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Moving toward morphing vehicles

Elizabeth A. Thomson
News Office

Picture a bird, effortlessly adjusting its wings to catch every current of air. Airplanes that could do the same would have many advantages over today's flying machines, including increased fuel efficiency.

Now MIT engineers report they may have found a way for structures — and materials — to move in this way, essentially morphing from one shape into another.

The discovery could lead to an airplane that morphs on demand from the shape that is most energy efficient to another better suited to agility, or to a boat whose hull changes shape to allow more efficient movement in choppy, calm or shallow waters.

This science-fiction outcome, in the works for 20 years, has been unobtainable with conventional devices such as hydraulics, which aren't practical for a variety of reasons — from cost to weight to ease of movement.

MIT's work involves a new application of a familiar device: the rechargeable battery. Papers describing the team's progress appeared earlier this year in *Advanced Functional Materials* and *Electrochemical and Solid-State Letters*.

Batteries expand and contract as they are charged and recharged. "This has generally been thought to be something detrimental to batteries. But I thought we could use this behavior to another end: the actuation, or movement, of large-scale structures," said Yet-Ming Chiang, the Kyocera Professor in the Department of Materials Science and Engineering (MSE).

Chiang and Professor Steven R. Hall of the Department of Aeronautics and Astronautics led a team that also includes MSE graduate student Timothy E. Chin and

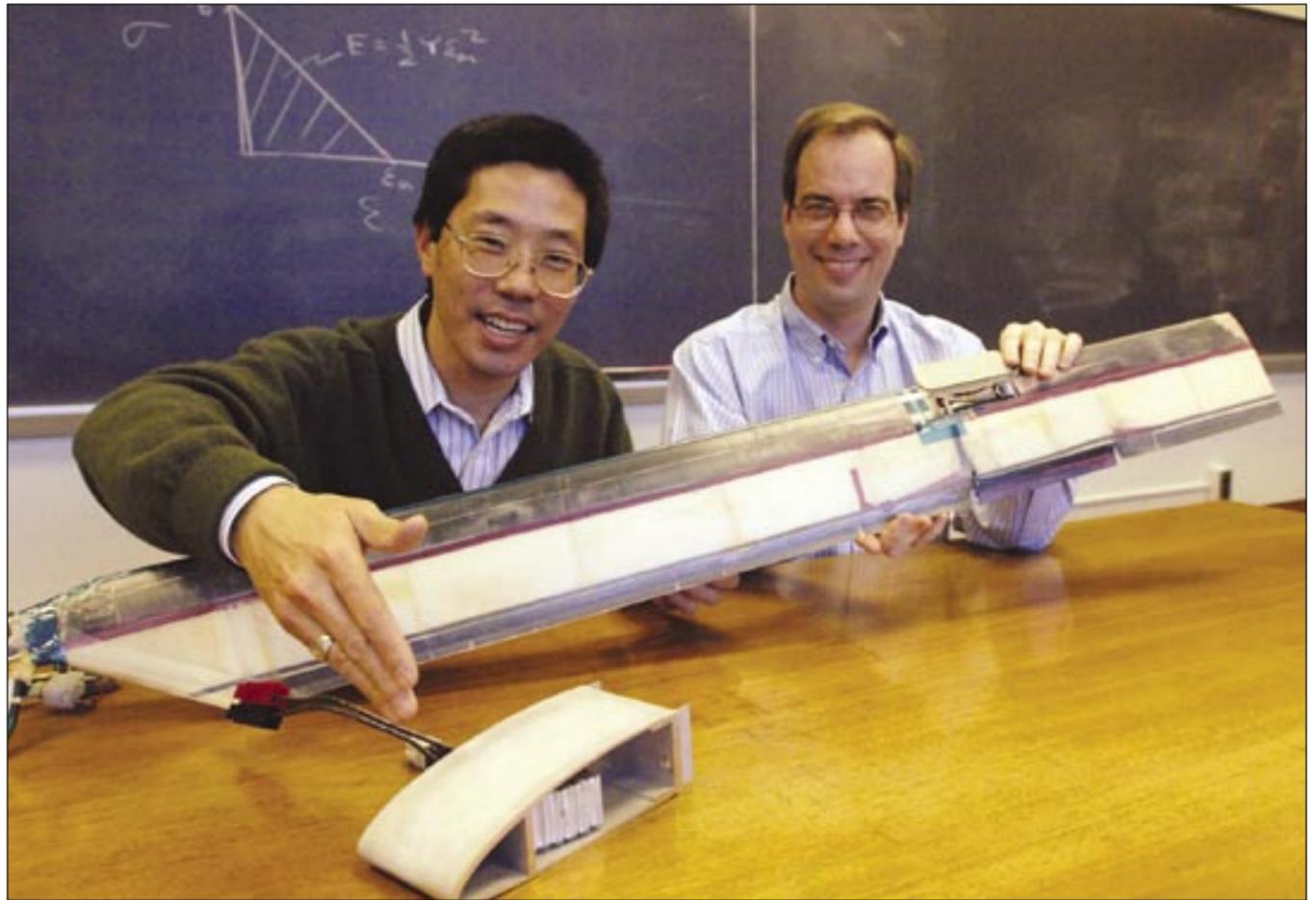


PHOTO / DONNA COVENEY

Professors Yet-Ming Chiang, left, and Steven Hall show components of their electrochemically actuated morphing rotor prototype (foreground) as well as a reduced-scale model (long object) of a previous technology that uses piezoelectrics as the active materials.

postdoctoral associate Yukinori Koyama, aero-astro graduate student Fernando Tubilla and postdoctoral associate Kyung Yeol Song, and three visiting students, Urs Rhyner (from the Swiss Federal Institute

of Technology, ETH-Zurich) and Dimitrios Sapanaras and Georg Baetz (University of Karlsruhe, Germany).

Several types of "active" materials are already used to move devices ranging

from miniature motors to micropositioners. None, however, "can enable the large-

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Work may speed interplanetary communications

MIT researchers have developed a tiny light detector that may allow for super-fast broadband communications over interplanetary distances. Currently, even still images from other planets are difficult to retrieve.

"It can take hours with the existing wireless radio frequency technology to get useful scientific information back from Mars to Earth. But an optical link can do that thousands of times faster," said Karl Berggren, assistant professor in the Department of Electrical Engineering and Computer Science (EECS).

Berggren, who is also affiliated with the Research Laboratory of Electronics (RLE), developed the detector with colleagues from the RLE, Lincoln Laboratory and



PHOTO / DONNA COVENEY

MIT Assistant Professor Karl Berggren of electrical engineering and computer science works on nanowires in the lab.

Hockfield offers views to higher ed commission

Testifying at a public hearing held by the U.S. Secretary of Education's Commission on the Future of Higher Education on Monday, March 20, in Boston, MIT President Susan Hockfield urged the panel to champion increased financial support for higher education, stronger K-12 preparation, and the diversity and innovation that have made American universities and colleges models for the rest of the world.

She urged the commission, in making its recommendations, to resist the urge to impose a standardized curriculum or mandatory testing. "My own belief is that strengthening those aspects of higher education at the root of our success — access, innovation and competition — will be more effective than standardization, mandates and penalties in promoting real, long-term improvements," she said.

Hockfield's comments on educational innovation stressed curricular change,

programs that make connections to the world of professional practice, and the use of technology. She cited as examples a range of MIT programs, including new degree offerings at the intersection of the life sciences and engineering; the MIT International Science and Technology Initiatives (MISTI), which places students in professional internships abroad; and MIT OpenCourseWare, which makes materials from more than 1,200 MIT courses available free via the web.

"Curricular innovation is not optional for U.S. universities," Hockfield said Monday. "It has been and will continue to be the source of our vitality and our ability to respond to changes in the world."

Pointing out that Congress recently cut \$12 billion from the budget for student

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NEWS

WORK BREAK

Students head to the Gulf Coast for spring break to help the area recover from last summer's hurricanes.

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ARTISTIC ADDITION

Sculptor Sarah Sze talks about her new work, 'Blue Poles,' which was just installed on the front of the Sidney-Pacific Graduate Residence.

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RESEARCH

BY A WHISKER

Neuroscientists discover an exquisite brain map linked to the whiskers of rats.

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PHOTO / WIKIPEDIA

EXPANSIVE THINKING

Brain researchers find unexpected activity in the visual cortex.

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A ROUNDING ERRAND

Graduate student Amos Winter works to help Tanzanians get better wheelchairs.

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Educators meet, discuss K-12 outreach

Sasha Brown
News Office

Working with K-12 students benefits both children and their college-aged mentors, said Professor Mitchel Resnick of the MIT Media Lab, who gave the keynote address at the first Continuum Conference, an event held to encourage more K-12 outreach on college campuses.

"MIT students should not only be at the university," said Resnick. "They should also be out in the world."

The conference brought roughly 50 educators from the Cambridge Public Schools and other area universities to the MIT Student Center on Evacuation Day (Friday, March 17) — a holiday for local schools — to discuss outreach ideas and opportunities in the Cambridge Public School system.

John Velasco, a graduate student in political science, planned and coordinated the conference along with Public Service Center Director Sally Susnowitz and conference coordinator Chandra Clarke.

As the creator of iMath, a program that

links Cambridge Public School eighth-graders with MIT students, Velasco knows how important outreach can be, he said.

After receiving the Howard Swearer Student Humanitarian Award last year for his work with iMath, Velasco used the award funds — along with a matching contribution from Chancellor Phillip Clay's office — to sponsor the conference.

"The ultimate goal is to get more MIT students involved in Cambridge," said Velasco, who said he believes helping in education provides a crucial service to the community. "Education gives kids the means to pursue their dreams," he said.

Resnick, a leader in educational technology, is also heavily involved in K-12 outreach as co-founder of the Computer Clubhouse network of after-school learning centers. "Kids are the future," he said.

During his talk, Resnick touched on what qualities make for strong mentors. He stressed that mentors ought to "share things they really care about. We all learn the most when we work on things we care deeply about."

Resnick encouraged mentors to be life-

long learners. Ultimately youngsters need to learn "how to be good learners," he said.

It is also important for mentors to recognize different learning styles, Resnick said. "Not everyone is successful in the same way," he said.

Finally, mentors must have respect for their students and expect respect in return. "To be a good learner, you have to take risks," he said. In a nurturing environment, students are more likely to take a chance or try something new, he said.

Both the mentor and the student need to feel that they are gaining, he said. "The experience would be the most sustainable if they (the mentors) feel like it is something for them too," he said.

Following Resnick's talk, the audience broke into small working groups to discuss program development, recruitment and communication.

Susnowitz said she hopes the conference will spark interest and get the ball rolling in terms of greater outreach. "We really want something to come out of this that is practical."

Change proposed to grad panel at faculty meeting

Deborah Halber
News Office Correspondent

Faculty chair Lorna J. Gibson presented a proposal at the March 15 faculty meeting to restructure the Committee on Graduate School Programs and rename it the Committee on Graduate Programs.

Currently made up of 40 members, the Committee on Graduate School Programs handles a variety of tasks, from recommending the adoption of new graduate degree programs to issuing formal complaints to underperforming graduate students.

The proposal would shrink the committee to six elected faculty members plus the associate chair of the faculty and two graduate student members. The dean for graduate students and the vice president for research would be ex officio members. The chair of the committee would be appointed by the chair of the faculty and faculty members would serve for three years (terms currently last one year) to allow for more continuity, said Gibson, who is the Matoula S. Salapatras Professor of Materials Science and Engineering.

The proposal will be put to a vote at the April faculty meeting, but Dean for Graduate Students Isaac M. Colbert said he "heartily approves" of the proposed changes. Currently, he said, "it's easier to tell who's not on the committee than who is on the committee. A body that large can't deal with the challenges graduate education is facing today at MIT and around the world."

Gibson said the hope is that a restructured committee will be able to "look at broader, Institute-wide graduate policies. With the shift to graduate education in interdisciplinary fields and the corresponding increase in ad hoc interdisciplinary doctoral thesis committees," more oversight is needed, she said.

She pointed out that more policies are governing international graduate students, and MIT is competing for grad students on a more global scale than in the past. A smaller committee may be able to accomplish more substantive work and improve the graduate student experience at MIT, she said.

Open access

Concerned that taxpayer-funded research is not accessible to the general public because of the tightly controlled, proprietary system enforced by some journal publishers, the National Institutes of Health (NIH) is asking every NIH-funded scientist who publishes results in a peer-reviewed journal to deposit a digital copy of the article in PubMed Central (PMC), the online digital library maintained by the NIH. Not later than 12 months after the journal article appears, PMC will then provide free online access to the public.

Director of Libraries Anne J. Wolpert and Vice President for Research Alice Gast discussed with the faculty MIT's response to this issue, which has been to support NIH researchers in complying with the policy, and also to enable any MIT researcher to use a more author-friendly copyright agreement when submitting articles for publication.

"The overwhelming majority of work produced by you is licensed back to you, and you can't always use your own work in the way you want to use it," Wolpert

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Isadore Singer to give Killian lecture tomorrow

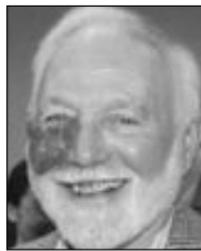
Anne Trafton
News Office

Institute Professor Isadore Singer, winner of the 2005-2006 James R. Killian Jr. Faculty Achievement Award, will deliver the Killian Award lecture on Thursday, March 23.

Singer will speak on "Some Geometry of the Past Half Century and Its Historical Background" at 4:30 p.m. in the Stata Center's Kirsch Auditorium.

Singer, a world-renowned mathematician who joined the MIT faculty after earning his Ph.D. from the University of Chicago in 1950, has made significant contributions in a wide range of mathematical fields, including geometry, analysis and algebra.

In his talk, Singer will describe "the exciting evolution of the past 50 years in our understanding of geometry," starting with his own experience at MIT in the early 1950s.



Isadore Singer

His talk will explain the Gauss-Bonnet formula and will also focus on collaboration between physicists and mathematicians, which has flourished in the past 30 years because "physicists need sophisticated mathematical techniques to address problems in string theory and because insights coming from physics have profoundly impacted mathematics."

In 2004, Singer was awarded the Abel Prize for a series of papers he co-authored with Michael Atiyah. The papers also earned the Bocher Prize from the American Mathematical Society in 1969, and in 2000, the society honored Singer with the Steele Prize for Lifetime Achievement. Singer won the National Medal of Science, this nation's highest science honor, in 1983.

The Killian Award was established in 1971 to recognize extraordinary professional accomplishments by full-time members of the MIT faculty. A faculty committee chooses the recipient from candidates nominated by their peers for outstanding contributions to their fields, to MIT and to society.



PHOTO / DONNA COVENEY

Let there be light

A passerby is silhouetted in the hallway lights in the basement of Building 1 on Wednesday, March 15.

Sloan rings bells on Wall Street, opening NASDAQ, NYSE

Two faculty members from the MIT Sloan School of Management have been ringing the bells on Wall Street.

Sohu.com, co-founded by its CEO, MIT alumnus Charles Zhang (Ph.D. 1994), and by Sloan Professor Edward Roberts, founder/chair of MIT's Entrepreneurship Center, celebrated its 10th anniversary as a company by ringing the opening bell for NASDAQ trading on Monday, March 13, in New York. Sohu has been named the official and exclusive Internet content and systems sponsor for the Beijing 2008 Olympics.

Founded in Boston, the company is headquartered in Beijing, with all of its 1,600 employees and activities based in China. The company is one of China's leading Internet portals, with revenues exceeding \$100 million in 2005. Roberts and Zhang are the only

company directors who have served since Sohu's founding.

This past December, Professor Michael Cusumano, Sloan faculty member in Strategy and Technological Innovation and Entrepreneurship, also got to participate in an opening bell-ringing ceremony. He was there when Patni Computer Systems, founded by MIT Sloan graduate Narendra Patni (G.M. '69), went public on the New York Stock Exchange on Friday, Dec. 8. Cusumano has been a director of the company for the past two years.

Patni is currently the sixth-largest Indian software company, with more than 11,000 employees (including more than 2,000 in the United States) and 2005 revenues of approximately \$450 million. It specializes in building customized software systems as well as providing maintenance and engineering services.

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Students plan Gulf Coast cleanup work over break

Sasha Brown
News Office

Eschewing bathing suits and beaches for hammers, saws and Tyvek suits might seem odd to some, but 70 MIT students plan to do just that, spending their spring break next week in the hurricane-ravaged Gulf Coast repairing, rebuilding and gutting homes damaged by last summer's storms.

Several campus religious organizations are taking students to the area devastated by Hurricane Katrina last August. In most cases, the trips were sponsored by the national side of the group's organization, and all are highly subsidized. Students are providing nominal amounts of money toward their trips.

"Most people have just really been wanting to do something," said Daniel Park (S.B. 2001; M.Eng. 2002) of the Asian Christian

Fellowship (ACF). Park is not going along, but he helped organize a trip for roughly 40 MIT students from ACF and the United Christian Fellowship. The group is headed to New Orleans for eight days through the national InterVarsity Christian Fellowship.

The students will leave on Saturday, March 25, and stay through the following Saturday.

Park was amazed by the interest he saw in aiding the Gulf region. "There are more people who want to help than there are opportunities to do so," he said.

The group will be staying at a local church in New Orleans and will be contributing to clean-up and recovery as well as anything else that is needed. "They will also spend some time talking about the social issues," Park said.

For the groups going, the trip is as much about understanding a complicated situation as it is about contributing to the

rebuilding effort.

"I hope the students will gain a more critical eye politically," said Rachel Shiffrin, MIT Hillel's program director. Shiffrin is going to Biloxi, Miss., with eight students. The MIT Hillel students will be doing roofing work alongside students from several other schools, including Brown University, the University of Delaware and University of California at Berkeley.

The group will stay four nights in a tent community, where they will spend two nights listening to speakers discuss the history of the Gulf Coast crisis and two nights exploring Jewish learning and how their work is contributing to their spiritual lives.

"This is not just a trip," said Shiffrin. "It is an opportunity to educate the students."

Twenty students from the Protestant Student Community will also be headed to New Orleans on March 25 along with their advisor, Rev. John Wuestnick. They will be

helping Common Ground Relief — a community-initiated relief organization, established just after Katrina struck.

Wuestnick is no stranger to community service on spring break. Every year he takes a group of students on a trip to assist Habitat for Humanity, an organization that builds homes for low-income families.

"Some of these students have gone with me every year," said Wuestnick, adding that there was more interest than usual this year.

The Protestant Student Community students will be headed into the heart of New Orleans, where they will don Tyvek suits and respirators to protect themselves as they help gut homes damaged irreparably by the hurricane.

Although the spring break trips are already planned, the MIT Public Service Center (PSC) has extended the deadline for Hurricane Katrina Relief projects only to April 12. Visit web.mit.edu/mitpsc/.

Building a better wheelchair

Grad student aims to help Tanzanians

Sasha Brown
News Office

A graduate student in mechanical engineering spent last summer assessing wheelchair technology and availability in a country where only 3 percent of those who need a wheelchair have one.

In June 2005, Amos Winter traveled to Tanzania on a public service fellowship to gather information for the Tanzania Training Center for Orthopedic Technologies in collaboration with San Francisco-based Whirlwind Wheelchair International.

"This is an area where I can make a real contribution," he said. During his time in Tanzania, Winter interviewed hundreds of wheelchair users about the challenges they face every day.

Most of the people he interviewed had been paralyzed as children, but had not received a wheelchair until they were in their 20s or 30s. Many had spent years strapping sandals on their hands and crawling on the ground to get around, Winter said.

For many, a wheelchair or the lack thereof was a major part of life, affecting employment, marriage status and more. "The wheelchair and the rest of their lives were completely intertwined," said Winter.

The problems Winter encountered were specific to the region, including the difficulties posed by the terrain, poverty, social stigma and the lack of knowledgeable wheelchair technicians. So, Winter said he tried to find solutions that would use what the region offered.

For example, after watching average Tanzanians pedal three-wheeled vehicles to and from work, Winter worked with local technicians to design a hand-crank to adapt them for use by the disabled. The system would allow wheelchair users to travel long distances without the fatigue associated with common wheelchairs, which are built for maneuverability rather than speed.

Local buses typically can't accommodate wheelchairs, so most who are disabled need to find their own way to work, Winter said. Up to 30 percent of Tanzanian wheelchair-users travel more than 5 kilometers (3.1 miles) over rocky and dusty terrain each day.

Getting a wheelchair repaired can also present daunting challenges in Tanzania, since many are imported and parts are expensive. Bicycles, in comparison, are plentiful and far less expensive, so Winter suggested using bicycle parts as replacement pieces. Over the life of a wheelchair, this small change



PHOTO COURTESY / AMOS WINTER

MIT graduate student Amos Winter and local technicians adapted this three-wheeled vehicle for use by the disabled. It is powered by a hand crank.



PHOTO / DONNA COVENEY

Graduate student Amos Winter displays a wheelchair model currently being produced in Tanzania at a MacVicar Day exhibit March 3 in the Stata Center. Winter is working on technical solutions to the challenges faced by wheelchair users in that country.

could save the user up to \$200.

Another problem Winter encountered was improperly fit wheelchairs. A poor fit can lead to pressure sores, which can become infected and painful. In some cases, the infections can even

lead to death, said Winter. "That is a relatively simple change to make," said Winter. Fitting a wheelchair is a skill that can be taught at little cost.

One of Winter's goals is to educate those who manufacture wheelchairs in Tanzania. He plans to spend the summer working on a manual of basic mechanical engineering skills. This September, he will present the manual both to local technicians in Tanzania and at the 2006 African Wheelchair Congress.

Working with Amy Smith, an instructor in the Edgerton Center, Winter plans to run a public service design seminar in spring of 2007 in which students will build on the ideas he started in Tanzania. "I am looking for it to be collaborative," said Winter, who expects a large turnout. "It is a problem that is appealing to people."

Winter described his experience in Tanzania as life-changing. "This will continue to be a part of my future career," he said. "It was inspirational."

For more information, visit the MIT Public Service Center web site at web.mit.edu/mitpsc/.

Grad students help with business of rebuilding La.

Amy MacMillan
Leaders for Manufacturing Program

Subhrangshu Datta watched in dismay as images from Hurricane Katrina unfolded on his TV screen last fall. He wanted to do more than just sign a relief check, so the MIT Sloan School of Management graduate student put his business skills to good use.

"We are here at MIT in this fantastic Leaders for Manufacturing (LFM) program with super-talented students. This opportunity is right up our alley," Datta said. LFM is offered jointly by MIT Sloan School of Management and the MIT School of Engineering, and is hosted by the Engineering Systems Division.

Datta recruited fellow LFM students Sabrina Chang, Julie Go, Phil Richards, Casey Phoenix, Wini Hebalakar and Aamir Sundrani to assist the devastated city of New Orleans.

The group reached out to Louisiana-based MIT alumni, manufacturing organizations and others and offered to help. Eventually, they were introduced to Suzy Potter, community development manager at the Blood Center, a nonprofit community service organization in New Orleans that is the primary supplier of blood and blood components in South Louisiana and parts of South Mississippi.

Potter said the Blood Center had sustained \$2 million in uninsured losses when 4 feet of rising water ruined all of its equipment and hurricane winds damaged its roof. The center, which served more than 50 area hospitals, employed more than 300 people before the storms hit; the staff was downsized by two-thirds in October, she said.

The MIT students flew to Louisiana at the end of January and toured the ravaged region with Potter. The group also volunteered for a day with Habitat for Humanity.

Datta and the others were stunned by the sights: "It looks like a war zone," Datta said.

"I couldn't believe that we were standing in the heart of a city five months after a disaster in one of the most resource-rich countries of the world," Hebalakar said. "I had seen the after-effects of disasters in other countries (including India), and New Orleans seemed like it was far from being rebuilt."

The students learned that the center's current priority is raising money through donations, so they are developing a financial and business plan that will ultimately enable the center to write grant applications and reach its goal of being fully operational again by mid-2006.

All donations will be dedicated to rebuilding and restoring the lab and relocating the storage and processing components farther inland, Potter said.

Rat whiskers lead to map of brain

Cathryn DeLude
News Office Correspondent

Neuroscientists at the McGovern Institute for Brain Research at MIT have discovered an exquisite micro-map of the brain. It's the size of the period at the end of this sentence, and it's in a most unexpected place — connected to the whiskers on a rat's face.

Based on discoveries in primates and cats, scientists previously thought that highly refined maps representing the complexities of the external world were the exclusive domain of the visual cortex in mammals. This new map is a miniature schematic, representing the direction a whisker is moved when it brushes against an object.

"This study is a great counterexample to the prevailing view that only the visual cortex has beautiful, overlapping, multiplexed maps," said Christopher Moore, a principal investigator at the McGovern Institute and an assistant professor in the Department of Brain and Cognitive Sciences, where he holds the Mitsui Career Development Chair. A paper on the work appeared online in *Nature Neuroscience* on March 20.

Scientists are interested in studying how fine-scale visual maps develop in the brain and process information as part of

their effort to understand how mental illnesses, strokes or epilepsy affect the cortex. But the standard workhorse for studying how brains develop, the rodent, evolved to spend its time underground in dark tunnels, and it lacks such visual maps. Rats instead use their whiskers to navigate.

"Our finding suggests that high-resolution sensory maps that can quickly and accurately handle many different kinds of sensory features are an essential hallmark of high sensory acuity, in whatever mode of perception is most important to the animal," Moore said. "It makes sense that mammals develop intricate sensory maps in the sensory system that is crucial for them — like vision is for us or the whisker system is for rodents."

Mapping coordinates

The layout of whiskers on a rat's face creates a topographic map, with one-to-one correspondence between a whisker and a "barrel" of approximately 4,000 densely packed neurons. Like the grid coordinates in the game Battleship, stimulating one whisker barrel, say the third one in from row D, or D3, tells the brain exactly what's happening at that location.

Moore and his graduate student Mark Andermann, the first author of the paper, hypothesized that a directional map lay hidden within each barrel. However, the technology didn't yet exist to find it. After

creating the world's most intricate whisker stimulator and a multineuron recording device, they discovered a micro-map for directional cues within one barrel. Interestingly, this map looks similar to the pinwheel layout of the visual map for line orientation, as if nature reused a similar layout for similar functions.

This directional map joins their recent discovery of a completely different kind of map spanning several whisker barrels, a frequency map reminiscent of the auditory system. Most likely, the frequency information from many barrels gets wired together with the directional cues from within a single barrel, giving the rat the multidimensional cues it needs to know how to negotiate the object before it.

The study also has important pragmatic implications. Rodents are an ideal model system for studying brain function for many reasons, including the ease of using cutting-edge genetic approaches, and they are currently used to study how mental illness, strokes and epilepsy affect the cortex. Discovering a highly refined sensory system in the rodents makes them even more appropriate as a model for studying precise sensory processing in mammals.

"Finding a new map in the brain is a truly exciting experience," Moore said. "It's a little like traveling to an unexplored island. It's literally charting new territory."

HOCKFIELD

Continued from Page 1

loans, Hockfield asserted that the United States needs to engage in "an informed public discussion of how the nation can pay for the education our young people need."

"Higher education is the best recipe we have for improving economic opportunity and the quality of life for our citizens," Hockfield said. But, she noted, "Today's college graduation rates are closely correlated to family income: To sustain our robust democracy and to compete in a global marketplace, we need to send an even higher percentage of our population on to college and graduation."



Susan Hockfield

MIT itself, she noted, adheres to need-blind admissions and need-based aid, and meets the full need of all admitted students: next year, some 57 percent of Institute undergraduates will receive MIT scholarship aid, totaling more than \$60 million.

Hockfield also underscored the need for a national effort to improve K-12 schooling and urged the commission to work to foster innovation in education.

In her remarks, Hockfield emphasized that the United States needs to start improving math and science education in the K-12 years. "In an era in which science and technology increasingly shape major policy issues, responsible citizenship itself requires mathematical and scientific literacy. MIT will continue our efforts to help strengthen K-12 math and science education."

The commission, established by Sec-



Higher education is the best recipe we have for improving economic opportunity and the quality of life for our citizens.

Susan Hockfield
MIT President

retary of Education Margaret Spellings in September 2005, is charged with ensuring "that America's system of higher education remains the finest in the world and continues to meet the needs of America's diverse population by expanding opportunity, innovation and economic growth." Chaired by Charles Miller, former chairman of the Board of Regents of the University of Texas System, its members include former MIT President Charles M. Vest.

Hockfield was the first in a series of distinguished college and university leaders to testify at Monday's hearing. Also among those invited to speak were Boston University President Robert Brown, former MIT provost, and Tufts University President Lawrence S. Bacow, former chancellor of MIT.

MIT Dean of Engineering Thomas L. Magnanti addressed the commission last month at a similar field hearing in San Diego. Magnanti recommended an "OpenCourseWare for Secondary Education" to improve early education in math and science, and he suggested the federal government provide incentives to universities and colleges to develop OpenCourseWare projects of their own.

"At its best, higher education has transformed lives and the nation's economy, and has become the envy of the world," Hockfield said in conclusion. "The evolution of these institutions and the system in which they operate is far from complete, but as we strive to define their 21st century versions, let us build on their fundamental strengths."



PHOTO / DONNA COVENEY

Assistant Professor Karl Berggren used the machine behind him to make nanowires, new technology that may speed interplanetary communications.

NANOWIRE

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Moscow State Pedagogical University.

The new detector improves the detection efficiency for single photons to 57 percent at a wavelength of 1,550 nanometers (billionths of a meter), the same wavelength used by optical fibers that carry broadband signals to offices and homes today. That's nearly three times the current detector efficiency of 20 percent.

The result will be real-time collection of large amounts of data from space. The work may ultimately permit the transmission of color video between astronauts or equipment in outer space and scientists on Earth.

The detector, which uses nanowires and superconductor technology, can sense extremely low light or laser signals in the infrared part of the optical spectrum — down to a single photon, the smallest and most basic unit of light. That has not been possible using conventional optical systems.

The detector also could be applied to quantum cryptography and biomedical

imaging, but the most immediate application is probably interplanetary communication, Berggren said.

Because of the vast distances between planets, current optical systems would require a large laser and a lot of power to send data at a high rate. And this would have to be done on spacecraft, which are typically starved for power. So there is a need for devices like the new detector that can operate quickly and, because they are more sensitive, receive signals from smaller lasers that do not use much power, Berggren said.

Single-photon detectors have been made by MIT and other researchers in the past, but they have not been both speedy and efficient at detecting light. The way Berggren and his colleagues improved the efficiency was to add a "photon trap" to the detector as well as an anti-reflection coating to keep light from bouncing off its surface.

The photon trap is an optical cavity consisting of the nanowire detector, a carefully measured gap of glass and a mirror. The nanowire is coiled tightly like the metal

on the back of a refrigerator to broaden its area of overlap with the laser light.

The wire is then cooled to just above absolute zero. That temperature is the point at which it becomes a superconductor and at which it can detect the absorbed photons. If a photon is not absorbed the first time it touches the wire, it bounces back and forth between the coiled nanowire and the mirror so it has more opportunities to be absorbed. The more photons that are absorbed, the greater the efficiency of the detector.

Berggren and his colleagues published their discovery in the January 23 issue of *Optics Express*. His co-authors are MIT RLE post-doctoral researcher Kristine Rosfjord and RLE/EECS graduate students Joel Yang, Vikas Anant and Eric Dauler; Lincoln Laboratory staff member Andrew Kerman; and Boris Voronov and Gregory Gol'tsman of Moscow State Pedagogical University.

The researchers are now working to make the detector even more efficient. This work was funded in part by the U.S. Air Force.

Research finds unexpected activity in visual cortex

Deborah Halber
News Office Correspondent

For years, neural activity in the brain's visual cortex was thought to have only one job: to create visual perceptions. A new study by researchers at MIT's Picower Institute for Learning and Memory shows that visual cortical activity can serve another purpose — connecting visual experience with non-visual events.

The study, which appeared in the March 17 issue of *Science*, implies that sensory parts of the brain may be able to accomplish more complex tasks than pre-

viously imagined, according to co-authors Marshall G. Shuler, MIT research affiliate, and Mark F. Bear, professor of brain and cognitive sciences. The findings have implications for understanding how our brains imbue sensory experience with behavioral meaning.

Electrodes were implanted in the visual cortex of adult rats. Initially, as expected, their neurons responded only to light. However, as the animal repeatedly experienced a light stimulus with the delivery of a drop of water, the neuronal activity changed. And in many cases, the neuron continued to be active after the light was extinguished until the water reward was delivered.

The neuron's activity, the researchers said, was related to the anticipation of the reward. What's more, neurons continued to predict reward times associated with the light cues even in different situations. "This is a strong indication that learning was actually occurring in the visual cortex," Shuler said.

Brain activity corresponding to "reward timing has been observed in higher-order brain regions, but never in the primary visual cortex," Bear said. "No one would have expected to see it there because the visual cortex is thought to be a detector of the physical features of the environment, with responses limited to those features to

ensure that sensory processing is reliable and reproducible."

"These neurons were not acting in response to what the stimuli were, but what they had come to mean," Shuler said.

The researchers are not sure whether the animal perceives this brain activity, but they plan to explore how it may guide appropriate behaviors.

"We are pretty optimistic we can uncover the mechanism" underlying this finding, Bear said. "There is a lot going on in the brain that we have been unaware of, studying anesthetized animals all these years."

This work was supported by the Howard Hughes Medical Institute.

MORPHING—

Continued from Page 1

scale structural morphing we've been working toward," Hall said.

For example, some "smart materials" called piezoelectrics can change shape in less than the blink of an eye, but they do so on almost a microscopic level. They wouldn't be capable of moving a wing the distance necessary to affect flight.

Similarly, shape-memory alloys have characteristics useful to large-scale actuation, but they require temperature control to work.

"So to make them work you've got to keep them warm and insulate them. And if you insulate them, it takes a long time to cool them down if you want them to return to their original shape," Hall said. Those are not exactly optimum conditions for seamless morphing.

In the quest for materials that would allow such morphing, engineers have recently focused on nature's approach to the problem. A plant that bends toward the light, quickly furls its leaves when touched, or pushes a concrete sidewalk aloft with its roots is essentially moving fluids between cells.

Chiang realized that the solid compounds used to store electrical energy in lithium rechargeable batteries could be made to work in a similar way. The movement of ions to and from these materials during charging and recharging, he thought, was analogous to the moving fluids in plants. Could this be a synthetic counterpart to nature's solution?

To find out, Chiang and Hall began testing commercially available rechargeable batteries of a prismatic form, then designed their own devices composed of graphite posts surrounded by a lithium source. The results were promising.

Among other things, they found that the batteries continued to expand and contract under tremendous stresses, a must for devices that will be changing the shape of, say, a stiff helicopter rotor that's also exposed to aerodynamic forces.

Other key advantages of the approach: The electrically activated batteries can operate at low voltages (less than five volts) as compared to the hundreds of volts required by piezoelectrics. The materials that make up the batteries are also inherently light. "For things that fly, weight is important," Hall said.

The researchers have already demonstrated basic battery-based actuators that can pull and push with large force. Later this year, they hope to demonstrate the shape-morphing of a helicopter rotor blade. The morphing capability should allow for a more efficient design, ultimately making it possible for a vehicle to carry heavier loads.

Team members say that other applications, including miniaturized devices for Micro-Electrical-Mechanical Systems (MEMS), may flow from these initial demonstrations.

The researchers emphasize that much work remains to be done, such as refining the design of the battery for optimal operation in a morphing vehicle. Chiang notes, however, that "we've been able to demonstrate the potential of this approach even using these very unoptimized off-the-shelf batteries."

This work was funded by the Defense Advanced Research Projects Agency (DARPA).



PHOTO / DONNA COVENY

A head for civil engineering

Senior Ira Simkhovitch helps move a model of an Easter Island head to test a theory of how the Rapa Nui people moved the giant stone heads into position on the island 1,500 years ago. This experiment, done Wednesday, March 15, was part of Professor Herbert Einstein's class in civil engineering design. For more photos, visit web.mit.edu/newsoffice/.

Noted economist Clyde Prestowitz to give Miller talk

Sarah H. Wright
News Office

Economist Clyde Prestowitz, a veteran of the Reagan administration and prominent conservative critic of the policies and conduct of the Bush White House, will deliver the annual Charles L. Miller Lecture at 4 p.m. on April 4, in the Bush Room (10-105).

The title of his talk is "The World Turned Upside Down: The Impact of the Return of India and China to Their Historical Global Weight."

Prestowitz served as a counselor to the secretary of commerce during Reagan's first term (1981-1985). In that role, he led U.S. trade and investment negotiations with Japan, China, Latin America and Europe.

A specialist in international trade policy and economic competitiveness, Prestowitz is the founder and president of the Economic Strategy Institute (ESI), a Washington, D.C., think tank. ESI engages in public policy related to globalization.

In a 2005 opinion piece for the *Boston Globe*, Prestowitz criticized the "confluence of America's consumerism with the strategic, export-led growth policies of many other countries" and characterized globalization as a "kind of pyramid scheme" for the United States.

Prestowitz is the author of, most recently, "Three Billion New Capitalists: The Great Shift of Wealth and Power to the East."

Prestowitz, who has said his Republicanism "came in the DNA," has also written op-ed articles for prominent media in which he argues the Bush administration is mislabeling itself as conservative.

The current White House is "not conservative, it's radical. It's on the wrong track domestically. It's on the very wrong track internationally. As a patriot, as a conservative, as a Republican, it's important to try to change it," Prestowitz wrote in a 2005 article for *Mother Jones* magazine.

AWARDS & HONORS

Institute Professor **Robert Langer** was named one of the "Fast 50: The People Who Will Change How We Work and Live over the Next 10 Years" in the March issue of *Fast Company*. The magazine writes that Langer, who specializes in innovative drug delivery systems, "is so creative — and so astonishingly prolific — that it's hard to imagine another scientist poised to have a major impact in so many different ways over the next decade."

Alan V. Oppenheim, Ford Professor of Engineering, is the 2005 recipient of the Signal Processing Education Award of the Institute of Electrical and Electronics Engineers (IEEE) Signal Processing Society. The award honors educators who have made pioneering and significant contributions to signal processing education.

Gregory Stephanopoulos, professor of chemical engineering, was recently inducted as a fellow of the American Institute for Medical and Biological Engineering. The 98 new members were inducted

on Thursday, March 2, in Washington, D.C.

Ioannis V. Yanniss, professor of polymer science and engineering, has been selected as a member of the editorial board of the Institute of Physics' newest journal, *Biomedical Materials*.

Marlene Manoff, associate head and collection manager at Dewey Humanities Library, has been honored with the Association of College and Research Libraries (ACRL) Women's Studies Section Career Achievement Award. The award recognizes significant longstanding contributions to women's studies in the field of librarianship over the course of a career. The award will be presented during the American Library Association annual conference in June.

Leticia Soto, who entered MIT's System Design and Management (SDM) program in January, was honored by the Society of Hispanic Professional Engineers with the "Hispanic in Technology — Gov-

ernment Award" at that organization's national convention held just a few days after she began the SDM program. The award is presented to an individual whose outstanding achievements have contributed to the field of engineering on a continuous basis, through design, production, management, research or any phase of engineering, and resulted in significant impact.

Sharon E. Gillett, principal research associate in the Engineering Systems Division's Center for Technology, Policy and Industrial Development, and **Michail Bletsas**, director of computing at the Media Lab, were recently named to the City of Boston's WiFi Task Force, which is charged with making Boston a world leader in wireless Internet access. The WiFi Task Force will explore how the city can utilize its assets, such as streetlights and buildings, to create an innovative wireless system that works for Boston. The task force will deliver a report this summer.

Theater class gets a bit technical

Lauren Maurand
Office of the Arts

Theater may not be the first thing that comes to mind when people think of MIT, but the music and theater arts section, which has been a part of the institution since 1987, sees a steady stream of student interest.

Classes in technical theater offer instruction in the creation of scenery, costumes, lighting and sound effects. These courses used to attract mainly juniors and seniors because students wouldn't elect to take it until they had fulfilled their academic requirements, but now that seems to be changing, according to Mike Katz, technical instructor in theater arts.

"We're seeing a greater percentage of freshmen in the stagecraft class," said Katz, who will give a talk on "The Science of Theater" at the Stata Center this Sunday, March 26.

According to Katz, in the 2005-06 academic year, underclassmen comprised almost half of his class, the highest percentage of any year from 1998 until the present. In previous years, underclassmen averaged only about 32 percent of the class.

Admissions Office Communications Manager Ben Jones confirms that in recent years there has been a lot of student interest in technical theater. "I think it has to do with the fact that we look for creative kids who embrace the MIT motto ("mind and hand"), and technical theater seems to go hand in hand with that," Jones said.

Perhaps surprisingly, technical theater at MIT is not as technological as other areas at the Institute. Technical coordinator Bill Fregosi asks his students to create things with their own hands rather than computer-aided design.

He said he wants them to be involved



PHOTO / DONNA COVENEY

Theater arts instructor Mike Katz, right, shows students how to hang lights backstage at Kresge Little Theater during stagecraft class on Thursday, March 16. The students are, from left, Maura Cordial, sophomore in electrical engineering and computer science; Nicole O'Keefe, freshman in mechanical engineering; Steven Flowers, junior in management; and Evan Taylor, junior in economics.

physically with the work and mentally with the text of the shows they produce. "Maybe we're the essence of MIT," said Fregosi, referring to the "mind and hand" motto.

MIT's theater arts program is not a professional track program; students can minor, but not major in theater. Katz believes this actually benefits both the students and the section since it means that the productions at MIT are designed and built by engineers, physicists, and others with technical expertise outside of theater who understand things like the physics behind lighting design.

"I don't think the majority of MIT stu-

dents even know anything about the theater department and its technical classes," said Matt Abernathy, a senior physics major who took a class in costuming to fulfill his humanities requirement. "If they did, I think more students would take technical theater."

On Sunday, March 26, Katz will conduct a F.A.S.T. (Family Adventures in Science and Technology) program titled, "The Science of Theater," exploring the physics and mechanical engineering involved in staging a show. The presentation, which is free and open to the public, will be held from 2 to 4 p.m. in Room E32-141 of the Stata Center. The MIT Museum is sponsoring the event.

FACULTY

Continued from Page 2

told the faculty. Copyright exemptions that were carefully crafted to allow the academy to teach and do research are steadily being superseded by intellectual property regimes that were developed for the benefit of the entertainment industry. "What Disney wants, the academy gets, whether it suits your interests or not," Wolpert said.

Among the reasons for universities to support open access is the high cost associated with renting access to journals, which for MIT alone has grown in the past decade from \$2.6 million to more than \$6 million a year.

Gast said that a discussion group convened around the issue has revealed different cultures across the MIT campus; some disciplines routinely share their work on the Internet while others disseminate findings solely through peer-reviewed proprietary journals.

An amendment that can be attached to any publication's copyright agreement was disseminated to principal investigators in February. "We have to wait and see how this plays out and see what feedback we get from publishers," Gast said. The goal is for MIT as an institution to work out agreements with publishers rather than make individual researchers fight their own battles. More information, as well as the amendment, which would over-

ride the publisher's copyright agreement, is available online at <http://libraries.mit.edu/about/scholarly/> and other MIT web sites.

"There is a distinct feeling among our counterparts at large private and public institutions that if MIT takes a reasonable and principled position on this issue, other institutions will be encouraged to do likewise," Wolpert said.

Divestment from Sudan

Harvard, Stanford, Yale and Brown Universities and Amherst College are among the private institutions of higher education that plan to divest in companies doing business with Sudan, to protest political violence there.

MIT President Susan Hockfield told the faculty that the Executive Committee decided in early March to reconvene MIT's Advisory Committee on Shareholder Responsibility, most recently active during the South African divestment movement, to examine MIT's investments in companies that may be doing business with Sudan. The committee, consisting of Corporation, faculty, administration, and student representatives, will "look at this issue seriously and take appropriate action," Hockfield said.

Research funding

Hockfield also reported on her most recent monthly trip to Washington, D.C., her first with William B. Bonvillian, MIT's

new director of federal relations. She and Bonvillian met with presidential advisor Alan Hubbard and Massachusetts Sens. John F. Kerry and Edward M. Kennedy and found them supportive of increased funding for basic research to advance a shared agenda to support enhanced innovation.

However, Hockfield said that in light of the short congressional session and the election year, she is "not confident there is sufficient bipartisan enthusiasm for getting this passed this year."

5th Picower-RIKEN Neuroscience Symposium
New Frontiers in Brain Science: from molecules to mind

<p>SCHEDULE: Sunday, March 26, 2006, 7pm-9:15pm Monday, March 27, 2006, 9am-5:30pm Tuesday, March 28, 2006, 9am-5:30pm</p>	<p>LOCATION: The Picower Building, MIT 43 Vassar Street, Cambridge, MA Auditorium: 46-3002 Smallest in the Picower Seminar Room 46-2310</p>
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Sponsored jointly by the Picower Institute for Learning and Memory and the RIKEN Brain Science Institute of Japan, the Picower-RIKEN Symposium brings together many of the world's most distinguished and creative neuroscientists to present their perspectives on "New Frontiers in Brain Science." The meeting will also feature poster presentations from local graduate students and postdoctoral researchers. While this conference is free, registration is required. Please visit: <http://web.mit.edu/picower/symposium> for registration information and full program details.

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.

HOUSING

Furnished room for rent in spacious Arlington home; near public transportation; parking available; kitchen privileges; washer & dryer on premises; own refrigerator & TV. Call 781-648-7425, 24 hrs a day; please leave message & return contact info.

3 BR unfurnished house for rent in Everett. Convenient to T and all major highways. No pets. Non smokers preferred. Utilities not included. \$1,600/month. Call 617-389-8842.

VACATION

Martha's Vineyard: Newly renovated 3+BR Chappaquiddick house on 1 acre. 1 mile to beach and golf, 3 miles from Edgartown. \$900 to \$1100 w/ky. 1 week June, 2 weeks August & 2 weeks September. Call David (781) 981-5087 or (603) 654-5513.

Houseswap: English family (lawyer/IT; 2 children) large house, garden in vibrant area close central London, seeks exchange in Boston area, near coast - last two weeks August. Contact bis@mit.edu or martin@burstyn.freeserve.co.uk.

FOR SALE

Upright piano, Ivers and Pond. Beautiful rich tone, cabinet. Moving. \$700. Call 781-581-9689 or e-mail jundzilo@mit.edu.

New in orig. box, Swarovski crystal backpack miniature. Metal detail is 18k gold-plated. Comes with certificate of authenticity. Photos available. Located on campus. \$30. Contact forsale@media.mit.edu.

NordicTrack 'WalkFit' aerobic treadmill with exercise computer, operating instructions, exercise guide, & assembly/care documentation. Seldom used. Good condition. Pick up Lexington, MA. \$150/bst. Call Ed, 781-981-1077.

STUDENT EMPLOYMENT

Positions for students with work study eligibility

Machine Science Inc., a non-profit organization pioneering new methods for hands-on programs in the Boston Public Schools, seeks mentors to help students w/ fun engineering & computer science projects. Each mentor will provide guid-

NEWS YOU CAN USE

Police move now official

The MIT Campus Police have officially moved into their new headquarters at 301 Vassar St., Building W89. The building is just past Simmons Hall and is on MIT's Shuttle and SafeRide routes.

MIT Campus Police will continue to be available to respond to community needs at two additional locations on campus; events registration is on the first floor of W31 (the former campus police building) and other services are in the Stata Center.

Emergency contact numbers will not change, and the move to W89 will not affect patrol routes, said John DiFava, director of security and campus police services.

The Vassar Street facility, formerly occupied by the MIT Professional Learning Center, was designed for the Campus Police by Boston architectural firm Donham and Sweeney. MIT Police Capt. David Carlson coordinated the project and the move to W89.

DiFava, a 20-year veteran of the Massachusetts State Police, wanted the facility to accommodate the changing ways in which police work is done — especially, the growing use of technology.

An open house for the community is planned for later this spring.

The police also announced a new anonymous tip line to report crime: 8-TIPS (x8-8477).

Tree removal

Bartlett Tree Experts will begin removing the great American elm in Killian Court next week, because arborists recently determined that it has reached its life expectancy and died, the Department of Facilities announced.

Due to the size of the tree, it will take several days to remove the branches, trunk and roots. Occupants of the nearby buildings and passersby should be aware that there will be noise associated with the removal.

There are very few great elms left in New England due to Dutch elm disease. Although this elm has died, it does not show signs of Dutch elm disease. A large, red oak tree will be planted in late April to replace the tree, the facilities announcement said.

Awards nominations

The deadline for Awards Convocation nominations has been extended to Friday, March 24. More than 30 awards will be presented to professors, students and other members of the MIT community. Descriptions of the awards can be found at web.mit.edu/awards/. Nominations can be submitted by e-mail to awards@mit.edu or by mail to Room W20-549.

ance to a group of enthusiastic middle or high school students, one day a week, after school - total of 10-15 two-hour sessions per semester. Several positions available, helping students complete a range of projects. Contact Emily Lin 617-354-7171 or emily@machinescience.org. \$14/hr.

SUMMER 2006 - The Food Project seeks crew leaders to lead a diverse group of youth entering the The Food Project's Summer Youth Program, which works to grow & distribute organic products for people in need. Each crew leader will have 8-10 teens who work together throughout the summer. Applicants must have prior experience working w/ teens & must be 20 years old by June 16, 2006, have a high school diploma & be available weekdays June 16-August 17. Contact Pertula George 781-259-8621 or pgeorge@thefoodproject.org. \$360/week.

Chinese scholar earns fellowship to explore race

Sarah H. Wright
News Office

An MIT professor of foreign languages and literature whose research focuses on pre-modern Chinese ideas about race has won a Frederick Burkhardt Residential Fellowship from the American Council of Learned Societies (ACLS) for 2007-2008.

Emma Teng, associate professor of Chinese studies, will spend a year in residence at the Radcliffe Institute for Advanced Study, working on a comparative study of Chinese and Chinese-American representations of Chinese-Western interracial marriage and biracial identity at the turn of the 20th century.

The Burkhardt is awarded to recently tenured faculty in the humanities and

social sciences.

Teng's Burkhardt project is a "major departure" from her previous work, which explored Chinese colonial representations of Taiwan. Teng's book on that topic, "Taiwan's Imagined Geography: Chinese Colonial Travel Writing and Pictures, 1683-1895," was published in 2004.

For her project on interracialism, Teng said she will be researching literature, racial theory and historical documents. One major focus will be on Eurasian memoirs, she said.

Her personal goal for the project is to gain a greater understanding of how "biracial" or "transracial" identities have been



Emma Teng

constructed historically and crossculturally and to attain a "fresh perspective on contemporary issues," she said.

Teng also plans to offer a new course, "Eurasian Bicultural Memoirs: 1900-2000," and to organize readings through the MIT Center for Bilingual/Bicultural Studies (CB/BS) when she returns.

"We have a significant number of students at MIT who are biracial and/or bicultural, even multiracial and multicultural. I hope the class will provide students with a chance to explore their own identity issues, but also broaden their understandings by looking at larger historical and cultural contexts," Teng said.

For Teng, the research phase of her Burkhardt project is an "exciting" period of "new discoveries and learning fascinating details about people's lives in the past," she said.

Reading memoirs has shown her "for those of 'mixed' European and Asian descent, 'race' was lived very differently in the U.S., Britain, Hong Kong, China, India, Australia and other parts of the globe, even within the same time period.

"Many of the authors I have been reading were truly global citizens who migrated multiple times during their lives; they describe how their racial identities were forced to shift as they moved to different geographic locations, with different social norms and different laws," she said.

Teng was awarded the 2005 Levitan Prize and was a co-winner of the MIT Edgerton Faculty Achievement Award.

Famed sculptor adorns Sidney-Pacific Sze project shows arts funds at work

Sarah H. Wright
News Office

Sarah Sze, internationally acclaimed sculptor and installation artist and winner of a 2003 MacArthur "genius" award, has installed a whimsical miniature fire escape on the front of MIT's Sidney-Pacific Graduate Residence.

The new work, commissioned by MIT's Percent-for-Art Program, is titled "Blue Poles," in honor of Jackson Pollock's 1952 drip painting by that name. Made of small blue steel ladders, balconies and stairways welded into fire-escape-like clusters, "Poles" climbs to the roof of the six-story building from just above the front door.

Sze discussed her MIT work at an opening reception held at the graduate residence on March 14.

A Boston native, Sze, 37, is widely known for her intricate, site-specific installations that hold galaxies of flotsam and jetsam in suspended animation. "Blue Poles" has a more direct, illustrative quality than Sze's other work.

She approached the MIT project by exploring the space, she said. "It's a kind of nondescript building, yet popular — students like it. I wanted to give their dorm personality in its context and to emphasize playfulness and spontaneity. I hope it gives the building character."

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I wanted to give their dorm personality in its context and to emphasize playfulness and spontaneity.

Sarah Sze

Internationally acclaimed sculptor

"Blue Poles" certainly gives anyone looking at the building an altered sense of scale and perspective. The artist's two favorite views are "looking straight down into the piece as it tumbles into space" and looking at it from the inside of the dorm, so the patterns and grids formed by surrounding buildings suddenly look "strangely huge," she said.

Sze's first installation combined wit and menace in an ephemeral 1991 piece constructed with friends during the first Gulf War and destroyed by nature within a few days. "We built a grid of 10,000 cocktail-sized American flags to blanket a lawn at Yale. It was a fun piece, definitely a sneaky piece, and political, unlike my other work. It disintegrated into the grass."

Since that time, Sze's installations have been in solo exhibitions in New York, London, Paris and Boston and in group exhibitions in the Whitney and Venice Biennials.

Sze made "Blue Poles" during a year-long residency at Alexander Calder's former studio in Sachet, France. The famed creator of mobiles and stabiles had a



PHOTO / DONNA COVENEY

Sculptor Sarah Sze stands outside the Sidney-Pacific graduate student residence on Friday, March 17. Her new work, 'Blue Poles,' can be seen behind her, running up the side of the building.

foundry next door, and it was there that Sze realized her plan to build her MIT piece as a "system, like an erector set, so we wouldn't have to use a crane. We brought it to the site as a 65-piece kit, welding some into clusters and popping in others where there were gaps," she said.

Sze described her own work as related to Calder's in its focus on gravity and air and play. "Calder's is a hard trail to follow, because those mobiles are so strong," she said. ("The Big Sail," a 1965 stabile by

Calder, is in McDermott Court at MIT.)

In designing "Blue Poles," Sze was inspired by her childhood memories of fire escapes on apartment buildings near her home, she said.

Those rickety iron or wooden structures, used both as places to relax and as escape routes, are rarely found on new buildings; "Blue Poles" reconnects the Sidney-Pacific residence to its urban past and to the myriad ways people adapt to crowding, anonymity and summer heat.

Paul Crocetti
Office of the Arts

Sarah Sze's whimsical fire escape at Sidney-Pacific Graduate Residence is the ninth and newest project of MIT's Percent-for-Art Program, which allots up to \$250,000 to commission art for each new major renovation or building project on the Institute's campus.

Founded in 1968 and administered by the List Visual Arts Center, the program brings internationally known artists into the architectural design and planning process at MIT. In some cases, such as "Blue Poles," artwork has been commissioned after the building is completed.

The program is unusual for a private university, according to Patricia Fuller, curator of public art at MIT. The Institute is the only such place that commissions art in collaboration with building on a consistent basis, she said.

The 50-year-old process of selecting and installing art in new MIT buildings has become a routine part of campus planning today. When each project begins, the director of the List Center serves as the chair of a site advisory committee, recommending artists to the committee and reviewing the development of their proposals.

But completing the Percent-for-Art Process is not always simple or easy. As with much public art, the works themselves receive a variety of responses.

In dormitory projects, "Sometimes the students have a problem because that's their space," said Hiroko Kikuchi, education/outreach coordinator for the List Center. But the intent, she said, is not to impose art on people. "We make sure we involve them in the art selection process and educate them about the art. You can't really have 100 percent control. It's a really interesting program, but so much patience is involved."

In the case of Sidney-Pacific, the committee that selected Sze and commissioned "Blue Poles" included the architect, housemasters, house managers and students of the dorm. They chose Sze from a short list of about a dozen artist-candidates, said Fuller.

The Sidney-Pacific project was "more difficult" than some others, Fuller said, because the dorm was already built and filled with students and activities.

Other recent Percent-for-Art installations include Dan Graham's "Ying/Yang Pavilion" in Simmons Hall and Matthew Ritchie's "Games of Chance and Skill," a three-part map of time and space that graces the walls of the Zesiger Sports and Fitness Center.

Examples of art-and-architecture collaborations on the MIT campus that predate the formal Percent-for-Art Program include Harry Bertoia's altarpiece and Theodore Roszak's bell-tower, created for Eero Saarinen's MIT Chapel, built in 1955.

MIT EVENT HIGHLIGHTS MARCH 15-19

 Science/ Technology	 Performance	 Architecture/ Planning	 Humanities
 Music	 Exhibit	 Reading	 Special Interest
 Business/ Money	 Film	 Sports	 Featured Event



PHOTO / JULIE MARR PHOTO / KATHY CHAPMAN

Jazzed up with Gayle and Blake

Multi-instrumentalist Charles Gayle, right, and MacArthur-winning pianist Ran Blake, left, will jointly celebrate the release, for each, of a new solo piano CD in a concert in Killian Hall on Saturday, April 1, at 8 p.m. Tickets are \$10, \$7 for students and seniors, free for MIT students with valid ID.

WEDNESDAY
March 22

 **“Operation Anaconda: Lessons Learned”**
Talk by Sean Naylor of Army Times. Noon-1:30 p.m. Room E38-615. 253-7529.

 **Gallery Talk**
Talk by Jane Farver, director of the List Visual Arts Center, in conjunction with “America Starts Here — Kate Ericson and Mel Ziegler 1985-1995.” Noon. List Visual Arts Center. 253-4680.

 **“Contemplation and Education”**
Talk by Father Thomas Keating, a Trappist monk and founder of the Centering Prayer Movement. 7-8:30 p.m. Room 10-250.

THURSDAY
March 23

 **MIT Chapel Concert**
Ensemble Trident: Maria Georgakarakou, soprano; Panayotis Terzakis, bass and percussion; Richard Maloney, medieval and renaissance lutes, oud and percussion. Noon. MIT Chapel. 253-2826.

 **“Waiting Time Dynamics in Large-Scale Queues”**
Talk by Petar Momcilovic of the University of Michigan. 4:15-5:15 p.m. Room E40-298. 253-7412.

 **Killian Lecture**
Institute Professor Isadore Singer, winner of the 2005-2006 James R. Killian Jr. Faculty Achievement Award, will speak on “Some Geometry of the Past Half Century and Its Historical Background.” 4:30 p.m. Stata Center, Kirsch Auditorium.

 **Karaoke Night at the Thirsty Ear**
Must be 21+. Proper ID required. 8 p.m. The Thirsty Ear Pub. 258-9754

FRIDAY
March 24

 **“Arnold Newman: 20th-Century Photographs”**
Arnold Newman is perhaps the best-known photographer of the world’s legendary artists, poets, politicians, actors and scientists. 9:30 a.m.-5 p.m. Room 10-150. 253-4444.

 **Reading of “The Downright Sexy Adventures of Drew Durango”**
Book by Associate Professor Thomas DeFrantz; music and lyrics by Michael Wartofsky, associate professor at Berklee College of Music. March 24-26. \$10, \$6 MIT students. 8 p.m. except 2 p.m. on March 26. Kresge Little Theater. 253-4720.

 **Norooz Celebration**
Persian New Year celebration. \$10. 8 p.m. W20. Lobdell.

SATURDAY
March 25

 **Varsity Sailing**
MIT hosts the race for the Marchiando Trophy. 9:30 a.m. Charles River. 258-5265.

 **International Championship of Collegiate A Cappella — New England Semifinals**
Featuring: University of New Hampshire Alabaster Blue, MIT Chorallaries, BU InAChord, The Harvard LowKeys, University of Hartford L’Shir, Mt. Holyoke College The M&Cs and BU Treblemakers. 7:30-10 p.m. \$12; \$7 students. Kresge Auditorium.

SUNDAY
March 26

 **Gallery Talk**
Talk by List Visual Arts Center staff in conjunction with “America Starts Here — Kate Ericson and Mel Ziegler 1985-1995.” 2 p.m. List Visual Arts Center. 253-4680.

 **F.A.S.T. Program: “The Science of Theater”**
A Family Adventures in Science & Technology presentation. 2-4 p.m. Room E32-141. 452-2111.

STAY TUNED

The robot designed by MIT researchers to help stroke victims with physical therapy will be featured on CNN tonight during the 5-6 p.m. time slot. Neville Hogan, professor of mechanical engineering and brain and cognitive sciences, will appear in the segment.

Go Online! For complete events listings, see the MIT Events Calendar at: <http://events.mit.edu>.
Go Online! Office of the Arts website at: <http://web.mit.edu/arts/office>.

EDITOR’S CHOICE

“KING LEAR”

MIT Shakespeare Ensemble production. March 23-25. \$8, \$6 students.

Mar. 23
Sala de Puerto Rico
8 p.m.

BICYCLING SKILLS WORKSHOP

Presented by MassBike and sponsored by the Commuting Task Group of the Working Group on Support Staff Issues.

Mar. 23
Room 3-270
Noon

NEUROSCIENCE SYMPOSIUM

Hosted by Picower Institute. Keynote address, “Unraveling Smell,” by Linda Buck of the Fred Hutchinson Cancer Research Center.

Mar. 26
Room 46-3310
7-9:15 p.m.

MIT EVENT HIGHLIGHTS MARCH 27-APRIL 2

MONDAY
March 27

SPRING BREAK WEEK

 **5th Picower-RIKEN Neuroscience Symposium:**
New Frontiers in Brain Science, From Molecules to Mind
Session one on technology, chaired by J. Troy Littleton, associate professor of biology. 9 a.m.-5:30 p.m. Room 46-3310 and simulcast in 46-3002. 253-4955.

 **“digital_minimal”**
Projects by the MIT SENSEable City Laboratory. 9 a.m.-5 p.m. Wolk Gallery. 258-9106.

 **Free Intermediate Salsa Lesson**
7-9 p.m. Room 50-140.

 **Trivia Night**
Must be 21+. Proper ID required. 8-11:30 p.m. Thirsty Ear Pub. 258-9754.

TUESDAY
March 28

 **5th Picower-RIKEN Neuroscience Symposium:**
New Frontiers in Brain Science, From Molecules to Mind
Session Two on learning and memory, chaired by Matthew Wilson, professor of brain and cognitive sciences. 9 a.m.-5:30 p.m. Room 46-3310 and simulcast in 46-3002. 253-4955.

 **“Higher-Order Variables and the Concept of Function: How the History of Mathematics Influenced Modern Logic”**
Talk by Dimitri Constant, research associate at the Diberner Institute. Noon-2 p.m. Room E56-100. 253-6989.

 **Imobile Breakdancing Session**
Open practice session. 7-9:30 p.m. Lobby 13.

WEDNESDAY
March 29

 **Gallery Talk**
Talk by Bill Arning, curator of the List Visual Arts Center, in conjunction with “America Starts Here — Kate Ericson and Mel Ziegler 1985-1995.” 12:30 p.m. List Visual Arts Center. 253-4680.

 **“Adventures in Arctic Nunavik”**
Talk by Henry I. Smith, professor of electrical engineering. 6:30-8 p.m. Room 32-124.

 **Israeli Dancing ‘80s Night**
Israeli dances by Shlomo Maman, Moshiko, Moshe Eskayo, Israel Yakovee, Shlomo Bachar Shmulik, and many others. 8-11 p.m. Room W20-202. 253-FOLK.

THURSDAY
March 30

 **Novartis Lecture in Organic Chemistry**
Talk by Jerrold Meinwald of Cornell University on “Chemical Studies of Biotic Interactions.” 4 p.m. Room 6-120. 253-1879.

 **List Visual Arts Center Film Night**
“66 Scenes from America.” 7 p.m. Bartos Theater. 253-4400.

FRIDAY
March 31

 **“Arnold Newman: 20th-Century Photographs”**
Arnold Newman is perhaps the best-known photographer of the world’s legendary artists, poets, politicians, actors and scientists. Last day. 9:30 a.m.-5 p.m. Room 10-150. 253-4444.

 **MIT Anime Club Weekly Showing**
7 p.m. Room 6-120.

 **WAM!2006 Opening Keynote**
Talk by Maria Hinojosa, senior correspondent for NOW on PBS, anchor and managing editor of NPR’s Latino USA, and former urban affairs correspondent for CNN. 8 p.m. Room 32-123.

SATURDAY
April 1

 **WAM!2006 Conference: “Women and the Media: Making Noise, Making Change”**
All day. Stata Center.

 **Charles Gayle and Ran Blake CD Releases Celebration**
Celebration of the releases of their new landmark solo piano CDs. \$10; \$7 students and seniors; free for MIT students. 8 p.m. Killian Hall. 354-6898.

SUNDAY
April 2

 **WAM!2006 Conference: “Women and the Media: Making Noise, Making Change”**
All day. Stata Center.

 **Gallery Talk**
Talk by List Visual Arts Center staff in conjunction with “America Starts Here — Kate Ericson and Mel Ziegler 1985-1995.” 2 p.m. List Visual Arts Center. 253-4680.

 **International Folk Dancing**
Every Sunday. 8-11 p.m. Student Center 2nd floor. 253-FOLK.