



## Speakers exhort the Institute and the nation to honor MLK's legacy and lead the way forward—quickly

**Ruth Walker**  
News Office Correspondent

MIT's 33rd annual Dr. Martin Luther King Jr. Celebration, held Friday, Feb. 16, was a sign of the Institute's "extraordinary commitment to the principles of Dr. King," President Susan Hockfield told the capacity crowd at Walker Memorial.

But this is a time when there is a great need to "accelerate the pace of change," she added.

"If MIT today is to advance its historic mission of teaching, research and service, we simply must increase opportunities for minority faculty, students and staff," Hockfield said.

"King urges us to walk together," she



**Ted Childs Jr.**

Participants at the celebratory breakfast, which also featured musical selections by the MIT Gospel Choir and solos by Hiram Ettienne, administrative assistant in electrical engineering

said, referring to his renowned 1963 "I Have a Dream" speech, from which she read an excerpt. "We have been walking forward. But we need to pick up the pace."



**Elizabeth Clay**

Still, in the larger context, the president had some good news to report: Of new faculty on campus this year, 11.5 percent are members of underrepresented minority

and computer science, could not ignore racism or injustice at MIT or anywhere else, Hockfield said: These are "issues that reach beyond any single individual or any single institution."

groups. And this year, there are eight new MLK visiting professors and scholars, more than ever before in the program's history.

And Hockfield pointed to the Institute's ongoing gender-equity initiative as a model, both for what can be achieved with concerted effort and for the kind of national influence an MIT initiative can have.

"We want our new initiative on minority faculty issues, recently announced by the provost, to have the same catalytic impact and to demonstrate the same kind of institutional and national leadership," she said.

The title for this year's King celebra-

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## Dresselhaus wins L'Oréal-UNESCO Award

MIT Institute Professor Mildred Dresselhaus is the North American winner of a 2007 L'Oréal-UNESCO Award for Women in Science.

She and four other recipients, each representing a different continent, were named at a ceremony Feb. 22 at UNESCO House in Paris where Sir Lindsay Owen-



**Mildred Dresselhaus**

Jones, chair of L'Oréal, and Koïchiro Matsuura, director-general of UNESCO, presented each laureate with her \$100,000 award.

Dresselhaus was selected for "conceptualizing the creation of carbon nanotubes," according to L'Oréal

and UNESCO (United Nations Educational, Scientific and Cultural Organization). Due to their small size, high strength and electrical conductivity, carbon nanotubes are ideal for new materials used in objects such as lightweight bicycles and flat-panel screens.

A native of Bronx, N.Y., Dresselhaus has conducted scientific research for more than four decades. An MIT professor of physics and electrical engineering, she received her Ph.D. from the University of Chicago. She began her MIT career at the Lincoln Laboratory studying superconductivity; she later switched to magneto-optics, carrying out a series of experiments that led to a fundamental understanding of the electronic structure of semimetals, especially graphite.

Dresselhaus was the first tenured

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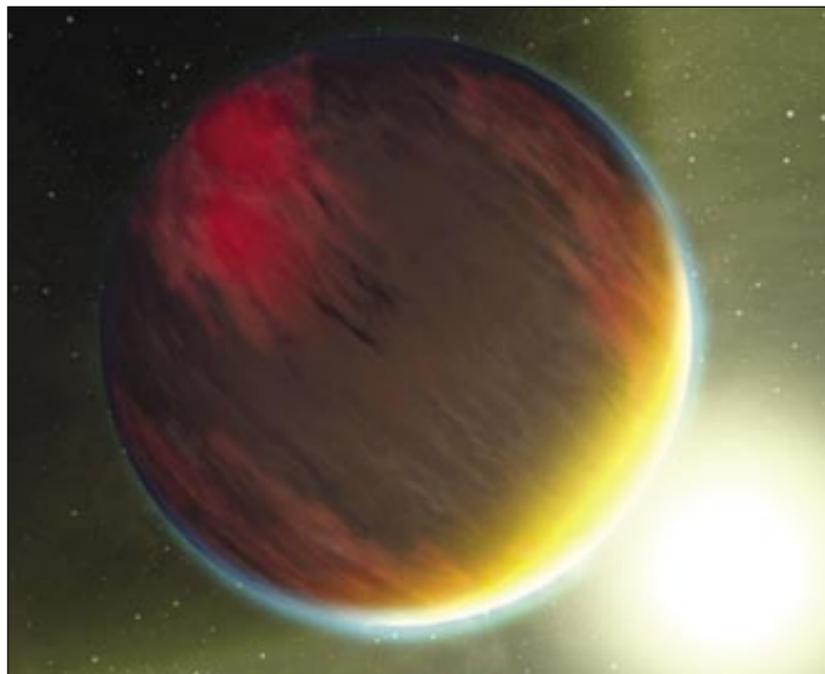


IMAGE COURTESY / NASA/JPL-CALTECH/T. PYLE (SSS)

This artist's concept shows a cloudy Jupiter-like planet, similar to HD 209458b, that orbits very close to its fiery hot star.

## Extrasolars' light guides atmosphere research

**Anne Trafton**  
News Office

So far, astronomers have discovered about 200 planets outside our solar system, known as "extrasolar" planets. Very little is known about most of them, but for the first time, scientists have obtained new information about the atmospheres of two such planets by splitting apart the light emitted from them.

Sara Seager, MIT associate professor of earth, atmospheric and planetary sciences, is part of a research group based at Goddard Space Flight Center that studied a planet about 904 trillion miles from Earth, known as HD 209458b. The

researchers used NASA's Spitzer Space Telescope to capture the most detailed information yet about an extrasolar planet.

Seager's team is one of three that are reporting spectral observations of extrasolar planets this week. Two groups studied HD 209458b, and one studied another planet in a different solar system. The work by Seager's team is reported in the Feb. 22 issue of Nature.

Astronomers often learn about distant objects, such as stars and galaxies, by studying the composition of light emitted by them, Seager said. But extrasolar planets are much dimmer than

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## New analog circuits could impact consumer electronics

Advances in digital electronic circuits have prompted the boost in functions and ever-smaller size of such popular consumer goods as digital cameras, MP3 players and digital televisions. But the same cannot be said of the older analog circuits in the same devices, which process natural sights and sounds in the real world. Because analog circuits haven't enjoyed a similar rate of progress, they are draining power and causing other bottlenecks in improved consumer electronic devices.

Now MIT engineers have devised new analog circuits they hope will change that. They reported the work at the International Solid State Circuits Conference (ISSCC) in San Francisco Feb. 11-15.

"During the past several decades engineers have focused on allowing signals to be processed and stored in digital forms," said Hae-Seung Lee, a professor in MIT's Microsystems Technology Laboratories (MTL) and the Department of Electrical Engineering and Computer Science (EECS). "But most real-world signals are analog signals, so analog circuits are an essential part of most electronic systems."

Analog circuits are used to amplify, process and filter analog signals and convert them to digital signals, or vice versa, so the real world and electronic devices can talk to each other. Analog signals are continuous and they vary in size, whereas digital signals have specific or discrete values.

The reason the two different types of electronic signal circuits did not advance at the same pace, Lee said, is because they are very different. Digital circuits can be decreased in size more easily, for example, by using the popular complementary metal oxide semiconductor (CMOS)

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# Francis E. Low, theoretical physicist and former provost, dies at 85

Francis E. Low, a retired MIT physicist and provost who worked on the Manhattan Project, died of heart failure on Feb. 16 at a retirement home in Haverford, Pa. He was 85.

"Francis was a hero of the physics department," said current department head Marc Kastner. "His theoretical ideas shaped much of modern particle physics as well as condensed matter physics, and he was a wise, generous colleague who helped many of us when we were starting our careers at MIT."

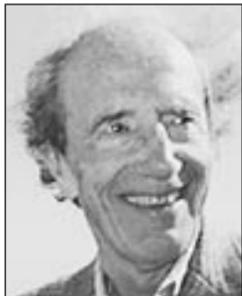
Low described his teaching and interactions with students as highlights in his long career. His former students include Alan Guth (Ph.D. 1972), the Victor F. Weisskopf Professor of Physics at MIT; Mitchell Feigenbaum (Ph.D. 1970), the Toyota Professor of Mathematical Physics at the Rockefeller University; and Susan Coppersmith (S.B. 1978), professor of physics at the University of Wisconsin at Madison.

Low, who was Guth's Ph.D. advisor, "combined a sharp intuition with a powerful calculational ability, and with these talents he contributed enormously to the foundations of theoretical physics. He delighted in learning new skills, from flying an airplane to playing the piano to composing music. Francis was a wonderful person and physicist, and I feel very lucky to have had a chance to absorb some of his zest, wisdom and inspiration," Guth said.

Low joined MIT's physics department in 1957 and served as provost from 1980 to 1985. During that time, he encouraged a prominent role for the humanities in MIT's curriculum. He was also proud that MIT became affiliated with the Whitehead Institute for Biomedical Research during his tenure as provost, according to his daughter, Margaret Low Smith.

Paul Gray, MIT president emeritus, said of Low, "This world-class theoretical physicist proved to be an adept and skillful leader. The faculty of the Institute and I are much in his debt for his willingness to undertake service to this special place."

Gray also noted that Low was the "key individual at MIT in planning, developing and negotiating all the critical elements" in establishing the Whitehead Institute for Biomedical Research 25 years ago.



Francis E. Low

Before becoming provost, he directed MIT's Center for Theoretical Physics and the Laboratory for Nuclear Science. An Institute Professor, he retired from MIT in 1991 but continued to teach physics for a few more years.

"Low's career spanned enormous changes in what it meant to be a physicist. When he began his training in the late 1930s, physics was still treated as just one subject among many. Yet soon after that, thanks to their wartime service, physicists' roles expanded dramatically. They became administrators, consultants, even political forces to be reckoned with. Francis excelled in each of these roles, while making several lasting contributions to physics itself. He has left an impressive legacy of ideas and of students," said David Kaiser, associate professor of science, technology and society.

In 1969, he became a founding member of the Union of Concerned Scientists. He served as chair for a short period but stepped down over a disagreement with members who refused to study whether nuclear reactors could be made safe and reliable.

During World War II, Low worked on the mathematics of uranium enrichment processes for the Manhattan Project at the Oak Ridge National Lab in Tennessee. He left the project to join the Army's 10th Mountain Division in Europe. He served as a mule driver and later as an artillery surveyor.

After the war, Low went to Columbia University, where he earned his Ph.D. in physics in 1950, followed by post-doctoral work at the Institute for Advanced Study in Princeton. He spent a few years teaching at the University of Illinois at Urbana-Champaign before arriving at MIT.

Low, who grew up in Manhattan, married his wife, Natalie Sadigur Low, in 1948. After she died in 2004, he moved from Belmont, Mass., to Haverford.

He had a pilot's license, enjoyed tennis and was a gifted piano player, known among friends for his ability to sing and play tunes by Cole Porter.

In addition to his daughter, he is survived by another daughter, Julie; a son, Peter; and six grandsons.

A memorial service at MIT will be scheduled at a later date.

## Vest is awarded Abelson Prize for service to society

Charles M. Vest, MIT president emeritus, has been awarded the 2006 AAAS Philip Hauge Abelson Prize for his outstanding contributions to public policy, education and university research.

Vest is a "leading voice in the ongoing conversation about the future of American research universities and has offered sound counsel to policymakers on some of the toughest issues confronting the nation," said Alan I. Leshner, chief executive officer of the American Association for the Advancement of Science (AAAS) and executive publisher of Science.

While serving as president of MIT from 1990 to 2004,



Charles M. Vest

Vest worked to strengthen government-university-industry relations and helped bring education and research issues to broader public attention. He put special emphasis on undergraduate education in science and engineering and also stressed the importance of racial and cultural diversity among faculty and students at MIT, AAAS materials stated.

Vest, who has been nominated to be the next president of the National Academy of Engineering, chaired the President's Advisory Committee on the Redesign of the Space Station and serves on the President's Committee of Advisors on Science and Technology. He chaired the U.S. Department of Energy Task Force on the Future of DOE Science Programs, was vice chair of the Council on Competitiveness for eight years and is a past chair of the Association of American Universities.

Vest also served as a member of the Commission on Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction and on the U.S. Secretary of Education's Commission on the Future of Education.

He now serves on an advisory committee on transformational diplomacy for the U.S. Secretary of State and on the Secure Borders and Open Doors Advisory Committee of the U.S. Department of Homeland Security.

The Abelson Prize was inspired by Philip Hauge Abelson, who served as long-time senior adviser to AAAS. "Chuck Vest has epitomized Phil Abelson's view of the citizen-scientist," said Leshner.

Vest earned his B.S. degree in mechanical engineering from West Virginia University in 1963 and his M.S. and Ph.D. degrees from the University of Michigan in 1964 and 1967, respectively. He is the recipient of 10 honorary doctoral degrees.

Vest, whose academic specialty was applied optics, says he enjoyed teaching and doing research. But he took the post of associate dean of the University of Michigan's College of Engineering at the behest of a colleague and found that he liked administrative work.

Asked by an interviewer in 2005 whether his background in engineering prepared him for his 14-year tenure as MIT president, Vest answered that an analytical approach can be helpful in defining and breaking down a problem. "But frankly," he said, "fostering the careers of young people is a thrill."

Vest also spoke of the changes for MIT and other institutions in the wake of the 9/11 terror attacks, with much more attention focused on scholars and students from abroad who seek visas to live and study in the United States. "My view is that it is the government's role to decide who comes to this country as an employee or scholar or student, but once they are admitted we should be able on our campuses to treat everybody exactly the same way," Vest said. He said it is essential that "we keep filling the bucket of new knowledge and new technology."

The Abelson Prize is awarded annually to either a public servant or to a scientist whose career has been distinguished both for scientific achievement and for other notable services to the scientific community. The prize consists of a plaque and an honorarium of \$5,000.

### DIGITAL TALK: WHERE IT'S AT



#### Prep computers for daylight saving time

The Energy Policy Act of 2005 changed the dates of daylight saving time this year. It will start three weeks earlier (March 11) and end one week later (Nov. 4) than last year. These date changes may impact your operating system and some software.

If you run a current operating system (Mac OS X 10.4; Windows XP or Vista; Linux Red Hat Enterprise 4) and subscribe to an auto update service, you should be set. If you don't subscribe or you have an earlier operating system, your date-time stamp may not automatically update on Sunday, March 11 at 2 a.m. You will then need to manually set the date-time stamp.

If you use TechTime for calendaring, IS&T advises that you cross-check your calendar pages for the weeks of March 11 through April 1 and the week of Oct. 29 with your reserved calendar snapshot on the web at [calendar-too.mit.edu](http://calendar-too.mit.edu). This snapshot displays the times you originally entered in TechTime, before IS&T applied a vendor patch on Feb. 19. Note that TechTime will correctly handle the time for any meetings you scheduled after Feb. 19.

To learn more about the impact of daylight saving time changes on computer systems and applications, visit [web.mit.edu/ist/topics/os/dst.html](http://web.mit.edu/ist/topics/os/dst.html). If you have questions, contact the Help Desk at [computing-help@mit.edu](mailto:computing-help@mit.edu) or x3-1101.

#### MIT Medical launches Patient Online

You can now connect with MIT Medical at any hour to manage many details of your medical care. Patient Online lets you send messages to your clinician, access your health history, request an appointment or renew a prescription, all from the convenience of your web browser. Patient Online is both secure and confidential: It upholds MIT Medical's strict privacy standards and complies with federal regulations.

To register for Patient Online, go to MIT Medical's home page at [web.mit.edu/medical/login.html](http://web.mit.edu/medical/login.html). Once you have an account, you can access the Online Front Desk to request, reschedule or cancel appointments or to update your contact information. The Online Consultation Room lets you communicate privately with your clinician and his or her staff about routine medical issues. You can also request prescription renewals and review your medications, list of allergies and immunization history. If you have questions about registering for or using Patient Online, e-mail [POLsupport@med.mit.edu](mailto:POLsupport@med.mit.edu).

#### Technotrash becomes Technocycle

Due to the strong interest on campus in recycling technological materials, the MIT Department of Facilities has revamped its Technotrash program. Now called Technocycle, the initiative features recycling bins in local mailrooms around campus. Community members can discard cell phones, PDAs, pagers, diskettes, CDs, tapes, keyboards and rechargeable batteries in these bins. Be sure, though, to delete any sensitive data before you toss!

Facilities also plans to put Technocycle bins in strategic public places on campus. Once these locations are finalized, Facilities will post the information at [web.mit.edu/facilities/environmental/reuse.html#technocycle](http://web.mit.edu/facilities/environmental/reuse.html#technocycle).

If you have a large amount of tech material to recycle, call x3-6360 or e-mail [recycling@mit.edu](mailto:recycling@mit.edu) to arrange for a pickup.

#### Sign up for security alerts

Awareness is the key to prevention. With so many security risks associated with computing nowadays, it's essential that you keep up to date. To receive the latest news on this front, be sure to subscribe to IS&T's Security-FYI e-mail newsletter. Its new format provides short summaries on software security patches and virus alerts, a safe computing tip, and any IT-security news that's relevant to MIT community members. To sign up for this informative and timely newsletter, go to [mailman.mit.edu/mailman/listinfo/ist-security-fyi](http://mailman.mit.edu/mailman/listinfo/ist-security-fyi).

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PHOTO / DAN BERSAK

Zachary LaBry, a junior in aeronautics and astronautics, listens to information on a student-led effort to bring biodiesel to campus at the second Re-Generator event on energy initiatives.

## Re-Generator event focuses on student energy initiatives

Deborah Halber  
News Office Correspondent

Dozens turned out for the second event seeking to broaden student involvement in a variety of energy-related campus initiatives.

The first MIT Generator, held last November, brought together working groups and individuals who shared the goal of making MIT a more environmentally and energy-friendly place. The Re-Generator was held Feb. 12 in the Stata Center.

After hearing presentations from groups whose efforts range from pasting energy-awareness stickers on light switches to developing tools to track building energy use, Zachary LaBry, a junior in aeronautics and astronautics, sought information on an effort to bring biodiesel to campus. "I'm interested in alternative fuels," he said.

The following working groups presented information and solicited new members:

- Biodiesel@MIT seeks to bring a biodiesel processor to campus to turn used vegetable oil from campus dining facilities into fuel for campus vehicles.
- The MIT Dorm Electricity Competition offers \$10,000 in energy-efficiency improvements to the dorm that shows the greatest percentage reduction in electricity per student from March 9 to May 4.
- The Sustainable Transportation Through Policy class aims to evaluate and recommend alternative commuter and business-related transportation policies for the MIT campus.
- The Energy Mapping Working Group seeks to identify ways to reduce MIT energy consumption by developing tools to

visualize campus energy use, building by building.

- Campus Building Energy Audits seeks to motivate behavioral change and identify building and system improvements by gathering information—and providing it to the energy mapping group and MIT Facilities—on how energy is used in buildings and modeling how that usage might be affected if improvements such as replacing windows were made.

- Closing the Loop wants to provide instant feedback on how our actions affect the planet. A "sticker blitz" on everything from lights to water heaters to revolving doors, for instance, could let people know that using the revolving door would save enough energy to light a 60-watt bulb for 23 minutes.

- The Indicators Working Group will assess "walk the talk" efforts on campus and measure MIT's progress against that of other universities through a biannual "MIT Sustainability Report."

- The Campus Visioning project seeks a way to create steps to enact and evaluate MIT's long-range environmental imprint through 2050.

- RecycleMania@MIT 2007 is MIT's entry in a national competition involving more than 200 colleges and universities trying to generate the largest total of recycled material.

- The Laboratory for Energy and the Environment and the Environmental Programs Office sponsor several campus sustainability UROPs each semester for hands-on projects on topics as diverse as energy conservation in laboratories to

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Sherwin Greenblatt

## Team unlocks genetic basis of Type 2 diabetes

Researchers from the Broad Institute of MIT and Harvard, Lund University and Novartis have announced the completion of a genome-wide map of genetic differences in humans and their relationship to Type 2 diabetes and other metabolic disorders.

All results of the analysis are accessible, free of charge, on the Internet to scientists around the world.

The work is the result of a pioneering public-private collaboration known as the Diabetes Genetics Initiative (DGI), which was formed in 2004 and is aimed at deciphering the genetic causes of Type 2 diabetes. Although Type 2 diabetes clearly runs in families, suggesting the importance of inherited factors, its genetic origins remain largely unclear.

"The Human Genome Project, HapMap database and new genomic tools have made it possible for the first time to screen the genome for DNA variations that contribute to common diseases," said principal investigator David Alt-

shuler, the director of the Program in Medical and Population Genetics at the Broad Institute and an associate professor at Massachusetts General Hospital and Harvard Medical School. "Since diabetes and cardiovascular risk factors are influenced by many genes, environment and behavior, these powerful new tools are required to pick up the effect of any one genetic risk factor."

As a so-called "complex" disease, Type 2 diabetes is influenced by several genetic factors that, when combined, can significantly increase a person's risk of disease, but alone exert only small effects. Initial analyses of the data generated by the DGI reflect this complexity.

Given the subtle nature of each genetic variation and the importance of subsequent scientific validation and replication, the partnership's conclusions have yet to be released, pending peer-review and publication. However, scientists worldwide can access the data without delay at [www.broad.mit.edu/diabetes/](http://www.broad.mit.edu/diabetes/).

## MIT, Abu Dhabi Future Energy Company sign cooperative agreement

Effort will help establish region's first research-driven grad program

MIT and the Abu Dhabi Future Energy Company (ADFEC) announced Sunday the signing of a cooperative agreement preparing the way for MIT's Technology and Development Program to help develop the Masdar Institute of Science and Technology in Abu Dhabi.

The agreement paves the way for MIT faculty, coordinated by MIT's Technology and Development Program, to assist Masdar in the development of a postgraduate educational and research institute, making it the first institution dedicated to research-driven graduate programs in the region.

The Masdar Institute of Science and Technology is envisioned as the centerpiece of a multifaceted, regional economic development program—the Masdar Initiative—announced in April 2006 by the Abu Dhabi government.

"MIT faculty and staff will provide advice, scholarly assessment and assistance in connection with the establishment of the Masdar Institute," said MIT Chancellor Phillip Clay. "This includes working with ADFEC to develop collaborative research and create indigenous academic programs, to create a strategy for commercializing Masdar Institute's research results and to build the institute's organizational and administrative capabilities."

Efforts are presently under way for MIT faculty to assist Masdar with recruiting faculty and administrators, developing joint research and designing educational programs. Student recruitment will follow. The Masdar Institute plans to admit its first postgraduate students in Abu Dhabi in the summer of 2009.

"The Masdar Institute will serve as the

nucleus of the Masdar Initiative, feeding it with talent and innovative technologies to enhance economic development and promote new industries using renewable energy and resources in the emirate and the region," said Sultan Al Jaber, CEO of ADFEC. "This cooperative agreement will lead to a superior relationship between the Masdar Institute and MIT to jointly address global energy issues."

Al Jaber highlighted the importance of developing indigenous R&D capabilities in Abu Dhabi to address issues of particular regional importance, such as energy, water and sustainability. "The guiding philosophy of Masdar is to transform the natural resource wealth of the country to a long-term, sustainable knowledge economy through the development of human capital that can effectively compete in the global marketplace," he added.

The collaborative research programs between MIT and the Masdar Institute will be interdisciplinary and will focus on areas central to the mission of the Masdar Initiative's goal of diversifying the region's economy.

The Masdar Institute will operate as an independent, nonprofit research and educational institution, conducting courses in English and offering postgraduate degrees to men and women in the United Arab Emirates, Middle East, North Africa and the South Asian region. It will augment academic resources of the region by providing a suitable vehicle for expanding R&D, developing strategic alliances with global corporations, providing entrepreneurial opportunities for startups and training and educating a work force to compete in the global market.



PHOTO / PAYAM ROUHANI

Abu Dhabi Future Energy Company CEO Sultan Al Jaber, left, and MIT Chancellor Phillip Clay prepare to sign the cooperative agreement.

## Faculty discuss widening international programs

Deborah Halber  
News Office Correspondent

A faculty committee looking into ways to expand MIT students' access to cross-cultural and international experiences recommended doubling existing opportunities from around 300 to 600 by the 2008-2009 academic year. The goal is to eventually increase by a factor of three or four the 15 percent of MIT student who currently take advantage of such experiences.

Linn W. Hobbs, professor of materials science and nuclear engineering, and Hazel L. Sive, professor of biology, reported the recommendations at the Feb. 21 faculty meeting, where the faculty continued its discussion of the recommendations of the MIT Task Force on the Undergraduate Educational Commons.

If approved, the changes to MIT's undergraduate curriculum will be the most far-reaching of the past half-century.

Among other recommendations, the task force endorsed an increased role for international educational experiences in the undergraduate years.

Noting that new MIT models for global experiences currently exist in pilot phases, ready to be expanded, the committee recommended a fivefold increase in opportunities to around 1,500 by the 2010-2011 academic year, which would provide almost every undergraduate a chance to work, travel or study abroad at some point

during his or her four years at MIT.

One committee member said that because MIT is a global institution, it's important for undergraduates to understand very different learning and work styles and gain a global toolkit that includes a competency to work in other cultures and to develop leadership skills across cultures.

While MIT already provides such opportunities through MIT International Science and Technology Initiatives (MISTI), the Cambridge/MIT Exchange and other programs, Hobbs and Sive acknowledged there are barriers to participation. These include a lack of student awareness of the programs, a limited number of slots, lack of flexibility to miss a semester on campus, lack of encouragement by mentors and a financial penalty for the large number of students who contribute to their tuition by working on campus. To address some of these concerns, the global MIT web site is now live internally.

The committee also recommended the development of an umbrella global education program and the creation of an Office of Global Education to advertise and facilitate international and cross-cultural education.

In previous meetings, the faculty voted to elicit campus-wide feedback on the task

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# Wrinkled 'skin' widens bioengineers' scope

Scientists, including one affiliated with MIT, have demonstrated a new method for developing wrinkled hard skins on polymers using a focused ion beam.

The technique has potential use for biological sensors and microfluidic devices, and it may offer new ways to build custom-made cell templates for tissue engineering.

The work, a collaboration among researchers at MIT, Harvard University and Seoul National University, was published in a recent issue of the *Proceedings of the National Academy of Sciences*. The researchers have also filed for a U.S. patent covering the discovery.

By controlling the direction and intensity of the ion beam, the researchers literally sculpted patterns on flat areas of polydimethylsiloxane, a silicon-based organic polymer more commonly known as the primary ingredient in Silly Putty®.

"This technique is a one-step process for creating wrinkled skins," said Ashkan Vaziri, a research affiliate in MIT's Biological Engineering Division. "The method is more robust compared with traditional techniques. The patterns can be generated along desired paths by simply controlling the relative movement of the ion beam and polymeric substrate. It's almost like using an airbrush on fabric. At a smaller scale the desired morphology of wrinkles can be achieved by controlling the ion beam intensity."

Because only the areas exposed to the beam are affected, the method enabled the scientists to create a variety of patterns—from simple one-dimensional wrinkles to peculiar and complex hier-

archical nested wrinkles—along desired paths. Specific examples to date include "S" shapes, circular patterns and long horizontal channels akin to the repeating tines of a closed zipper.

"Irradiation by the ion beam alters the chemical composition of the polymer close to its surface and forms a thin stiff skin, which wants to expand," said Vaziri. "The consequent mismatch between the mechanical strain of the generated stiff skin and the underlying polymeric substrate, almost like a tug-of-war, buckles the skin and forms the wrinkle patterns."

Such patterns can be used in the construction of microfluidic devices for particle separation and mixture and also have potential use in designing biosensors. The researchers have also started a close collaboration with scientists at the Harvard-MIT Division of Health Sciences and Technology aimed at exploring the behavior of living cells on these patterned substrates. Such research may lead to the development of an effective and robust method to build custom templates for engineering and growing tissues.

Vaziri's co-authors are Professor John Hutchinson and Myoung-Woon Moon of Harvard, and Sang Hoon Lee, Jeong-Yun Sun and Kyu Hwan Oh, all from Seoul National University.

The research was supported in part by the Korea Research Foundation, the Center for Advanced Materials Processing (part of the 21st Century Frontier R&D Program), the Office of Naval Research and Harvard Engineering and Applied Sciences.

—Michael Patrick Rutter,  
Harvard University

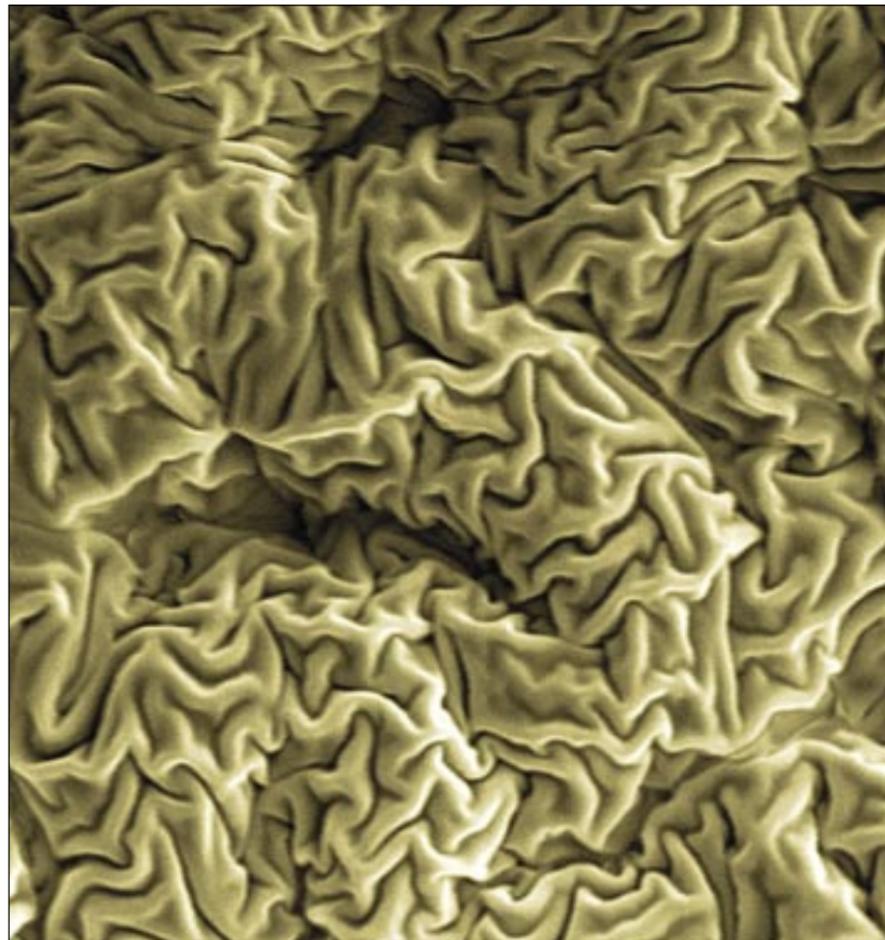


PHOTO COURTESY / MOON, ET AL.

A focused ion beam induced this wrinkled hard skin on a polymer surface. The wrinkles are hierarchical with the primary wavelength of 465 nanometers.

## PLANETS

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stars and thus far more difficult to study.

Light from extrasolar planets is "very, very hard to measure because the stars are so bright and the planets are faint. This planet is right at the edge of what we can detect with this telescope," said Seager, who arrived at MIT in January to start a program devoted to studying extrasolar planets.

The study appearing in *Nature* was led by Jeremy Richardson of the Goddard Space Flight Center near Baltimore, Md. The three studies mark the first time a telescope has captured enough light to detect traces of molecules in an extrasolar planet's atmosphere.

"This is an amazing surprise," said Spitzer Project Scientist Michael Werner of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "We had no idea when we designed Spitzer that it would make such a dramatic step in characterizing exoplanets."

Studying light spectra only works with so-called "transit planets"—planets whose orbits carry them in front of their sun when viewed from our solar system. HD 209458b, discovered in 1999 in the constellation Pegasus, was the first of 14 such planets that have been found.

Only a few of those planets, including HD 209458b, are bright enough for the spectral studies to yield useful data. A research group at Caltech is reporting spectral observations of another such planet, known as HD 189733b. Both planets are classified as "hot Jupiters," meaning they are large and gaseous, like Jupiter.

Temperatures on HD 209458b range from 1100 to 1600 degrees Kelvin, and the planet is so close to its sun that it takes only three and a half days to complete its orbit.

From previous observations, scientists

already knew that HD 209458b had sodium, hydrogen, helium and carbon in its atmosphere. They also expected it to have water vapor, but the Goddard spectral analysis did not show any signs of water vapor in the atmosphere. Scientists did not find traces of water vapor in the atmosphere of HD 189733b either.

"That doesn't mean water vapor's not there, but it means the atmosphere is behaving differently than expected," Seager said.

The Goddard team's other major finding was evidence of sandy particles known as silicates in the atmosphere of HD 209458b. NASA scientists hypothesize that clouds of those particles could be blocking emissions from water vapors.

Another team that studied HD 209458b, based at JPL obtained similar results.

The Goddard team recorded its data during two eclipses of HD 209458b, each of which lasted for about three hours. By subtracting the light that was emitted by the sun alone from the light of the planet and sun together, the researchers obtained a spectrum of light from the planet itself.

After the infrared light was captured, it was separated into its component wavelengths, the same way a prism diffracts light into a rainbow. Signatures at different wavelengths represent emissions from different chemical compounds present in the atmosphere.

The new results offer hope of finding and analyzing other planets, including smaller, rocky planets like Earth.

"It's very hard to find Earth-like planets because they're too small. But that's the ultimate goal," said Seager.

Seager's team's research was funded by NASA, the Goddard Center for Astrobiology, the Spitzer Theory Program and the Carnegie Institute of Washington.



Sara Seager

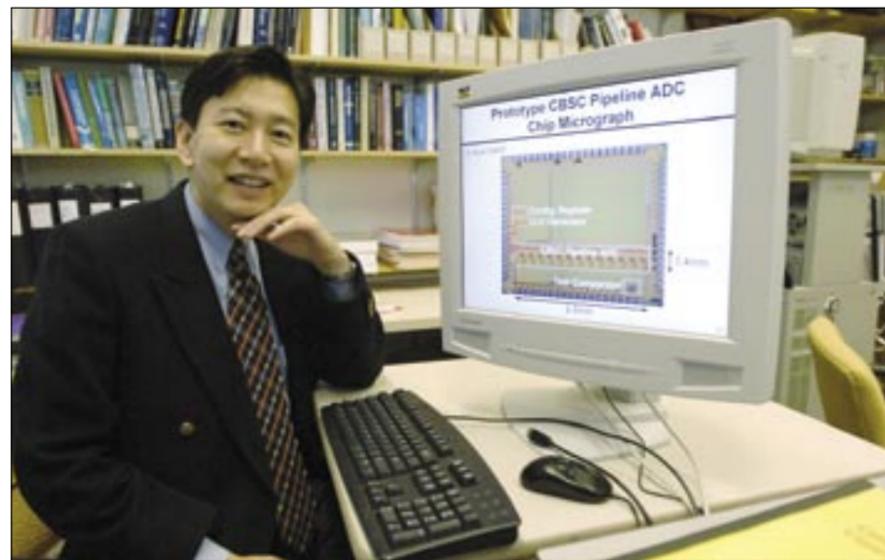


PHOTO / DONNA COVENEY

MIT professor Hae-Seung Lee and his colleagues have developed new analog circuits—comparator-based switched capacitor circuits—that handle voltage differently than conventional analog ones, resulting in greater power efficiency.

## CIRCUITS

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technology. And much of the design and performance enhancement can actually be done by computer software rather than by a human. That's not the case with analog circuits, which Lee said require clever designs by humans to be improved because of their variable nature.

"There is a lot of room for innovation in the human design," he said. "The importance of analog circuits is growing in light of the digital improvements, so engineers can make a difference in products by working on them." Currently, analog circuits are rather expensive and they consume a disproportionate amount of power compared with digital circuits.

Another blow to analog circuits is that the advancements in fabrication (manufacturing) technology to improve digital circuits have had a negative impact on them. Traditionally, many conventional analog circuits have relied upon devices known as operational amplifiers. Two negative side effects that advanced fabrication technologies have had on operational amplifier-based analog circuits are that when used in consumer or other devices, they have reduced the range of the analog signal and decreased the device's gain.

To compensate for these shortcomings, analog circuits must consume much more power, thus draining precious energy from batteries.

In addition, it still is not clear whether traditional operational amplifier-based circuits can be applied to emerging technologies such as carbon nanotube-nanowire devices and molecular devices.

Lee's research group, in collaboration with Professor Charles Sodini's group in MIT's MTL and EECS, recently demonstrated a new class of analog circuits that Lee said eliminates operational amplifiers while maintaining virtually all benefits of operational amplifier-based circuits. These new comparator-based switched capacitor (CBSC) circuits handle voltage differently than conventional analog ones, resulting in greater power efficiency.

Lee said CBSC may enable high-performance analog circuits in emerging technologies because it would be easier to implement comparators than operational amplifiers in these technologies.

The first prototype MIT CBSC was demonstrated in an analog-to-digital converter and presented at 2006 ISSCC. The

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# Computer model mimics how the brain recognizes objects

Cathryn M. Delude  
McGovern Institute

For the first time, MIT scientists have applied a computer model of how the brain processes visual information to a complex, real-world task: recognizing the objects in a busy street scene. The researchers were pleasantly surprised at the power of this new approach.

"People have been talking about computers imitating the brain for a long time," said Tomaso Poggio, the Eugene McDermott Professor of Brain and Cognitive Sciences and a member of the McGovern Institute for Brain Research at MIT. "That was Alan Turing's original motivation in the 1940s. But in the last 50 years, computer science and AI (artificial intelligence) have developed independently of neuroscience."

"Our work is biologically inspired computer science," said Poggio, who is also co-director of the Center for Biological and Computational Learning.

"We developed a model of the visual system that was meant to be useful for neuroscientists in designing and interpreting experiments, but that also could be used for computer science," said Thomas Serre, a postdoctoral associate in Poggio's lab and lead author of a paper on the work in the March 2007 IEEE Transactions on Pattern Analysis and Machine Intelligence.

"We chose street scene recognition as an example because it has a restricted set of object categories, and it has practical social applications," said Serre.

Near-term applications include population surveillance and assistance for automobile drivers; eventually, applications could include visual search engines, biomedical imaging analysis and robots with realistic vision. On the neuroscience end, this research is essential for designing augmented sensory prostheses, such as ones that could replicate the computations carried by damaged nerves from the retina.

"And once you have a good model of how the human brain works," Serre explained, "you can break it to mimic a brain disorder." One brain disorder that involves distortions in visual perception is schizophrenia, but nobody understands the neurobiological basis for those distortions.

"The versatility of the biological model

turns computer vision from a trick into something really useful," said co-author Stanley Bileschi, a postdoctoral associate in the Poggio lab.

## Recognizing scenes

The IEEE paper describes how the team "showed" the model randomly selected images so that it could "learn" to identify commonly occurring features in real-world objects such as trees and people. In so-called supervised training sessions, the model used those features to label by category examples of objects found in digital photographs of street scenes, such as buildings and cars. The photographs derive from a street scene database compiled by Bileschi.

Compared to traditional computer-vision systems, the biological model was surprisingly versatile. Traditional systems are engineered for specific object classes. For instance, systems engineered to detect faces or recognize textures are poor at detecting cars. In the biological model, the same algorithm can learn to detect widely different types of objects.

To test the model, the team presented full street scenes consisting of previously unseen examples from the street scene database. The model scanned the scene and, based on its supervised training, recognized the objects in the scene. The upshot is that the model was able to learn from examples: This, according to Poggio, is a hallmark of artificial intelligence.

## Modeling object recognition

Teaching a computer how to recognize objects has been exceedingly difficult because a computer model has two paradoxical goals. It needs to create a representation for a particular object that is very specific, such as a horse as opposed to a cow or a unicorn. At the same time the representation must be sufficiently "invariant" so as to discard meaningless changes in pose, illumination and other variations in appearances.

Even a child's brain handles these contradictory tasks easily in rapid object recognition. Pixel-like information enters from the retina and passes through the hierarchical architecture of the visual cortex. What makes the Poggio lab's model so innovative and powerful is that, computationally speaking, it mimics the brain's own hierarchy. Specifically, the "layers" within the model replicate the way neu-

rons process input and output stimuli according to neural recordings in physiological labs.

## Making it more useful

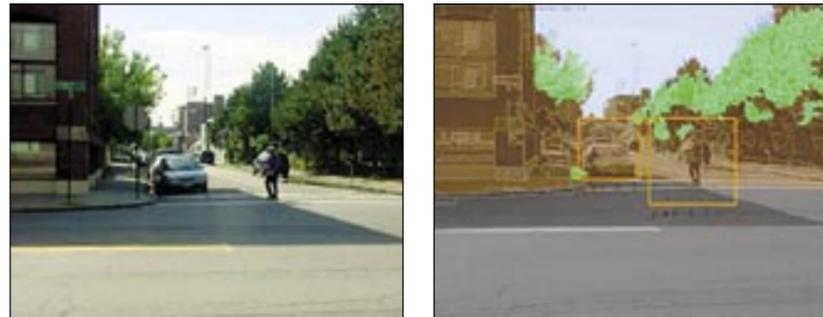
The model used in the street scene application mimics only the computations the brain uses for rapid object recognition. The lab is now elaborating the model to include the brain's feedback loops from

the cognitive centers. This slower form of object recognition provides time for context and reflection, such as: If I see a car, it must be on the road and not in the sky.

Giving the model the ability to recognize such semantic features will empower it for broader applications, including man-

## See SURVEILLANCE

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IMAGES COURTESY / STANLEY BILESCHI, MCGOVERN INSTITUTE FOR BRAIN RESEARCH AT MIT

An MIT model for object recognition takes as input the unlabeled images of digital photographs from the street scene database (left) and generates automatic annotations (right). The orange bounding boxes are for pedestrians ('ped') and cars ('car'). The system would have also detected bicycles if present. For sky, buildings, trees and road, the system uses color coding (blue, brown, green and grey).

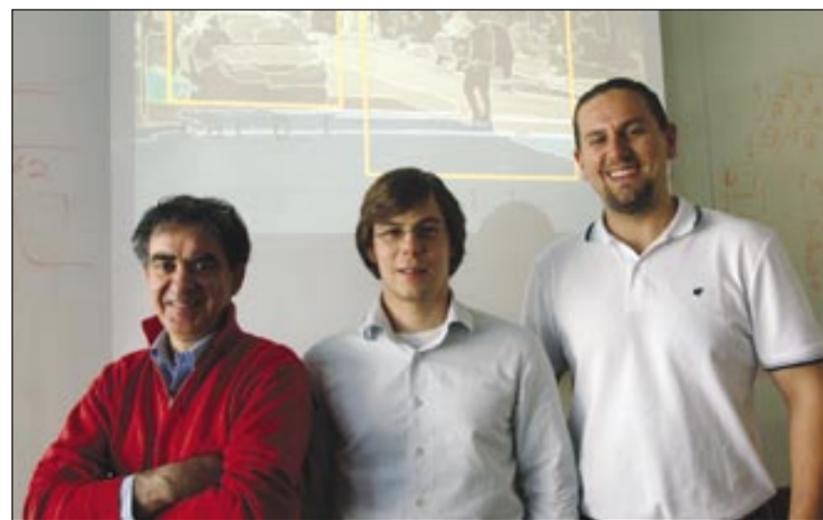


PHOTO / DONNA COVENEY

Tomaso A. Poggio, professor of Brain and Cognitive Sciences (left), and postdocs Thomas Serres and Stanley Bileschi (right), stand in front of a street scene.

## Data suggest a genetic link for schizophrenia

Deborah Halber  
News Office Correspondent

Gene mutations governing a key brain enzyme make people susceptible to schizophrenia and may be targeted in future treatments for the psychiatric illness, according to MIT and Japanese researchers.

The work, by scientists from MIT's Picower Institute for Learning and Memory and Japan's RIKEN Brain Science Institute, was reported in the early online edition of the Proceedings of the National Academy of Sciences on Feb. 20.

According to the National Institute for Mental Health, an estimated 51 million people worldwide suffer from schizophrenia. Although 80 percent of schizophrenia cases appear to be inherited, the specific genetic components underlying individuals' susceptibility and pathology are largely unknown.

By studying genetically engineered mice and the genetic makeup of schizophrenic individuals, the MIT and Japanese scientists pinpointed the PPP3CC gene and other genes in the early growth response (EGR) gene family (specifically, EGR3) as likely suspects for causing the disease.

These genes are critical in the signaling pathway for the brain enzyme calcineurin. Calcineurin is prevalent in the central nervous system, where it plays a role in many neuronal functions whose disturbances would play into the disorganized thinking, attention deficits, memory and language

problems that characterize schizophrenia.

The researchers confirmed that the PPP3CC gene is involved in diagnosed schizophrenia in Caucasian, African-American and Japanese individuals. EGR3 involvement was confirmed through a separate test.

"These data suggest that the brain signals governed by calcineurin stand at a convergent point of the molecular disease pathology of schizophrenia, and the involvement of the EGR genes reinforces this," said co-author Takeo Yoshikawa of the RIKEN Brain Science Institute. This knowledge could lead to new schizophrenia therapeutics targeting the calcineurin system, he said.

"This study provides genetic and biological evidence that PPP3CC and EGR3, both constituents of the calcineurin signaling pathway, may independently elicit increased risk for schizophrenia," said co-author Susumu Tonegawa, Picower Professor of Biology and Neuroscience at MIT. "These findings raised a novel and potentially important role for EGR genes in schizophrenia pathogenesis."

In addition to Yoshikawa and Tonegawa, authors are Kazuo Yamada, Yoshimi Iwayama, Tetsuo Ohnishi, Hisako Ohba, Tomoko Toyota and Jun Aruga of RIKEN Brain Sciences Institute; David J. Gerber of the Howard Hughes Medical Institute and the RIKEN-MIT Neuroscience Research Center; and Yoshio Minabe of Kanazawa University School of Medicine in Japan.

This work is supported by the RIKEN Brain Science Institute and other agencies and institutes.



Susumu Tonegawa



PHOTO / STEPHANIE SCHOROW

Scot Osterweil, creative director of the CMS Education Arcade, shows freshman Paul Medlock-Walton a game designed to teach math and literacy to middle school students.

## CMS fetes digital games, cultural research

Stephanie Schorow  
News Office Correspondent

The students, staff and faculty of MIT's Comparative Media Studies program showed they could walk and talk the talk of transformative media technology when they turned the Stata Center lobby into an attention-grabbing interior landscape on Feb. 22.

A human-sized comic book hero placard pointed the way. A three-section slide show filled a wall with moving images of CMS projects. Computers, brochures and,

of course, food competed for table space. "Grab a stress bulb," CMS undergraduate administrator Generoso Fierro told passersby as he handed out squeezable canary-colored toy light bulbs, stamped with "Comparative Media Studies."

Most important, on hand to chat and answer questions were representatives of the Convergence Culture Consortium, New Media Literacies, the Educational Arcade, Hyper Studio and other programs within CMS, itself part of MIT's literature

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# Panel reviews four centuries of remixing the Bard

Robin H. Ray

News Office Correspondent

A Japanese production of "King Lear" with an all-male cast, a film version of "Hamlet" with the Prince of Denmark as video artist and playful reedits of the balcony scene from "Romeo and Juliet" that become YouTube valentines—these are just three of the many multimedia and cross-media interpretations of William Shakespeare's work that a panel of scholars discussed at the MIT Communications Forum, "Remixing Shakespeare," on Feb. 15. As the participants made clear, reworking Shakespeare across many media is nothing new.

The forum was, in the words of Henry Jenkins, the John E. Burchard Professor of Literature, who introduced the participants, "an all home-team event, showcasing the literature faculty here at MIT." Acting as moderator was Mary C. Fuller, associate professor of literature.

Diana Henderson, professor of literature and dean for curriculum and faculty support, spoke first and set the stage with a discussion of multimedia

and cross-media practices, historic and contemporary. She noted that Shakespeare himself was not confined to plays but also wrote lyric and narrative poetry, and furthermore that rewriting and co-writing were standard practice in the Elizabethan theater. "He was certainly not the genius figure/scriptural god that he became a few hundred years later," she said. Later, during the Restoration period, Shakespeare's plays and other classics were rewritten to suit contemporary tastes. Most notably, and notoriously, Nahum Tate rewrote "King Lear" to give it a happy ending: King Lear gets the throne back and Edgar and Cornelia pair up. It is easy to mock such efforts, Henderson observed, but the historical context is key: This plot change "speaks to a generation that has lived through, and perhaps may live through again, they think, the usurpation of the throne or the killing of the king."

The 19th and early 20th centuries abounded with Shakespeare experimentation, including musical versions, opera (by Verdi and Gounod, among others) and silent film. These genres, examples of which were screened at the forum, beg

the question of whether it is still Shakespeare if (as in opera) the plot and words have been thoroughly revised and (as in silent film) if there is no sound.

Henderson pointed to recent film versions of Shakespeare to show "how malleable the boundaries of Shakespeare are and continue to be." Michael Almareyda's "Hamlet" with Ethan Hawke in the lead role (2000), another made-for-TV "Hamlet" starring Campbell Scott (2000) and Paul Mazursky's "Tempest" (1982), in which the Shakespeare script was jettisoned entirely, retaining only the characters and a parallel setting, show that "there are a lot of virtues in impurity."

Peter Donaldson, professor of literature, then took the podium, noting that he finds it useful to go back to some very old literary terms in thinking about remixing (in film, on the Internet, on stage), namely metaphor, conceit (extended and elaborated metaphor), and allegory. All of these concepts, like many of today's remixes (in hip-hop, for example), are about holding two things in mind or in view, at once independently and interactively.

He took up Almareyda's "Hamlet" in detail, focusing on Hamlet as videogra-

pher. Ethan Hawke's character is based in part on the persona of Kurt Cobain, evoking alienated youth culture. The young prince, heir to the Denmark Corporation, is shown filming his environs and his fellow characters, constantly editing the footage and reviewing it, in a disheveled room at the "Hotel Elsinore"—in short, displaying the kind of endless mulling-over for which his character is famous.

Other remixings Donaldson highlighted were Michael Hoffman's "A Midsummer Night's Dream" (1999), suffused with references to opera and self-consciously parading its anachronistic 19th-century setting, and playful or parodying works, of which there are hundreds posted on the Internet. He screened a remarkable clip of Peter Sellers, dressed and lighted in imitation of Lawrence Olivier's Richard III, ponderously reciting the lyrics to "A Hard Day's Night."

Remixing Shakespeare is alive and well. Said Henderson, "It's the reason why some of us find ourselves spending whole lifetimes looking at Shakespeare, not just because of a particular play text but because these four centuries of the remix allow you a reflection of culture at large."

## MLK

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tion was "Maximizing Potential: The Congruence of Diversity and Excellence." Two student speakers reflected on this topic and on King's life and legacy.

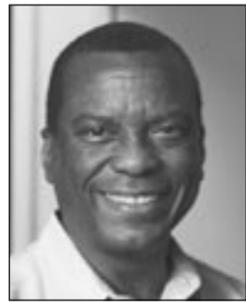
Elizabeth Clay, graduate student in urban studies and planning, made an impassioned plea for justice and equity in cities. "As a master's student in urban planning, I often think about what makes a city great," she said.



Tabitha Bonilla

Cities like New York, London, Mumbai and São Paulo, she said, "all draw from the best and the brightest, the most creative and the cleverest. New citizens dare to make their marks there, and in doing so, make those cities wealthy and vibrant. Their excellence and their diversity exist in a virtuous circle."

"But often it is those who bring so much to the city... that struggle to afford the city they helped build."



Ike Colbert

She cited the discrimination that Latin American immigrants often face in the United States, for instance. "And similar discrimination faces construction workers who build the gleaming towers of Mumbai and yet go home to illegal settlements with no water and no toilets."

In her talk, senior Tabitha Bonilla cited her own German-Jewish-Mexican family as an example of the true wealth inherent in diversity, and she reflected on discrimination both against—and among—underrepresented minorities.

The keynote speaker at the King breakfast was Ted Childs Jr., a former IBM executive now in practice as a diversity consultant. Considering the future workforce of the United States, he lamented the lack of a "competitive national talent strategy."

In the interest of national competitiveness, Childs, who is black, told the group, "We have to end the focus on affirmative action as a race and gender dialogue. Affirmative action has to be about disadvantage. People who are white and poor have to be able to benefit from affirmative action because we need them on the playing field."

## CEHS calls for pilot project proposals

The Center for Environmental Health Sciences at MIT, an interdisciplinary research center funded by the National Institutes of Environmental Health Sciences, invites MIT faculty to submit applications for funding of pilot projects related to environmental health research. The center anticipates funding five or more projects with a direct cost of \$15,000 to \$25,000 each. The deadline for submitting proposals is March 1. The pilot program seeks to:

- Provide initial support for new investigators to establish research in the area of environmental health.
- Allow for exploration of innovative new directions representing a significant departure from ongoing funded research for established investigators in the environmental health sciences.
- Stimulate investigators from other

areas of endeavor to apply their expertise to environmental health research.

- Provide an opportunity for investigators to take a multidisciplinary approach to environmental health research.

Proposal guidelines: Applicants should submit a four-page proposal, which outlines the specific aims, background and significance, and proposed research plan. Please include a face page with title of project, faculty name, affiliation, phone and e-mail.

Applications should also include a detailed budget and budget justification, biographical sketch and other support in the NIH format (forms are available at [grants1.nih.gov/grants/funding/phs398/phs398.html](http://grants1.nih.gov/grants/funding/phs398/phs398.html)).

Submit six copies of completed applications to Jacqueline Breen, Administrative Officer, CEHS, Room 56-235.

## FACULTY

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force's report. These have focused primarily on the recommendations regarding math, science and engineering requirements, so faculty chair Steven R. Lerman, the Class of 1922 Distinguished Professor of Civil and Environmental Engineering, directed Wednesday's discussion to the recommendations on changing the general Institute requirements within the School for the Humanities, Arts, and Social Sciences and on international experiences.

Currently, eight new experimental classes are being developed, some interdepartmental and possibly interschool.

In a separate agenda item, Provost L. Rafael Reif said that the names of a core group of faculty members who will explore the issues facing faculty from underrepresented minority groups on campus will be announced soon. The most important goal is to improve our numbers of underrepresented minorities, he said, because MIT is committed to understanding the experiences of minority faculty.

## SURVEILLANCE

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aging seemingly insurmountable amounts of data, work tasks or even e-mail. The team is also working on a model for recognizing motions and actions, such as walking or talking, which could be used to filter videos for anomalous behaviors—or for smarter movie editing.

Additional co-authors are Maximilian Riesenbuber, now at the Georgetown University Medical Center, and Lior Wolf, now at Tel Aviv University.

The street scene database is freely available at [cbcl.mit.edu/](http://cbcl.mit.edu/). This research was partially funded by the Defense Advanced Research Projects Agency (DARPA), the Office of Naval Research, the National Science Foundation and the National Institutes of Health.

## CMS

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section.

The occasion was the CMS Colloquium special event: "Converging Media: Games, Literacy and Culture Research Fair."

"We wanted to show the range of activities CMS is involved in," explained DeFlorez Professor of Humanities Henry Jenkins. "It's also a chance to show our students about branding and publicity. We always get kids to think about our messages and our role as communicators."

Of great satisfaction to Geoffrey Long, a second-year graduate student, was the timing of the three PowerPoint projectors that were showing images of CMS projects in a continuous loop. Each projector managed, every 30 seconds, to coordinate the projection of the words "Comparative Media Studies" across the wall.

He hoped that students walking into the fair would get a sense of excitement.

"The greatest thing about CMS is that it's still a small department but it's the fastest growing undergraduate major," Long said. "There's so much cool stuff happening here. The concept of the fair is to spread that out a little bit. I don't think people know about us as much as they should."

One of the newer projects is a joint MIT and Singapore project, the "Gambit Game Lab," which will promote and foster digital game research globally. Philip Tan, Gambit executive director, chatted with fair-goers under a Gambit banner and near a laptop loaded with some of his personal game collection.

"We're focusing on innovation in a way that makes it practical," he explained, as a zombie stumbled with a menacing gait across the laptop's screen. That requires "trying to take every single one of our research ideas and build a game out of it. Not only does that mean we have to keep ourselves very practical but gives a means

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## DRESSELHAUS

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woman professor at MIT's School of Engineering and one of the first women ever to receive a Fulbright Fellowship. She has received numerous awards, including the U.S. National Medal of Science and 19 honorary doctorates worldwide.

In addition, Croatian native Petra Klepac, a graduate student in biology, received one of 15 UNESCO-L'Oréal international fellowships. She will use the \$40,000 award to study population dynamics and optimal control of infectious diseases at Pennsylvania State University.

Along with Dresselhaus, the L'Oréal-UNESCO laureates include:

- Latin America: Ligia Gargallo, professor of physical chemistry, Pontifical Catholic University of Chile, Santiago, Chile.
- Africa: Ameenah Gurib-Fakim, professor of organic chemistry and provice-chancellor, University of Mauritius, Mauritius.

- Europe: Tatiana Birshtein, professor, Institute of Macromolecular Compounds, Russian Academy of Sciences, St. Petersburg, Russia.

- Asia/Pacific: Margaret Brimble, professor, chair of organic and medicinal chemistry, University of Auckland, New Zealand.

Now in its ninth year, the L'Oréal-UNESCO Award for Women in Science is the only one of its kind to honor eminent women scientists at the international level. The five laureates are nominated by respected scientists from around the world and a jury of 14 selects the final recipients. This year's jury is presided over by Nobel Laureates Christian de Dève of the Institute of Cellular Pathology in Belgium and Pierre-Gilles de Gennes of the Collège de France in Paris. Three hundred and sixty-two women from 76 countries have been recognized as L'Oréal-UNESCO laureates or fellows.

The Women in Science program also offers an online community, Agora ([www.agora.forwomeninscience.com/agora/](http://www.agora.forwomeninscience.com/agora/)).

## CIRCUITS

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second prototype, an 8-bit, 200 megahertz analog-to-digital converter, will be presented at the conference this month.

Other key MIT members of the research team are EECS graduate students John Fiorenza and Todd Sepke, who were involved in the work presented in 2006; and EECS graduate student Lane Brooks.

The research leading to the 2006 ISSCC paper was funded by Microelectronics Advanced Research Corp. The research leading to the paper presented this month was funded by the MIT Center for Integrated Circuits and Systems and a National Defense Science and Engineering Graduate Fellowship.



PHOTO / DONNA COVENY

### Bearing up

MIT is celebrating Daffodil Days 2007, an MIT Women's League-sponsored fundraiser for the American Cancer Society. Heather Peach, a child-life specialist, Janet Plotkin of the MIT Women's League and social worker Evelyn Malkin play with a child whose twin is a cancer patient at Massachusetts General Hospital. Teddy bears like the ones above can be sent to cancer patients for a donation of \$25.

## SHASS selects 26 Burchard Scholars

Twenty-six sophomores and juniors have been selected as Burchard Scholars in the School of Humanities, Arts, and Social Sciences (SHASS) for 2007.

The awards, named after the school's first dean, John Ely Burchard, are given to students who demonstrate unusual abilities and academic excellence in the areas embraced by the school. According to SHASS dean Deborah Fitzgerald, overseer of the Burchard Program, the students selected in the 21st year of competition for the awards "are from exciting and diverse backgrounds and are a remarkable group of gifted young scholars."

The Burchard Scholars and a rotating group of faculty will be invited to a series of dinners, beginning in February, at which an MIT faculty member or visiting scholar will present work in progress, followed by a discussion. This will allow students and faculty members to mix and will give students, especially, an opportunity to engage in the kind of intellectual exchange that characterizes scholarship in the humanities, arts and social sciences. The emphasis throughout the program will be interdisciplinary.

Aside from Fitzgerald, the selection committee consisted of Margery Resnick, professor of literature; Rebecca Faery, director, first-year writing, writing and humanistic studies; Wyn Kelley, senior lecturer, literature; Thomas Levenson, associate professor, writing and humanistic

studies; Anthony Lioi, assistant professor, writing and humanistic studies; Michael Ouellette, senior lecturer, music and theater arts; and Janet Sonenberg, professor of theater arts.

The Burchard Scholars are as follows: Allison Berke '08, biology, mathematics; Raja Bobbili '08, electrical engineering and computer science, economics; Gabriel Cira '08, architecture; Daniel Denis '08, nuclear science and engineering; Ross Goodwin '09, economics, political science; Ruijie He '08, aeronautics and astronautics, political science; Reshmaan Hussam '09, economics; Anthony Jones '08, mechanical engineering; Ellis Kim '09, management; Gloria Lee '09, brain and cognitive sciences, literature; Noel Lee '08, chemistry; Richard Lin '09, materials science and engineering, biology; Matthew Lord '09, mathematics; Lauren McLendon '08, biology; Mahalia Miller '09, civil engineering; Navine Nasser-Ghods '09, brain and cognitive sciences; Juan Prajogo '08, economics and management science; Thaned Pruttivarasin '08, physics, music; Tala Qusous '08, biological engineering; Jugal Shah '08, nuclear science and engineering, biology; Lisa Song '08, environmental science; Lucia Tian '08, electrical engineering, economics; Jiao Wang '08, biological engineering; Angelica Weiner '09, urban studies and planning; Rany Woo '08, brain and cognitive sciences; Yi Zhou '09, economics and mathematics.

## MacVicar Day highlights student learning

MacVicar Day 2007 will be held on Friday, March 2. Provost L. Rafael Reif will announce the new MacVicar Faculty Fellows following the meeting of the MIT Corporation.

Each year, a public program on MacVicar Day explores some aspect of innovative teaching or learning practices. This year, the program is titled "I Learn Best When..."

Beginning at 3:30 p.m. at the Stata Center (Room 32-141), "I Learn Best" will include a round-table discussion moderated by Duane Boning, associate department head of electrical engineering and computer science. Faculty participants Ruth Perry, professor of literature, and

David Wallace, associate professor of mechanical engineering, will join students and an alumnus in sharing personal learning strategies and tools that enable them to master valuable knowledge and skills.

As part of the MacVicar celebration, exhibits and demonstrations of technologies that support learning will be on display along the Stata Student Street, and a reception will follow the roundtable discussion at 5 p.m.

The MacVicar Faculty Fellows program was established in 1992 to honor the life and contributions of the late Margaret MacVicar, who was a professor of physical science and the first dean for undergraduate education at the time of her death in 1991.

## List Center wins two awards

The List Visual Arts Center is has been chosen to receive two awards from the New England chapter of the International Association of Art Critics, USA (AICA/USA) for the region's best visual art exhibitions during the 2005-2006 season. "America Starts Here: Kate Ericson and Mel Ziegler," jointly organized by the List Visual Arts Center and Skidmore College, was chosen to receive the First Place Award for Best

Monographic Museum show in Boston. In addition, the List Center's exhibition, "Choreographic Turn: Daria Martin and Peter Welzin in Collaboration with William Forsythe," was chosen to receive the second place award for 'Best Thematic Museum Show' in the Boston area at the fifth annual AICA/New England awards ceremony which will be held today at the Isabella Stewart Gardner Museum.

## MIT Sloan alum Michael Kaiser, of Kennedy Center, wins 2007 Muh award

Michael M. Kaiser, the "turnaround artist" who led the financial revitalization of Alvin Ailey American Dance Theater, the American Ballet Theatre and other arts organizations, is the recipient of the 2007 Robert A. Muh Alumni Award.

The Muh award honors an MIT graduate for noteworthy achievement in the humanities, arts and social sciences.

Kaiser, a 1977 graduate of MIT Sloan School of Management who is now at the helm of the John F. Kennedy Center for the Performing Arts in Washington, D.C., will deliver a talk titled "Cultural Diplomacy" on Thursday at 5 p.m. in Bartos Theater, Building E15.

"We are delighted to welcome Michael Kaiser to campus as the next Robert A. Muh Award winner," said Deborah Fitzgerald, the Kenan Sahin Dean of the School of Humanities, Arts, and Social Sciences.

"Through his distinguished career as one of the top arts administrators in the world, he exemplifies the excellence we seek to honor with the Muh Award."

Before entering the arts management field, Kaiser was a management consultant in the corporate sector. In 1985, he sold the consulting firm he founded, Kaiser Associates, which specializes in helping large corporations formulate strategic plans. Among his clients were General Motors, IBM, Corning Glass Works and 50 other major corporations. Kaiser Associates remains a major participant in the strategy-consulting field.

Kaiser took over as general manager of the Kansas City Ballet, where he retired the financially troubled organization's deficit and developed a specialty in arts turnarounds—helping, among others, the Alvin Ailey Dance Theater Foundation, the American Ballet Theatre and Britain's Royal Opera House.

The Kennedy Center was not in a financial crisis when Kaiser arrived there in 2001, so instead he focused on turning the Kennedy Center into a national destination.



Michael M. Kaiser

The key to success in turning around an arts center is similar to that of turning around a business, Kaiser said. "If you have a good product, that will help turn things around. All the techniques I learned (at MIT Sloan) can apply to the business world. But success is the hardest thing to measure in the nonprofit world."

Kaiser graduated from Brandeis with a degree in economics and received his master's degree in management from Sloan.

Kaiser has served as a research economist for Nobel prize-winning economist Wassily Leontief and is the author of three books: "Strategic Planning in the Arts: A Practical Guide" (1995); "Developing Industry Strategies: A Practical Guide of Industry Analysis" (1983); and "Understanding the Competition: A Practical Guide of Competitive Analysis" (1981).

He has received the Dance Magazine Award in 2001, Capezio Award in 2002, Helen Hayes Washington Post Award for Innovative Leadership in the Theater Community in 2003, St. Petersburg 300 Medal in 2004, Washingtonian of the Year in 2004,

U.S. Department of State Citation in 2005, Blacks in Dance Award in 2005, First American to receive China's "Award for Cultural Exchange" in 2005 and the Order of the Mexican Eagle in 2006. Kaiser was named Impresario of the Year in 2006 by Musical America.

The Robert A. Muh Alumni Award was first announced in October 2000 at the 50th anniversary celebration of the School of Humanities, Arts, and Social Sciences (SHASS).

Muh (S.B. 1959), a life member of the MIT Corporation and past chair of the Humanities Visiting Committee, endowed the award to honor an MIT alumnus or alumna who has made significant contributions to education, scholarship or performance, academic administration or arts management in the humanities, arts or social sciences. The award rotates among the three major areas in SHASS.

## 'N (Bonaparte)' is third in Harrington's war trilogy

Robin H. Ray  
News Office Correspondent

The winter/spring 2007 issue of TheatreForum magazine, a prestigious venue for new works of drama, will include a script by Laura Harrington, lecturer in theater arts at MIT since 1995. Harrington's play "N (Bonaparte)," which premiered at Boston's Pilgrim Theatre Com-



Laura Harrington

pany in 2005, is a tragicomedy about the deposed French emperor, set on the island of St. Helena where Napoleon is in exile. Among its characters are an Irish doctor, a pandering valet, the dead empress Josephine, Joan of Arc and a lot

of rats. For much of the play, Napoleon reposes (fully clothed) in a bathtub.

Harrington's work is intimately bound up with sound and music. She has written half a dozen musicals and is among the few living artists writing libretti for opera. Her libretto for "Resurrection," first produced in 1999 by the Houston Grand Opera, was set to music by Tod Machover, head of MIT Media Lab's Hyperinstruments/Opera of the Future group. She is currently at work on a new musical, "Out of the Blue," with the award-winning composer Jenny Giering. "Out of the Blue" was commissioned and workshopped at Suffolk University in 2006 and has just won a spot in the Penn State University New Musicals Festival for April 2007.

Harrington discussed "N" and her current and past projects.

**Q:** How does "N" fit among your recent works?

**A:** I think of "N" as the third play in a loosely formed trilogy about war. "Hallowed Ground," set during the last days of the Civil War, puts us on the ground with four very young characters (ages 15 through 19) following a battle. "Pickett's Charge" is a modern comedy about Civil War re-enactors who get their fondest wish and fall through a hole in time. Looking at war through the lens of re-enactors gave me a chance to explore our love affair with war.

**Q:** How does "N" differ from your other plays?

**A:** With "N," I wanted to explore the idea that violence is like a virus cascading through the centuries. And this time I wanted to deal with the men in power, the generals. Napoleon thought of himself as one of the great generals of all time and compared himself to Caesar, Hadrian, etc. The idea of the most famous human being on the planet imprisoned on a rock in the middle of the ocean, surrounded by rats, was just too delicious to pass up. Here is the hubris of empire brought low.

**Q:** What was your creative starting point with "N"?

**A:** The inciting image for this play was Napoleon in his bathtub on St. Helena. It was a lead tub, the room was very dark. The longer he was on St. Helena, the more time he spent in the bath. It is said that his hand wore a groove in the side of the tub from rubbing it so much.

**Q:** What inspires you to explore history in your work?

**A:** We live in a society that has amnesia when it comes to history. This is a very dangerous habit. I love the story that JFK was reading Barbara Tuchman's "The Guns of August" during the Cuban missile crisis. I'm not sure what George W. Bush reads, but there's certainly no evidence that he reads or understands history.

# Metro Boston flora and fauna show global warming's grip

Deborah Halber  
News Office Correspondent

In a Lowell, Mass., cemetery on Memorial Day in 1868, a photograph captured mourners in heavy winter clothing gathered under leafless trees near the graves of two brothers killed in the Civil War.

At the same spot on Memorial Day in 2005, cemetery visitors wore light spring clothes. The trees were in full flower.

These photographs are a close-to-home reminder of the effects of global warming, said Boston University biology professor Richard Primack and BU graduate student Abraham Miller-Rushing at a Feb. 21 Soap Box event, "Global Warming: Up Close and Local," at the MIT Museum.

Primack, an author of textbooks on conservation biology, said that in 1992, global warming received little more than a mention in his textbooks. It has since

expanded into a whole section, and he became interested in how global warming is affecting species and how to detect the local signature of global warming.

Discussions on global warming mentioned the same studies over and over, and they were all in far-off places like Antarctica. "In Boston, we could do better," he said. Four years ago, with Miller-Rushing's help, he started gathering data from unlikely sources, such as the hobbyist who collected cemetery photos, on the timing of flowering plants, ribbiting frogs and migrating birds.

He found that all these things were happening earlier and earlier. Because of its heat-trapping buildings and parking lots, Boston and other urban areas warmed more than the rest of the country—2.5 degrees Celsius versus 0.6 degrees elsewhere.

When co-dependent species become out of sync, it can cause species to decline

and become extinct very rapidly. Birds who return after certain flowers have bloomed and insects have hatched could starve.

This science, the study of the timing of recurring natural phenomena, is called phenology. Primack and Miller-Rushing urged everyone attending the Soap Box to become amateur phenologists by recording the arrival of flowers, butterflies and dragonflies, and other seasonal events, and sending them to him. Many in the audience said they would be willing to get involved.

The researchers have found data at the Arnold Arboretum, where plants have started flowering an average of eight days earlier over time; bird migration information recorded in Manomet, Mass.; a woman who kept precise outdoor records at her home for 50 years; naturalists' diaries and birdwatchers at Mt. Auburn Cemetery who seek to outdo each other

by spotting the first wood thrush of the season. Even Thoreau's Concord, Mass., diaries with his painstaking observations of 600 species have been invaluable.

This information provides patterns that can help explain which species are most sensitive and which are least sensitive to climate change, so we can make predictions about the future, Primack said. "We'd like to create a map of how things are changing across New England."

"This is not about glaciers or extinct frogs in the mountaintops of Costa Rica," he said. "This is a way people can see for themselves that climate change is affecting the organisms living in our gardens and the birds visiting our bird feeders."

This Soap Box program will be part of the new Cambridge Science Festival to be held April 21-29.

To send nature observations, e-mail richardprimack@hotmail.com with "Nature's Calendar NE" in the subject line.



PHOTO / DONNA COVENY

## Chilly scenes of winter

Kurt Stiehl, a senior in mechanical engineering, just couldn't resist the skating rink that a recent cold snap created on Killian Court.

# RE-GENERATOR

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green building design to behavior change for computer energy use.

- A group seeking to reduce MIT greenhouse gas emissions has collected 500 signatures on a letter asking MIT President Susan Hockfield to lower MIT's emissions, and the group is working to pass a resolution on emissions reductions through the Undergraduate Assembly and Graduate Student Council.

- MIT Student Pugwash seeks to institute an MIT graduation pledge to "explore and take into account the social and environmental consequences of any job I consider and will try to improve these aspects of any organization for which I work."

## Walking the talk

At the Re-Generator, Leon R. Glicksman, professor of building technology and mechanical engineering and director of MIT's Building Technology Program, gave an update on the Campus Energy Task Force.

The Campus Energy Task Force is the first of several task forces created by the MIT Energy Initiative (MITEI), an Institute-wide effort to meet the global energy challenge. The task force, also known as "Walk the Talk," is centered on how the MIT campus will reflect the institutional commitment to efficiency, innovation, cutting carbon emissions and energy usage and serve as a model for other universities.

Among its goals are to create a long-range, campus-wide plan for energy demand and supply; identify and promote short-term measures; develop a loan fund and other resources for improvements; develop and fund research and educational opportunities; and establish a campus research center.

The task force, chaired by Glicksman and Sherwin Greenblatt, director of the MIT Venture Mentoring Service, is made

up of faculty members Vladimir Bulovic, associate professor of electrical engineering and computer science; Robert L. Jaffe, professor of physics; Meg Jacobs, Class of 1947 Career Development Associate Professor of History; John Sterman, Jay Forrester Professor of Management; Christopher P. Zegras, assistant professor of urban studies and planning; and Les Norford, professor of architecture.

Student representatives are Sloan doctoral candidate Jason Jay and civil and environmental engineering sophomore Ariel Esposito; administration members are chief facilities officer Bill Anderson; environmental health and safety programs director Bill Van Schalkwyk; Peter Cooper, manager of sustainability engineering and utility planning; Steve Lanou, program manager for sustainability initiatives; Associate Provost Lorna Gibson; administrative assistant Amy Donovan; and Director of undergraduate teaching labs Dick Fenner.

This spring, the Campus Energy Task Force plans to identify a strategy for increasing campus efficiency, review it with the MIT community, present it to the administration for action and start near-term solutions.

"Now that the MITEI has formed a Campus Energy Task Force, the Institute's commitment to 'walking the talk' is clear," said Jay, one of Re-Generator's organizers. "What remains is for students, staff and faculty to help lead the way forward, applying our technical and leadership skills to tough energy and environmental challenges around MIT."

Re-Generator was sponsored by Sustainability@MIT, the MIT Energy Club, UA Sustainability Committee, Students for Global Sustainability, Share a Vital Earth (SAVE), MIT Student Pugwash and Sloan Net Impact, with support from the Environmental Programs Office, the Laboratory for Energy and the Environment and MIT Facilities.



PHOTO / STEPHANIE SCHOROW

Generoso Fierro, CMS undergraduate administrator, offered 'stress bulbs' stamped with 'Comparative Media Studies' to visiting CMS student Cabell Gathman.

# CMS

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of sending our research out."

Projects include the development of new games played with body movement or that use aural cues; this may open up the game market to the sight impaired, Tan said. Such innovations may require new genres or stories. For example, previously unserved gamers may not like zombies, Tan noted, although he added with a grin, "a lot of people do like zombies."

"It's very important for us in CMS to observe the medium as it develops and maybe even try to contribute to it so it can run the gamut of all the different kinds of expressions it's capable of," Tan said. "None of us want to see games pigeonholed. There's a tendency for the gaming industry to do that because risk is such an issue."

Across the lobby, Scot Osterweil, creative director of the Education Arcade—

which explores the use of educational games—fielded numerous questions about an education game in development, tentatively called "Labyrinth." Designed to teach math and literacy to middle school students, Labyrinth features puzzles and monsters that challenge students to solve problems; it's not meant for play during school hours but kids may play it at home to prepare themselves for a math curriculum in class.

"This is a chance to restate what good learning games are about," Osterweil explained. Behind him a poster proclaimed the four "freedoms" of game play: freedom to fail, freedom to experience, freedom of effort and freedom to try on new identities.

The fair demonstrated that CMS research "may be serious but it's also fun and has real-world applications," said Margaret Weigel, New Media Literacies research manager.