Guardia Field then returned to MIT, where he earned an Sc.D. degree in 1954. He then joined the faculty of MIT's Department of Meteorology, where he remained until his retirement in 1984.

Sanders preferred to spend most of his professional time preparing lectures and interacting with students. He influenced his field not only through his own research but also through nurturing the talents of his students. Sanders took entire classes for outings on his sailing yacht, Stillwater, bringing joy as well as knowledge to the study of weather.

Sanders was a passionate sailor and participated in many ocean races, including the Newport-Bermuda and Marblehead-Halifax races. He also loved to cruise the coast of Maine and the Canadian Maritimes with his family and friends. An accomplished tenor, he sang with the MIT Choral Society and more recently with a choral group in Marblehead.

"I don't think we will ever see his equal—not just for his scientific insight, but his outgoing nature, his helpfulness, his sometimes acerbic wit and without fail remaining the consummate gentleman at all times," said his friend and colleague, Ed Zipser.

Sanders is survived by his wife, Nancy (Brown) Sanders; two sons, John Sanders and Duncan Sanders-Fleming; a daughter, Christopher Sanders; and several grandchildren.

PHOTOS / **DONNA COVENEY**

Dealing wheeling

MIT's annual auction of abandoned bikes, organized by Campus Police, always brings bright smiles to lucky bidders. Above, MIT Police Sgt. Craig Martin runs the Oct. 27 auction. Below, Alison Derrick, crew coach, delights in her newly won three-speed mobility.

OBITUARY

Robert H. Stevens

Robert H. Stevens, a retired employee of MIT's Instrumentation Lab and the Francis Bitter Magnet Lab, died July 3 at Milton Hospital after suffering a stroke. He was 90.

Stevens began a 25-year career at MIT in 1957, when he first started work for the Instrumentation Lab at MIT, which was working on guidance gyroscopes for the Polaris submarine missile program and space programs.

In the 1970s, he worked with Professor Gene Simmons in the Department of Earth, Atmospheric and Planetary Sciences as an administrator and technician on geological projects involving plate tectonics and seafloor spreading.

Stevens worked for the Magnet Lab, now known as the Francis Bitter Magnet Lab, until his 1982 retirement.

Born in 1915 in Lebanon, N.H., Stevens had lived in Milton for more than 60 years.

He served in the Massachusetts Army National Guard during World War II, and in his retirement, he volunteered at the Museum of Science and gave tours at the Church of the Presidents in Quincy.

Stevens is survived by his wife, Audrey (Munch) Stevens; a son, Jeffrey L. Stevens of Roslindale; and a daughter, Janet H. Stevens of Quincy.

Donations may be made to either the Shriners Burn Institute of Boston, 51 Blossom St., Boston, MA 02114, or to the Schepens Eye Research Institute, 20 Staniford St., Boston, MA 02114.

MIT Medical offers flu shots

As the flu season approaches, MIT Medical reminds you to consider getting immunized. You may get a flu shot when you visit your clinician for a regular appointment or you may make an appointment for one of several vaccination clinics taking place in November at MIT Medical in Cambridge. Please note that one of the clinics is being held on Veteran's Day, an Institute holiday.

- Wednesday, Nov. 1, 3 to 7 p.m.
- Thursday, Nov. 2, 7 a.m. to 7 p.m.
- Monday, Nov. 6, 7 a.m. to 3 p.m.
- Veteran's Day, Friday, Nov. 10, 7 a.m. to 12:30 p.m.
- Friday, Nov. 17, 7 a.m. to 3 p.m.

Call your primary care provider's office (if you do not have a primary care provider, please call 617-253-4481) Monday through Friday between 8:30 a.m. and 5 p.m. to make an appointment to get your flu shot at one of the Cambridge clinics.

The vaccination is a covered benefit for all students, MIT Health Plan members and members of the MIT community covered by Medicare. All others will be charged a $35 fee for the vaccine, payable at the time of the vaccination. Cash, checks and credit cards will be accepted.

DIGITALK: WHERE IT'S AT

Forum on E-mail Migration

In response to suggestions from colleagues and customers, IS&T will host a Community Forum on E-mail Migration on Thursday, Nov. 2, in Room W20-307 from 2 to 3:30 p.m. This forum will give IS&T the opportunity to hear more about customers' experiences and requirements as the e-mail landscape evolves.

Continuing an e-mail migration process that began last January, IS&T will retire support for the Eudora e-mail application effective Dec. 31, 2006. With the support of IT colleagues around campus, IS&T strongly endorses migrating from Eudora to Outlook 2003, Outlook Express or Apple Mail. Also, Qualcomm, the vendor for Eudora, recently announced that it will discontinue selling a commercial version of Eudora early next year, although MIT's existing site license will be honored until it ends in June 2007.

IS&T provides several types of assistance to support the community in the e-mail migration process. For details, go to web.mit.edu/ist/topics/email/migration.html.

R.S.V.P. for AdminIT breakfast

IS&T's Departmental Information Technology Resource (DITR) Team runs the AdminIT Program, which offers desktop computing maintenance services to administrative members of the MIT community at no charge to the department. These services cover a range of needs, including standardization of desktop applications, semiannual preventive maintenance visits and specialized support. The related Administrative Desktop Renewal Program provides options for replacing older computers.

If you think your department could benefit from participating in the AdminIT Program, come join members of DITR on Wednesday, Nov. 8 for an informational breakfast meeting. The event, which starts at 9 a.m., will be held in Room W20-491. To R.S.V.P., e-mail to Chuck King, AdminIT program coordinator, at ditr@mit.edu. To learn more about the program, visit web.mit.edu/ist/services/hardware/adminit.

NameConnector upgrade

IS&T has upgraded NameConnector, the automated voice response system for MIT's telephone switchboard. This technology lets callers to MIT's main number, 253-1000, say the name of the person or department they wish to reach and then be connected automatically.

The upgrade, from Parlance Corporation, mitigates background noise and improves name recognition for callers with strong accents. It will also allow IS&T to add some features over the next few months. These include "barge in" (where a caller can interrupt the prompts and say the name) and support for hands-free operation by recognizing specific words such as "OK" or "cancel." IS&T also expects to simplify the initial prompt so that callers can say either a person's name or a department name, without having to select which option they want.

NameConnector allows up to five different versions of a person's name (e.g., Thomas Smith/Tom Smith). If callers are having trouble reaching you or your department, send e-mail to nameconnector@mit.edu, or call 253-1000 and ask to speak to an operator. To learn more about NameConnector, see web.mit.edu/ist/services/telecommunications/nameconnector.

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Housing panelists explore unit supply, quality and cost

Ruth Walker
News Office Correspondent

Students and off-campus visitors who gathered for the third session of the Affordable Housing Forum heard that, despite the much-ballyhooed "slump" of the real estate market, the total value of housing stock in the United States is around $20 trillion—down only a trillion or two from a few years ago—and most Americans are pretty well housed.

Two panelists, Xavier de Souza Briggs, associate professor of urban studies and planning, and William C. Apgar Jr., senior scholar at Harvard's Joint Center for Housing Studies, discussed the state of the nation's housing and what national housing policy should be in the session, held in Room 10-485 on Oct. 23. The evening event was organized by the MIT Housing Group, a new student organization launched this year.

Although the panelists agreed Americans are relatively well housed, they also noted that millions of the working poor find that the high cost of housing consumes most of their income. Who in such circumstances can afford health insurance on the pocket change left over after the rent is paid—or a new set of wheels with which to seek a better job?

Briggs, who is also editor of the 2005 book, "The Geography of Opportunity: Race and Housing Choice in Metropolitan America," identified three key problems on the current housing scene:

• Unit quality: "We would love to think this is a bygone problem … but in fact substandard housing is still a striking problem." He compared the situation in Los Angeles, for instance, with its large populations of immigrants and day laborers, to what is found in parts of the developing world.

Xavier de Souza Briggs

Ari Goldstein

• Affordability: It's not a problem everywhere, but where it is, it's serious, Briggs said. "You've got an outrageously bad problem in a few dozen of the fastest-growing or otherwise most important metro areas in this country," he said.

• "Spatial concentration" of affordable housing or, at its extreme, "ghettoization": Local zoning regulations simply exclude many types of affordable housing from certain jurisdictions. And research has shown that racial and ethnic discrimination is still very much a problem, Briggs said. "It's not the brute, overt discrimination of years past. It's more subtle. Some people may not even know they've been the victims."

On the positive side of the ledger, Briggs identified some hopeful signs that local politicians, even in some traditionally conservative communities, are acting to ease the affordability crisis. He told, for instance, of going to Orange County, Calif., to "meet face to face with the America that needs to be converted" and finding surprising receptivity to "density bonuses," which can help hold housing prices in check.

Both Briggs and Apgar, a former Clinton administration colleague of Briggs's, attacked the "ideology of homeownership."

Homeownership has been given too much credit, they said, for creating stable neighborhoods and better citizens. Rather, the panelists maintained, stable housing is what makes a difference, and that may well be rental housing. But in the overheated housing market of the past few years, many people were pushed into mortgage commitments they weren't really ready for.

The MIT Housing Group was launched this year by Ari Goldstein, a master's student in city planning who is to graduate this spring. "We're hoping that MIT will continue to produce leaders in housing design, policy and development," he explained in an interview before the Briggs-Apgar panel. "I started the group because I felt a need that wasn't being filled."

Goldstein, who comes to MIT after some time working on housing issues for New York City, sees a lot of potential in the cross-pollination across the disciplines represented by the group, which has attracted about 50 students, with a solid core of about 20. To ensure continuity into next year, the group is set to elect Erica Sims, an M.B.A. candidate at the Sloan School, as co-chair at its next meeting.

"Student initiative is incredibly important in this area," said Briggs, who predicted that the student group will have an effect on campus.

"Housing is a tremendously broad and constantly evolving area, one that touches every major public issue and some of humanity's deepest values and institutions: community, family, security, aesthetics, status and success, access to opportunity," he said.

"It's crucial to have students working together, across specialties, as they prepare for careers that can help redefine housing's future around the globe. I expect it will encourage significant curriculum innovations at MIT as well."

AIDS expert equates treatment, human rights

Smallpox and polio prove global efforts can work

Stephanie Schorow
News Office Correspondent

Jim Yong Kim, the former HIV director at the World Health Organization, asked an MIT audience to recall the time when many health experts believed the best approach to AIDS in Africa was to let people die.

"It's very hard to imagine a very few years ago, the consensus was not to treat," said Kim, who gave the Arthur Miller Lecture on Science and Ethics Oct. 23 on "Human Rights, Ethics and the Global Response to the AIDS Pandemic: Why We Can't Wait."

The talk was sponsored by the Program in Science, Technology and Society (STS) and held in Bartos Theater.

Citing reasons varying from "it's too expensive" to "Africans are too 'primitive' to deal with complex treatment," to "treatment will take attention away from prevention," many world health officials did not jump to distribute new anti-AIDS drugs in Africa during the late 1990s, Kim said.

But Kim, now director of the Francois-Xavier Bagnoud Center for Health and Human Rights at the Harvard School of Public Health, argued passionately that treating those with AIDS was a matter of human rights. The failure to treat—as well as prevent—the disease is "duplicitous and cowardly," he told his audience.

Moreover, new antiretroviral drugs could be effectively distributed and used even in developing nations, he said. To dramatize his point, he displayed slides showing before and after pictures of AIDS patient Joseph Jeune. The first photo showed an emaciated, near skeletal figure; the second, a smiling, more robust man.

Kim, who was a founding trustee of the international group Partners in Health and also a 2003 MacArthur "genius" award winner, recounted the history of the change in attitudes about AIDS to illustrate his suggestion that we "re-think the entire world of human rights" to focus on "human rights in the doing."

Certainly the AIDS situation is grim. Three million people die each year from AIDS, and 40 million people are infected, with about 80 percent of them living in the world's poorest countries, Kim said. The high infection rate in many African countries means that if the death toll is not halted, "in two generations you will face social collapse," he said.

Kim noted that many health workers who advocated against treatment were not bad people; rather the grim work and horrific situations had forced many to make

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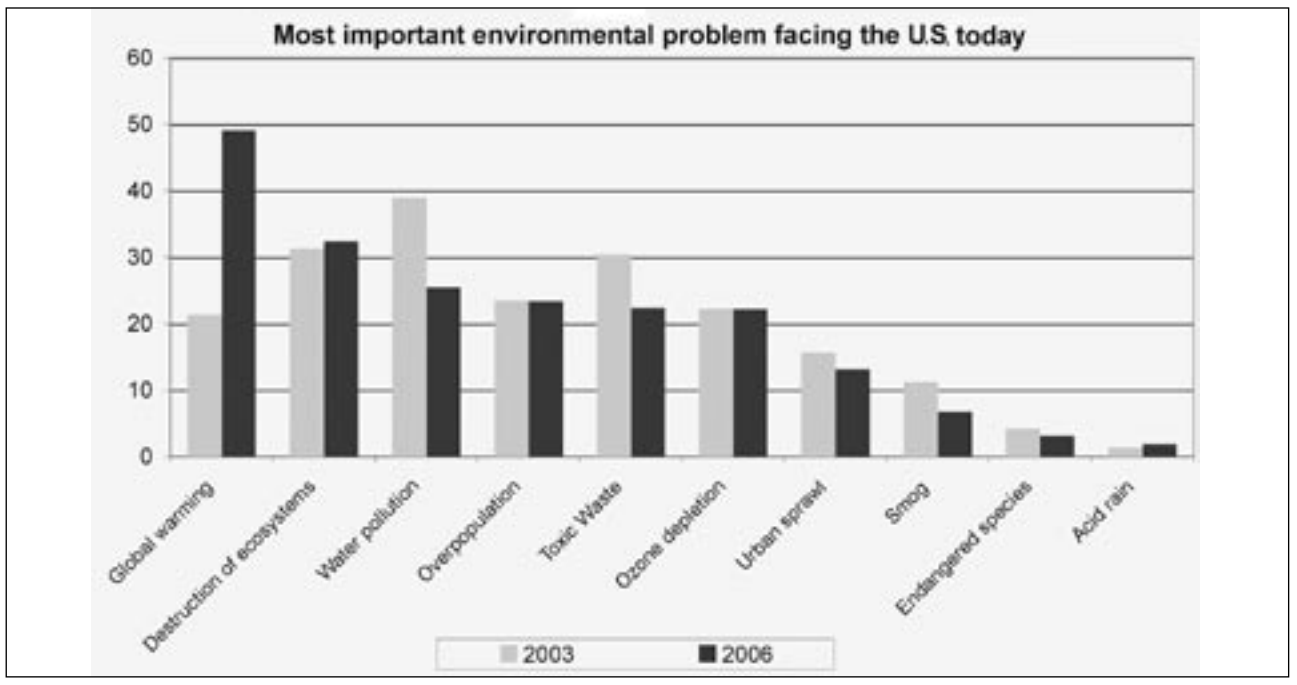

GRAPHIC COURTESY / **THOMAS E. CURRY**

Chart, above, displays how Americans responded in 2003 and in 2006 to MIT surveys asking them to rank 10 environmental issues in order of importance. Numbers represent percentages.

SURVEY

Continued from Page 1

ever, among 10 environmental problems, global warming (or climate change) now tops the list: Almost half the respondents put global warming in first or second place. In 2003, the destruction of ecosystems, water pollution and toxic waste were far higher priorities.

There is also an increased sense that global warming is an established problem. In the 2006 survey, 28 percent of the respondents agreed that it is a serious problem and immediate action is necessary—up from 17 percent in 2003. All together, almost 60 percent of the 2006 respondents agreed that there's enough evidence to warrant some level of action.

The other big change is a substantial increase in people's willingness to spend their own money to do something about it. In 2003, people were willing to pay on average $14 more per month on their electricity bill to "solve" global warming. In 2006 they agreed to pay $21 more per month—a 50 percent increase in their willingness to pay.

Could $21 make a real difference? Assuming 100 million U.S. households, total payments would be $25 billion per year. "That's real money," said Herzog. "Whether it can solve the whole problem or not is, I think, still a question. But it can certainly make significant strides."

For context, Ansolabehere pointed out that the total federal budget on energy R&D is now about $1.4 billion per year.

"Another reading of this outcome is that people want not a little bit more spent but rather a lot more spent to solve this problem—and they're willing to pay," he said.

The MIT team undertook the original survey in 2003 to find out what the public thought about carbon capture and storage (CCS), an approach that Herzog and his LFEE colleagues had been studying for more than a decade. The team was not surprised to find that more than 90 percent of the respondents had never heard of CCS. The 2006 survey showed similar results.

In general, the respondents' understanding of climate change and possible mitigation technologies showed little change between 2003 and 2006. In terms of their technology preferences, in 2006 most still recommended using more wind and solar energy and increasing efficiency, but more were willing to consider CCS and nuclear energy as possible approaches.

"It's not that people have learned something fundamental about the science, but they've come to understand that this problem is real," said Ansolabehere. "It takes a prolonged discussion of a complex topic like this really to move public concern, and what's happened over the past three years has got to continue."

The researchers plan to analyze the survey results in more depth, in particular to test for correlations between answers to questions and the economic, political, geographical and other demographic characteristics of the respondents.

This research was supported by the MIT Carbon Sequestration Initiative (sequestration.mit.edu/CSI/index.html). For more details about the surveys and their results, go to sequestration.mit.edu/research/survey2006.html.

Next energy technologies may mimic nature

Deborah Halber
News Office Correspondent

New technologies will play a major role in providing the world's growing population with the energy it will need in the coming decades—that was one of the messages of the MIT Museum's second of three "Soap Box" events devoted to energy.

Daniel Nocera, W.M. Keck Professor of Energy and professor of chemistry, and Angela M. Belcher, professor of biological engineering and materials science and engineering, spoke Oct. 25 about "The Role of New Technologies in a Sustainable Energy Economy."

Before the event, Belcher, who applies natural processes to the creation of new materials, handed out delicate abalone shells lined with iridescent mother of pearl. "Around 500 million years ago, organisms based in changing ocean concentrations starting making hard materials, because all of the sudden, they had the opportunity," she said. "Male and female abalone make millions and millions of baby abalone and build beautiful materials. They don't use any toxic materials and they don't add toxic materials back to their environment.

"Why didn't organisms make solar cells and batteries? They just haven't had the opportunity yet," Belcher said. Belcher engineers bacteria and viruses with the genetic programming to build solar cells and batteries. Given a certain genetic code and the right ingredients, the organisms self-assemble into tiny, nanoscale working devices and structures such as semiconductors. When the process is complete, there is no longer any living entity in the component, although it does contain organic parts.

Angela M. Belcher

Human beings are themselves "examples of self-assembling, self-correcting systems," she said, so it's not so far-fetched to think of such systems being put to use. Using the same materials (such as yeast) that produce beer, Belcher aims to create environmentally friendly sources for electronic devices.

Nocera talked about the necessity of finding alternative energy sources.

"What will be the oil of the future?" Nocera asked. "Water plus light."

Mimicking photosynthesis, Nocera proposes to store the high-energy bonds of light for later use. That's what photosynthesis is all about: When we eat plants, we release energy originally gathered from sunlight. "You're getting powered by sunlight. That's where our future has to evolve to," he said.

Photosynthesis splits the hydrogen and oxygen bonds in water and stores the energy as a solid. But currently available photovoltaics, or solar cells, are too expensive, "so science has to deliver new materials," Nocera said. "We would take these materials and store the sunlight in batteries."

A human being, considered as energy

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Green design research unites Institute across disciplines

Teresa Hill
Laboratory for Energy and the Environment

Green design research at MIT has one focal point in the Department of Mechanical Engineering, where Professor Timothy G. Gutowski works on environmentally benign manufacturing processes, system analysis for environmental performance and product design for recycling, among other related topics. In the same department, David R. Wallace, associate professor of mechanical engineering and engineering systems and co-director of the MIT CADlab, focuses on environmentally conscious product design and integrated computer-aided design, including aesthetics.

Faculty members from the departments of materials science and engineering, urban studies and planning, chemistry and architecture, and the Engineering Systems Division, are also addressing aspects of "green" materials and production. Research ranges from targeted work on basic science to interdisciplinary methods bringing social and technological knowledge to bear on issues such as conservation and recycling.

MIT research on, for example, alternative energy or improved engine design holds promise in the search for a low-carbon energy regime. Reduced energy use is a critical objective of green design; others include waste management, efficiency, air and water quality, health impacts of pollution and policy tools.

Randolph E. Kirchain, assistant professor of materials science and engineering systems, has been investigating the sustainability of current and emerging material systems in the life cycles of automobiles and electronics.

Joel Clark, professor of materials science and engineering systems, is developing a framework to analyze the dynamic behavior of supply, demand and prices in mineral markets.

Jeffrey I. Steinfeld, professor of chemistry, is a leader in the study of high sensitivity spectroscopic techniques for the measurement of trace gas components in the atmosphere. His group is also investigating the application of supercritical fluids as environmentally acceptable reaction media.

In the Department of Urban Studies and Planning (DUSP), Karen R. Polenske, professor of regional political econ-

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PHOTO / **HEIDEMARIE M. STEFANYSHYN-PIPER**

High-flying flag

NASA astronaut Heidemarie M. Stefanyshyn-Piper (S.B. 1985), the first alumna to fly in space, took this photo during her September mission aboard the Atlantis space shuttle. Her assignment: installing solar power structures on the outside of the International Space Station. A Navy captain, Stefanyshyn-Piper rowed for MIT varsity crew while in ROTC. This year, 17 MIT midshipmen belong to a Navy ROTC unit with members from several local universities. *—Domenico Pellegrini*

MANUFACTURING

Continued from Page 1

interested in being environmentally friendly. In fact, in an MIT Laboratory for Manufacturing and Productivity working paper from earlier this year, Gutowski wrote that the World Business Council for Sustainable Development includes 180 international corporations, and the Global Environmental Management Initiative has members in 22 business sectors totaling $915 billion in annual sales. And, he added, many leading corporations have adopted sustainable development as a major corporate strategy.

But there are paradoxes

For one, because of increased efficiency, energy use per kilogram of product produced by major industrial sectors has been declining. But, Gutowski pointed out, efficiency and increased production go hand in hand. And usually, increased production more than offsets any gains in efficiency. "Hence, energy efficiency alone has not resulted in an absolute reduction in energy use," he said.

Further, in the United States, the barriers to "environmentally benign manufacturing" differ from industry to industry and can be frustratingly complex. For instance, Gutowski said, automobiles, compared with other products, are already recycled very effectively, with only around 15 percent of the average car ending up in a landfill at the end of its life. So a suggested manufacturing alternative—using lightweight composites instead of steel—would solve one problem (making cars lighter and more fuel-efficient) while creating several others: Composite materials would increase waste because they are currently not recyclable, have no feasible recycling technologies on the horizon and increase manufacturing costs.

Meanwhile, microelectronics has different issues. Computers are used for approximately two to three years, compared with around 10 years for a car, and the recycling rate for all electronics is quite low. In addition, the manufacture of integrated circuits—the devices at the heart of all electronics products—requires the use of ultrapure materials and energy-intensive manufacturing processes.

Furthermore, new technologies such as those used to produce and process nanoscale materials and other advanced manufacturing processes exceed the energy use of older technologies by six to eight orders of magnitude on a per-unit-of-material-processed basis, Gutowski said.

Gutowski hopes these challenges can be overcome through the development of new technologies, the creation of new policies and, maybe most important, the public's willingness to foster change and absorb some of the costs. "People will pay more in the short run for environmentally friendly products," he said. "There will be a cost to this, but I don't think it will be something we can't manage."

Gutowski added that one of the most important things we can do is "educate our students and citizens about the high cost of our large-scale production and consumption on the ecosystems that presently support life as we know it."

MIT offers new medical sciences program

MIT graduate students interested in integrating their research in the life sciences with experiences in clinical medicine are encouraged to apply to the newly established Graduate Education in Medical Sciences (GEMS) program. An informational session will be held at 5 p.m. on Wednesday, Nov. 8 in 32-G449 in the Stata Center.

MIT was one of 13 universities to receive GEMS awards from the Howard Hughes Medical Institute (HHMI). Some 51 universities applied.

"A growing volume of research at MIT is related to the life sciences. Much of this work is motivated by an interest in advancing human health, yet there are very few opportunities for those working in the area to learn about human pathophysiology and medicine," said Elazer Edelman, the Thomas D. and Virginia W. Cabot Professor in the Harvard-MIT Division of Health Sciences and Technology.

The GEMS program seeks to "facilitate development of training programs that improve the understanding of medicine and pathology by Ph.D. scientists conducting biomedical research," said William Galey, director of graduate education programs at HHMI.

Ten students will be selected for admission to the first GEMS class of February 2007 from already enrolled Ph.D. students in MIT's Schools of Science and Engineering. The GEMS program runs concomitantly with the normal course of an MIT graduate education and can be completed in one and a half years without prolonging a normal Ph.D. career.

The GEMS curriculum includes a human pathology course, including molecular and cellular mechanisms of disease; a medical pathophysiology course; and a clinical experience where students work with experienced mentors who move seamlessly between clinical medicine and basic biological research. Two additional seminars will focus on the skills needed to succeed in interdisciplinary research from the scientific, medical and ethical perspectives.

The Harvard-MIT Division of Health Sciences and Technology (HST) "has been extraordinarily successful in facilitating productive engagement and fruitful working relationships with physicians in improving human health across a wide range of applications," wrote Deans Thomas L. Magnanti (School of Engineering) and Robert J. Silbey (School of Science) in a joint letter. "This program to foster translation is of great social importance, and we are very pleased that HST will leverage this experience so that graduate students pursuing Ph.D. training in the biological sciences in departments in the Schools of Science and Engineering will be afforded the opportunity to integrate medical knowledge within their graduate education."

The GEMS program is offered under the auspices of HST through a collaborative effort between MIT, Harvard Medical School and three Harvard teaching hospitals (Massachusetts General Hospital, Brigham and Women's Hospital and Beth Israel Deaconess Medical Center).

GEMS leverages HST's 36-year infrastructure designed specifically to integrate medicine, science, engineering and business within its own degree programs.

Additional information and applications for the incoming class of 2007 are available online at hst.mit.edu/gems. For questions regarding the academic program, please send an e-mail to gems@mit.edu.

Mars group launches high-flying fundraiser ... ka-ching!

Sasha Brown
News Office

Those who cannot afford the million-dollar price tag attached to space tourism will be happy to learn that at least their names—and their logos—will be able to travel into space for a much smaller fee, thanks to a group of MIT students working on the design of a small research spacecraft.

For the past five years, students from MIT's Mars Gravity Biosatellite Program and from around the world have worked together to create a satellite design that, when built, will be able to simulate a trip to Mars by sending mice into orbit around the Earth.

The biosatellite group will study how Martian gravity—about one-third that of Earth—will affect the mammalian body. They hope their work will pave the way for future manned missions to Mars.

The program is the largest known student-led spacecraft design program, with more than 450 student participants from universities around the world.

Thus far, the program has received funding from partner universities, NASA and many corporations. But the program needs a lot of money to continue, especially if the students want to meet their goal of launching from Earth in 2010. The satellite will remain in orbit for five weeks.

IMAGE COURTESY / **MIT MARS GRAVITY BIOSATELLITE PROGRAM**

A chart, above, divides the proposed 100,000-square centimeter Mars biosatellite into 'Your Name in Space' price sections to facilitate fundraising.

"Most of it is funding dependent," said Rosamund Combs-Bachmann, assistant program coordinator for the project. The students need to raise an estimated $30 million to design, implement, launch and operate the mission.

To that end, the students from MIT and the Georgia Institute of Technology have designed a unique funding scheme that will allow companies and individuals to buy square centimeter sections of the spacecraft that will be marked with their logo or name. They have dubbed their fundraiser "Your Name into Space" (YNIS).

The entry price is just $35 for one square centimeter of space, said Combs-Bachmann. There will be at least 100,000 square centimeters of space, but in order to make the name legible, donors should buy at least four, she said.

The logos and names will be printed on aluminum panels with an ink jet printer, said Combs-Bachmann, who called YNIS "a great way to get visibility and support student research."

As for who might fund such a project, Combs-Bachmann said she expects YNIS to appeal to a wide range, including corporations and "individuals who are interested in space exploration or student research." The biosatellite group is also open to the idea of one donor who would be willing to pay for all 100,000 square centimeters.

Donors who choose a location on the outside of the spacecraft for their logos will receive photographs of their "name" from space.

Donors who choose a location inside the return vehicle will receive their very own piece of the spacecraft hardware after the mission.

"It is great way not only to raise money, but also to get people excited about space exploration," said Combs-Bachmann.

To learn more, please visit www.yournameintospace.org or marsgravity.org.

SPIDERS

Continued from Page 1

orb-weaving spider. One species of golden orb spider creates a web so strong it can catch small birds. In the South Pacific, people make fishing nets out of this web silk.

The researchers chose the golden silk spider because of the formidable strength of its web. But Kojic was taken aback when the first palm-sized spider crawled out of the box he received in the mail from an accommodating employee of Miami's MetroZoo. (She simply gathered some up from the grounds; the zoo does not exhibit golden orb spiders.)

"This is pretty scary," he said. "I'd never seen a spider this big. I never grew up around anything with furry knuckles." But he quickly settled into dissecting the peanut-sized protuberance on the spider's back containing its silk-producing gland and spinneret.

Inside Charlotte's web

Spiders don't actually spin ("spinning" refers to the age-old art of drawing out and twisting fibers to form thread); instead, they squirt out a thick gel of silk solution. (One teaspoonful can make 10,000 webs.) They then use their hind legs as well as their body weight and gravity to elongate the gel into a fine thread.

Kojic, who first practiced on silkworms, learned how to extract a microscopic amount of the gel-like solution from the spider's silk-producing major ampullate gland.

The researchers used devices called micro-rheometers—custom-made to handle the tiny drops of silk solution—to test the material's behavior when subjected to forces. The team tested the thick solution's viscosity, or how it flowed, by "shearing" it, or placing it between two rapidly moving glass plates. They tested its stickiness by pulling it apart, like taffy, between two metal plates.

The magic that makes silk so strong, the researchers discovered, happens while it flows out of the spider's gland, lengthens into a filament and dries.

The key to spider silk is polymers.

Plastics, Kevlar (used in bulletproof vests) and parts of the International Space Station are some of the many items made from polymers. The proteins in our bodies are polymers made from amino acids. From the Greek for "many" and "units," polymers are long linked chains of small molecules. They can be flexible or stiff, water-soluble or insoluble, resistant to heat and chemicals and very strong.

Silk protein solution consists of 30-40 percent polymers; the rest is water. The spider's silk-producing glands are capable of synthesizing large fibrous proteins and processing those proteins into an insoluble fiber.

"The amazing thing nature has found is how to spin a material out of an aqueous solution and produce a fiber that doesn't re-dissolve," McKinley said. Like a cooked egg white, dry spider silk doesn't revert to its former liquid state. What started out as a water-based solution becomes impervious to water.

The silk protein's long molecules are like tangled spaghetti. They form a viscous solution but are slippery enough to slide past each other easily and squeeze through the spider's ampullate gland. As the silk gel flows from the gland through an S-shaped, tapered canal to the outside of the spider's body, the long protein molecules become aligned and the viscosity (or resistance to flow) drops by a factor of 500 or more.

As the resulting liquid exits the abdomen through the spinneret, it has the characteristics of a liquid crystal. It's the exquisite alignment of the protein fibers, Kojic said, that gives silk threads their amazing strength.

While the silk stretches and dries, it forms miniscule crystalline structures that act as reinforcing agents. Engineered nanoparticles—tiny materials suspended in artificial silk—may be able to serve the same purpose.

In conjunction with the polymer synthesis and analysis work of Paula T. Hammond, an MIT professor of chemical engineering, McKinley's laboratory will use the new insights about spider silk to team up with MIT's Institute for Soldier Nanotechnologies to emulate the properties of silk through polymer processing.

"We're interested in artificial materials that emulate silk," McKinley said. Tailoring the properties of the liquid artificial spinning material to match the properties of the real thing "may prove essential in enabling us to successfully process novel synthetic materials with mechanical properties comparable to, or better than, those of natural spider silk," the authors wrote.

This work was supported by the NASA Biologically Inspired Technology Program, the DuPont-MIT Alliance and the MIT Institute for Soldier Nanotechnologies.

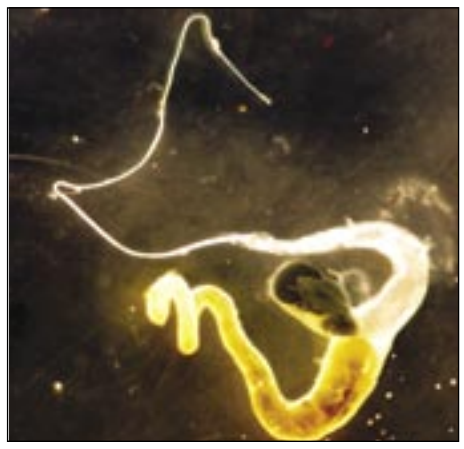

PHOTO / **JOSE BICO**

The golden silk spider produces a gel-like silk solution in the peanut-sized major ampullate gland, above. Manufactured silk could be used for artificial tendons and ligaments.

PHOTO / **DONNA COVENEY**

Professor of Mechanical Engineering Gareth McKinley, left, and HST graduate student Nikola Kojic used the micro-rheometer in their lab to study the viscosity and stickiness of spider silk. The taffy-like 'thread' is actually a protein solution, they found.

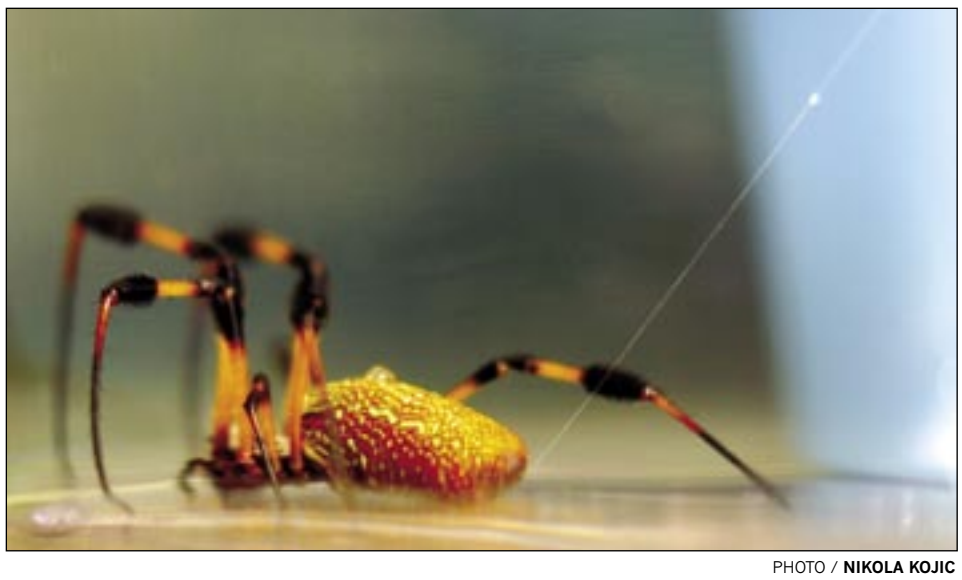

PHOTO / **NIKOLA KOJIC**

The golden silk spider, commonly found in Florida and other southeastern states, is known for its size, furry knuckles and formidably strong silk.

Black belt means business for MIT Sloan Fellow

Paul Thibodeau

Amy MacMillan
Leaders for Manufacturing Program

Like all good Canadians, MIT Sloan Fellow Paul Thibodeau was placed on hockey skates at the age of 2. However, by the age of 7, the New Brunswick native was not on his way to becoming the next Wayne Gretzky.

"I was a bad stick handler, and a bad skater—for Canadian standards," he said. Furthermore, as a youngster, Thibodeau was a bit hyperactive, and hockey simply didn't calm him down enough.

His parents told him to choose a different activity, and for the next 20 years, Thibodeau successfully focused his energy into judo, an Olympic sport from Japan whose name means "the gentle way." He earned his black belt at 16 and was the 1999 Canadian University Champion. He was a runner-up for the 2000 Canadian Olympic team but retired in 2003 after blowing out both of his knees.

Thibodeau earned both his M.Sc. and Ph.D. in radiobiology from the Université de Sherbrooke in Quebec in 1997 and 2001, respectively.

In 2001, he moved to Paris to train for the Olympics and conduct his postdoctoral research on the role of free radicals in inflammation. He chose France as a training ground because there's a strong culture of judo and many medium-weight men in France, which provided him sparring partners at his level and weight. On the academic front, he was awarded the 2003 Best Thesis Award in Life Sciences at the Université de Sherbrooke.

"Judo is probably the best way that I learned my perseverance and the strategic skills that I have so often applied while doing scientific research. It is where I have learned to surpass myself from a physical and mental standpoint," he said.

Today, Thibodeau still tries to practice judo twice a week, although most of his time is consumed by the Sloan Fellows Program. He chose Sloan to further his education because of the school's convergence of business and science, two areas he's strongly interested in. Both are in his blood, he said: His mom was a physics teacher, and his dad was a businessman. Thibodeau's ultimate goal is to hold a job that combines life sciences and business.

He's confident that his former international judo career will help him confront future challenges in his business profession. "A judo player who has a real fighting spirit does not give up in the face of challenges," he says.

LANDER

Continued from **Page 1**

popular professor of biology who has taught at MIT since 1993. In 1987, Lander received a MacArthur "genius" award. He achieved world renown for his leadership role in the Human Genome Project, which completed sequencing of the human genome in 2003.

"Eric Lander's name is familiar to anyone who has kept an eye on scientific breakthroughs of the past decade or so," said the U.S. News article. "Heading up the Broad Institute of Harvard and MIT, he's got a hand in most of the things that are possible now that the human genome is sequenced. The challenge for biology, he says, is no less than to reveal the molecular basis of human disease. His to-do list includes discovering the mechanisms of cancer, decoding the signals that cells use to communicate, and laying bare the sources of genetic variation. He's equally enthusiastic about developing the technology and techniques needed to do that work."

The panel that picked the leaders accepted nominations from a wide range of sources and compiled research on each nominee. According to the magazine, the committee defined a leader as a person who "motivates people to work collaboratively to accomplish great things." Twenty winners were selected, including some teams, from a field of more than 200.

"Lander is not one of those researchers more comfortable dealing with lab rats than people. His multifaceted background (he was trained in mathematics and taught economics before going into biology) helps him talk across scientific borders and steer notoriously individualistic scientists to work together. With his easy metaphors, he can get even lay audiences excited about concepts that otherwise would sail over their heads," the article said.

Other winners include ex-U.S. Supreme Court Justice Sandra Day O'Connor and architect Frank Gehry, who designed MIT's Stata Center.

AIDS

Continued from **Page 3**

tough choices and they saw hard decisions as part of the profession. "There was a kind of machismo in the public health world," he said.

Kim took another approach. At WHO, he launched a "3 by 5" program to get three million AIDS victims into treatment by 2005—"It was no longer a debate, it was a target." The target was deliberately overly ambitious; three million will probably be in treatment by 2008—"not bad" for a health organization, Kim said.

Moreover, treatment and prevention went hand in hand and setting up the infrastructure to treat AIDS almost meant creating primary care programs for all, he said. The next target is universal access to health care by 2010.

Asked by a member of the audience if his work was overwhelmingly depressing, he replied, "The only thing you have to keep telling yourself is 'My depression is not the point.' Optimism is a moral choice."

Kim pointed to worldwide efforts against smallpox and polio as examples of how health battles can be won. "In a world in which we're spending $2 billion a day for a war in Iraq that many people are questioning, why would public health officials argue against the kinds of investments which are very modest in comparison for treating a deadly condition that affects so many people?" he said.

GREEN

Continued from **Page 4**

omy and planning, has developed a new systemic approach to study the impacts of coal use in China. Assistant Professor JoAnn Carmin studies civic and organizational engagement in environmental governance. Assistant Professor Judy Layzer focuses on collaborative policy-making and ecosystem management.

Leon Glicksman, professor of building technology and mechanical engineering and head of the building technology program, leads research on energy-saving building technologies. His group is developing integrated real-time design tools to assess energy, lighting and comfort in buildings.

In the Department of Architecture, Leslie K. Norford, professor of building technology, is focusing on electric utility conservation and control of thermal storage systems. Associate Professor John Ochsendorf assesses the environmental impacts of building materials and design for sustainable construction and infrastructure.

The new MIT Energy Initiative will bring together existing and projected research on energy alternatives and climate change.

For a listing of MIT faculty members involved in environmental research at MIT, contact the Laboratory for Energy and the Environment (thill@mit.edu).

SOAP BOX

Continued from **Page 4**

over time, uses around the same amount of energy as a 100-watt light bulb. In 2050, Nocera said, an estimated global population of nine billion will consume 28 trillion watts per day. Meeting that demand would require growing energy-dedicated crops everywhere on the face of the earth, a new nuclear plant being built every 1.6 days for the next 45 years, or windmills covering the entire surface of the planet.

"It's got to be the sun," Nocera said, because the sun pours more energy onto the Earth's surface in an hour than the entire planet uses in a year.

Audience questions ranged from the potential dangers of self-replicating organisms (imagine a science-fiction scenario of being overrun by virus batteries) to whether Nocera's formula of future energy needs took conservation into account.

Belcher said that the organisms in her laboratory self-assemble but do not self-replicate, so there is no danger of them proliferating out of control.

Nocera said the 28 trillion watt (terawatt) figure already assumes "unprecedented conservation" along the lines of the current standard of energy consumption of people in equatorial Guinea, not the current standard for the industrialized world.

"The question is: How much is the human global population really worried about this?" Nocera said. "The real discoveries will come from basic science in academia and the next steps from industry. Funding sources tend to be short-sighted, and this approach will not help us come up with a revolutionary technology to impact energy in the next 50 to 100 years.

"We had better start taking energy as personally as health care. We need to engage everyone," Nocera said.

The Soap Box energy series is cosponsored by the Energy Research Council and the MIT Technology and Culture Forum.

Libraries offer online access to Chronicle

The MIT Libraries have purchased an electronic subscription that offers full access to current and back issues of The Chronicle of Higher Education—previously available only to individual subscribers. On-campus users will be automatically recognized as being from MIT and granted access through the Chronicle's web site at chronicle.com. Off-campus users with certificates can gain access through Vera (Virtual Electronic Resource Access) at libraries.mit.edu/vera. Vera is the Libraries' online gateway for the MIT community to more than 33,000 electronic journals and 400 databases.

CLASSIFIED ADS

Members of the MIT community may submit one classified ad each issue. Ads can be resubmitted, but not two weeks in a row. Ads should be 30 words maximum; they will be edited. Submit by e-mail to ttads@mit.edu or mail to Classifieds, Rm 11-400. Deadline is noon Wednesday the week before publication.

VEHICLES

1996 VW Jetta Gls, 4-Dr green sedan, auto, 48K, exc. cond. New paint, many features/extras, smoke/pet-free owner. $5900. For photos/test-drive, contact forsale@media.mit.edu or 617-921-1203. Located downtown Boston, on red line.

2002 Honda Civic LX 4-Dr, black, 49K, AC, AM/FM/tape, year old tires, exc. cond., $10,950, llapide@mit.edu or 617-258-6083.

1996 Chevy Silverado 2500 extended cab truck. 4 wd, ps, pb, pw, pl, remote starter, 8' bed. New motor with 3,000 miles. 2-tone paint. $5200/bst. E-mail kweisse@adelphia.net.

2003 Saturn Ion-3, 41K, 4-Dr, white, all-wheel ABS brakes, FWD, dual airbags, 5-speed manual transmission, power everything, 6-CD changer, premium sound, $9285/bst., 617-694-1929, saturn2003@mit.edu.

1994 Mercury Cougar. All pwr opts, 120K, 8 cyl, great shape, no rust. $3500/bst. E-mail chrsdemeo@gmail.com.

FOR SALE

Typewriter: Royal 10 model has beveled glass side panels. Image of this model online at www.typewritermuseum.org/collection/index.php3?machine=royal10&cat=kf. This one is in good to excellent condition. Asking $100. In North Cambridge. E-mail jceggles@mit.edu.

Futon w/ yellow cover $45, file cabinets, wood, each $50, mahogany small chest, four drawers, new condition $200. No reasonable offers on the furniture rejected. Oriental rugs, $150 and up, men's racing bike, large frame, $55. Call 617-332-8251 or e-mail: rgunder@mit.edu.

"Relax the Back" Backsaver Zero Gravity recliner chair. Marine blue leather. Bought new for $1600, will sell for $400/bst. Contact Dorothy at 617-253-8342 or dag@space.mit.edu.

Men's leather jacket, size large. Medium brown, below hip length, fleece lining, made in Italy. New, $45. Call Rosalie at 781-391-1307.

VACATION

Bethel Maine/Sunday River Ski Area: 4 BR, 1.5 BA half-house for rent. Sleeps 10. Walk to restaurants/bars and shops in village. Free shuttle to Sunday River-only 3 miles away. Weekly $1200, weekends $500. Pets welcome. 617-306-7553 or Janine@mit.edu.

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MISCELLANEOUS

Balloons for your holiday office parties are available on campus. I am an experienced (10 years), creative balloon artist, available for your holiday parties. Centerpieces, arches, balloon trees. Contact Jen at 617-452-3522 or jfield@mit.edu.

HOUSING

Very nice furnished bedroom for rent, near Harvard Square. To share 3BR house w/ (1) male Harvard Divinity student from Nigeria & (1) working professional female. $625 (all utilities included), call Trisha at 617-792-9499.

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Group eases culture shock

Sasha Brown
News Office

For many of the spouses and partners of MIT students, the first semester starts out exciting, but the second half is often when culture shock sets in, said Jessica Barton, director of the MIT Spouses and Partners Group, which is holding its biannual meeting to address the issue.

The two-hour meeting will be held Nov. 1 in W20-400 from 3-5 p.m.; it will be an opportunity for the spouses and partners to meet one another and discuss the topic at hand: "Culture Shock, Delayed Culture Shock and Reverse Culture Shock."

Although the meeting has traditionally attracted international spouses and partners, it is also open to people from other parts of the United States who also experience culture shock upon arriving at MIT, "mostly around driving," Barton said.

This time of year—a traditional period of academic intensity as well as preholiday planning—can prove to be the most challenging, Barton said, for international spouses and partners: About 60 percent of the international student spouses at MIT have visa restrictions that say they cannot work, Barton said. "They need to be creative and find ways to structure their days."

Often it is in the colder, darker months of late fall when fatigue starts to set in. "This is a time when people get very busy at MIT," said Barton. "It is normal for both them and their families to feel irritable and have trouble adjusting."

The meeting will provide an opportunity to chat with people in similar circumstances and perhaps spark the kinds of friendships that help people make it through their years at MIT. "A lot of our job is to help them network," Barton said.

For many, the adjustment is easier because they are only here for a few months at a time. But for those who have spouses in the Ph.D. programs, they could be at MIT and in Boston for years. "The adjustment all depends on how long people will be here," said Barton.

Currently 30 active members go on the field trips and attend the meetings and seminars. "A lot of people meet each other through the program and then we might not see them again," Barton said.

In many ways, independence is the goal of the program. By providing the spouses and partners with a network, the students themselves are also less stressed. "It is a great group for everyone," Barton said.

For more information go to web.mit.edu/medical/spousesandpartners/.

Web technology enriches French studies

Robin H. Ray
News Office Correspondent

French-language students at MIT are benefiting from a breakthrough method of instruction developed by Senior Lecturer Gilberte Furstenberg and her colleagues. Working in parallel with English classes at institutions of higher learning in France, the Cambridge students are using Internet forums to explore issues of cultural difference that lie deep beneath the surface of language.

As Furstenberg explained in a talk entitled "The Pedagogy of Intercultural Understanding," given on Oct. 20 under the aegis of the Center for Bilingual/Bicultural Studies, "Learning entails not just facts and knowledge but building understanding of another culture, a journey of exploration and discovery."

Furstenberg's innovative National Endowment for the Humanities-funded program, Cultura—"where the Pont Neuf meets the Brooklyn Bridge"—was specifically designed to facilitate cultural exchange rather than merely build vocabulary or reinforce grammar. It addresses some of the new priorities set out in MIT's Task Force on the Undergraduate Educational Commons, which included among its recommendations the strengthening of intercultural studies and further encouragement of study abroad by undergraduates. Says Furstenberg, "It's an educational priority on campuses across the country," as greater globalization in education, science, law and business demand greater willingness to see things from a different cultural point of view. "What we do in Cultura tackles these issues head-on."

Students on both sides of the Atlantic compare a variety of similar French and American materials that are located on an MIT web site and then, through a series of forums, share their comments and perspectives, with the goal of getting an insider's view of each other's culture. At the beginning of their journey, students are asked to write down, in their native language, word associations ("suburb/banlieue," "France," "freedom," "success"), sentence completions ("A rude person is…") and answers to questions that are designed to illuminate contrasts in cultural values and attitudes ("What would you think if you saw a mother at the supermarket hitting her child?" or "What do you do if you see a student cheating at an exam?"). The classes also read and compare print media (The New York Times and Le Monde); watch videos in tandem, taking advantage of the many French films that have been remade in English, such as "Three Men and a Baby"; and compare historical documents and literary texts.

PHOTO / **DONNA COVENEY**

Gilberte Furstenberg, above, created 'Cultura' so students may see 'where the Pont Neuf meets the Brooklyn Bridge.'

The posted responses become fodder for wide-ranging discussions as students probe differences in attitude, humor and interpersonal dynamics: An American student may comment that the French seem to touch each other more than Americans do, while the Americans are more generous with the phrase, "I love you"; a French student will respond or ask for clarification, and these exchanges in turn are used as sources of cultural and language information. Both sets of students notice right away, for example, that Americans tend to use the first person (I, me, my, mine) and personal anecdotes, while the French students use the impersonal and passive voice ("It is clear that…," "One may conclude…"). Postings generally number between 600 and 800 per semester: a large sample to mull over and analyze. (You can get a glimpse of the Cultura workings at web.mit.edu/french/culturaNEH/.)

Cultura leads the way

Since its introduction in 1997, Cultura has been adopted at numerous colleges and universities, including Brown, Barnard, University of Chicago, the University of California at Berkeley and Smith, and put to work in many languages besides French. Educational technical consultants Rich Garcia and Carter Snowden, from Academic Computing at MIT, have been instrumental in facilitating the use of Cultura by instructors and allowing it to be easily exported to other universities.

Furstenberg's sophisticated teaching methods grew out of her drive to put the technologies being developed at MIT to work in teaching the humanities. Recognizing the potential of interactive video to revolutionize language learning, she developed an award-winning "virtual immersion" software program, co-designed with Kurt Fendt, called "A la Rencontre de Philippe," which pulls students into helping a young Parisian man with his housing, work, and love problems and which was recently published by the Paris-based CLE International. She also designed the concept and pedagogy for "Dans un quartier du Paris," an interactive tour of a Paris neighborhood, published by Yale University Press, before teaming up with former colleagues Shoggy Waryn and Sabine Levet to produce Cultura.

"I believe something like this could only happen at MIT," she says.

Vogler Quartet joins Mozart homage

Acclaimed violist Marcus Thompson, the Robert R. Taylor Professor of Music at MIT, continues his series of guest performances with visiting string quartets on Friday, Nov. 3, with a performance of Mozart's Viola Quintet in E flat major with the Vogler Quartet. The concert, at which the Vogler Quartet will also perform Haydn's String Quartet No. 52 in E flat major, Op. 64, No. 6; Berg's String Quartet, Op. 3; and Webern's Six Bagatelles, Op. 9, will take place at 8 p.m. in Kresge Auditorium.

The concert marks the fifth of six concerts in a two-year series at MIT celebrating the 250th anniversary of Mozart's birth, in which Thompson performs all six of Mozart's viola quintets with visiting string quartets.

The Vogler Quartet was founded in East Berlin in 1985. With a repertoire of more than 200 works from all periods, the quartet is widely known for its extraordinary musical intelligence, creative playing, homogenous sound, rich nuances, powerful interpretations and unconventional programming. All four members studied at the Hochschule für Musik in Berlin and came to international prominence in 1986 by winning the International String Quartet Competition in Evian, Germany.

R.D. Lewis Music Library turns 10

Heather Denny
MIT Libraries

The newly renovated Rosalind Denny Lewis Music Library opened its doors 10 years ago. Thanks to the generosity of Cherry Emerson (S.M. 1941) and other donors, the library added a mezzanine, new listening/viewing equipment, comfortable study rooms, an audio preservation room, a special collections room and new office space for staff. New detailing included glass panels etched with a canon composed by Institute Professor John Harbison.

Since 1996, the renovated library has served its users well: People entered the library more than 500,000 times; approximately 330,000 items were circulated; more than 26,000 books, scores and recordings were added to the collection and more than 20 concerts and events were performed in the library by MIT faculty, students and staff.

A total of 26 music oral history interviews with 16 individuals were also recorded.

The library will host a celebration of its 10th anniversary on Wednesday, Nov. 15 from 2 to 4 p.m. For information on upcoming events, please go to libraries.mit.edu/music/.

From Corelli to Cole Porter: MIT posts its favorites

The 10 most frequently borrowed CDs and musical scores over the past 10 years show the Institute community is classically inclined yet enjoys a world music beat.

Cole Porter

Arcangelo Corelli

Top 10 most circulated CDs:

1 Vivaldi—L'Estro Armonico & Bartók—String quartets (tied at 226 loans)

2 Schumann—Dichterliebe, Liederkreis & Corelli—Concerti Grossi Op. 6 (tied at 215 loans)

3 Corelli—Trio Sonatas (213 loans)

4 Wagner—"Tristan und Isolde" (209 loans)

5 Mozart—"Don Giovanni" (204 loans)

6 "Music from Ethiopia" (202 loans)

7 Handel—"Messiah" (198 loans)

8 Bizet—"Carmen" & Bach—Brandenburg Concertos (tied at 196 loans)

9 "Shona Spirit: Mbira Masters from Zimbabwe" (193 loans)

10 Mozart—String Quartets 14 & 15 (191 loans)

Top 10 most circulated scores:

1 Schubert—Gesänge für eine Singstimme mit Klavierbegleitung, Peters (99 loans)

2 Haydn—String Quartet in B flat major, Op. 76 No. 4. Wiener Philharmonischer (81 loans)

3 Boulez—"Le Marteau sans Maître," pour voix d'alto et 6 instruments, Universal Edition (77 loans)

4 Strayhorn—"Take the 'A' train"; edited by Gunther Schuller. Smithsonian Institution (75 loans)

5 Haydn—Quartet for 2 Violins, Viola and Violoncello. Op. 74, No. 1. Eulenburg & Mozart—"Don Giovanni." Vocal score, Schirmer (tied at 72 loans)

6 Chopin—"Balladen." G. Henle (69 loans)

7 Corelli—Sonate: a violino e violone o cimbalo. Edizioni Scelte & Beethoven– Klaviersonaten I. G. Henle & Vaughan Williams—"The Lark Ascending": Romance for Violin and Orchestra. Eulenburg & Beethoven—Piano sonatas; edited by Heinrich Schenker. Universal Edition (tied at 68 loans)

8 Purcell—"Dido and Aeneas"; edited by Ellen Harris. Eulenburg & Bartók—Music for string instruments, percussion and celesta. Boosey & Hawkes (tied at 67 loans)

9 Beethoven—Klaviersonaten II. G. Henle (66 loans)

10 Porter—The Cole Porter song book. Simon and Schuster (65 loans)

For call numbers and additional information about Top 10 titles go to: libraries.mit.edu/music/activities/index.html.

PHOTO / **JAMES M. LONG**

Scene outside of time

James M. Long, an administrative assistant in the Ralph M. Parsons Laboratory, visited Beirut in March 2006. An architectural and landscape photographer, he remained aware of the political and social currents swirling around him at that time, but chose to set those issues aside in the pursuit of a strictly aesthetic vision in his artwork. "Photographing Lebanon: A Work in Progress by James M. Long" is on view at the Rotch Library (Room 7-238) through Nov. 30.

Machinima work group animates life 'in-world'

Robin H. Ray
News Office Correspondent

Student researchers working with Beth Coleman, assistant professor in comparative media studies and in the Program in Writing and Humanistic Studies, are exploring machinima, one branch of the rapidly evolving world of computer animation. As members of the Machinima Work Group, they are experimenting in the medium to find new modes of cinematic expression.

Machinima (pronounced "machine-ima," the word is coined from "machine" and "cinema") is animation that is made by harnessing 3-D game engines, such as those used in Xbox or PlayStation games, and adding original content—dialogue, dramatic situations, and new or modified characters. Relative to traditional computer-generated imagery, in which animators must create the characters, scenes (levels) and action from scratch, machinima is fast and cheap—though still enormously time-consuming. The most well-known work of machinima to date is "Red vs. Blue," a comic sci-fi series based on the popular Xbox games Halo and Marathon. (You can download episodes from "Red vs. Blue" at rvb.roosterteeth.com/archive/.) But many, including Coleman's group, are working to expand the medium above and beyond the genre of parody and to gauge its potential for artistic and cinematic expression.

Coleman explained in a recent interview that the medium has really exploded in the past five years, to the point where you now see ads on television that are made in machinima.

"It's popular because it's inexpensive and faster," she said, "but also there's a preference for the style of video games for this generation." People who grew up playing Quake and Doom feel comfortable in virtual game spaces and are stimulated by the possibility of manipulating them. They find, though, that machinima film-making has many of the same constraints and requirements as other kinds of film-making: You still have to write a script, develop the characters, make the storyboards, and edit and re-edit the work.

IMAGE COURTESY / **B. COLEMAN**

In the Machinima Work Group's animation, 'Boba Fett's Day Off,' their robo-avatar-star, above, mingles with slim, stylish women in a gravity-free yet gritty virtual landscape.

Katherine Kuan, an electrical engineering and computer science major at MIT, has been working on the machinima project since February. Said Kuan, "It started out slow, building characters on my own in Second Life," a virtual world in which people create their own "avatars" and can spend real money to buy virtual sets, costumes or scripts from other "residents." (For more on Second Life, see secondlife.com.) She enjoys working in Second Life: "It's very flexible, you can build whatever you like, and it's kind of like real film production."

This October, Coleman organized a couple of two-day "cross-university" tutorials to bring interested parties up to speed on the tools and relative merits of two different 3-D engines, UT (Unreal Tournament 2004) and Second Life. "We've done some experimenting as our own production group," said Coleman, "now we're getting together with other people."

Beth Coleman

Participants included two design students from Parsons Design School, Mikhail Akopyan and Jenny Yi-Chen, who came up from New York City especially for the tutorial, as well as Kuan. Rodica Buzescu, a Harvard graduate who manages the Second Life presence of the Berkman Center for Internet and Society at Harvard Law School, gave the group the benefit of her extensive experience "in-world." Among the issues addressed: how to get hair to flow naturally and how to make trees.

The participants came from diverse perspectives and backgrounds. While Kuan approached it from a programming background, Akopyan is a sculpture student who has used game engines to produce not animation but sculpture "without material and physical constraints." Although his interests "lean away from the technical," he found the project exciting and worth the trip from New York. Buzescu, meanwhile, noted that "Machinima is just one of my interests. I used to run a group in-world for people with Asperger Syndrome, using Second Life as a place to practice their social skills."

As the tutorial proceeded, scenes from the Machinima Work Group animation, whose working title is "Boba Fett's Day Off," popped up on Buzescu's laptop. A cement living space hovered in the air above a green landscape, where a puffy white robot mingled with a couple of slim, well-dressed women. "Hey," Coleman remarked, "the basement is floating."

"Why not?" answered Buzescu. "There's no gravity."

Novelist portrays people blinded by science

Cambridge-based novelist Allegra Goodman has been recognized for her achievement in fiction by The New Yorker, which named her one of the best writers under 40; by Salon; and with a Whiting Writers' Award. But it is "Intuition," her 2006 novel of love, greed and science, that may hold special appeal for members of the MIT community.

In her March 6 review of "Intuition," Sue Halpern wrote in The New York Times Book Review, "Goodman has written an energetic indictment of high-stakes science, presenting it as a system that makes unreasonable demands on young researchers, promotes cupidity, doesn't tolerate dissent. In the end, though, this argument fails to move (those) who come to realize that despite its failings they'd rather do 'the slow exhausting work of science than anything else.'"

Halpern summarized Goodman's plot this way: "An anxious, ambitious, down-on-his-luck postdoctoral researcher suddenly obtains results that look too good to be true—the virus he's injected into cancer-riddled mice appears to be melting away their tumors—and his girlfriend, another postdoc in the same lab, comes to suspect he's fudged his results. But she doesn't know for sure: There's no hard evidence, just some sloppy, discarded lab notes that seem to suggest it."

Goodman will read and discuss her work on Tuesday, Nov. 7 at 7 p.m. in Room 6-120.

Goodman's other books include "The Family Markowitz," "Kaaterskill Falls," and "Paradise Park."

Comedy Central

Belgium has the highest concentration of comic strip artists per square kilometer of any country in the world. Willem De Graeve, director of the Belgian Comic Strip Centre, will discuss the history of Belgian comics and their importance in Belgium today. His talk, titled "Comic strips of Belgium or The Big Success of a Small Country," will take place on Thursday, Nov. 2 at 7 p.m. in Room 32-155.

City Science fest seeks project proposals

The Cambridge Science Festival, presented by the MIT Museum, is the first-ever such festival in the United States. To be held April 21-29, 2007, the city-wide event will offer a wide range of science and technology-related activities—creative exhibitions, concerts, plays, poetry readings, lectures, debates and demonstrations—over a period of nine days and in a variety of locations.

This pioneering multimedia event is seeking contributions of performing, visual or media arts projects connecting art and science.

Proposals are being accepted for all aspects of the science festival, including opening and closing ceremonies, daily events and activities, evening celebrations and performances, and indoor and outdoor activities.

While the festival is designed to appeal to audiences from preschoolers to senior citizens, the majority of festival programming will focus on students in grades K-12 and their families.

The overarching theme for the inaugural Cambridge Science Festival is "Science in the City." Four subthemes—"Innovations," "Science & the Arts," "Energy & the Environment" and "Science in Everyday Life"—will provide unity and easy-to-understand structure for all festival events.

All venues will be in Cambridge and will include auditoriums, outdoor public spaces, theaters, storefronts, private businesses and city streets.

Organizers are looking for ideas that celebrate science and technology in ways that combine spirit, interactivity and audience appeal.

Questions?

If you would like to discuss your proposal prior to submitting it, please contact Kate Bernhardt or Ellen Bluestein at 617-253-6914; or via e-mail at info@cambridgesciencefestival.org.

Applications and additional information are available at www.cambridgesciencefestival.org.