

12 students named Fulbright scholars

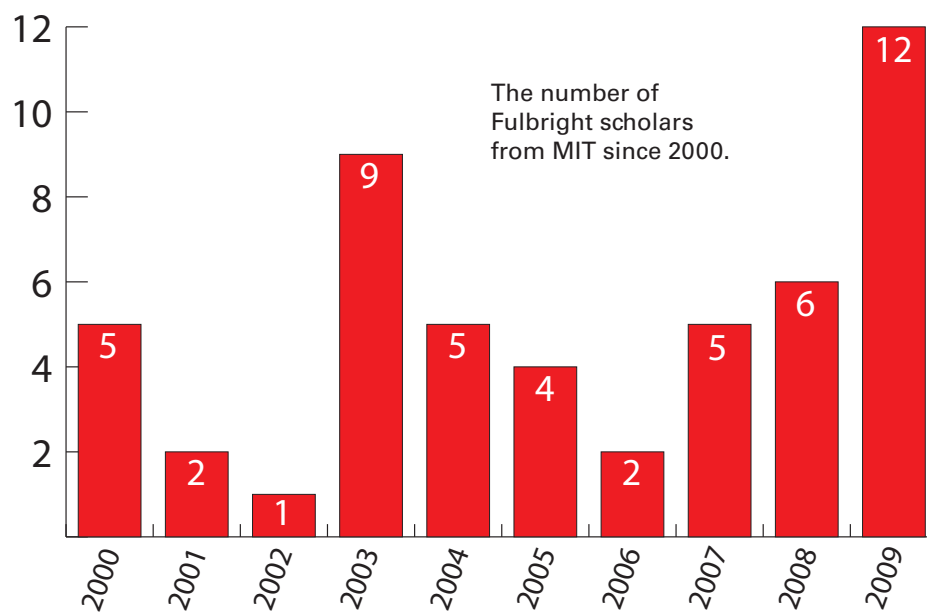
Two recent MIT graduates and 10 current students have been awarded Fulbright scholarships to study abroad for the 2009-2010 academic year.

This year's tally of 12 Fulbright winners is MIT's highest on record, eclipsing the nine MIT students who received the scholarships in 2003. Two MIT students were also chosen as alternates, but will not learn final results of their applications until mid-summer.

Fulbright scholarships have given students a role in U.S. foreign relations since their inception in 1946. More than 7,000 students apply for the program each year, and about 1,500 are selected based on their achievement and potential. Each grant covers the costs of travel abroad and living expenses for one academic year.

The Fulbright scholarship winners from MIT are:

Koyel Bhattacharyya, who recently



completed her SB in chemistry. She will travel to France to conduct electrochemistry research at l'Ecole Normale Supérieure on the delivery of nanoquantities of ions and their role in the nanofabrication of molecular electronic devices, artificial photosynthetic system, organic light-emitting diodes, biosensors, and the study of many cellular functions.

Nathan Cisneros, a PhD student in political science, will travel to Japan to examine the persisting dualism between workers with job protection and good wages with those without such security, by examining bargaining incentives created by enterprise unionism. He will collaborate with Professor Nobuhiro Hiwatari of the University of Tokyo while in Japan.

Greg Distelhorst, a PhD student in political science. He will continue the

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MIT helps smokers quit

MIT Medical's tobacco treatment manager has helped dozens kick the habit



Alice Waugh
MIT Medical

"Quitting smoking is easy — I've done it hundreds of times," said a rueful Mark Twain. Like many would-be ex-smokers, he had trouble "staying quit," but MIT Medical is helping smokers stop for good with a program that's free for anyone in the MIT community.

Since early 2008, Lauren Mayhew has worked with about 30 employees, students and others at MIT on kicking the habit. Mayhew, a tobacco treatment program manager who works in MIT Medical's Center for Health Promotion and Wellness, uses classes and one-on-one counseling sessions to help smokers develop a plan for quitting and then to manage stress and cravings after they put down their cigarettes.

"I would not have made it if it wasn't for Lauren," says Stacy Pyron, financial officer and executive assistant for the Lemelson-MIT Program, who smoked her last cigarette on Sept. 30, 2008. At MIT Medical's Nov. 20 Kick Butt competition — where elaborate student-built machines tried to stub out a lit cigarette

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PHOTO / DONNA COVENEY

Secretary Chu visits MIT

Nobel Laureate and U.S. Energy Secretary Steven Chu visited MIT on May 12 and delivered the Compton Lecture. Chu spoke to a packed 10-250 on the topic of 'The Energy Problem and the Interplay between Basic and Applied Research.' For full coverage of Chu's lecture, please visit <http://web.mit.edu/newsoffice>.

PEOPLE

New Knight fellows

Twelve mid-career journalists have been selected for the 27th group of Knight fellows at MIT.

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RESEARCH & INNOVATION

Regrowing bone, cartilage

New tissue scaffold shows promise for treating arthritis, sports injuries.

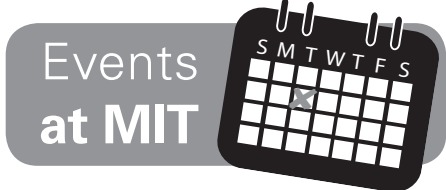
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NEWS

8 teams win IDEAS competition

Each win up to \$7,500 to help start businesses to solve pressing problems in developing countries.

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Scratch Day goes global

Conference on programming language spans 100 sites

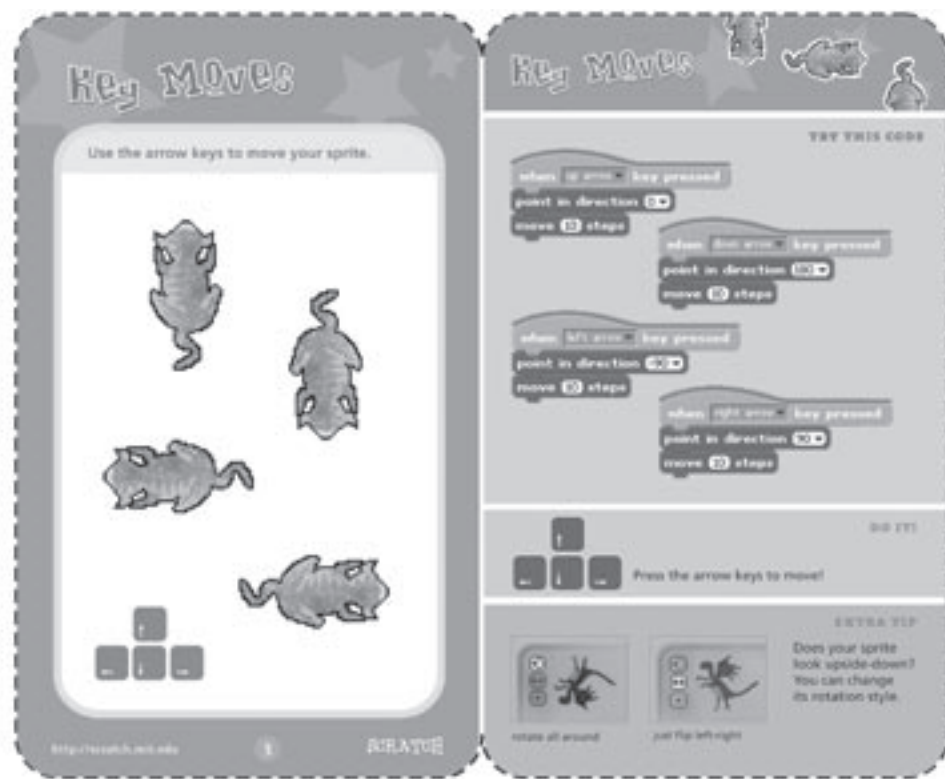
David Chandler
News Office

On May 16, two years from the day of its initial launch, the Media Lab-developed programming language Scratch is being celebrated with events in more than 100 locations in 41 countries around the world, says its creator, Mitchel Resnick.

Resnick, the LEGO Papert Professor of Learning Research at the Media Lab and head of the Lifelong Kindergarten group, led the team that created Scratch as a way of enabling kids to create their own interactive stories, games and animations — and to help them learn to think creatively, reason systematically and work collaboratively. Programs can be constructed, using the free downloadable software, simply by snapping together colorful little modules that look, and function, much like LEGO bricks.

The resulting programs, games, interactive stories and so on can then be uploaded to the Scratch site, where other users anywhere in the world can see, play with and modify them. Scratch is currently available in more than 50 languages, making it easy for users worldwide to collaborate and build on projects.

Every month, the Scratch web site has been getting a half-million unique visitors. More than 275,000 people have registered to be able to upload their projects to the site, and almost one million have downloaded the Scratch software to their computers. About one project per minute (1,500 per day) gets uploaded to the site.



A 'key moves' card, which shows how to use the Scratch programming language. The cards are available on the Scratch web site at <http://scratch.mit.edu>.

The software download, and access to all the projects that have been uploaded, are available at <http://scratch.mit.edu>.

Even the "Scratch Day" events, except for the one at the Media Lab, are entirely initiated and run by the worldwide community of users, with very little promotion by the Scratch team. In addition to dozens of local gatherings in the United States, there will be events around the world, from Europe and South America to China, India and even Iran. "We didn't promote it, hardly at all," says Resnick, who was delighted to see how it took off as a grassroots movement. "It's an

indicator of the interest in Scratch around the world."

In Cambridge, the afternoon events (already closed, having reached the maximum number of registrations) will consist of a set of four parallel workshops. The event is aimed both at students who use the software and parents and teachers who work with them.

Within the next few months, the Scratch team will be launching a new web site aimed specifically at educators who work with the language, providing resources and suggestions. They will also be holding a workshop this summer for teachers.

Today

• **"Drip, Drip, Drip..."** In Lobby 13, the interactive exhibits developed and produced by Terrascope freshmen on water use and sustainability will be on display through May 31.

• **Bike Awareness Day - MIT's Bay State Bike Week Event.** 11 a.m.-2 p.m. in W20, Student Center Plaza. Food, fun and free stuff. Bike safety tips, maintenance and repair demonstrations. Ride in the campus bike tour. Bring your bike and participate.

• **MIT \$100K Entrepreneurship Competition finale.** Speaker: Rodney Brooks, founder of iRobot. 6-9 p.m. in W16. Come watch the finale of the MIT \$100K Entrepreneurship Competition where we will give away \$100,000 in cash to a startup plus a \$10,000 audience choice winner.

Friday, May 15

• **"Environmental law, policy, & economics: Reclaiming the environmental agenda."** Noon-1 p.m. in E51-145. Please join us as Nicholas Ashford, professor of technology and director of the technology and law program at MIT, shows how environmental law cases have led to important legal, economic, and scientific developments, and how use of the law can stimulate technological change and industrial transformation.

• **MIT Pappalardo fellows in physics symposium.** 2-5 p.m. in 4-349. Five members of the department's renowned postdoctoral fellowship program, the Pappalardo Fellowships in Physics, will present highlights of their independent research.

• **"And Things of That Nature"** - Opening of student exhibition, Mills Gallery. 6-8 p.m. at Mills Gallery, Boston Center for the Arts. The public opening of "And Things of That Nature," an exhibition featuring projects developed by graduate students at MIT's Visual Arts Program: Haseeb Waqar Ahmed, Gina Badger, Caitlin Berri-gan, Jaekyung Jung, Jin Jung, Matthew Mazzotta, Alexander Rosenberg and Jess Wheelock.

Monday, May 18

• **"Recycling Nuclear Waste: Addressing Nuclear Waste in the 21st Century."** Speaker: Senator Tom Carper. 10 a.m.-noon in 56-114. One of the long-term questions about nuclear energy is how to manage the waste. For many years, U.S. nuclear utilities have paid fees to the federal government for nuclear waste disposal. But work on disposal has come with delays and roadblocks. It is time to responsibly move forward to address the nuclear waste issue.

Tuesday, May 19

• **"Soap Box: What's the Latest in Solar Energy?"** 6-7:30 p.m. in N51, MIT Museum. Speaker: Marc A. Baldo. Learn more about luminescent solar concentrators.

FULBRIGHT: MIT sets Institute record with 12 study-abroad scholars

Continued from Page 1

research that he has begun under the tutelage of Richard Locke, the Alvin J. Siteman (1948) Professor of Entrepreneurship and Political Science, and of Edward Steinfeld, an associate professor of political science, on China's global competitiveness and social policy. In China he will conduct fieldwork in two southern Chinese manufacturing centers to investigate how local government and private firms has responded to new laws that improve labor condition and expand worker rights while raising operational costs for employers.

Erica Dobbs, a PhD student in political science, will conduct her Fulbright research in the European Union. Using the knowledge she has gained both in her graduate program and her work for the Service Employees International Union, she will examine the role labor unions play in integrating recent immigrants into their communities in Ireland and Spain.

Nicholas DuBroof, a master's degree student in urban studies and planning, will travel to Mexico to examine urbanization of ecological conservation lands in Mexico City following a 1992 constitutional reform that allowed for the privatization of communally owned land called ejidos. While there he will collaborate with Professor Clara Salazar Cruz of El Colegio de Mexico.

Xaq Frohlich, a PhD student in the Program in Science, Technology and Society, will travel to Spain carry out further dissertation research. Frohlich is examin-

ing the globalization of the food market in relation to differences in international standards on food safety and risk, as well as cultural concerns about preserving local foodways. His main vehicle for this study is an analysis of the laws and science that influence food labeling.

Jennifer Furstenau, a PhD student in architecture, will continue research she began with Associate Professor John Ochsendorf in Switzerland with the Pantheon Project at the Univeritat Bern. The Pantheon Project has conducted extensive analysis of Roman dome technology but currently lacks an engineer to help advance the project. Furstenau will therefore assist their project and will further her own dissertation research on the structural integrity of historic masonry domes.

Anneka Lenssen, a PhD student in art history, will conduct research in Syria where she will investigate the artistic and intellectual movements of 1960-1980, a period when the state founded art institutions to support representation of a shared future. Through this study, Lenssen hopes to re-examine the relationship between modern art and society.

John Lopez, a PhD candidate in architecture history, will travel to Mexico to study the transformation of Mexico City from a pre-Columbian city to a colonial one via the desagüe, a public works project to drain six lakes surrounding the city to control flooding. The project was one of the largest engineering enterprises of pre-

industrial society anywhere in the world.

Matt Orosz, a PhD student in the Department of Civil and Environmental Engineering. Prior to Orosz's graduate program at MIT, he lived in Lesotho for two years as a member of the Peace Corps. During that time, he recognized Africa's potential to implement renewable energy sources. Next year he will travel to South Africa on a Fulbright to evaluate the technical, economic, and social applicability of solar technology for use in low-income housing.

Amanda Shing, who earned her SB in chemistry last year, was granted a Fulbright Scholarship in Malawi to research the viability of the Universal Nut Sheller (UNS), a low-cost, human-powered device designed to shell various nuts, reducing the labor and time needed to shell and raising the initial value of nuts for sale by local communities. Shing first worked with the UNS as a D-Lab student, and now plans to promote and improve the device.

Rebecca Woods, a PhD student in the Program in Science, Technology, and Society, will travel to New Zealand to conduct her dissertation research. She will trace the history of several British livestock breeds from their localized origins within Britain in the early 19th century to distant new homes in New Zealand and North America, and finally back to Britain, where they are classified today as endangered "traditional" breeds.

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Eight teams win IDEAS awards

Grants will support efforts in developing nations

David Chandler
News Office

At an awards ceremony on Monday, May 4, for MIT's annual IDEAS contest, eight teams were awarded prizes of up to \$7,500 each for their efforts to create business ventures that could address pressing needs in the world's developing countries.

This year's competition saw a big increase in the number of entries, said its co-founder Amy Smith, a senior lecturer and creator of the D-Lab program at MIT. Thirty-five teams, each of them including at least one MIT student, vied for this year's awards, up from about 25 last year, Smith said.

The competition includes a special category, called the Muhammad Yunus Innovation Challenge to Alleviate Poverty, for projects aimed at tackling a specific issue in the developing world. This year's Yunus Challenge centered on affordable, small-scale energy solutions.

Two of the winning entries addressed this challenge, with projects to provide electricity in rural areas not currently served by electric grids. One is based on a fuel cell powered by dirt — or, more accurately, by the microbes living in dirt. The device can be made for under \$20, can be used to power lights or radios or to charge cellphones, and can provide power for months on end, says mechanical engineering graduate student Aviva Presser, leader of the team called Lebonê, which holds a patent on the technology.

The other power source, by a team called EGG, would use conventional rechargeable battery technology with a new distribution system. The batteries would be charged centrally, whether in a place where grid power is available or from solar panels or other sources, and provide them to local users on a rental basis. After paying an affordable annual fee, the user then returns the depleted batteries to a central location to be swapped for a fully charged set. The system will be tested in Tanzania. The team consists of five students from MIT and three from Harvard Business School.

Among the other winners was team called Aquaport, which created an ingenious modular water-transportation system to save the time and effort of carrying jugs of water, usually balanced on

women's heads, home from central wells. The system consists of molded disk-shaped tanks that snap together to form a larger drum shape, which then is fitted with an axle and a handle allowing it to be rolled along the ground instead of being lifted and carried. The system, costing less than \$40, will be tested this summer in rural Ghana.

As for the quality of the water itself, that issue is addressed by a winning entry from a team called the Global Citizen Water Initiative. This open-source system will allow local users to order water test kits and then input the information into a location-based database that can provide information on water quality, both for the community and for public health officials and researchers.

THIS YEAR'S WINNERS:

- Braille Label Maker
- HeatSource Textiles
- Lebonê
- EggTech
- BLISS
- Global Citizen Water Initiative
- Vision Group
- Aquaport

Two different winning teams aim to provide help for the visually impaired. One winner was the 6-dot Braille labeler, a device that allows blind or visually impaired people to easily type labels that can be attached to objects such as food cans or boxes, allowing them to be identified quickly. The labeler, initially developed last fall as a project in the 2.009 product design class, will be licensed for manufacture sometime this summer, said team leader Karina Pikhart. Another winner is the Seeing Machine, a portable device that translates images from a digital camera or other source into a simplified form that can be beamed directly into the eye, bypassing distorting effects in the lens. The device is about to go into clinical trials.

A team called Business and Life Skills School (BLISS) is seeking to promote education and eliminate child labor among refugees in Pakistan. School attendance rates are low there because of the costs and local perceptions that the education is not useful. The team plans to introduce a curriculum that teaches useful skills, as well as hands-on afterschool activity that could cover the costs of education.

Finally, a team called Heatsource is developing a phase-change material for the Himalayan region. The material, made from local fabrics and readily obtained paraffin, can be used for clothing or bedrolls. Recharged in the sun, the material can then provide warmth for an extended period.

The winning teams will all take part in a two-day retreat later this month to further develop their plans.



PHOTO / GWEN FREDERICK

Team members presented their projects during the IDEAS competition's poster session on Monday, May 4. Eight teams were awarded up to \$7,500 to create business ventures that could address problems in developing countries.

12 journalists named Knight fellows

The Knight Science Journalism Fellowship program at MIT has selected 12 journalists from seven countries for its 27th class of fellows.

The Knight Fellowship is a mid-career program for working journalists who specialize in science, technology, medicine or the environment.

The new fellows, who will study at MIT during the 2009-2010 academic year, are:

- Michael Barnes, a TV documentary producer from England who has worked on the American science series NOVA;
- Marcin Jamkowski, a writer and photographer from Poland who has worked extensively for National Geographic;
- Konstantin Kakaes, a writer for The Economist who has

been based in Mexico City during the past four years;

- Chris Mooney, a blogger and author who has worked for Seed magazine;
- Susan Moran, a freelance writer on environmental issues from Boulder, Colo.;
- Onche Odeh, senior science and agriculture reporter at the Daily Independent newspaper in Lagos, Nigeria;
- Mary Otto, a former Washington Post reporter and now editor of Street Sense newspaper in Washington;
- Rowan Philp, senior correspondent at the Sunday Times in Johannesburg, South Africa;
- Eugenie Reich, a British freelance writer who has worked extensively for New Scientist magazine;
- Craig Simons, an American reporter who was Beijing bureau chief for the Cox newspapers;
- Daniela Hirschfeld, the editor of the magazine Galería in Montevideo, Uruguay, and a regular contributor to the online news service Scidev.net;
- Xiaojian Zhao, a health reporter for the magazine Southern Weekly in Beijing, China.

Alumnus adds to support of J-PAL

Mohammed Abdul Latif Jameel '78 has committed a substantial gift to support the Abdul Latif Jameel Poverty Action Lab (J-PAL) in its mission to reduce poverty worldwide by ensuring that policy is based on scientific evidence. The lab, named in honor of Jameel's father in 2005, is based in the Department of Economics in the School of Humanities, Arts, and Social Sciences. Jameel's new commitment will allow J-PAL to expand its work over the next five years and well into the future with the primary goal of improving the lives of 100 million people worldwide by 2013.

J-PAL takes the concept of randomized trials from medicine and adapts it to evaluate the most effective ways to improve the lives of the poor — tackling issues from children's health, to women's empowerment and small holder productivity. Working closely with partners all over the world, J-PAL translates research into action, providing evidence to governments, nongovernmental organizations, private companies and international agencies on how to make their programs more effective and promoting the scale up of approaches that are particularly cost effective.

MIT President Susan Hockfield said, "Through the original gift that launched the Abdul Latif Jameel Poverty Action Lab, Mohammed Abdul Latif Jameel performed a hugely creative act of philanthropy — supporting groundbreaking anti-poverty research that would produce powerful ripples of positive change in the lives of people across the developing world. By pinpointing ways to make health and education interventions far more effective, J-PAL's findings have already improved daily life for millions. His magnificent new commitment will help ensure that these insights exponentially transform development policy and practice around the world. J-PAL's scientific assessment of how best to relieve the burdens of poverty helps governments and NGOs target their limited funds — never more important than in this time of scarce resources and growing human need. On behalf of all those whose lives will be improved by J-PAL's insights and recommendations, we are enormously grateful to our alumnus and dear friend, Mohammed Abdul Latif Jameel."

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Picower-led team pinpoints gene key to Alzheimer's-like reversal

Success in restoring memories in mice could lead to human treatments

Deborah Halber
Picower Institute

A team led by researchers at MIT's Picower Institute for Learning and Memory has now pinpointed the exact gene responsible for a 2007 breakthrough in which mice with symptoms of Alzheimer's disease regained long-term memories and the ability to learn.

In the latest development, reported in the May 7 issue of *Nature*, Li-Huei Tsai, Picower Professor of Neuroscience, and colleagues found that drugs that work on the gene HDAC2 reverse the effects of Alzheimer's and boost cognitive function in mice.

"This gene and its protein are promising targets for treating memory impairment," Tsai said. "HDAC2 regulates the expression of a plethora of genes implicated in plasticity — the brain's ability to change in response to experience — and memory formation.

"It brings about long-lasting changes in how other genes are expressed, which is probably necessary to increase numbers of synapses and restructure neural circuits, thereby enhancing memory," she said.

The researchers treated mice with Alzheimer's-like symptoms using histone deacetylase (HDAC) inhibitors. HDACs are a family of 11 enzymes that seem to act as master regulators of gene expression. Drugs that inhibit HDACs are in experimental stages and are not available by prescription for use for Alzheimer's.

"Harnessing the therapeutic potential of HDAC inhibitors requires knowledge of the specific HDAC family member or members linked to cognitive enhancement," Tsai said. "We have now identified HDAC2 as the most likely target of the HDAC inhibitors that facilitate synaptic plasticity and memory formation.

"This will help elucidate the mechanisms by which chromatin remodeling regulates memory," she said. It also will shed light on the role of epigenetic regulation, through which gene expression is indirectly influenced, in physiological and pathological conditions in the central nervous system.

"Furthermore, this finding will lead to the development of more selective HDAC inhibitors for memory enhancement," she said. "This is exciting because more potent and safe drugs can be developed to treat Alzheimer's and other cognition diseases by targeting this HDAC specifically," said Tsai, who is also a Howard Hughes Medical Institute investigator. Several HDAC inhibitors are currently in clinical trials as novel anticancer agents and may enter the pipeline for other diseases in the coming two to four years. Researchers have had promising results with HDAC inhibitors in mouse models of Huntington's disease.

In addition to Tsai, co-authors are Picower postdoctoral associate Ji-Song Guan; and colleagues from Massachusetts General Hospital; Harvard Medical School; the Whitehead Institute for Biomedical Research; MIT's Department of Biology; the Dana Farber Cancer Institute; and the Netherlands Cancer Institute.

For more on this story, visit the News Office's web site at web.mit.edu/newsoffice.

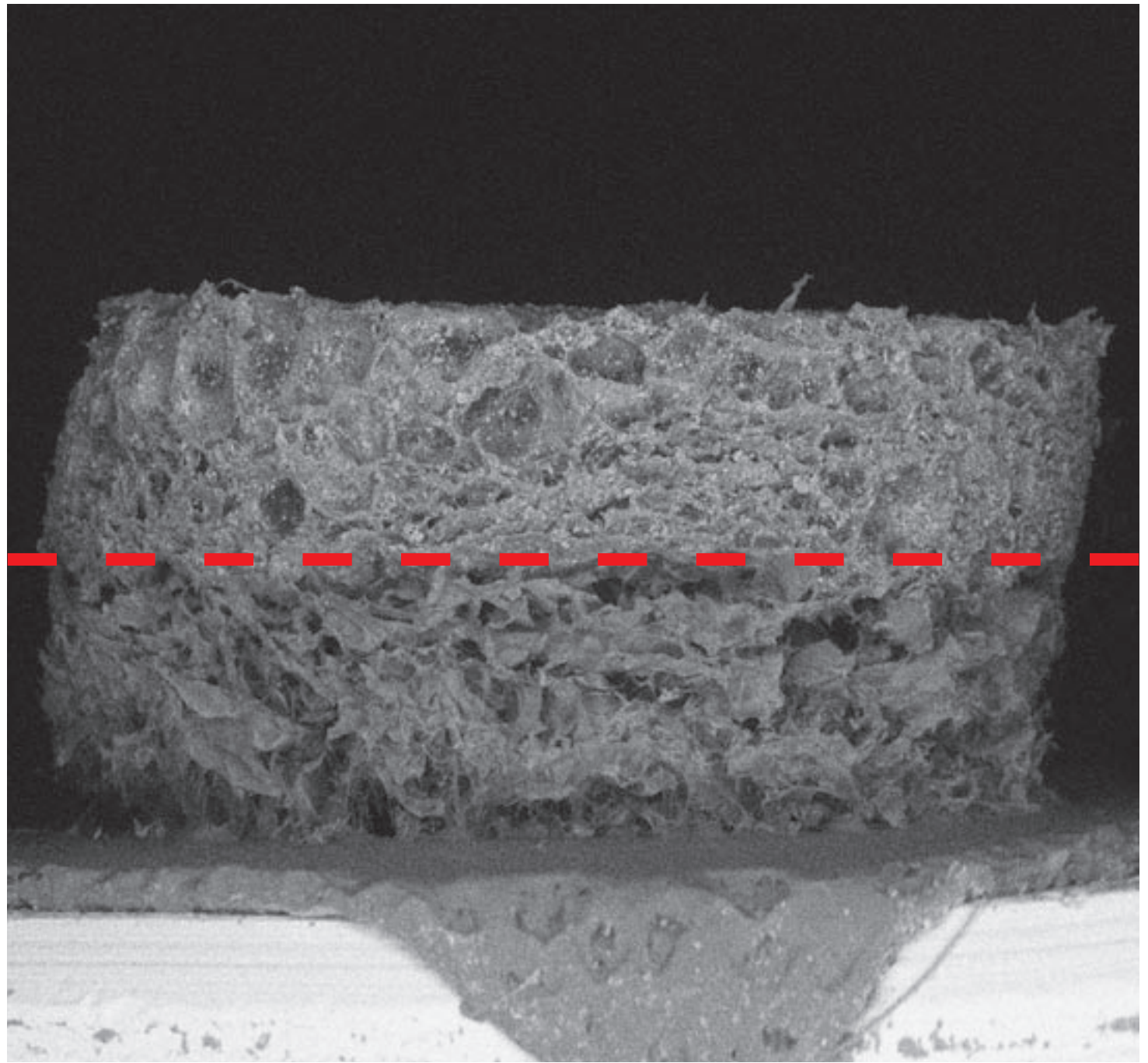


IMAGE / LORNA GIBSON

MIT and Cambridge University scientists developed this tissue scaffold that could help repair knees and other joints. The top section stimulates bone growth while the lower half stimulates cartilage growth.

New tissue scaffold regrows cartilage and bone

Work could help heal sports injuries, arthritis

Anne Trafton
News Office

MIT engineers have built a new tissue scaffold that can stimulate bone and cartilage growth when transplanted into the knees and other joints.

The scaffold could offer a potential new treatment for sports injuries and other cartilage damage, such as arthritis, says Lorna Gibson, the Matoula S. Salapatras Professor of Materials Science and Engineering and co-leader of the research team with Professor William Bonfield of Cambridge University.

"If someone had a damaged region in the cartilage, you could remove the cartilage and the bone below it and put our scaffold in the hole," said Gibson. The researchers describe their scaffold in a recent series of articles in the *Journal of Biomedical Materials Research*.

The technology has been licensed to Orthomimetics, a British company launched by one of Gibson's collaborators, Andrew Lynn of Cambridge University. The company recently started clinical trials in Europe.

The scaffold has two layers, one that mimics bone and one that mimics cartilage. When implanted into a joint, the scaffold can stimulate mesenchymal stem cells in the bone marrow to produce new bone and cartilage. The technology is currently limited to small defects, using scaffolds roughly 8 mm in diameter.

The researchers demonstrated the scaffold's effectiveness in a 16-week study involving goats. In that study, the scaffold successfully stimulated bone and cartilage growth after being implanted in the goats' knees.

The project, a collaboration enabled by the Cambridge-MIT Institute, began when the team decided to build a scaffold for bone growth. They started with an existing method to produce a skin scaffold, made of collagen (from bovine tendon) and glycosaminoglycan, a long polysaccharide chain. To mimic the

structure of bone, they developed a technique to mineralize the collagen scaffold by adding sources of calcium and phosphate.

Once that was done, the team decided to try to create a two-layer scaffold to regenerate both bone and cartilage (known as an osteochondral scaffold). Their method produces two layers with a gradual transition between the bone and cartilage layers.

"We tried to design it so it's similar to the transition in the body. That's one of the unique things about it," said Gibson.

There are currently a few different ways to treat cartilage injuries, including stimulating the bone marrow to release stem cells by drilling a hole through the cartilage into the bone; transplanting cartilage and the underlying bone from another, less highly loaded part of the joint; or removing cartilage cells from the body, stimulating them to grow in the lab and re-implanting them.

The new scaffold could offer a more effective, less expensive, easier and less painful substitute for those therapies, said Gibson.

MIT collaborators on the project are Professor Ioannis Yannas, of mechanical engineering and biological engineering; Myron Spector of the Harvard-MIT Division of Health Sciences and Technology (HST); Biraja Kanungo, a graduate student in materials science and engineering; recent MIT PhD recipients Brendan Harley (now at the University of Illinois) and Scott

Vickers; and Zachary Wissner-Gross, a graduate student in HST. Dr. Hu-Ping Hsu of Harvard Medical School also worked on the project.

Cambridge University researchers involved in the project are Professor William Bonfield, Andrew Lynn, now CEO of Orthomimetics, Dr. Neil Rushton, Serena Best and Ruth Cameron.

The research was funded by the Cambridge-MIT Institute, the Whitaker-MIT Health Science Fund, Universities UK, Cambridge Commonwealth Trust and St. John's College Cambridge.

“*If someone had a damaged region in the cartilage, you could remove the cartilage and the bone below it and put our scaffold in the hole.*”

Lorna Gibson
professor of materials science and engineering

Implantable device offers continuous cancer monitoring

New device, much smaller than a penny, could track tumor's growth

Anne Trafton
News Office

Surgical removal of a tissue sample is now the standard for diagnosing cancer. Such procedures, known as biopsies, are accurate but only offer a snapshot of the tumor at a single moment in time.

Monitoring a tumor for weeks or months after the biopsy, tracking its growth and how it responds to treatment, would be much more valuable, says Michael Cima, MIT professor of materials science and engineering, who has developed the first implantable device that can do just that.

Cima and his colleagues recently reported that their device successfully tracked a tumor marker in mice for one month. The work is described in a paper published online in the journal *Biosensors & Bioelectronics* in April.

Such implants could one day provide up-to-the-minute information about what a tumor is doing — whether it is growing or shrinking, how it's responding to treatment, and whether it has metastasized or is about to do so.

"What this does is basically take the lab and put it in the patient," said Cima, who is also an investigator at the David H. Koch Institute for Integrative Cancer Research at MIT.

The devices, which could be implanted at the time of biopsy, could also be tailored to monitor chemotherapy agents, allowing doctors to determine whether cancer drugs are reaching the tumors. They can also be designed to measure pH (acidity) or oxygen levels, which reveal tumor metabolism and how it is responding to therapy.

With current tools for detecting whether a tumor has spread, such as biopsy, by the time you have test results it's too late to prevent metastasis, said Cima.

"This is one of the tools we're going to

need if we're going to turn cancer from a death sentence to a manageable disease," he said.

In the *Biosensors & Bioelectronics* study, human tumors were transplanted into the mice, and the researchers then used the implants to track levels of human chorionic gonadotropin, a hormone produced by human tumor cells.

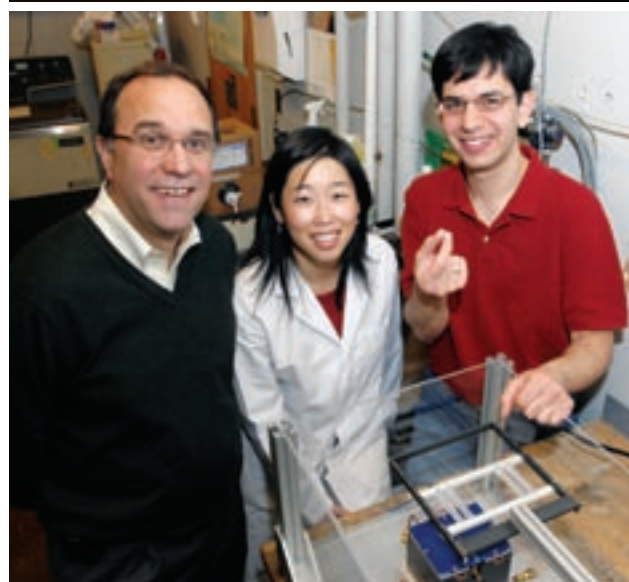
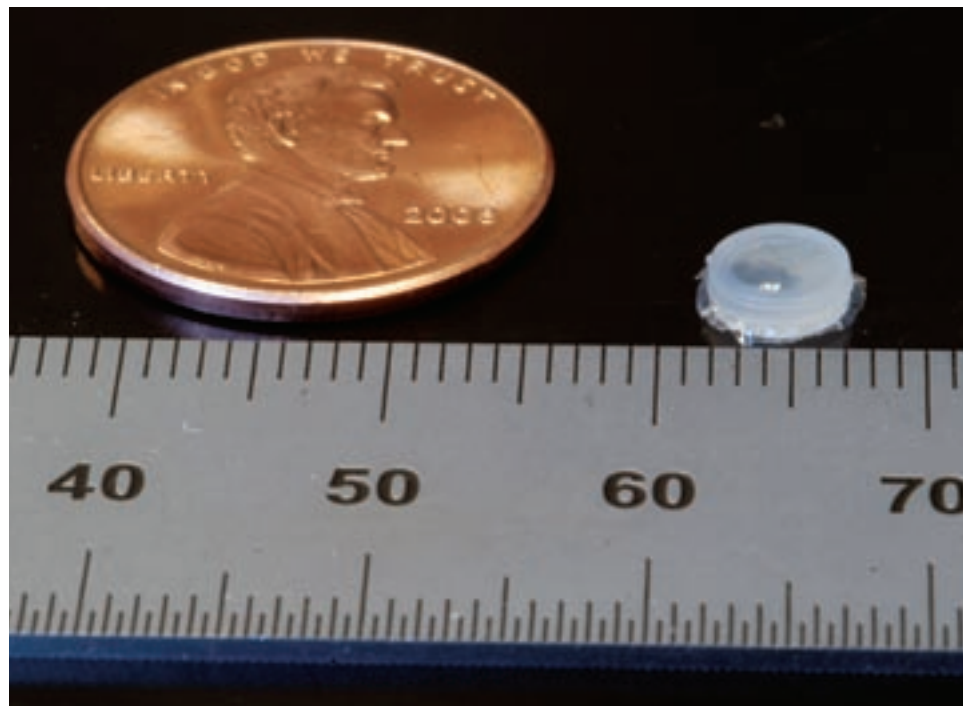
The cylindrical, 5-millimeter implant contains magnetic nanoparticles coated with antibodies specific to the target molecules. Target molecules enter the implant through a semipermeable membrane, bind to the particles and cause them to clump together. That clumping can be detected by MRI (magnetic resonance imaging).

The device is made of a polymer called polyethylene, which is commonly used in orthopedic implants. The semipermeable membrane, which allows target molecules to enter but keeps the magnetic nanoparticles trapped inside, is made of polycarbonate, a compound used in many plastics.

Cima said he believes an implant to test for pH levels could be commercially available in a few years, followed by devices to test for complex chemicals such as hormones and drugs.

Lead author of the paper is Karen Daniel, a recent MIT PhD recipient. Other authors are recent PhD recipients Grace Kim and Christophoros Vassiliou; Marilyn Galindo, research affiliate in the Harvard-MIT Division of Health Sciences and Technology; Alexander Guimares, a radiologist at Massachusetts General Hospital; Ralph Weissleder, a professor of radiology at Harvard Medical School; Al Charest, visiting assistant professor of biology at MIT; and Institute Professor Robert Langer.

The research was funded by the National Cancer Institute Centers of Cancer Nanotechnology Excellence and the National Science Foundation.



PHOTOS / (A) COURTESY OF MICHAEL CIMA, (L) DONNA COVENEY

MIT researchers have developed a device, shown above, that can be implanted into a tumor to monitor how it responds to treatment. In the photo at left, recent PhD recipient Christophoros Vassiliou, right, holds the device, alongside Professor Michael Cima and recent PhD recipient Grace Kim.



Solar-powered art

Last week marked the opening at the MIT List Visual Arts Center of 'The Immeasurable Distance,' a solo exhibition that includes works based on artist Matthew Day Jackson's residency at MIT. Among the pieces on display is 'Chariot II-I like America and America likes me' a crashed car frame Jackson rescued from the front lawn of his cousin, racecar driver Skip Nichols. Jackson painstakingly restored and rebuilt the car as a material metaphor for transformation. One of the physical-metaphors in the work is that the car appears to float on a spectrum of fluorescent lights arranged in a circular red, orange, yellow, green, blue, indigo, violet sequence.

This sequence of lights is not powered by the building's local power grid but by alternative energy — and that's where MIT's Department of Facilities comes in. Several months ago, Walt Henry and Dick Amster of Facilities met with Jackson to discuss design options to power the lighting for Chariot II. Peter Cooper, Ron Adams, Eric Beaton, and Julia Ledewitz — members of Henry's team in the Systems Engineering Group — worked to develop a solar array installed on the roof that provides the power to illuminate Chariot II. The exhibition runs through July 12.

PHOTO COURTESY OF THE MIT LIST VISUAL ARTS CENTER

MIT student project wins coveted EPA award

Patrick Gillooly
News Office

MIT students working to bring affordable, eco-friendly energy to off-the-grid areas of the world have received one of six Environmental Protection Agency (EPA) grants for programs that protect the environment and are economically sustainable.

Doctoral students Amy Mueller and Matt Orosz, both members of the research group of Harold Hemond, the William E. Leonhard (1940) Professor of Engineering in the Department of Civil and Environmental Engineering, initiated the project. They have been working for several years in Lesotho with the goal of replacing polluting diesel generators — which are commonplace in the mountainous south African country — with a more affordable and environmentally friendly alternative.

Their solar power generator, based on technology that uses a parabolic trough to concentrate solar power, is similar in concept to multimegawatt plants now being built in the Nevada desert, but are scaled to provide 3 to 5 kilowatts of power as well as hot water for individual institutions such as rural health clinics. The EPA award, from the agency's People, Prosperity and the Planet (P3) program, includes a \$75,000 grant that will go toward helping the students install a next-generation prototype solar collector at a clinic this fall or early next spring.

"The best way to help these communities is by helping the institutions that are there to serve them," said Mueller. As the grant requires the project to be economically viable as well, Mueller and Orosz have worked to engineer the solar plant so it can be built using locally available parts and labor.

The ultimate goal, Mueller notes, is to teach local residents how to build the solar power plants on their own, thus providing a business opportunity that will create a stronger electricity infrastructure in developing countries.

The P3 award competition encourages college students to apply technology in innovative ways to tackle global environmental challenges. For more information on award winners, visit http://epa.gov/ncer/p3/project_websites/2009/2009awardwinners.html.



PHOTO COURTESY OF STG INTERNATIONAL

MIT students recently won a coveted EPA grant for their work on a project in Lesotho, Africa, that is bringing solar power generators to off-the-grid areas.

Annual support staff 'toolkit' and luncheon set for June 11

MIT will host the third annual Support Staff Professional Development Toolkit event on Thursday, June 11. A collaboration between the Working Group on Support Staff Issues (WGSSI) and the Human Resources Department, the event features a series of workshops that give support staff an opportunity to focus on their professional development.

The toolkit event is coupled with the annual Support Staff Appreciation Luncheon, hosted by WGSSI and funded by HR. The toolkit and the luncheon are open to all support staff, but separate, advance registration is required for each activity.

Building on last year's model, each workshop will be presented by a support staff person and a colleague from HR. This year's event will cover the following topics in one-hour workshops: "Communicating Upward," "The ABCs of Diversity and Inclusion," "Promotions and Transfers at MIT," "Toolkit: Skills and Job Families at MIT," and "Networking for Your MIT Career."

"The toolkit event is one way to show our commitment to investing in our support staff. We hope with enough advance notice that managers and supervisors will encourage their staff to participate in this event," says Human Resources Vice President Alison Alden. "It's always important that we find the time for developing our support staff."

The direct link for registering for the luncheon — <http://web.mit.edu/membership/lunch.html> — will go live on May 18 and will remain active until May 29.

The link to register for the Support Staff Toolkit will also go live on May 18, at which time an e-mail reminder will be sent. Go to <http://web.mit.edu/sapwebss> and click the training tab and then "Training Catalog and Registration." Click "Career Management and Employee Benefits" and look for "Support Staff Toolkit Introduction."

QUITTING: MIT Medical program helping smokers kick the habit

Continued from Page 1

— she wore a "Day 51" T-shirt she made for herself. "I celebrate every chance I get," she says.

Mayhew helps smokers pick a "quit date" within a few weeks of their first meeting, and then meets with them regularly to develop methods for coping with cravings and strategies for dealing with potentially "triggering" situations. A typical treatment plan involves some combination of a medication (an over-the-counter nicotine patch or gum, or a prescription drug such as Zyban or Chantix) plus stress reduction techniques and other cognitive and behavioral approaches.

"Some people just want some information but they're not really ready to quit; they're still contemplating the decision," says Mayhew, who received tobacco treatment training at the University of Massachusetts Medical School's Division of Preventive and Behavioral Medicine. "I work with them to help them understand and resolve their ambivalence, and to hopefully get to the point where they're ready to make a quit attempt. Everyone is ambivalent to some degree; no one runs in here and says, 'Yay, I really want to quit and I'm completely ready!'" Adds Pyron, "It's a common misconception that you have to really want to quit to succeed. There's a difference between wanting to quit and being ready to."

A medical issue, not a moral one

Though Mayhew has plenty of data on the unhealthy effects of smoking, that's not why people consult her. "Anyone who smokes knows it's bad for them," she says. "They don't necessarily need any more information about that; they need someone who understands the addiction and shows them that there are effective approaches to quitting. It's good if they hear from their doctor that they should quit smoking, but they still need help and guidance on how to go about it."

As one form of encouragement, Mayhew reminds clients that smoking is powerfully addictive both physically and psychologically. "Cigarettes are a highly engineered nicotine delivery system designed to get people addicted,"

she says, noting that nicotine gets to a smoker's brain just seven seconds after inhaling. "It's also a major coping tool for anger, anxiety and depression. And the habit is reinforced by associations like always having a cigarette after dinner or with a glass of wine."

"That five o'clock cigarette was a hard one to quit because I looked forward to it so much," says Pyron. "I'd go hide behind the Marriott to smoke it."

Mayhew explains to clients that unsuccessful attempts to quit are not a moral issue and that tobacco addiction is a chronic medical condition. "A lot of smokers feel ashamed. There can be a real sense of failure if they've tried to quit before," she says. Studies show it takes five to eight attempts on average for most smokers to quit for good, Mayhew adds.

"It's a drug, and no one expects anyone to quit any other drug on the first try all by themselves," says Stacie Slotnick, writer and editor at the Media Lab and another ex-smoker. She smoked a pack a day of Camel filters but used a nicotine patch (which delivers nicotine more slowly and in lower quantities) along with frequent visits to Mayhew after quitting in January 2008. "It was an enormous help to have someone I could call or e-mail," Slotnick says. "Lauren is

very supportive and nonjudgmental. She just really gets it. I can't stress enough how I wouldn't have been successful without her."

One of Mayhew's techniques is having clients focus on their breathing as a way to combat cravings. "I discovered that one thing I liked about smoking was just taking the deep breaths," says Pyron, who started running short distances after quitting and now runs four and a half miles every morning. "I love just being able to do it without feeling like my lungs are going to explode," she adds with a laugh. Also helpful, Slotnick and Pyron say, was Quitnet.com, an online forum that sends members daily e-mails with figures on how much money they've saved and how many days they've added to their lives by quitting.

Along with helping current smokers, Mayhew hopes to do more work on smoking prevention. MIT, like any other university, has its share of "occasional smokers," but even one to four cigarettes a week is bad for your health, "and every time you have nicotine, you're setting yourself up for addiction," she says.

For more information on MIT Medical's free tobacco treatment program, go to <http://medweb.mit.edu/wellness/topics/smoking.html>, call 617-258-6965 or e-mail helpmequit@med.mit.edu.



PHOTO / DONNA COVENEY

Stacy Pyron, of the Lemelson-MIT Program, left, talks with Lauren Mayhew, the tobacco treatment manager in MIT Medical's Health Promotion and Wellness, who helped Pyron quit smoking several months ago.

MIT commercial property price index continues fall

Gauge declines nearly 6 percent in first quarter; demand sentiment in record drop

Transaction prices of commercial property sold by major institutional investors fell by almost 6 percent in the first quarter of 2009, according to an index developed and published by the MIT Center for Real Estate.

The 5.8 percent drop in the transactions-based index (TBI) for the first quarter is the fourth consecutive quarterly drop and the sixth in the past seven quarters. The index is now 21 percent below where it was a year ago and 26 percent below its mid-2007 peak — comparable to the 27 percent drop the index experienced in the previous major commercial property downturn in the late 1980s and early 1990s.

“It’s possible that the first quarter of 2009 was the nadir in market sentiment,” said Professor David Geltner, director of research at the MIT Center for Real Estate. “Sales volume is down almost to nothing, as reflected in our demand index. The prices buyers are willing to pay fell a record 12 percent in the first quarter and is now

28 percent below a year ago and 39 percent below its mid-2007 peak,” Geltner noted.

The MIT/CRE publishes not only the price index based on closed deals, but also compiles indices that separately gauge movements on the demand side and the supply side of the market that it tracks. The demand-side index tracks the changes in prices that potential buyers are willing to pay (sometimes called a “constant-liquidity” index of the market, because it tracks how much prices would have to change to keep a constant ability to sell as many properties at the same rate of trading volume). That index has now fallen steadily for all of the past seven quarters. In contrast, the supply-side index, reflecting what deep-pocket institutional owners of commercial properties are willing to sell for, actually rose slightly, by about 1 percent, in the first quarter. “This type of disconnect between the supply and demand sides of the market, with demand-side sentiment plunging and property owners refusing to sell into such losses, is greater than we have ever seen before, and is very nearly removing every bit of liquidity from the market,” said Geltner.

“As is generally the case, the results posted by our

index are corroborated by recent evidence from another commercial property price index whose methodology was developed at the MIT/CRE, the Moody’s/REAL Commercial Property Price Index produced by Moody’s Investors Service,” said MIT/CRE Research Technician Holly Horrigan, noting that Moody’s March results were scheduled to be published May 19. “The Moody’s was already down 22 percent as of February,” Horrigan noted.

The TBI tracks the prices that institutions such as pension funds pay or receive when transacting commercial properties such as shopping centers, apartment complexes and office towers. The MIT Center’s TBI is based on prices of National Council of Real Estate Investment Fiduciaries (NCREIF) properties sold each quarter from the property database that underlies the NCREIF Property Index (NPI), and also makes use of the appraisal information for all of the currently 6,000 NCREIF properties. Such an index — national, quarterly, transaction-based and by property type — had not been previously constructed prior to MIT’s development of it in 2006. NCREIF supported development of the index as a useful tool for research and decision-making in the industry.

News in brief

Endicott House, gardeners’ group holding plant sale May 20-21

The annual Endicott House spring plant sale will take place from 9 a.m. to 2 p.m. on Wednesday, May 20, in McDermott Court, and on Thursday, May 21, on the Student Center lawn.

Staff from Endicott House and volunteers from the MIT Gardeners’ Group will be selling a selection of vegetable plants, herbs, flowers, supplies (such as earth boxes), and other garden-related items. The sale is a great way to get healthy and reasonably priced plants and garden supplies while also supporting the greenhouses at Endicott House. Community members who expect to buy a lot of plants should try to bring boxes.

Committee on Animal Care solicits feedback

The Committee on Animal Care is soliciting information that would aid MIT’s effort to maintain the humane care of animals used in research.

Established to ensure that MIT researchers working with animals comply with federal, state, local and institutional regulations on animal care, the Committee on Animal Care inspects animals, animal facilities and laboratories, and reviews all research and teaching exercises that involve animals before experiments are performed.

If you have information about inadequate animal care or treatment, please call 617-253-9436 or call Professor Claude Canizares, vice president for research and associate provost, at 617-253-3206. All concerns about animal care will be handled confidentially and will be investigated by the committee. The panel will report its findings to anyone who has such concerns, as well as to the vice president for research and associate provost.

Blood drive this week in student center

MIT’s American Red Cross Team and Network will be sponsoring a blood drive through the rest of this week in La Sala de Puerto Rico on the second floor of the MIT Student Center.

Dates and times for the blood drive are:

Today — noon to 6 p.m.
Thursday, May 14 — noon to 6 p.m.
Friday, May 15 — noon to 6 p.m.

For more information or to make an appointment, visit <http://web.mit.edu/blood-drive/www/>. All donors will have an opportunity to enter raffles for tickets to the Red Sox and the Dave Matthews Band at Fenway Park, and will receive a scratch and win ticket from Unos.



More than child’s play

Civil and environmental engineering (CEE) sophomores showed off the fruits of their labor this week when they displayed the energy-harvesting machines they designed and built in 1.102 (Introduction to CEE Design II).

Senior Allison St. Vincent, left, helps sophomore Emily Moberg demonstrate the Glowing See-Saw Water Pump, which at a leisurely pace pumped six gallons of water every minute from the Kresge moat to the students’ handmade Plexiglas fountain (shown in the background). At a faster pace, the machine pumped closer to 10 gallons per minute.

PHOTO / DONNA COVENEY

‘Bother bots’ win the day

Annual 2.007 robot competition features good defense

David Chandler
News Office

There were a variety of ways to score points in this year’s 2.007 competition, which culminated in head-to-head (or wheel-to-wheel) matches among about 150 robots built by the students over the course of the semester. But one strategy seemed to prevail: preventing one’s opponent from scoring, using a secondary “bother bot” to get in the way.

The final contest, which had no effect on students’ grades for the class but nevertheless spurred intense competition and effusive cheering, was held Thursday, May 7, at the Johnson Athletic Center’s ice rink. And the best bother bot brought home the gold — or rather, its creator, sophomore Edward Grinnell, did.

Asked to deliver a victory speech after the final round, Grinnell offered oration of machinelike economy and precision: “2.007 is awesome!” he said.

2.007, which evolved from a class started in 1970 by Woodie Flowers SM ’68, ME ’71, PhD ’73, the Pappalardo Professor of Mechanical Engineering, Emeritus, focuses on design and manufacturing and is a required class for sophomores in mechanical engineering. The class’s traditional semester-ending competition features robots built mainly from identical kits of components issued to each student.

The matches were played on a two-meter square playing field divided down the middle by a row of cinderblock “buildings” separated by alleys 3 inches wide. The robots, which operated autonomously for the first 10 seconds of each minute-long match and then were controlled using radio control devices, could score by moving blocks to a designated spot,

extra points for stacking the blocks, more points for picking up crushed cans and placing them in a slot, and the highest scores for crushing a can and then placing it in the slot. The scores could also be multiplied by moving a boot, attached to a pulley, toward one’s own side of the field — something that none of the robots managed to do.

Many students built elaborate can-crushing devices, some of which worked well in the preliminary elimination rounds on Wednesday. But because the bother bots were so effective in thwarting can crushers, not a single can was successfully crushed during the final contest, which featured the 32 highest-scoring bots.

“The bother bots seemed to rise to the top,” said lead instructor Daniel Frey PhD ’97, a professor of mechanical engineering and engineering systems. “A good defense often beats a good offense.”

Simple but robust strategies prevailed. In second place was a machine built by Pablo Bello, which also had a bother bot of its own but was defeated by Grinnell’s more sturdy low-slung wedge-shaped bother bot. The third-place finisher, built by Elvine Pineda, was decorated with blue lights and was one of the most attractive robots in the contest; very effective in the early rounds, it quickly grabbed the pre-crushed cans and placed them in the slot. But in its semifinal matchup, it was successfully thwarted by Bello’s bother bot, which prevented it from reaching the slot.

Trophies and T-shirts were given to the top eight finishers, and the top four finishers will have an opportunity to attend a similar international robot design competition in Tokyo this summer. Organizers also presented the Whitelaw prize — a special award for excellence in design and manufacturing — to four competitors.

Dick Fenner, director of the Pappalardo Lab, emphasized that while the competition is a fun and exciting conclusion for the class, just creating a novel design and building a machine that works at all, in the brief period of one semester, is a significant accomplishment. “If you put something on the table and it wiggles, you’re a hero in my book,” he said.

Ancient trading raft sails anew

Faithful copy of pre-Columbian vessel tested on Charles River

David Chandler
News Office

For the first time in nearly 500 years, a full-size balsa-wood raft just like those used in pre-Columbian Pacific trade took to the water on Sunday, May 10. Only this time, instead of the Pacific coast between Mexico and Chile where such rafts carried goods between the great civilizations of the Andes and Mesoamerica as long as a millennium ago, the replica raft was floated in the Charles River basin.

The faithful reproduction of the ancient sailing craft, built from eight balsa logs brought from Ecuador for the project, was created in less than six weeks by 30 students in the Ancient Materials class taught by Professor of Archeology and Ancient Technology Dorothy Hosler of the Department of Materials Science and Engineering. The replica was based on an analysis carried out by Hosler and her former student Leslie Dewan '06, which was published last year in the *Journal of Anthropological Research*.

Based on drawings and descriptions recorded by Spanish, Portuguese and Dutch explorers, Dewan and Hosler figured out the dimensions and construction methods that most likely were used for the ancient craft, and reproduced these as accurately as possible. While some other attempts have been made to reproduce the ancient craft, including a one-third scale version built by Dewan and other students five years ago, none had previously copied the ancient designs and materials so precisely. No modern materials were used in the construction.

The full-size replica was built to confirm the computer analysis of the craft's size, capacity and construction, and to prove that such a vessel really is seaworthy and could have made the voyages of thousands of miles indicated by Hosler's research on similarities in the metalwork design and manufacture between the Andean and Mesoamerican cultures. The reproduction was financed through a donation from Alcan-Beltec Corp.

The raft will undergo a series of tests over the summer, but so far it performed very well, Hosler said. Although high winds caused problems for many sailboats on the Charles on Sunday, the raft with nine students aboard remained very stable, she said.



PHOTOS / DONNA COVENEY

ABOVE: Junior Derreck Barber, left, hands one of the eight daggerboards, used to control the craft, to freshman Chinedum Umachi, while a group of students waits on the raft.

RIGHT: Freshman Erich Brandeau works on the balsa raft.

BELOW: Students carry the raft toward its launching point on the Charles River while Leslie Dewan '06, foreground, directs them.

