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Bob Langer named an Institute Professor

Elizabeth Thomson
News Office

Robert S. Langer, the Germe-shausen Professor of Chemical and Biomedical Engineering, has been named Institute Professor, the highest honor awarded by the MIT faculty and administration.

“Bob Langer is an extraordinary colleague and an extraordinary engineer-scientist,” said Rafael Bras, the Bacardi and Stockholm Water Foundations Professor and chair of the faculty. “His work on drug delivery systems and tissue engineering has literally saved many lives. As an author and inventor he has no peer, anywhere. Yet, Bob always finds the time to generously serve MIT and the nation. He always has the time for students and to excel as a teacher. Those extraordinary talents make him the obvious choice for Institute Professor. The faculty is thrilled to honor Bob Langer in this manner.”

“Bob Langer’s appointment as Insti-

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Robot’s gait mimics toddlers’

Elizabeth Thomson
News Office

Three independent research teams, including one from MIT, have built walking robots that mimic humans in terms of their gait, energy-efficiency and control. The MIT robot also demonstrates a new learning system that allows it to continually adapt to the terrain as it walks.

The work, which is described in the Feb. 18 issue of the journal *Science*, could change the way humanoid robots are designed and controlled. It also has potential applications for robotic prostheses and it could aid scientists’ understanding of the human motor system.

Developed at MIT, Cornell and Holland’s Delft University of Technology, the three robots are all based on the same principle—they are an extension of several years of research into “passive-dynamic walkers” that walk down a shallow slope without any motors. Passive-dynamic walkers were inspired by walking toys that have been around since the 1800s.

Robotic toddler

Control programs in the Cornell and Delft robots are extremely simple, because a large portion of the control problem is solved in the mechanical design. The MIT robot uses customized learning software that exploits this design, allowing the robot to teach itself to walk in less than 20 minutes, or about 600 steps.

Dubbed “Toddler” because it learns to walk and because it toddles when it does so, the robot “is one of the first walking robots to use a learning program, and it is the first to learn to walk without any prior information built into the controller,” said Russ Tedrake, a postdoctoral associate in MIT’s Department of Brain and Cognitive Sciences.

Among other things, the learning program allows the robot to navigate efficiently over a variety of walking surfaces; it may eventually allow robots to navigate very rough terrain. That’s because the program works so quickly that

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PHOTO / DONNA COVENEY

Postdoctoral associate Russ Tedrake and alumna Teresa Weirui Zang watch their robotic toddler navigate the medical building foyer.

Groundbreaking new major established, first in 29 years

Denise Brehm
News Office

The Massachusetts Institute of Technology faculty approved a new course of study for undergraduates, in Biological Engineering, the first entirely new curriculum established at the Institute in 29 years.

MIT is the first university in the nation to take the step of fusing molecular and cellular bioscience with engineering to create a new biological engineering discipline. Many other universities and medical schools offer biomedical engineering (or bioengineering) programs aimed at applying engineering to medicine, and there are biological engineering programs that have an entirely different focus—generally mainly on agriculture. But an engineering discipline grounded in molecular and cellular biology, enabling a broad spectrum of applications, including but not focused on medicine, has not been established before now. Other universities are expected to be influenced by MIT’s approach.

“MIT’s program is pioneering the premise of doing engineering analysis, design and synthesis based in modern molecular life sciences with the aim of impacting a diverse set of application areas and industries ranging from microelectronic materials to ocean ecology,” said Linda Griffith, professor of mechanical and biological engineering and chair of the biological engineering undergraduate program committee at MIT.

The MIT program is different because the engineering will be taught from the beginning entirely in the context of biology, rather than in the context of machines or chemistry or materials. By contrast, the curricula in biomedical engineering programs typically have students take their engineering courses in various other engineering departments, then learn to apply engineering to medicine and physiology.

Nine new subjects at MIT have been developed for the course of biological

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Drinking education program proves highly effective at MIT

Sasha Brown
News Office

The “tyranny of the minority” is how Associate Dean Danny Trujillo refers to alcohol abuse on college campuses. The few students who do engage in dangerous drinking have a negative impact on the lives of the majority—the students who choose to abstain or drink moderately.

In a 2003 survey of MIT undergraduates, only one in four students reported ever having engaged in binge drinking. But 42 percent of MIT students reported feeling the secondhand effects—interrupted study or sleep time—of others’ alcohol consumption. Additionally, that minority accounts for 73 percent of alcohol-related injuries, vandalism and police infractions, Trujillo said.

Binge drinking among MIT students is low compared to universities nationally and slightly less than at its peer institutions. The rate of heavy episodic drinking at MIT reported in the 2003 survey—28

percent—is similar to that of MIT’s peer institutions, which average about 30 percent. The rates at state schools nationally tend to run much higher, 50 percent or more.

Trujillo came to MIT three years ago following a national search for an associate dean for alcohol education and community development. Since then, he has worked in collaboration with the Mental Health Department of MIT Medical to prevent alcohol abuse on campus through the adoption of a screening and intervention program known as SBI (Screening and Brief Intervention.)

His work is paying off. The rate of binge drinking decreased by 40 percent for MIT students who entered the MIT-SBI program.

At the end of last year, the program was recognized by the U.S. Department of Education as one of three model alcohol and drug prevention programs in higher

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Performance pairs words of Paul Auster with music of Don Byron and others.
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Cambridge, MIT win EPA grant

The City of Cambridge and MIT will collaborate to significantly reduce diesel pollution from their respective vehicle fleets over the next two years, thanks to a grant from the U.S. Environmental Protection Agency announced Feb. 23. The grant is one of 18 awarded nationwide from a pool of 83 applicants.

Through the Clean Diesel Collaborative for a Healthy Cambridge, MIT and the city will retrofit 34 medium- and heavy-duty vehicles with advanced pollution control equipment (including catalyzing equipment and filters). The goal is to reduce emissions per vehicle 40 to nearly 70 percent for some pollutants.

Like many cities, Cambridge has a large population of people who are especially vulnerable to air pollution, particularly diesel emissions. Exposure to diesel pollution has been linked to numerous health conditions, including asthma, heart disease and cancer. The Cambridge Health Alliance identified childhood asthma as a priority health concern in its 2004 Cambridge Public Health Assessment.

"Partnering with the City of Cambridge in EPA's voluntary diesel retrofit program is one way that MIT is demonstrating its strong commitment to excellence in environmental stewardship," said Jamie Lewis Keith, MIT's senior counsel and managing director for Environmental Programs and Risk Management.

"This initiative offers an innovative approach to realizing measurable reductions in air pollutants, strengthening collaborative ties, and demonstrating new

technologies that drive excellent environmental performance on campus and throughout the city. MIT is extremely grateful to the EPA for selecting our joint proposal with the city," Keith said.

"We intend to use this collaborative project not only to make significant reductions in our own emissions, but also to share our experience and demonstrate to others the feasibility of the technology so that it can be more widely adopted," said Steven Lanou of MIT's Environmental Programs Office, who is spearheading the effort for MIT. "The more we can diffuse the technology across diesel fleets, the greater the environmental benefits we can achieve."

Laxmi Rao and Norm Magnuson of MIT's Department of Facilities are leading the implementation. They worked with Lanou to develop MIT's proposal.

The EPA grant of \$83,467 through the agency's Voluntary Diesel Retrofit Grant Program will launch the new initiative and cover the implementation costs. The Massachusetts Port Authority (Massport) also received a grant through this program.

The Clean Diesel Collaborative marks the second major phase of the City of Cambridge's effort to reduce emissions from its working vehicles. Last fall, as part of the first phase, the city adopted the use of biodiesel—a clean-burning alternative fuel produced from domestic sources—for the majority of its large vehicle fleet. Now more than 80 city-owned vehicles, including garbage trucks, construction vehicles, and about a dozen city-owned school



PHOTO / DONNA COVENEY

The need for Speedo

The men's swimming and diving team made its annual run through the Infinite Corridor last week before finishing third at the New England conference championships in the Zesiger Center last weekend. In the 400 medley relay, MIT sophomore Craig Edwards, senior J.P. Carlucci, graduate student Jonathan Varsani and junior Grady Snyder posted the fastest time in the nation with a split of 3:22.85.

buses, run on biodiesel.

The collaborative also marks an expansion of MIT's efforts to improve the environmental performance of its vehicles; through the program, MIT will introduce biodiesel for the first time into its diesel vehicles.

The Clean Diesel Collaborative for a Healthy Cambridge is a joint effort with MIT's Environmental Programs Office and Department of Facilities, and Cambridge's Departments of Public Works and Community Development.

—Elizabeth Thomson

Construction plans outlined in town-gown report

In its annual report to the City of Cambridge, MIT noted that "the \$1.4 billion building program of the last several years is drawing to a close," but outlined some further demolition and construction plans, including a potential Music and Theater Arts Teaching Laboratory.

The eighth Town Gown Report summarizes data on MIT's population, taxable and tax-exempt land, parking facilities and monetary payments to Cambridge. The report was presented to the city on Feb. 1 at a meeting before the city's Planning Board.

The section on future plans of the Town Gown Report includes the following projects planned (some only tentatively) over the next five to seven years:

- The proposed Music and Theater Arts Teaching Laboratory, a teaching facility for musical and theatrical disciplines that would be used primarily for rehearsal and teaching. Plans call for a building of approximately 36,000 square feet on what is now a parking lot at the corner of Albany Street and Massachusetts Avenue. "The project will be considered for further design work pending progress on fundraising," the report says.

- Demolishing the Hayward Garage and temporarily replacing it with surface parking, pending a future decision on how to use the parcel.

- Relocating the occupants of Buildings E32, E33 and E34 elsewhere on campus and demolishing those buildings. The site will have an underground parking garage tied to an academic project yet to be determined.

- Consolidating the Department of

Physics (now spread throughout 13 buildings on campus) in one area through a project involving space-swapping with other departments plus renovation and new construction. About a third of the program space will be provided by new construction of a building in the courtyard framed by Buildings 2, 4, 6 and 8, and demolition of Building 6A. Construction is expected to begin later in 2005.

- The ongoing Vassar Street redevelopment project, half of which is already complete.

- Additional student housing—Cambridgeport and West Campus locations are under consideration but there are no plans for any specific site.

- The last two projects associated with the Evolving Campus program, the Media Lab Extension (renamed the Media Arts and Sciences Project) and the East Campus Project involving the Sloan School and School of Humanities, Arts and Social Sciences, both conceived of as fully private gift-funded projects, have been delayed while fundraising proceeds.

The complete report can be downloaded from the web site of MIT's Office of Government and Community Relations.

PILOT agreement

At a Feb. 8 meeting with the City Council's Committee on University Relations, City Manager Robert Healy told City Councillors and MIT's Executive Vice President John Curry that the new PILOT agreement signed by MIT and the city in December has helped the city with its bond rating by providing Cambridge long-

term revenue protection and predictability.

Healy noted that Fitch Ratings, which assigns bond ratings to municipalities, highlighted the new agreement in its annual review of Cambridge's finances. Cambridge is one of 12 U.S. cities with three

Triple A ratings from the nation's three major credit rating agencies.

The PILOT agreement was lauded in The Boston Globe and the Cambridge Chronicle, which praised it as "historic" in an editorial.

City to redo Mass. Avenue

Sasha Brown
News Office

Massachusetts Avenue is getting a makeover.

The City of Cambridge announced plans to redo Massachusetts Avenue from Memorial Drive to Central Square, focusing a good deal of effort on Lafayette Square at the intersection of Main and Columbia streets. The project will begin later this month and is expected to take about a year and a half to complete.

During construction, crews will keep two lanes of traffic (one in each direction) open at all times. Crosswalks and bus stops will be operational, but may shift location from time to time.

The project has several goals, including improvement in safety for all modes of transportation—bicycle, vehicle and pedestrian—and beautification and improved functionality.

The city will repave the road. Sidewalks will be paved with cement and a decorative brick edging, bicycle lanes will be added,

and current street lighting will be replaced by historic reproductions from 1907.

The overhaul planned for Lafayette Square includes a new traffic signal and crosswalks at the Landsdowne Street intersection, and a landscaped community plaza with benches, tables, trees and attractive walkways.

Construction will take place from 7 a.m. to 4:30 p.m. Monday through Friday. On rare occasions, work may go later, but never past 7 p.m., a city spokesperson said. No construction work will occur on weekends or holidays.

The initial work of excavating the roadway was scheduled to begin in February, but was delayed because of snow. City officials expect the work to be complete by September 2006.

Community members with questions or problems about the project may contact the City of Cambridge's Department of Public Works Community Relations Manager Rebecca Fuentes at (617) 349-6948. For further information, see the city's web site at <http://www.cambridgema.gov/TheWorks/projects/southmass.htm>.

HOW TO REACH US

News Office

Telephone: 617-253-2700
E-mail: newsoffice@mit.edu
<http://web.mit.edu/newsoffice>

Office of the Arts

<http://web.mit.edu/arts>



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MIT senior honored by USA Today

Kristen Collins
News Office

For Laurel Yong-Hwa Lee, the awards just keep rolling in.

Lee is one of 20 students named to the All-USA College Academic Team, an award given each year by the editors of USA Today, the nation's top-selling newspaper with an average daily circulation of 2.3 million. She was selected by a panel of judges from more than 600 students nominated by colleges and universities across the United States. She is recognized for her outstanding intellectual achievement and leadership. The award includes \$2,500 in cash.

Lee also received one of the top academic awards last fall when she won a Rhodes Scholarship, which she will use to pursue a doctorate in clinical medicine at Oxford University.

A few months earlier, she was profiled in Glamour magazine's Top 10 College Women list. She and fellow senior Swati Maria Saini were recognized for their leadership, community and academic achievements, and were featured in the magazine's October 2004 issue. And in February 2004, Lee was named a Burdard Scholar in the School of Humanities, Arts and Social Sciences at MIT, an honor given to students who demonstrate unusual abilities and academic excellence.

The senior from Bothell, Wash., is both an academic superstar and a passionate young woman aiming to change the world with her work. While all four of the awards recognize her scholastic achievement, the two given by media also recognize her leadership and the well-rounded nature of her accomplishments. In addition to her scholarship, she has done volunteer work in Honduras, rows with the MIT crew team, and is an accomplished violinist.

Lee came to the U.S. at age 16 from Korea. Now a pre-med double-major in brain and cognitive sciences and biology, she plans to pursue her Ph.D. in infectious diseases



Laurel Yong-Hwa Lee

and tropical medicine at Oxford, having already lined up a mentorship with the head of the Medical Research Council in England. Her interest in infectious diseases stems from her experience working as a medical coordinator for a foundation supporting abandoned women and children and a hospital emergency room in Honduras.

"While building strong relationships with single mothers in shelters and children in orphanages, and developing a deeper appreciation of the public health care system in Honduras, I developed a sense of responsibility for addressing the challenges I witnessed—specifically in the areas of infectious diseases," Lee said.

"I decided to pursue a medical path to integrate my training in basic science with the study of infectious diseases that continue to be constant threats to the lives of people I met in Honduras, as well as people throughout the rest of the world," said Lee.

Lee's nomination for the USA Today award focused on her academic research, achievements and honors, but included an emphasis on her community and personal interests as well. She has devoted a significant amount of her time at MIT not only to her dual major, but to the varsity lightweight crew team.

"My training as a varsity rower during the past three and a half years has invigorated my body and mind," said Lee. She plans to continue rowing at Oxford.

Also a nationally recognized violinist with more than 15 years of training, Lee has maintained a persistent passion for music. She began playing the violin at age six, and once considered a career in music.

She now considers music a complement to her scientific ambitions, and lights up when she talks about her music analysis work with Professor Lowell Lindgren, a renowned musicologist in MIT's Music and Theater Arts Section.

She found that MIT's culture allows her to pursue both music and science and enjoy her rowing, activities that helped her become an All-USA collegian.

Belcher named a 'woman to watch'

Professor Angela Belcher is one of 10 New England innovators in fields from biotechnology to software to be honored in Mass High Tech's 2005 Women to Watch program.

"These women will shape the future of their industries while serving as role models for young girls going into science and engineering," said Mass High Tech editor Jim Malone. Each was featured in an article in the Feb. 21 issue of the business and technology newspaper.

Belcher is an associate professor in the Department of Materials Science and Engineering and the Department of Biological Engineering. She is known in part for coaxing biological molecules to self-assemble into nanomaterials with increasingly complex structures. In 2004 Belcher won a MacArthur Fellowship, commonly known as the "genius" grant.

The other Mass High Tech Women to Watch come from Boston University's computer science department, The Digiticians, Target Software Inc., the Charles Stark Draper Laboratory, Authoria Inc., the Boston Cure for Multiple Sclerosis, Genzyme Corp., Botzam Inc., and Novartis Institutes for Biomedical Research.



Angela Belcher

LANGER

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tute Professor recognizes the enormous scale, scope and importance of his contributions to MIT and the larger society," said President Susan Hockfield. "His pioneering work at the interface between engineering and the life sciences has opened up entirely new directions for biomedicine. In his remarkably collaborative spirit, extraordinary productivity, depth of curiosity and record of innovation, he embodies the core values of MIT."

Robert A Brown, provost and the Warren K. Lewis Professor of Chemical Engineering, also lauded the appointment. "Bob Langer is one of MIT's most amazingly creative and prolific faculty members. It is an honor to have Bob on the MIT faculty and he richly deserves the recognition bestowed by the Institute Professorship."

Langer described his initial reaction to the appointment as "a combination of shock on the one hand and joy on the other. I look at the other people who are Institute Professors, and it's really humbling."

"I love MIT, and feel very honored and flattered," said Langer.

The title of Institute Professor is reserved for those few individuals who have "demonstrated exceptional distinction by a combination of leadership, accomplishment and service in the scholarly, educational and general intellectual life of the Institute or wider academic community," according to MIT's Policies and Procedures manual. With Langer's appointment, there are now 15 Institute Professors.

"I cannot imagine an individual more deserving than Bob of recognition as an Institute Professor," said Robert C. Armstrong, the Chevron Professor and head of the Department of Chemical Engineering. "He is not only a great example to the world of MIT's excellence in research, but is also a great faculty colleague and teacher and mentor of our students at home. His enormous professional stature and his broad value and engagement across units of MIT are both important attributes of an Institute Professor."

Taking risks

When asked what advice he'd give engineers and scientists beginning their careers, Langer said, "Take some risks. Don't necessarily follow a conventional career path."

In 1974, Langer did just that, with his new MIT Ph.D. in chemical engineering in hand. "At the time, young chemical engineers went into the petroleum industry. I opted for a postdoctoral position with cancer researcher Judah Folkman at Children's Hospital," Langer said.

At Children's, one of the things he tackled was the problem of how to get large molecules, which held promise for fighting cancer and other diseases, through plastic delivery systems in a controlled manner. The general consensus at the time was that this was impossible.

Langer persevered and ultimately discovered engineer-

ing principles that allowed a desired release of such medically important molecules from plastics. "There's no question that my decision to join Judah's lab exposed me to things I'd never seen, and that few chemical engineers at the time had seen," he said.

He went on to become the holder of some 500 issued and pending patents. More than 100 different companies license those patents and are creating products based on his innovations. These include a dime-sized polymer wafer that delivers chemotherapy directly to the site of a brain tumor, and a device that cuts the pain associated with needles and IVs.

Of his many accomplishments, what is Langer most proud of? "That's a little like asking which of your children you're most proud of," he said with a laugh. That said, there were two areas that came to mind.

"I'm very proud of how well my students have done," he said. Some 130 Langer students and postdoctoral associates are professors at universities around the world, including three at MIT. In addition, 150-200 past students are in top industrial positions.

"I'm also very proud of the impact of our inventions," he continued. Over 40 of these are now approved by regulatory authorities such as the FDA or are in clinical trials.

Langer joined the MIT faculty in 1977 as a visiting professor in what was then the Department of Nutrition and Food Science. A graduate of Cornell University, he received the Sc.D. from MIT in chemical engineering in 1974.

He has received more than 100 major awards. In 2002, he received the \$500,000 Charles Stark Draper Prize, considered the equivalent of the Nobel Prize for engineers, from the National Academy of Engineering. He is the only engineer to receive the Gairdner Foundation International Award; 64 recipients of this award have subsequently received a Nobel Prize. In 1998, he received the \$500,000 Lemelson-MIT Prize, the world's largest prize honoring invention, for being "one of history's most prolific inventors in medicine."

In 1989 Langer was elected to the Institute of Medicine of the National Academy of Sciences and in 1992 he was elected to both the National Academy of Engineering and to the National Academy of Sciences. He is one of very few people ever elected to all three United States National Academies and the youngest in history (at age 43) to ever receive this distinction.

Institute Professorships

The process for selecting Institute Professors involves an ad hoc faculty committee convened by the chair of the faculty and the president. That committee evaluates each nominee, in part by soliciting opinions from professionals in the nominee's field. The committee's recommendations are reviewed by the Academic Council and approved by the Executive Committee of the Corporation.

In addition to the prestige associated with the title, an



PHOTO / DONNA COVENEY

Dr. Robert Langer is MIT's newest Institute Professor.

Institute Professor has a distinct measure of freedom to define the scope and nature of his or her responsibilities. Reporting directly to the provost, an Institute Professor does not have regular departmental or school responsibilities. As a result, the appointment provides a special opportunity to work across departmental boundaries.

The 14 other current Institute Professors are Emilio Bizzi, brain and cognitive sciences; John M. Deutch, chemistry; Peter A. Diamond, economics; Mildred S. Dresselhaus, electrical engineering and computer science (EECS) and physics; Jerome I. Friedman, physics; John H. Harbison, music and theater arts; John D.C. Little, management; Thomas Magnanti, management and EECS; Mario Molina, earth, atmospheric and planetary sciences and chemistry; Joel Moses, EECS; Phillip A. Sharp, biology; Isadore M. Singer, mathematics; Daniel I.C. Wang, chemical engineering; and Sheila E. Widnall, aeronautics and astronautics.



PHOTO COURTESY / CHARLES HARVEY

Tsunami saltwater

Professor Charles Harvey and a research team traveled to Sri Lanka to measure the impact that saline ocean water from the tsunami had on drinking water wells. Additional photos and Harvey's trip diary are posted on the News Office web site.

Primitive brain is smarter than we think, study shows

Primitive structures deep within the brain may have a far greater role in our high-level everyday thinking processes than previously believed, report researchers at the MIT Picower Center for Learning and Memory in the Feb. 24 issue of *Nature*.

The results of this study led by Earl K. Miller, associate director of the Picower Center at MIT, have implications about how we learn. The new knowledge also may lead to better understanding and treatment for autism and schizophrenia, which could result from an imbalance between primitive and more advanced brain systems.

Our brains have evolved a fast, reliable way to learn rules such as "stop at red" and "go at green." Dogma has it that the "big boss" lobes of the cerebral cortex, responsible for daily and long-term decision-making, learn the rules first and then transfer the knowledge to the more primitive, large forebrain region known as the basal ganglia, buried under the cortex.

Although both regions are known to be involved in learning rules that become automatic enough for us to follow without much thought, no one had ever determined each one's specific role.

In this study, Miller, who is the Picower Professor of Neuroscience, and postdoctoral associate Anitha Pasupathy found that in monkeys, the striatum (the input structure of the basal ganglia) showed more rapid change in the learning process than the more highly evolved prefrontal cortex. Their results suggest that the basal ganglia first identify the rule, and then "train" the prefrontal cortex, which

absorbs the lesson more slowly.

"These findings suggest new ways of thinking about learning," Miller said. "They suggest that new learning isn't simply the smarter bits of our brain such as the cortex 'figuring things out.' Instead, we should think of learning as interaction between our primitive brain structures and our more advanced cortex," he said.

Common wisdom suggests that when we learn new things, the prefrontal cortex figures things out first. Then, as our behaviors become familiar and habitual, the more primitive, subcortical basal ganglia take over so that the now-familiar routines can be run off automatically and occupy less of our thoughts.

"What we found was evidence for something very different," Pasupathy said. "We found that as monkeys learn new, simple rules the striatum of the basal ganglia shows evidence of learning much sooner and faster than the prefrontal cortex. But, an interesting wrinkle is that the monkeys' behavior improved at a slow rate, similar to that of the slower changes in prefrontal cortex."

This suggests that while the basal ganglia "learn" first, their output forces the prefrontal cortex to change, albeit at a slower rate.

The researchers speculate that the faster learning in the basal ganglia allows us to pick up important information needed for survival. The prefrontal cortex then monitors what the basal ganglia have learned. Its slower, more deliberate learning mechanisms allow it to gather a more judicious "big picture" of what is going on, Miller said.

TODDLER

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Toddler is able to continuously adapt to the terrain as it walks.

Tedrake demonstrated Toddler at a press briefing Feb. 17 at the annual meeting of the American Association for the Advancement of Science in Washington, D.C. His co-authors of the *Science* paper are Professor Andy Ruina of Cornell, Steven Collins of the University of Michigan, and Martijn Wisse of Delft.

Tedrake's MIT advisor on the work is Professor Sebastian Seung of the Department of Brain and Cognitive Sciences. The project involved a number of MIT students that participated through the Undergraduate Research Opportunities Program, including seniors Ming-fai Fong and Andrew Baines, and junior Derrick Tan. The version of the robot featured in *Science* was designed and built by Tedrake and mechanical engineering alumna Teresa Weirui Zhang.



It is the first to learn to walk without any prior information built into the controller.

Russ Tedrake

Postdoctoral Associate
Brain and Cognitive Sciences

Energy-efficient gaits

The three robots are quite energy efficient. Cornell's "seems to be at least 10 times more efficient than anybody else's," said Ruina. Rough calculations suggest that it approaches human efficiency, consuming an amount of energy per unit

Robots serve humans on land, in sea and air

Lauren Clark
School of Engineering

MIT's version of the "robotodder" is just the latest MIT entry in the world of robots that can move themselves in a variety of settings. There's still a long way to go before today's robots evolve into practical, everyday technologies, but even now, autonomous robotic vehicles developed at MIT are exploring uncharted or hazardous places, assisting troops in combat and performing household tasks.

On land

In addition to his well-known work on humanoid robots such as Kismet, Professor Rodney Brooks led the development of several robotic vehicles and co-founded a company, iRobot, that develops these machines commercially. iRobot produces Roomba, a disc-shaped robotic vacuum cleaner for home use, and PackBot, a small, tank-like battlefield robot that can climb stairs and right itself when it flips over. Troops in Afghanistan use PackBots to explore enemy caves, and soldiers in Iraq use them to detect improvised explosive devices and inspect weapons caches. iRobot has also partnered with John Deere to develop r-Gator, an unmanned jeep that can shuttle supplies to and from combat zones.

"In 20 years, we've gone from robots that can hardly maneuver around objects to ones that can navigate in unstructured environments," said Brooks, director of the Computer Science and Artificial Intelligence Laboratory (CSAIL).

He also pointed to the many applications for labor-saving robots, from autonomous lawnmowers to mobile "assistants" for the elderly. Brooks and his CSAIL colleagues are currently working on an experimental robotic assistant built onto a Segway transporter. However, smarter, multi-functional robots that operate usefully are still a ways off. They will require advances such as object recognition (for example, the ability to differentiate between a pile of salt and a crumpled ball of white paper), manual dexterity and interfaces that could make a robot as easy to use as a refrigerator.

Then there's the final frontier: space. With funding from NASA, CSAIL is developing prototypes of autonomous vehicles and humanoid robots for exploration on the Moon and Mars.

In the sea

Professor Chryssostomos Chryssostomidis, director of the Autonomous Underwater Vehicles Laboratory (AUV Lab), envisions "robots filling the vast void of oceans, roaming around, observing, communicating, and reporting back." His lab has spent the past 15 years developing AUVs that have carried out missions ranging from surveying shipwrecks to testing underwater navigation and communication software.

The lab developed the Odyssey class of submarine-like vessels, which evolved into AUVs produced commercially by BlueFin Robotics, a company that spun out of the AUV Lab and still works closely with it. BlueFin vehicles aid research, survey offshore oil fields, and assist the U.S. Navy in mine warfare and battlespace preparation.

The next generation of AUVs, said Chryssostomidis, will include smaller, more robust vehicles that could be tossed out of an aircraft; hovering AUVs that inspect ship hulls for mines; biomimetic AUVs that mimic marine animals (based on past MIT projects such as Robotuna); and surface crafts for applications such as hydrographic surveying and communicating with and shadowing AUVs.

The biggest challenge for AUV engineers is power generation. Most AUVs run on batteries, and current fuel-cell technology limits missions to hours rather than weeks or months of continuous underwater activity. Chryssostomidis and his colleagues are also working on underwater acoustic communication via modem and on software that enables high-level control of both communication and navigation.

In the air

Eric Feron and his research group in the Laboratory for Information and Decision Systems are working on several projects that may lead to more airborne robots. Those projects include intelligent aircraft, communication among multiple air vehicles, and automated takeoff and landing.

The group has already made progress in two of these areas. The "robochopper," a model helicopter outfitted with a sophisticated instrumentation box, can perform autonomous aerobatic maneuvers at the flip of a remote-control switch. Feron, an associate professor of aeronautics and astronautics, also led the development of an intelligent aircraft guidance system that allows a pilot in one airplane to guide another unmanned airplane by speaking commands in English.

An agile aerial vehicle such as the robochopper is better suited than a surface robot to some scenarios, said Feron, noting that it's easier to fly a miniature robotic helicopter through a chaotic urban environment than to deploy a land robot down in the streets.

Feron is taking on the challenge of autonomous landing. Unmanned aircraft presently use GPS (Global Positioning System) for navigation, but that technology is not reliable enough to manage the fine transition between air and ground. "We wouldn't want to put it in any of the critical tasks involved in landing," he said.

The solution, says Feron, is to mimic a human pilot's vision. He is developing what he calls a "collaborative vision scheme," in which the "eye" of a helicopter (a camera), looks at a specially designed target sitting on the landing area. The target allows the helicopter to obtain the position parameters in real time necessary for landing.



PHOTO / DONNA COVENEY

This robot, dubbed "Toddler" by its creators, adapts to the terrain as it walks.

weight and distance comparable to a human walker. The MIT and Delft robots, though not built deliberately to be energy efficient, still use much less energy than, say, their famous cousin, Honda's humanoid robot Asimo.

How do they move? The Cornell robot supplies power to the ankles to push off. When the forward foot hits the ground, a simple microchip controller tells the rear foot to push off. The Delft robot uses a pneumatic push at the hip, and the MIT robot uses electric motors that directly move the ankle. All three robots have arms synchronized to swing with the opposite leg for balance.

The robot work was done primarily to study the biomechanics and control of human locomotion, but it could have applications in practical robotics. Collins, for example, is applying some of what he's learned to the design of a powered prosthetic foot for amputees.

Students' idea for new café serves up nicely

Sasha Brown
News Office

Architecture is as much about creating an environment as it is about manufacturing a building or space, says MIT architecture graduate student Scott Francisco, who took the lead in conceptualizing the new Steam Café on the fourth floor of Building 7.

The Steam Café is located in the space formerly occupied by the Dome Café, which closed at the end of the fall term. The café has done well since opening on Feb. 14, said Rich Berlin, director of campus dining. "Business has basically doubled," over that of the old café, he said.

The new café is a collaborative effort among students in the Culture Lab, which is a research group in the School of Architecture and Planning, working with MIT's Office of Campus Dining and Sodexo Corporation, which runs most of the campus dining facilities.

Since arriving at MIT in the fall of 2003, Francisco had noted a less than ideal grab-and-go food culture on campus.

Working with Culture Lab, Francisco joined forces with Nick Senske, another graduate student in architecture. Together, they wanted to create a space on campus that encouraged seated, relaxed and

social eating.

The idea fit squarely into Campus Dining's planned redesign for the Dome. "Scott's work and the goals of the Culture Lab to encourage community and healthier eating are exactly what our campus needs. The Steam Café is perfectly aligned with our broader goals for Campus Dining," said Berlin.

Each day offers a new menu based on brown rice and an alternate grain, such as white or wild rice. To accompany the rice, the café offers well-seasoned, ethnic, vegetarian and meat hot entrées. Additionally, there are soups, salads, sandwiches and a variety of healthy and low-calorie beverages. Much of the produce is organic.

Senske brought his technological research to the project and developed a basic web infrastructure to facilitate community feedback and recipe submissions which will form the core of the menu.

"We want to tap into the diversity that is already at MIT," Francisco said, adding that he would like to see family recipes from around the globe become menu items.

Working with a relatively small budget—\$25,000 for the interior and \$25,000 for the exterior—Francisco and a crew of other volunteers worked in the hobby shop sawing and sanding to make new countertops from the old tables of Walker



PHOTO / DONNA COVENY

Architecture graduate students Scott Francisco (left) and Nick Senske spearheaded the design and menu of the new Steam Café, located on the fourth floor of Building 7.

Memorial that had been relegated to storage.

The exterior of the café features large, Baltic birch seating blocks pushed next to taller tables cut from the same wood. Diners sit back to back, sharing blocks, in an overall atmosphere of collegiality.

With the leftover seating from the Dome, the café can seat close to 100 people, said Francisco, who hopes that patrons will utilize the seating to make connections and build community. "The idea was to see how design can impact cul-

ture," he said. "We are fighting against just grabbing a slice of pizza and leaving to sit at your computer alone."

Steam Café is open Monday through Friday. It serves a healthy, balanced breakfast beginning at 8 a.m. and switches to lunch at 11 a.m. Hot entrees are served until 3 p.m., and unlike the old Dome, which closed at 3 o'clock each day, Steam will continue selling snacks, sandwiches and coffee until 6 p.m., so long as there is community demand.

S.B. in mechanical and ocean engineering proposed

Sasha Brown
News Office

In an all-around positive meeting on Feb. 16 in the Stata Center, the faculty heard discussion on three brand-new programs, all of which were met with excitement and good cheer.

The faculty voted unanimously to approve the new S.B. in biological engineering. The S.B. marks the first completely new undergraduate course of study in 29 years; it was greeted with thunderous applause by the roughly 60 faculty members present.

Professor J. Kim Vandiver of mechanical engineering presented the proposal for a new S.B. in mechanical and ocean engineering. After the Department of Mechanical Engineering and the Department of Ocean Engineering merged on Jan. 1, the new S.B. was unanimously approved by the faculty of both departments. The new S.B. offers an opportunity to "reincarnate the degree in a new way," Vandiver said.

The new S.B. in mechanical and ocean engineering would meet the department's main goals, he said. It will preserve the ocean engineering identity at MIT while attracting a greater number of students because the degree also will be in mechanical engineering.

The track for a student hoping to earn an S.B. in mechanical and ocean engineer-

ing is "not terribly different than any other engineering road map," said Vandiver. Students would take 15 subjects beyond the General Institute Requirements and be able to choose two electives from a restricted list.

Students currently enrolled in the ocean engineering degree program will have the opportunity to take the S.B. in ocean engineering or the new degree.

Dean of Engineering Thomas L. Magnanti assured the faculty that the new S.B. had "strong support on behalf of the School of Engineering."

Faculty will have the chance to vote on the proposal at the March 16 faculty meeting.

The faculty also heard from Jeffrey Meldman, director of undergraduate programs at the Sloan School and associate dean in the Office of the Dean for Undergraduate Education, regarding the new Sloan School of Management undergraduate minor in management, which has already been approved.

Meldman gave an overview of the new minor, which will start in fall 2005. Initial enrollment will be limited to 100 undergraduates a year, due to the anticipated high demand, said Meldman. After the four-year phase-in period Sloan hopes to offer the course through an open-door policy, he said.

"This is a highly valuable complement to MIT undergraduate degrees," Meldman said.

neering. It is wonderful to see MIT's leadership on this important frontier propelled by such a wonderful group of faculty colleagues."

The last new course of study established at MIT before today was Linguistics and Philosophy in 1976. Since then, other departments have added different "flavors" to their undergraduate degree programs. For instance, the Department of Mathematics now offers a bachelor of science in mathematics with an emphasis on computer science. A number of new graduate programs have been developed, most notably the Computational Systems and Biology program that started in 2004. But the Feb. 16 faculty vote in favor of the new biological engineering course established the first new course of study in 29 years.

ALCOHOL

Continued from Page 1

education. The award recognizes innovative and empirically validated programs that effectively address alcohol and other drug issues among college student populations.

In October 2004, MIT's program was honored at the National Meeting on Alcohol and Other Drug Abuse and Violence Prevention in Higher Education.

"It has been a very effective program," said Trujillo.

The initial goals of the SBI program have been to reduce student alcohol use and the harms associated with excessive use, as well as to reduce the number of disciplinary actions that emerge because of excessive drinking. Students can be referred to the program following an alcohol policy infraction or by medical personnel after a visit to emergency care, by the mental health service or by athletic coaches and residence staff. Still other students come on their own.

The SBI program consists of two one-on-one meetings with a trained staff member of the Mental Health Department. "It is non-judgmental and not a treatment program," said Trujillo, who explained that the meetings are considered opportunities for students to learn about alcohol at MIT and reflect upon the role of alcohol in their lives.

Many have been surprised. "I learned a lot about statistics," said one SBI participant in an evaluation. "It's good to know how many people actually drink compared to the exaggerated number that you believe. A large majority of the students at MIT promote moderate alcohol use." Among SBI participants, 81 percent recommend that MIT continue the SBI program.

Calling all first-years

In September 2004, new freshmen were invited to complete an online survey that assessed their experiences with drinking and perceptions of alcohol use at MIT. Those who reported binge drinking or academic, legal or personal consequences associated with their drinking in the past 30 days were invited to participate in the SBI program. (Binge, or heavy episodic, drinking is defined as five or more drinks in a row for men and four or more for women at least once in the previous two

weeks.)

As incentive for participating in the survey, students were given \$15 in Tech Cash, a policy that led to an 86 percent survey participation rate. Last fall, 20 percent of students surveyed met the criteria for the SBI program; the first 70 interview slots were filled in 20 hours.

"First-year students are a critical group," said Trujillo. Prevention and early intervention have been shown to be the best ways to address high risk behavior and encourage responsible decision-making.

Many students start drinking because of what they perceive the "norm" to be, said Trujillo, which makes it very important to clear up misperceptions about college drinking as soon as students get to college. Among freshmen, 59 percent said they believe the typical MIT student drinks once a week or more. In fact, only 31 percent of MIT students consume alcohol once a week. Only 11 percent drink more than once a week.

Thus far, the program has been a great success. A 2004 evaluation comparing former SBI participants to a non-participant control group found that those who had been through the program had lower rates of excessive drinking and other high-risk behaviors. Heavy episodic drinking decreased by 40 percent among SBI participants, but it increased by more than 60 percent for non-participants.

Participants also experienced significantly fewer negative consequences, particularly related to academic performance, as a result of their drinking. They engaged more frequently in "protective behaviors," such as opting not to play drinking games, choosing not to drink at parties, alternating between non-alcoholic and alcoholic drinks to pace themselves, and expressing concern regarding the legal and disciplinary consequences associated with excessive use.

The program is an active collaboration between students and multiple MIT departments, including the Office of Community Development and Substance Abuse; the Mental Health and Urgent Care departments of MIT Medical; the Campus Alcohol Advisory Board; the Office of Student Conduct; the Department of Athletics, Physical Education and Recreation; Information Services and Technology; and the MIT Card Office.



Daniel Trujillo

MAJOR

Continued from Page 1

engineering, in addition to advanced subjects in math, chemistry and biology. Core subjects include Thermodynamics of Biomolecular Systems; Fields, Forces and Flows of Biological Systems; Molecular, Cell and Tissue Biomechanics; Biomolecular Kinetics and Cell Dynamics; and two laboratory subjects in biotechnology and biological instrumentation. The math and science core will include organic chemistry, genetics, cell biology, biochemistry and differential equations.

MIT Provost Robert Brown described the establishment of the new program as "a tremendously important step in the development of the academic interface between biology, health science and engi-

Wilczek to explain oddities of universe in Ford lecture

Professor Frank Wilczek, who won the 2004 Nobel Prize in physics, will present the seventh Ford/MIT Nobel Laureate Lecture on Monday, March 7 at 4 p.m. in Kresge Auditorium. The title of his lecture will be "The Universe is a Strange Place." In advance of the upcoming lecture, MIT Cable will broadcast the six previous Nobel lectures this week.

Wilczek's is the final lecture in the five-year series sponsored by Ford Motor Co. He is the 11th Nobel laureate to speak in the wide-ranging series, which sometimes had two or three laureates speaking on similar topics.

Wilczek's presentation will include pictures and a movie. He summarizes the talk this way: "Over the course of the 20th century we have constructed a very successful fundamental theory of the behavior of matter. Viewed from this perspective, the world looks very different from our everyday reality. It is a very strange place and a beautiful one. I'll discuss this, and show in particular how we come to understand the building blocks of matter as notes in a Music of the Void. Finally I'll mention some recent discoveries indicating that the world is even stranger than we've understood so far."

Students develop networking skills

When the Undergraduate Practice Opportunities Program (UPOP) offered MIT sophomores the chance to learn and practice networking skills in a special session last year, the students almost unanimously cited it as a not-to-be-missed opportunity.

This year, another 215 students mingled at a "mocktail" party on Feb. 16 at the Stata Center with 50 alumni and others affiliated with MIT, including employers of UPOP interns. Geared to simulate the social situations in which networking and other business interactions occur, the event followed an interactive presentation led by Jodi R. Smith of Mannersmith, an etiquette consulting firm.

Devon Biondi, UPOP program manager for Student Services and Alumni Relations, said that Smith teaches skills the students haven't had the opportunity to learn before. "Experience gives people confidence, but if you're a sophomore and don't have work experience in your intended field, how do you get it?" asked Biondi.

"She taught us many common-sense strategies that students don't normally think of using in a networking situation when we're under pressure," said Gita Srivastava, a sophomore in mechanical engineering.

The alumni and friends of MIT who attended represented a variety of industries, including finance, engineering, law, biotechnology, and nonprofit and government organizations.

"It's valuable for engineers and business people to be able to handle a range of business networking situations successfully," said alumnus Paul Edelman (Ph.D. 1978), managing director of Edelman & Associates, an executive search firm. "I really enjoyed interacting with the students and also tuned up professional skills that will be useful the next time I am at a conference, a professional meeting or even a party."

Smith helped prepare participants with exercises that included creating a "tagline" (a quick introductory summary about yourself to initiate conversation), shaking hands effectively, and entering and exiting discussions gracefully.

"The skills practiced at the event are essential not only to students preparing to find internships for the summer but also for everyone involved in day-to-day business," said Bondi.

"It taught me a lot about the importance of nonverbal communication, how seemingly small details such as body language and name tag placement can make a huge difference in professional interactions," said Bradley Edwards, a sophomore in electrical engineering and computer science.

No alcohol was served at this party, but when students are faced with professional networking events at which alcohol is served later in life, Smith advised them to avoid or minimize their drinking.

"Consuming alcohol rarely makes networking better," said Smith. To emphasize the point, she mentioned that January is a busy month for her firm because companies hire her to advise employees who behaved inappropriately at holiday parties.

The networking event was part of the program's Spring Professional Development Seminar Series, in which employers and MIT alumni volunteer to coach students through the recruiting process and professional development.

UPOP exposes students to the multifaceted nature of professional engineering practice and prepares them to make a smooth transition from academe to the workplace. It is administered from the office of the Dean of Engineering; the program has been funded as an initial five-year pilot and is currently in its fourth year.

Week of cultural celebration planned for MIT

MIT will offer a series of presentations and performances celebrating racial and cultural diversity as part of the Campus Committee on Race Relations' first CCRW Week, March 5-12. Events in the series are being sponsored by different cultural groups across campus.

The goals of CCRW Week are to educate, entertain and promote further awareness and appreciation for cultural difference within the MIT community.

Performances will include the one-man play "Black Boy," based on Richard Wright's 1945 autobiography depicting the hardships and discrimination he suffered growing up in the South. Actor Charles Holt plays all roles in this performance, portraying Wright from age four to 28.

Other performances include "¡Yo Soy Latina!" a play originally performed Off-Off-Broadway that explores life as a Latina in the United States. Also planned is a performance of "Haitian Drum and Dance," presented as part of

the Western Hemisphere Project's Series on Haiti.

Toni Lester, an associate professor of law at Babson College, will discuss her compilation of writings, "Gender Nonconformity, Race, and Sexuality: Charting the Connections" on March 9. Evelyn C. White, author of "Alice Walker: A Life," will discuss her biography of the Pulitzer Prize-winning author the next evening, March 10. White will be joined by Professor Helen Lee from MIT's Program in Writing and Humanistic Studies. Both events will feature Q & A sessions with the writers.

CCRW Week will also include discussions and film screenings focused on race and ethnicity issues. A schedule of events can be found at the CCRW web page.

Later in the term, undergraduates from the Martin Luther King Jr. IAP Design Seminar plan to distribute rubber bracelets to promote unity and cultural understanding at MIT. This initiative is funded in part by the CCRW Grants Committee.

NEWS YOU CAN USE

Pomiecko memorial Friday

A memorial service for John Christopher Pomiecko has been scheduled for March 4, from 2:30 to 3:30 p.m. in Killian Hall. A reception will follow the service. All members of the MIT community, friends and family are invited. Chris Pomiecko was a program administrator in Comparative Media Studies, an avid film buff and duplicate bridge player who died Feb. 6, following a car accident. He was 48.

Shapiro memorial scheduled

A memorial service for Institute Professor Emeritus Ascher Shapiro will be held in the MIT Chapel on Saturday, March 5 at 2 p.m. Speakers will include Provost Robert Brown, Professor John Heywood and Professor Roger Kamm.

Professor Shapiro, who was a pioneer in the field of biomedical engineering and a leader in fluid mechanics research and education, died in his Jamaica Plain home on Nov. 26 of liver cancer. He was 88.

Awards nominations sought

Nominations are being accepted until March 18 for awards that will be announced at the annual Institute Awards Convocation on May 10. For information on the more than 30 awards that will be presented or to submit a nomination, go to the awards web site at <http://web.mit.edu/awards> or call 253-7546.

Report concerns on animal care

Vice President for Research and Associate Provost Alice Gast and the chairman of the Committee on Animal Care are once again soliciting any information which would aid MIT's effort to maintain the humane care of animals used in research.

The committee was established to ensure that all MIT researchers working with animals comply with federal, state, local and institutional regulations on animal care. To that end, it inspects animals, animal facilities and labs, and reviews all research and teaching exercises which involve animals before experiments are performed.

If you have information about inadequate animal care or any information that would help the committee fulfill its responsibilities, contact the committee at 253-9436 or call Gast at 253-1403. All concerns about animal care will be handled confidentially and will be investigated by the committee.

Student writing solicited

The 2005 Ilona Karmel Writing Prizes Competition is accepting manuscript submissions (essays, plays, poetry, fiction and technical papers) from undergraduate and graduate students. The deadline for entries is 5 p.m. on Friday, April 1.

For information, visit the Program in Writing and Humanistic Studies office in Room 14E-303 or go to <http://web.mit.edu/humanistic/www>.

Order cell phones online

Information Services and Technology (IS&T) and MIT Procurement, together with MIT-preferred cell phone vendors Nextel and Verizon Wireless, have developed online catalogs for departmental and personal use. These secure catalogs (certificates required) expedite cell phone orders and information requests. Departments can make purchases using MIT procurement cards; individuals can use their personal credit cards. For links to the new catalogs, as well as contact information, see the IS&T Cellular Telephones web page at <http://web.mit.edu/ist/services/telecommunications/cellphones.html>.

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.

FOR SALE

Cherry wood table w/4 chairs, 4 cushions, \$140/bst; Braided burgundy carpet, \$30. Blk wood entertainment plus vcr/cd holders, \$8. Hamster complete set/1gallon fish tank/\$9. Folding computer stand (steel) \$40. lmorales@mit.edu or 617-916-1708.

1997 Shopsmith Mark V Model 510. Home woodworking system: 10" table saw, 12" disc sander, drill press, horizontal boring machine, wood lathe, 11" bandsaw, two extension tables, manual. Great condition. \$1,000/bst. trbashaw@mit.edu.

Beautiful Persian rug in excellent condition, \$2500. Jewel tones w/ivory background. 9' x 17'. Professionally hand washed recently. Rug too large for new home. peterb@mit.edu (for pictures).

VEHICLES

'92 Plym. Grd Voy. LE Minivan, FWD, 7 pass., white, no rust, airbag, PS, PW, PL, ABS, AM/FM/Tape, f/r H/AC, NS orig. own., 167K w/serv. rec., new AT, tires, rad., muf. \$1,495. 617-253-6601 or rwelsch@mit.edu.

2001 Subaru Legacy. 59,592 miles. Very good cond., dark green. \$11,000. ehendrix@mit.edu.

2000 Chrysler Sebring convertible-V6. Well maintained, excellent condition and garaged yr-round. Leather seats, 6-disc CD-player with (6) infinity speakers. 85K. \$8,500. Photos: <http://home.comcast.net/~bfgcat/>. Cheryl at 253-3092 or 978-276-0670.

HOUSING

Summer sublet wanted: MIT administrative staff (F) looking for studio or 1 BR. Dates needed: June-Aug. Dates flexible. 617-699-6893.

3 BR, fully equipped cottage for rent in Lyman, Maine. Quiet setting, beautiful sunsets. Steps to the water. Space still available in July. maturner@mit.edu.

Martha's Vineyard: 4BR Chappaquiddick house

on 1 acre. Newly renovated. 1 mile to beach, 3 miles from Edgartown. June through September left. \$900 to \$1150 weekly. David at 781-981-5087 or 603-654-5513.

Martha's Vineyard cottage: 2 BD/1.5BA in Oak Bluffs with wraparound deck, outdoor shower, barbecue, sunny open interior, DW &W/D. Accessible to lagoon, tennis & bike trails. Reasonable. Nina at ninad@mit.edu.

Inman Sq.: furnished room for visiting faculty/postdocs. Kitchen, laundry, all utils, cable and wireless LAN, linens, included. Walk to MIT. References. \$250/week (short-term), \$950 - \$1,000/mo. 617-625-9839 or sokolovska@mac.com.

Arlington: one rm in large house. 30 yards from MBTA Bus 77. Rent \$490, \$500 security. Utilities/month: oil \$70 in winter, power \$40, internet \$15. No pets. jhang@mit.edu.

Somerville: 1 BR, hrdwd flrs, off street prkg. Non-smoker. No pets. Red line, #85 bus to Kendall Sq. Pref. prof. person. \$950/mo. (1st and sec. dep.) 617-625-3908.

Arlington Heights: share 2 BR apt., 1st floor of house, LR, DR, spare room, storage, near public trans., off-street parking, W/D, dishwasher. No

pets/smoking. Avail 4/1. \$625/mo. + utils. 781-316-2346 or dheggstad@ill.mit.edu.

Ocean front summer cabin, Mount Desert Island, ME: 2BD/1BA w/living/kitchen area; picture windows, deck overlooking water; stairway to beach. Mins from Acadia National Park, Bar Harbor. \$1,000/week June-Sept. Steve at 253-5757 or chorover@mit.edu.

STUDENT POSITIONS

Positions for students with work-study eligibility.

Jumpstart seeks Advanced Desktop & Network Support Technician. Requirements: 1-2 years experience in help desk support, phone systems technologies, Microsoft packages, ghost imaging, networking protocols; Windows XP and Windows 2000 server certifications. Cover letter, resume: jobs@jstart.org.

Duties: work one-on-one on reading and writing with a 10th grader. Payment: four hours of tutoring, two hours of reflection, planning, and professional development/week. Requirements: Adherence to professional standards, eagerness to improve. Training provided. mdd@massed.net.



PHOTO / DONNA COVENEY

Adele Santos addresses the MIT Women's League on Feb. 18. In the background is a portrait of former MIT First Lady Priscilla Gray.

Santos' talk gives history of women in architecture

Sarah H. Wright
News Office

Adele Santos, dean of the School of Architecture, presented an informal talk to the MIT Women's League that portrayed both the general changes in opportunities and roles for women in architecture and planning and her own enthusiasm for the profession.

Fresh from the "red-eye" flight that returned her to Cambridge from San Francisco and her firm, Santos Prescott and Associates, Santos spoke to the group assembled at noon in the Emma Rogers Room for about 40 minutes on Friday, Feb. 18.

A native of Cape Town, South Africa, Santos described her parents as encouraging and the educational and social life outside her home as a "reactionary milieu."

"A woman's place was in the home. A B.A. prepared you to be intelligent and married, and I was socialized to believe that women were artistic, not analytical. We weren't 'big thinkers.' We could design kitchens, but not be planners," she recalled.

A top student in South Africa (and frequently the only woman in her classes), Santos moved to London, receiving the

A.A. diploma from the Architectural Association in 1961. "There were three women in my class. Then came the dramatic changes. By the time I got to the University of Pennsylvania, women were tops in all the technical subjects. Classes were 50 percent women," she said.

Santos received the master of architecture in urban design from Harvard University in 1963 and the master of architecture and master of city planning degrees from the University of Pennsylvania in 1968. She began practicing architecture that year, achieving renown for her range as a designer and her commitment to affordable housing and to a sustainable interplay between building design and civic life.

She told the attentive group that her path into the profession was once a routine entry for women. "I was married to a husband who was my partner. At the time there were very few women practitioners. After the seventies, we didn't hit the glass ceiling in school; we hit it in the profession," she said.

But all that has "completely transformed" in the past two decades, she said.

"Firms headed by women are growing, and they are getting projects because of being considered more responsive to clients, more interactive. More and more women are staying in the profession. Some are graduating, raising their children, and entering later. I am very optimistic about the significant role women will be playing in the profession," Santos said.

As dean of architecture, Santos described her goal is for MIT to be "THE destination school, the place that is pushing the edges of knowledge. There's no place like this on earth. I'm excited about building bridges with other parts of the campus, too, as professions involved with the environment start to merge and use the same techniques," she said.

Regarding her own experience, Santos noted that women of her generation entering any of the former "male bastions" like law or medicine made sacrifices in the face of inadequate accommodation to child-raising or family life. Having children was "one piece of your life you lopped off," she said.

Today, those sacrifices may not be necessary. But, said Santos with clear delight, architecture itself—the complex work, the competitive field, the long hours, the "red-eye" itself—remains demanding.

"Long hours? Of course," said Santos. "But what I say to young women today is, 'Don't worry about that! It's fun!'"

Auster and Byron in concert

Author Paul Auster and jazz clarinetist Don Byron will join forces as guest artists with the MIT Festival Jazz Ensemble and clarinetist Evan Ziporyn in a program titled "Words and Music and other Sonic Collaborations" on Friday, March 4 at 8 p.m. in Kresge Auditorium. Admission is \$5 at the door.

The performance is part of MIT's "Words and Music" series, which pairs spoken word artists with composers and improvisers.

Joining Byron at this concert will be guitarist David Gilmore, bassist Lonnie Plaxico and drummer Ben Wittman.

Paul Auster is one of America's leading novelists. He has published poems, essays, translations and movie scripts, but is best known for two of his novels: "The New York Trilogy" and "The Music of Chance." New York Newsday has called his novels "beautifully designed artifacts, intellectual puzzles dedicated to the proposition that life is a mystery ruled by chaos and chance." His most recent novel, "Oracle Night," just appeared in paperback. He wrote and directed the 1998 film, "Lulu on the Bridge," in which he cast Don Byron.

For more than a decade, Byron has been a singular voice in a dizzying range of musical contexts, exploring widely divergent traditions while continually striving for what he calls "a sound above genre." As clarinetist, composer, arranger and social critic, he redefines every genre of music he plays, be it classical, salsa, hip-hop, funk, klezmer or jazz—from swing and be-bop to cutting-edge downtown improvisation.

Byron has been consistently voted best

clarinetist by critics and readers alike in leading music journals; he was named Jazz Artist of the Year by Down Beat in 1992. Acclaimed as much for his restless creativity as for his unsurpassed virtuosity as a player, Byron has presented a multitude of projects at major music festivals around the world, including Vienna, Hong Kong, London and New Zealand. He recently received his first Grammy nomination in the Best Jazz Instrumental Solo category for his performance on "I Want To Be Happy" on his album "Ivey-Divey."

The MIT Festival Jazz Ensemble, directed by Frederick Harris, is a student ensemble that performs a broad range of repertoire spanning traditional and contemporary jazz styles. Recent guest artists have included Kenny Werner, Steve Turre and Joe Lovano.

An acclaimed clarinetist and composer in his own right, Professor Evan Ziporyn has collaborated with Don Byron for the past several years, most recently on a soon-to-be-released CD for Cantaloupe Records. He is a member of the Bang on a Can All-stars (Musical America's 2005 Ensemble of the Year) and the Steve Reich Ensemble, as well as director of MIT's Gamelan Galak Tika. Ziporyn has also worked with, among others, Paul Simon, DJ Spooky, Meredith Monk, Matthew Shipp, Henry Threadgill, and Cecil Taylor. He is the Kenan Sahin Distinguished Professor of Music at MIT.

"Words and Music" is presented by the Music and Theater Arts Section in collaboration with the Program in Writing and Humanistic Studies. For more information, call 617-253-9800.



PHOTO / SUZANNE DECHILLO, THE NEW YORK TIMES

Poet of glass and steel

Santiago Calatrava, an internationally acclaimed architect, engineer and artist, will present a public lecture on Tuesday, March 8, from 6:30 to 7:30 p.m. in Room 10-250. While a visiting artist at MIT March 8-10, Calatrava will receive the 2005 Eugene McDermott Award in the Arts from the Council for the Arts at MIT, and meet and work with architecture, civil engineering and computer science students. Established in 1974, the McDermott Award is given annually to a distinguished artist recognized for excellence and innovation in his/her field. Beginning this year, MIT has increased the award to \$70,000 and raised the criteria, reflecting the award's growing status, as well as the heightened importance of the arts at MIT. Calatrava was named one of Time Magazine's Innovators of 2004. The magazine called him the "poet of glass and steel."

ARTS NEWS

Mark Harvey, lecturer in music, has been commissioned by the Organization of American Kodaly Educators (OAKE) to create an extended jazz composition entitled "Modern Invention" inspired by William Billings, a prominent Boston composer of the Revolutionary War period. "Modern Invention" will receive its world premiere in a concert presentation on Friday, March 11 by the Aardvark Jazz Orchestra with guest vocalist Jay Clayton as part of the OAKE National Conference in Springfield, Mass. The program will also include the Duke Ellington composition "It's Freedom," featuring senior lecturer Pamela Wood

as vocal soloist and narrator.

Neon artist Alejandro Sina, who was a fellow at the Center for Advanced Visual Studies in the 1970s, is currently showing his sculptures, which range from tabletop sculptures to mobiles to large installations that move or spin in programmed patterns, at Boston's L'Attitude Gallery (218 Newbury St.). On Sunday, March 6, he and his wife/collaborator Moira will present a multimedia talk titled "The Art and Science of Neon Lightworks" at 7 p.m. at the gallery. Their exhibit, "Light Up Your Night," will be on view through March 31.

▶ DEAN SANTOS' RECENT PROJECTS

- **Mission Bay Housing**, a mixed-use building in San Francisco's Mission Bay development (2001)
- **FuturePlex**, a 1.3-million-square-foot development in San Francisco designed to be certified under the LEED rating system by the U.S. Green Building Council (2001)
- **Light on Learning**, a study funded by Pacific Gas & Electric to develop prototypes for day lighting in California schools (2000)
- **Penn Children's Center**, her winning project in a competition to design a child care center at the University of Pennsylvania
- New facilities for the Please Touch Museum in Philadelphia (1998)
- **Light on Learning**, Artist's residence for Villa Montalvo in Saratoga, California (1998)

MIT EVENT HIGHLIGHTS MARCH 2 - 6

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





PHOTO / ELSA CHEN


Origami


Origami mayfly folded by graduate student Brian Chan. This and other origami art is on display through March 2 at the Wiesner Gallery in the Student Center.


WEDNESDAY
March 2

 **MIT Excellence Awards**
Fourteen individuals and six teams will receive these MIT awards. Noon. Kresge Auditorium. 253-5986


 **Robert A. Muh Alumni Award**
Professor Ned Block of New York University will receive award and give talk, "What is Consciousness in the Brain?" 5pm. Bartos Theater. 258-6760.

 **Reading and Discussion**
Perikles Monioudis
Swiss writer Monioudis reads from his novels in both English and German. 5-7pm. Room 14S-200. 253-4771.


 **Mountain Temples and Temple Mountains**
Lecture by Michael W. Meister, specialist in Indian and Pakistani art. 6:30pm. Room 3-133. 258-8438.


 **Israeli Folk Dancing (participatory)**
8pm. Lobby 13. 484-3267.

THURSDAY
March 3

 **MIT Chapel Concert**
"Concordia Goes Baroque."
Noon. MIT Chapel. 253-9800.

 **The Bhopal Gas Tragedy: Reflections 20 Years Later**
Talk by Rajan Sharma, lawyer for the Bhopal victims. 4:30pm. Room 4-370. 258-7614.

 **Unbinding Our Lives: Chinese Women in America (1850-1935)**
A one-women show, performed by Christina R. Chan. 6pm. Room 32-155.

 **MIT Kinaesthetics Lab: "Laws of Motion"**
Ten original pieces accompanied by live music, written and performed by Martin Case. \$10, \$5 students & seniors. 8pm. Kresge Little Theater.

FRIDAY
March 4

 **"All in the Family"**
Technical Instructor Barbara Hughey and family play the music of Telemann, R. Strauss, and Chopin. Noon. Killian Hall. 253-9821.

 **MacVicar Day 2005**
Robert Silbey hosts panel discussion, "What Should We Achieve in a Four-Year MIT Education?" 3pm. Room 6-120. 253-6057.

 **Traditional Vietnamese Music Concert**
Concert and talk by Vietnamese music scholar Phong Nguyen. 7pm. Killian Hall. 253-9800.

SATURDAY
March 5

 **Visualizing Physics: Hands-on Physics Demonstrations**
Try the same experiments as MIT students taking "Introduction to Electricity and Magnetism." 2-4pm. MIT Museum. 253-4444.

 **Afro-Haitian Drum and Dance**
Afro-Haitian drumming, Haitian art and Haitian food and crafts. 2pm. Walker Memorial.

 **Early Spring Dance**
Dancing to include ballroom and latin dances. 8pm. Morss Hall. 686-0823.

 **Grads on Ice**
Skating with Grad students from all over the Boston area. 9pm. Johnson Ice Rink. 253-2982.

SUNDAY
March 6

 **Hart Nautical Gallery**
"Iquarium"—A virtual fluid flow display. Hart Nautical Gallery. 9am-8pm. 253-5942.

 **Gallery Talk**
Talk by Hiroko Kikuchi, List Visual Arts Center Education/Outreach Coordinator. 2pm. List Visual Arts Center. 253-4680.

 **International Folk Dancing (participatory)**
8pm. Lobdell Dining Hall. 253-FOLK.

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

SONIC COLLABORATIONS
Jazz Ensemble with special guests, Jazz clarinetist Don Byron and poet, author and film director Paul Auster. \$5. 253-9800.

Mar. 4
Kresge Auditorium
8 p.m.

CCRR WEEK
The Committee on Campus Race Relations will hold events to celebrate diversity, including lectures and theater performances. 253-1706.


Mar. 5
March 5 - 12


STRANGE UNIVERSE
The Ford/MIT Nobel Laureate Lecture featuring 2004 Nobel laureate Frank Wilczek of physics.


Mar. 7
Kresge Auditorium
4 p.m.

MIT EVENT HIGHLIGHTS MARCH 7 - 13


MONDAY
March 7


 **Reconstructing Iraq**
Third seminar in the "Politics of Reconstructing Iraq" Colloquium. 5:30pm. Room 1-190. 324-0318.


 **Muslims and the Language of the Other**
Talk by Post-Doctoral Fellow, Dr. Abier Ziadeh Shamma. 5:30pm. Room 3-133. 253-1400.


 **Reading of "The Man in My Head"**
Book by Associate Professor Thomas DeFrantz performed by Boston actor/musician Jose Delgado. 7:30pm. Killian Hall. 253-4720.

TUESDAY
March 8


 **Emile Bustani Middle East Seminar**
Dr. Ussama Makdisi of Rice University asks, "Is The Arab World Anti-American?" 4:30pm. Room E51-095. 253-8961.


 **Evidence for Water on the Surface of Mars**
Talk by Professor John Grotzinger, member of NASA's science team for the Mars robotic investigations. 5:30pm. MIT Room, Faculty Club. 308-9795.


 **Recent Work**
Talk by Architect and Engineer Santiago Calatrava. 6:30pm. Room 10-250. 253-7791.


 **Chicks Make Flicks**
Julie Akeret's "Someone Sang to Me." 7pm. Room 32-124. 253-8844.

WEDNESDAY
March 9

 **Terrorism**
Colonel Russ Howard discusses terrorism. Noon. Building E38, 6th Fl Conference Room. 253-8092.

 **Advanced Music Performance Student Recital**
Graduate student Amanda Wang on the violin. 5pm. Killian Hall. 253-9800.

 **"Past Lives" Opening Reception**
Exhibit of hand-made books by Ilavenil Subbiah. 5-7pm. Room E51-095. 253-9759.

 **"Hidden Warriors: Voices from the Ho Chi Minh Trail"**
Documentary screening and talk by professor and filmmaker Karen Turner of Holy Cross College. 7pm. Room 6-120.

THURSDAY
March 10

 **Festival de Las Americas**
Delicious treats and various organizations. Noon-2pm. Lobby 10.

 **MIT Chapel Concert**
Guitarist Glorianne Collver-Jacobson and percussionist Gerdes Fleurant. Kresge Auditorium. 4 p.m.

 **Clipper Ships: The Design Process**
Lecture in conjunction with current exhibition. 6:30-8pm. MIT Museum. 253-4444.

 **"The Bear"**
Dramashop student-directed workshop production of play by Chekhov. March 10-12. 8pm. Kresge Rehearsal Room B. 253-2908.

 **"Othello"**
Shakespeare Ensemble production directed by Kortney Adams. March 10-12, 17-19. \$8, \$6 students. 8pm. Sala de Puerto Rico.

FRIDAY
March 11


 **Advanced Music Performance Student Recital**
Graduate student Caitlin Smythe sings. 5pm. Killian Hall. 253-9800.


 **Human Rights in Haiti: Health and Gender Issues**
Talk by Professor Erica James and Partners in Health Medical Director Joia Mukherjee. 7pm. Room 4-237.


 **MIT Symphony Orchestra**
Marco Betta's world premiere of "Lacrime," Mozart's Adagio and Fugue; Brahms' Symphony in D Major. \$5. 8pm. Kresge Auditorium. 253-9800.

 **Thelonius Monk**
Tap performance: "Monk's Mood: A Performance Meditation on the Life and Music of Thelonius Monk." March 11-13, 17-19. 8pm, except 2pm on March 13. Kresge Little Theater. 253-4720.

SATURDAY
March 12

 **"A Needle Woman"**
Videos created between 1999 and 2001, document Kimssooja, dressed in simple gray clothing standing rigidly on several busy city streets. Media Test Wall, Building 56. On view 24 hours. 253-4400.

 **Collegiate Figure Skating Competition**
8am-6pm. Johnson Athletic Center Ice Rink.

 **MIT Wind Ensemble**
World premiere of Evan Ziporyn's "The Ornate Flute" with Anne Harley, soprano. \$5. 8pm. Kresge Auditorium. 253-9800.

SUNDAY
March 13

 **Hoops Against Cancer**
Intercollegiate basketball tournament featuring several contests. \$5. Noon. Rockwell Cage.

 **29th Annual Israel Folk Dance Festival**
\$12. 3pm. Kresge Auditorium. 253-2982.

 **MITHAS Concert**
Presented by MITHAS (MIT Heritage of South Asia) in cooperation with Sangam. \$20, \$10 students, MIT students free. 4pm. Wong Auditorium. 258-7971.