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# TechTalk

S E R V I N G   T H E   M I T   C O M M U N I T Y

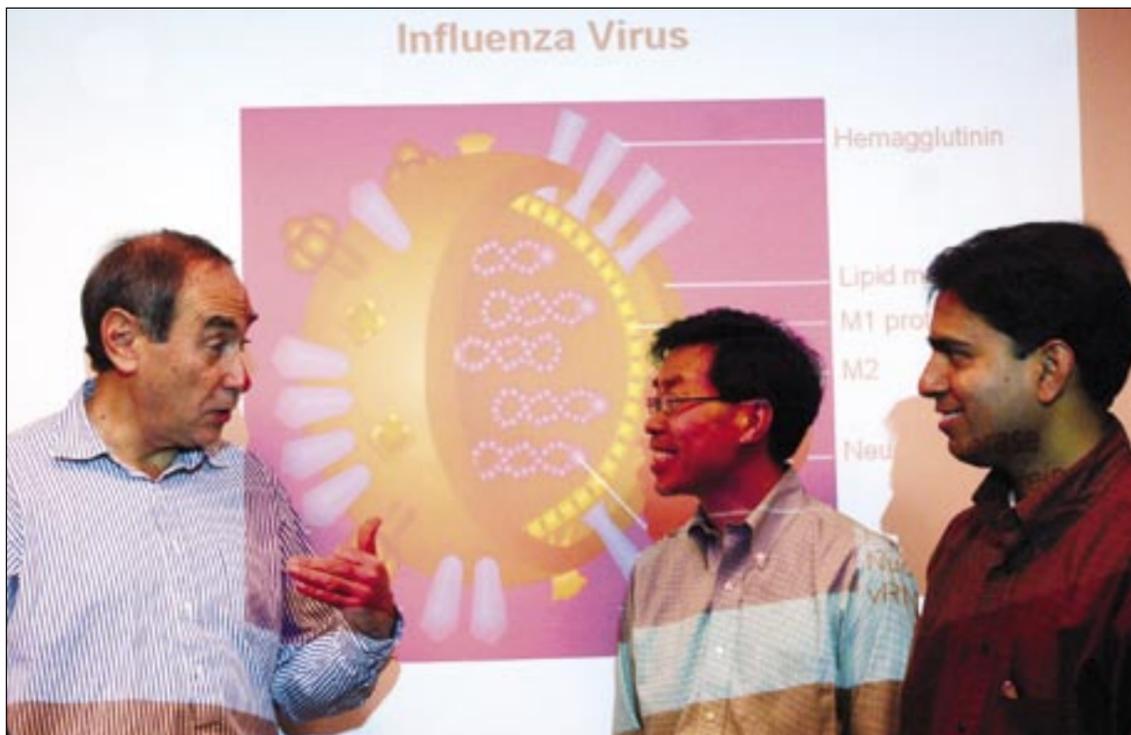


PHOTO / DONNA COVENEY

## Battling influenza

MIT researchers have developed an antimicrobial coating that is extremely effective at killing flu viruses and several types of bacteria. From left to right, Professor Alexander Klibanov of chemistry and bioengineering, Professor Jianzhu Chen of biology, and postdoctoral associate Jayanta Haldar discuss their work in front of a slide showing the structure of the influenza virus. See story on page 5.

# MIT implant measures tumor growth, treatment

Anne Trafton  
News Office

A tiny implant now being developed at MIT could one day help doctors rapidly monitor the growth of tumors and the progress of chemotherapy in cancer patients.

The implant contains nanoparticles that can be designed to test for different substances, including metabolites such as glucose and oxygen that are associated with tumor growth. It can also track the effects of cancer drugs: Once inside a patient, the implant could reveal how much of a certain cancer drug has reached the tumor, helping doctors determine whether a treatment is working in a particular patient.

"You really want to have some sort of rapid measure of whether it's working or not, or whether you should go on to the next (drug)," said Michael Cima, the Sumitomo Electric Industries Professor of Engineering in the Department of Materials Science and Engineering, and the leader of the research team.



Michael Cima

Such nanoparticles have been used before, but for the first time, the MIT researchers have encased the nanoparticles in a silicone delivery device, allowing them to remain in patients' bodies for an extended period of time. The device can be implanted directly into a tumor, allowing researchers to get a more direct look at what is happening in the tumor over time.

With blood testing, which is now commonly used to track chemotherapy progress, it's hard to tell if cancer drugs are reaching their intended targets, says Grace Kim, a graduate student in the Harvard-MIT Division of Health Sciences and Technology and one of the researchers working on the implant. That's because the system of blood vessels surrounding tumors is complicated, and you can't trust that drugs present in the blood have also reached the tumor, according to Kim.

### Implanted magnetic sensing

The new technique, known as implanted magnetic sensing, makes use of detection nanoparticles composed of iron oxide and coated with a sugar called dextran. Antibodies specific to the target molecules are attached to the surface of the particles. When the target molecules are present, they bind to the particles and cause them to clump together. That clumping can be detected by MRI (magnetic resonance imaging).

The nanoparticles are trapped inside the silicone device, which is sealed off by a porous membrane. The membrane allows molecules smaller than 30 nm to get in, but the detection particles are too big to get out.

The device can be engineered to test for many things at the same time, leading Kim to offer a turkey-based analogy.

"When you're cooking a turkey, you can take the temperature with a thermometer," she said. "But with some-

## Technology, altruism guide Marshall winner

Sasha Brown  
News Office

Graduate student Finale Doshi, a campus leader with an extensive record of service to the Institute and the world, has been awarded a Marshall Scholarship for study at the University of Cambridge for 2007.

Doshi said she plans to use her scholarship and research time to develop "intelligent machines that will improve people's lives."

Marshall Scholars must demonstrate outstanding academic achievement and a capacity to make a significant contribution to society. The scholarships, given every year since 1953, are awarded by the United Kingdom as a national gesture of thanks to the United States for aid received under the post-World War II Marshall Plan. Winners may attend any British university. Forty Marshall Scholars are chosen each year from more than 1,000 applicants.

Doshi, a native of Richmond, Va., graduated from MIT in June 2005 with dual bachelor's degrees in aerospace engineering and physics, as well as a minor in creative writing. She is now a graduate student in electrical engineering and computer science.

Doshi's passion for using technology to improve lives was sparked early in her MIT career when she was diagnosed with severe tendonitis, which made typing virtually impossible. Doshi worked with the Edgerton Center to develop a prototype ergonomic keyboard that would help herself and other people who were suffering.

"While young, Finale struggled with her dual passions of technology and altruism; she saw them as mutually exclusive, and even failed to recognize her own selfless acts of volunteerism as anything but ordinary," wrote Professor Linn Hobbs of material science and nuclear

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PHOTO / JASON DORFMAN

Marshall winner Finale Doshi shows the wheelchair with a voice-activated command system she designed.

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Spectroscopy Lab researchers offer optics crossword challenge.

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# Chocolate buffet raises \$4,000 for AIDS Action

Sasha Brown  
News Office

Anyone strolling through Lobby 10 on Friday, Dec. 1 could help fight AIDS by sampling a sumptuous selection of cheesecakes, cookies, candies and more during the annual chocolate buffet honoring

World AIDS Day 2006. The cost for three chocolate treats: \$5.

One hundred percent of the proceeds from the sale and raffles—totaling close to \$4,000—were slated for the AIDS Action Committee of Massachusetts. Hundreds of people came through the buffet, which was staffed by volunteers from the MIT Women's League, the Japanese Wives

Group and individual students and staff.

World AIDS Day is an international day of coordinated action, raising awareness about Acquired Immune Deficiency Syndrome (AIDS) and the virus that causes it (HIV). This year marks the 25th anniversary of the first reported cases of AIDS in the United States.

In 1988, the World Summit of Ministers of Health on Programs for AIDS Prevention called for an opportunity to open channels and raise awareness and communication to support the fight against AIDS worldwide.

Since then, World AIDS Day has received the support of the World Health Assembly, the United Nations, and governments, communities and individuals around the world. It is the only international day of coordinated action against AIDS.

The theme for World AIDS Day 2006 was "Stop AIDS, Keep the Promise."

The MIT buffet was the brainchild of Ellen Shapiro, former president of the Women's League and current board member who coordinates the event each year. "I wanted to leave MIT a gift. And I love chocolate," Shapiro said. Each year, the treats are donated by dozens of members of the MIT community and several local restaurants and bakeries.

The buffet has become one of the more popular—and touching—events on campus, Shapiro said. She has been moved over the years when students, faculty and staff come to her with a check and mention someone close to them who has been affected by AIDS. "It is a very emotional day," she said.

Behind the buffet tables hung large panels from the AIDS Memorial Quilt. Each panel is comprised of smaller squares made by the family and friends of a person who has died of AIDS. "We treat the panels with the same care one might give the American flag," Shapiro said. They never let the pieces touch the ground and make sure when hanging them that they are given the proper respect, she said.

"This is a wonderful opportunity to remember those who have passed and also to reflect on those who are currently affected," Shapiro said.

The day was also about education. Several groups, including the AIDS Action Committee of Massachusetts, Brigham and Women's Hospital, the Boston Living Center, Cambridge Cares About AIDS, the Center for Health Promotion and Wellness at MIT Medical, the Children's Hospital AIDS Program, the Latin American Health Initiative, the MIT Lesbian, Bisexual, Gay and Transgender Issues Group, the Massachusetts Asian and Pacific Islanders for Health and the NAMES Project Foundation, had information tables.

"People come up and ask how they can be tested," Shapiro said. "Even in a place like MIT with so many smart students, people still do not know those things."

The AIDS Action Committee of Massachusetts, a nonprofit, community-based health organization whose mission is to stop the HIV/AIDS epidemic by preventing new infections and optimizing the health of those already infected. AIDS Action provides free, confidential services to 2,500 Massachusetts men, women and children living with AIDS.



PHOTO / LISA DAMTOFT

Left to right: Kanako Hironaka, Rika Fujishiro, Dayanna Garcia (freshman), Sasha Brown

## Stephen Heywood, son of Prof. John Heywood, dies at 37

Book and film documented ALS's terrible arc

Deborah Halber  
News Office Correspondent

Stephen Heywood, son of MIT mechanical engineering professor John B. Heywood, died Sunday, Nov. 26 in Newton-Wellesley Hospital. He was 37.

Stephen Heywood's eight-year battle with Lou Gehrig's disease was featured in the book "His Brother's Keeper" and in the recent documentary, "So Much, So Fast."

Heywood died two days after his ventilator became accidentally disconnected, according to his family.

John Heywood is director of MIT's Sloan Automotive Lab and the Sun Jae Professor of Mechanical Engineering.

Stephen Heywood, a strapping 6-foot-3-inch carpenter, was restoring his dream house in Palo Alto, Calif., in 1998 when he was diagnosed with amyotrophic lateral sclerosis (ALS), a neuromuscular illness that gradually destroys the central nervous system. ALS is also known as Lou Gehrig's disease, in honor of the New York Yankees first baseman who died of ALS in 1941.

Upon learning of his younger brother's illness, Stephen's brother Jamie, a 1991 MIT graduate, abandoned his career in technology development at the Neurosciences Institute outside San Diego to create a foundation to hasten potential clinical applications of basic ALS research. Now the largest worldwide test factory for possible medications and treatments of ALS, the ALS Therapy Development Foundation ([www.als.net/](http://www.als.net/)) has 13 full-time scientists

and \$20 million in funding.

After his diagnosis, Stephen Heywood moved to Newton, Mass., to be close to his tight-knit family, who all participated in his care as his paralysis progressed. He was eventually forced to use a wheelchair and to communicate via an implant in his brain that allowed him to move a cursor on a computer screen, similar to the method used by fellow ALS sufferer Stephen Hawking, the renowned British physicist.

The Heywood story inspired a book, "His Brother's Keeper," written by Pulitzer Prize-winner Jonathan Weiner, and a wide range of media coverage. In a film completed last year, Newton-based filmmakers Steven Ascher and Jeanne Jordan captured Heywood's physical deterioration in an intimate family portrait while documenting its effects on his relationships, especially with his wife, Wendy, and his brother Jamie.

"Stephen is gone, left in our hearts and in the relationships and structures he has built," Jamie wrote in an e-mail message to friends soon after he learned of his brother's death at Newton-Wellesley Hospital. "Stephen was in command of his world and his body at all times and never lived life on anything other than his own terms."

"Stephen's real work, of course, was to raise awareness of ALS, to spur his brother's research work, and to live a rich and considered life in spite of cruel odds," Burr wrote.

He is survived by his wife, Wendy, and son, Alexander.

A memorial service was held Sunday, Dec. 3 at Grace Episcopal Church in Newton Corner.

## Dining for dollars day supports Community Giving

From 8 a.m. to 5 p.m. today, helping to fund MIT service projects will be as easy as buying lunch.

MIT Campus Dining will donate a portion of its sales to the MIT Community Giving Campaign. The contribution will benefit the MIT Community Service Fund, which provides financial assistance to support MIT student, faculty and staff volunteers in community service projects.

Five percent of the sales from Anna's Taqueria, Bosworth's, Café Four, Cambridge Grill, Dunkin' Donuts, Forbes Family Café, Hungry Mind Café, Pacific Street Café, Sepal, Shinkansen, Starbucks and Steam

Café will go to the campaign.

Customers need only buy a meal, beverage or snack at any of the locations and a portion will automatically go towards the effort.

"This event is made possible by the generous support of the vendors and contractors who work with Campus Dining to provide services to the MIT Community," said Anne Wilson, marketing specialist for campus dining and enterprise services.

Visit [web.mit.edu/dining](http://web.mit.edu/dining) for more information about MIT Campus Dining.

—Sasha Brown

## MARSHALL

Continued from Page 1

engineering, the chair of the MIT Foreign Scholarships Committee, in his endorsement letter for Doshi.

"While she still remains modest about her own valuable contributions to others, she deliberately chose to pursue graduate work in computer science, reasoning that it would allow her to effect more good for society than if she pursued aerospace engineering or physics or dedicated all her spare time to volunteerism," Hobbs said.

Throughout her time at MIT, Doshi has continued to shine, serving as the leader and principal organizer of the mobile autonomous system laboratory course, a robotics competition at MIT, during her first year of graduate school.

Currently, she is designing a wheelchair with a voice-activated command system that she hopes will give "the same freedom

of movement to the severely handicapped as people with full mobility."

Doshi says she plans to continue what she has started at MIT during her time at Cambridge. "The Marshall is an opportunity for me to experience a different culture (and their perspectives on useful and responsible technology) while furthering my own research goals," Doshi said.

"The University of Cambridge has some excellent programs in statistical machine learning. Beyond the research objectives, I also look forward to meeting new friends and researchers both at Cambridge and through the Marshall community."

Notable Marshall Scholars include Supreme Court Justice Stephen Breyer, former Interior Secretary Bruce Babbitt, electronics entrepreneur Ray Dolby, and New York Times Pulitzer Prize-winning columnist Thomas Friedman.

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# 200 faculty resume debate on proposed undergraduate curriculum changes

Deborah Halber  
News Office Correspondent

Focusing heavily on potential changes in math and science requirements, around 200 faculty members convened at a special meeting Nov. 29 to discuss proposed changes in the General Institute Requirements (GIRs) contained in a report from the Task Force on the Undergraduate Educational Commons.

The faculty passed a motion to delay any votes on the proposal until at least February.

The Nov. 29 meeting was the faculty's third opportunity to discuss the task force's proposal, which constitutes the most dramatic changes to the MIT core curriculum in the last 50 years.

The recommendations, which include new requirements in science, mathematics and engineering as well as in the humanities, arts and social sciences, also promote an increased role for international educational experiences for undergraduates.

Steven Lerman, professor of civil and environmental engineering and chair of the faculty, said that this "open comment" period would continue between faculty and the Committee on the Undergraduate Program (CUP). The discussion also will be resumed at the February faculty meeting. CUP, he said, "will eventually digest the com-



Steven Lerman



Robert Silbey

ments and come back with recommendations. Any proposals to change the GIRs will then require a debate and vote by the faculty before being approved." Implementation of any changes would be undertaken at the departmental level.

Each student will choose one course from five of either five or six areas of focus (e.g., chemical sciences, computation and engineering, life sciences, mathematics, physical sciences, and project-based experiences), plus two semesters of calculus and one of physics.

Each focus area will have several different options. For example, electricity and magnetism (Course 8.02) and a

new geophysics class have been put forward as possible equal selections from the physical sciences focus area. While many majors would still require 8.02, not all students would be required to take it.

Wednesday's discussion centered on issues such as whether giving freshmen more choices would destroy the shared experience that has revolved around a core set of classes; whether not requiring 8.02 of all students will weaken some students' knowledge of basic physics; whether too much choice will lead to some students neglecting courses until it's too late to comfortably fit them in if they decide to switch majors; and how already over-taxed MIT faculty will be able to provide the additional advising necessary to guide freshmen through the expanded new choices.

David Mindell of the Program in Science, Technology and Society, a member of the task force, said the goal was not to impose new requirements but to keep the number of GIRs the same or smaller "to allow students to do the things they want to do and to put flexibility and accountability in the hands of students."

Mindell said that 66 faculty, or roughly 6 percent, are involved in freshman advising. "The question on the table is how much to relegate freshman advising into a one-size-

See **MEETING**

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## Panel reports to provost on MLK Program

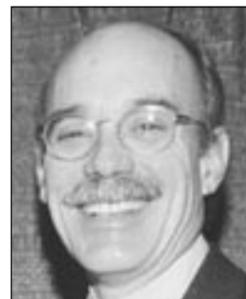
Provost L. Rafael Reif has announced that the panel he established last December to review the Martin Luther King Visiting Professor and Scholar Program has submitted its report. The charge to the committee, Reif noted in a

letter to the faculty, was "to extract lessons learned from the ten-year experience and discuss the program in the context of new Institute initiatives, to evaluate the program and suggest changes, if appropriate, and to consider ways in which this program may serve to increase the number of minority faculty at MIT."

In its report, the panel stressed the importance of integrating the program into an Institute-wide strategy for the recruitment and



L. Rafael Reif



Rafael Bras

promotion of underrepresented minorities in the faculty, as well as promoting a better understanding of its goals and providing appropriate infrastructure.

Reif noted that he would ask the new associate provost for faculty equity, once appointed, to develop an Institute-wide strategy for the recruitment, hiring and promotion of underrepresented minorities on the faculty and to integrate the MLK Visiting Professors and Scholars Program, modified along the lines recommended by the panel, into that strategy. He noted that he would also be asking the associate provost for faculty equity to increase the awareness of the goals, objectives and implementation of the program among faculty and academic administrators.

The members of the panel were: Professors Rafael L. Bras (chair), Stephen C. Graves, Sabine Iatridou, Cesar L. McDowell, F. Dale Morgan and Christine Ortiz. Reif expressed gratitude to the panel for "their contribution in guiding our efforts to improve this program." A public version of the panel's report, omitting appendices, is available to the MIT community at [web.mit.edu/provost/reports.html](http://web.mit.edu/provost/reports.html). An MIT certificate is required to access the document.



PHOTO / B.A. CULLUM

Lorlene Hoyt, assistant professor in urban studies and planning, with Philippe Morgan de Rivery G, in New Orleans' French Quarter.

## DUSP prof offers BID for French Quarter

Ruth Walker  
News Office Correspondent

Lorlene Hoyt has still not made up her mind about downtown management organizations.

An assistant professor in urban studies and planning, Hoyt spent much of her career studying these controversial entities. She knows them well enough to call them by nickname—"BIDs," for "business improvement districts." Still, she says, "It's tough for me to say fundamentally whether they're good or bad. That's what's so fascinating about the New Orleans project."

She's referring to this semester's class project: Her students are creating a plan for a BID for the French Quarter in New Orleans, to be presented Dec. 15.

The idea is that the French Quarter is the greatest economic asset of the storm-ravaged city and the best place for investment that will generate growth and renewal that will spill over to the surrounding area.

Of her students in Course 11.422 (Downtown Management Organizations), she says, "We're looking to extract lessons learned from around the globe and apply them in an effort to jump-start the French Quarter."

BIDs are separate units of governance layered over a municipal or other local government. A BID is set up with defined geographic limits and taxing authority within those limits. As the name suggests, business interests are often the driving force within a BID. Its goals are typically to provide enhanced public services such as security and sanitation to make an area safer for tourists, shoppers, employers and others.

BIDs have been instrumental to the revitalization of big cities, notably New York. But they have also drawn fire for privatizing security in public spaces and for helping city halls escape accountability for delivery of public services.

Hoyt acknowledges that in an ideal world, service delivery wouldn't even be an issue. But she says pragmatically, "This is where we are." At their best, she says, BIDs can help "raise the bar" for official accountability. Hoyt notes that in South Africa, BIDs enter into performance agreements with municipal governments to ensure adequate police patrols, for instance.

And service to private interests isn't necessarily at the expense of public inter-

See **DUSP**

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## MIT launches Campaign for Students

On Dec. 1, President Susan Hockfield announced to the MIT Corporation that the Institute is launching a major fundraising effort to support undergraduate and graduate education and student life. Beginning this fall, MIT plans to raise at least \$500 million over the next five years to support undergraduate scholarships, graduate fellowships, initiatives growing out of the report of the Task Force on the Undergraduate Educational Commons, and programmatic and capital investments in student life.

"The Campaign for Students will help ensure the continuing excellence of MIT's living and learning experience. It will provide crucial support for our long-standing policies of need-blind admission and need-based aid at the undergraduate level, and for graduate aid," Hockfield said. MIT students are absolutely the best in the world, and the campaign will help ensure the continuing excellence of the living and learning experience we offer them."

Chancellor Phillip L. Clay will take on a leadership role in the new campaign, working closely with Interim Vice President for Resource Development Stephen A. Dare and the Resource Development staff. Over the next 18 months, the Institute will work to identify volunteer leaders for the campaign and to engage lead donors. A formal launch is expected in October 2008. The Campaign for Students will conclude in 2011 to coincide with the celebrations of the 150th anniversary of MIT's founding.

Commenting on campaign priorities, Clay noted, "We are currently hoping to raise at least \$200 million for undergraduate scholarships, \$100 million for graduate fellowships, \$100 million for the undergraduate commons and \$100 million for student life and related capital projects."

The Campaign for Students, which will complement the efforts already underway in schools and departments campus-wide, is a central component of fundraising activities in support of institutional priorities that also include the MIT Energy Initiative, capital projects, and research and teaching in areas at the intersection of the life sciences and engineering, including cancer. It follows the success of the record-breaking \$2 billion Campaign for MIT, which concluded in December 2004 and raised more than \$450 million for scholarships, fellowships and student life.



Phillip L. Clay

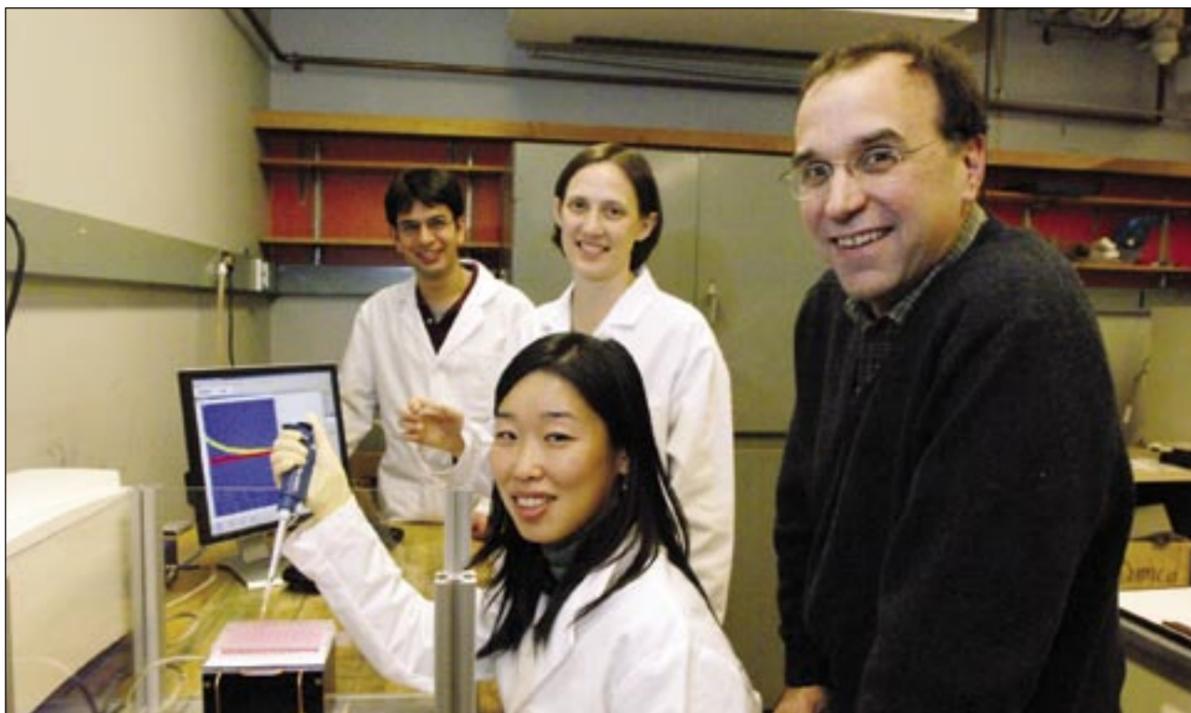


PHOTO / DONNA COVENEY

MIT researchers are working on an implantable chip that can track whether a person is responding to cancer chemotherapy treatment. Standing, from left to right, are graduate student Christophoros Vassiliou, graduate student Karen Daniel and Michael Cima, professor of materials science and engineering. Seated in front is graduate student Grace Kim.

## Broad wins \$200M for genomics research

The Broad Institute of MIT and Harvard has announced an award of nearly \$200 million from the National Human Genome Research Institute (NHGRI) to support applications and enhancements of large-scale DNA sequencing for biomedicine. Over the next four years, the grant will fund a wide range of biomedical projects, including efforts to understand the genetic basis of cancer and other complex human diseases, to dissect the regulation of the human genome based on comparisons with genomes of other mammals, and to decode and analyze the genomes of key microbes.

The NHGRI grant will also support work aimed at developing and implementing a new generation of DNA sequencing technologies with the potential to dramatically increase throughput and decrease cost.

"DNA sequencing is an increasingly powerful tool for biomedical discovery. It is now transforming biology and medicine by shedding light on such diverse problems as cancer, infectious disease, metabolic disease, gene regulation and evolution," said Eric Lander, principal investigator of the grant and the director of the Broad Institute.



One important area of work will be the identification of genes responsible for human diseases. Toward this end, the grant will fund genomic sequencing under The Cancer Genome Atlas (TCGA) Pilot Project, a joint project between NHGRI and the National Cancer Institute aimed at identifying the mutations that underlie different cancers. The grant will also support other genomic sequencing efforts to reveal the genetic variations that contribute to certain inherited diseases.

### Sequencing our animal friends

Another major area of research will be comparative studies that use evolutionary information to decipher the human genome. By sequencing the genomes of several mammals, such as the mouse, dog, horse, elephant, guinea pig and others, and then comparing them to the human genome, researchers can pinpoint the DNA sequences that have been most highly conserved across millions of years of evolution. These regions highlight crucial biological functions within the human genome.

A third key area will be genomic studies to probe the genetic machinery of important microscopic organisms, including fungi, bacteria and viruses.

Finally, the NHGRI will also support work aimed at dramatically increasing the speed and reducing the cost of large-scale DNA sequencing. The Broad Institute is developing new laboratory and computational methods for DNA sequencing and is collaborating with companies to develop next-generation DNA sequence detectors.

The grant was awarded through a competitive, peer-reviewed process. The other two institutions to receive grants under this program are the Washington University School of Medicine and the Baylor College of Medicine. The Broad Institute award reflects renewed funding of an earlier large-scale sequencing grant from the NHGRI in 2003.

## IMPLANT

Continued from Page 1

thing like this, instead of just taking the temperature, you can find out about the moisture, the saltiness, and whether there's enough rosemary."

In addition to monitoring the presence of chemotherapy drugs, the device could also be used to check whether a tumor is growing or shrinking, or whether it has spread to other locations, by sensing the amount and location of tumor markers.

The next step for the research group is to start more extensive preclinical testing. They will be looking for a hormone, human chorionic gonadotropin, that can be considered a marker for cancer because it is produced by tumors but not normally found in healthy individuals (unless they are pregnant).

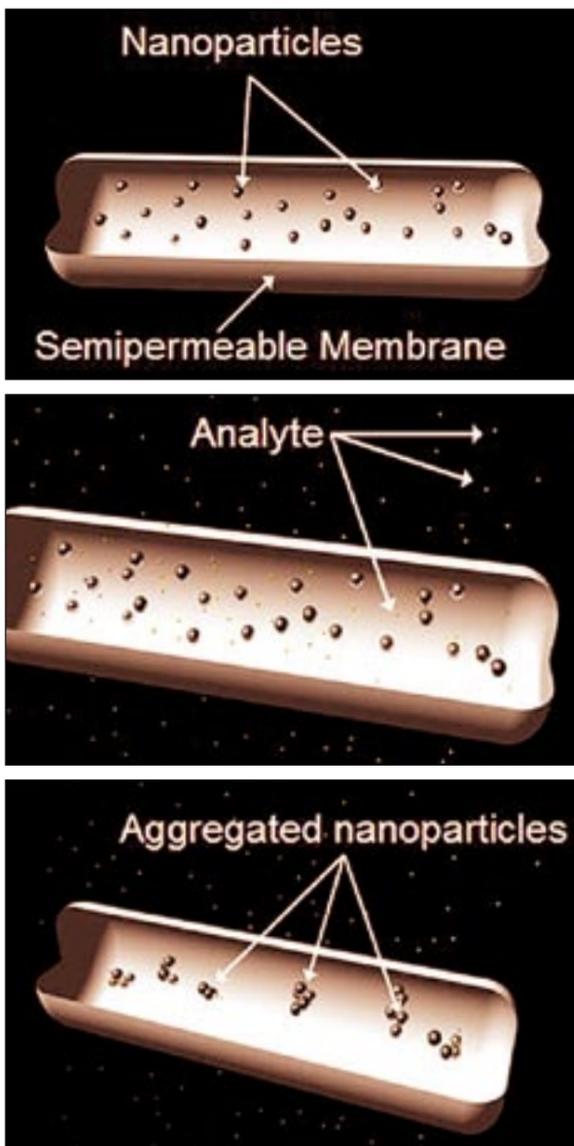
The researchers are now preparing a paper on the work and have presented their findings at recent meetings of the European Cancer Society and the American Institute of Chemical Engineers.

Other MIT researchers involved in the project are Karen Daniel, a graduate student in chemical engineering, Christophoros Vassiliou, a graduate student in electrical engineering and computer science, and Noel Elman, a postdoctoral associate in the Materials Processing Center. Lee Josephson, an associate professor at the Center for Molecular Imaging Research at Massachusetts General Hospital, is also contributing to the project.

The research is funded by a nanotechnology grant from the National Cancer Institute.

Nanoparticles tailored to detect a particular molecule, or analyte, are suspended within a device that allows them to be delivered into a patient's body (top panel). In the middle panel, analytes enter the device through a porous membrane. In the bottom panel, the nanoparticles attach to the analytes and clump together. Those clumps can be detected by magnetic resonance imaging.

IMAGES COURTESY / CIMA RESEARCH GROUP



## Center for Cancer Research receives grant to study tumor cell 'microenvironment'

Elizabeth Thomson  
News Office

Research into the "microenvironment" of tumor cells is the focus of a \$6 million grant from the National Cancer Institute to MIT's Center for Cancer Research.

"It has been clear for a long time that tumor cells do not proliferate and progress in isolation—rather, they are dependent on support from their surroundings, which include extracellular matrix and various supporting (or stromal) cells," said Richard Hynes, the principal investigator for the grant and the Daniel K. Ludwig Professor for Cancer Research in the Department of Biology.

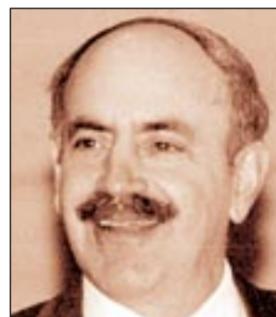
Similarly, tumor cells can also be con-



Richard Hynes



Tyler Jacks



Robert Weinberg

trolled by elements in their environment, including a variety of cell types of the immune system.

"Interest in these 'microenvironmental' influences on tumor growth and progression has been growing in recent years, and

technologies to study these interactions between tumor cells and their surroundings have advanced," said Hynes, who is also a Howard Hughes Medical Institute investigator.

Co-investigators on the grant are Tyler Jacks, a professor of biology and director of the CCR; Robert Weinberg, a professor of biology and member of the Whitehead Institute for Biomedical Research, and Dr. Ralph Weissleder of Massachusetts General Hospital.

Projects through the grant, which will be awarded over five years, will involve collaborations among these investigators and some additional external collaborators. There will also be interactions with other groups of investigators in NCI's Tumor Microenvironment Network.

## Psychologist ponders bonds with robo-pets

Stephanie Schorow  
News Office Correspondent

In the face of techno-doomsday punditry, Sherry Turkle has long been a proponent of the positive. In her books, "The Second Self: Computers and the Human Spirit" and "Life on the Screen: Identity in the Age of the Internet," Turkle has explored the relationship between human and machine and found much to ponder and even praise.

But now the director of the MIT Initiative on Technology and Self has a confession: "I have finally met technology that upsets and concerns me."

Turkle, the Abby Rockefeller Mauze Professor of the Social Studies of Science and Technology, outlined her concerns about the implications of increasingly personal interactions between robots and humans during a Nov. 20 lecture on "What Questions do 'Sociable Robots' Pose for STS?," part of the Program in Science, Technology and Society (STS) fall colloquium.

Turkle, a clinical psychologist, spoke earnestly and openly about her fears, acknowledging that some parts of her research "gave me the chills" on a very personal level and that she is "struggling to find an open voice."

A pioneer of the now accepted notion that "technologies are never just tools,"



Sherry Turkle

alive for a Furby. You know something this smart should have arms. It might want to pick up something or to hug me."

From Furbies to robotic dogs like Aibo to pocket "pets" like Tamagotchis to Paro, a robotic baby seal that responds to touch, children and even adults are forming bonds with machines, showing that the killer app may be "nurturing." That is, rather than the computer taking care of us, we take care of the computer, Turkle said.

Increasingly sophisticated robots—with big eyes that follow our faces or which respond to human voice and touch—trigger "Darwinian" responses in us; we are "wired" to react to objects that track our movement, Turkle said.

"This is not about building AI with a lot of smarts," she said. The impact is "not on what it has but how it makes people feel."

One of Turkle's concerns was triggered by the effect of a sophisticated interactive doll, Hasbro's "My Real Baby," and of the Paro seals on the elderly. She left a few "My Real Baby" dolls (which were not a big retail hit with children) in a local nursing home, and when she returned later, she found that the staff had bought 25 of them because of the soothing effect on the residents.

"The only one who's not happy here is the sociologist," said Turkle, raising her hand.

That soothing response was based on a sham, she believes. "What can something that does not have a life cycle know about your death, or about your pain?"

She cited the case of a 72-year-old woman who, because she is sad, says she sees that her robotic toy is also sad. "What are we to make of this relationship when it happened between a depressed woman and a robot?" Turkle asked.

The Q&A period triggered a lively debate over whether such bonding is necessarily bad.

Ultimately, human-like robots will be "test objects by which we are finding out new stuff about ourselves," Turkle said.

## Antimicrobial 'paint' kills flu, bacteria

Spiky polymers poke holes in the membranes that surround influenza viruses

Anne Trafton  
News Office

A new "antimicrobial paint" developed at MIT can kill influenza viruses that land on surfaces coated with it, potentially offering a new weapon in the battle against a disease that kills nearly 40,000 Americans per year.

If applied to doorknobs or other surfaces where germs tend to accumulate, the new substance could help fight the spread of the flu, says Jianzhu Chen, MIT professor of biology.

"Because of the limited efficacies with existing (flu) vaccines and antivirals, there's room for other complementary approaches," said Chen, one of the authors of a report on the new material that appeared Nov. 13 in the online edition of the Proceedings of the National Academy of Sciences.

In a typical year, 200,000 people in the United States are hospitalized from influenza virus infection, and 36,000 of them die, according to the Centers for Disease Control. If an avian flu pandemic broke out, as many experts fear, the death toll could be in the millions.

Most fatal flu cases occur in the elderly or in people with weakened immune systems. Available flu vaccines are only 30 to 40 percent effective among those groups, and only 70 to 80 percent effective among healthy adults.

Influenza is spread when viruses released by an infected person accumulate on surfaces, where other people pick them up. Stopping the viruses before they infect people could prevent some flu cases, says Chen.

The new substance can do just that, by killing influenza viruses before they infect new hosts. The "antimicrobial paint," which can be sprayed or brushed onto surfaces, consists of spiky polymers that poke holes in the membranes that surround influenza viruses.

Influenza viruses exposed to the polymer coating were essentially wiped out. The researchers observed a more than 10,000-fold drop in the number of viruses on surfaces coated with the substance, according to Alexander Klivanov, MIT professor of chemistry and bioengineering and the senior author of the paper.

### Combating E. coli, too

The polymers are also effective against many types of bacteria, including human pathogens *Escherichia coli* and *Staphylococcus aureus*, deadly strains of which are often resistant to antibiotics. For example, *S. aureus* causes serious problems in hospitals, where it can spread among patients and health care workers.

"In the U.S., more people die in hospitals of diseases they didn't have when they got to the hospital than from the disease that prompted them to go to the hospital in the first place," said Klivanov, who anticipates the new material would be useful in a hospital setting, as well as others where people congregate.

The new coating acts in a very different way from the many antibacterial products—such as soaps, sponges, cutting boards, pillows, mattresses and even toys—that are now on the market.

Those products—which kill bacteria but not viruses—depend on a timed release of antibiotics, heavy metal ions or other biocides, a system that has many drawbacks, says Klivanov. Once all of the biocide has been released, the antimicrobial activity disappears. Also, it can be harmful to release all of these biocides into the environment.

One of the benefits of the new polymer coating is that it is highly unlikely that bacteria will develop resistance to it, Klivanov said. Bacteria can become resistant to traditional antibiotics by adjusting the biochemical pathways targeted by antibiotics, but it would be difficult for bacteria to evolve a way to stop the polymer spikes from tearing holes in their membranes.

"It's hard to develop resistance to someone sticking a knife in your body," Klivanov said.

In a prior experiment designed to test for resistance, 99 percent of bacteria that were exposed to a polymer-coated surface died. The researchers then took the surviving one percent, let them multiply and again exposed them to the surface. They repeated the cycle 12 times, and each time, approximately 99 percent of the bacteria were killed, suggesting that the microbes were not becoming resistant.

The MIT researchers are working with industrial and military partners such as Boeing and the Natick Army Research Center to develop the coatings for practical use.

Once the polymer coating is applied to a surface, it should last about as long as a regular coat of paint, Klivanov said. Accumulation of dead bacteria and viruses diminishes the effectiveness of the nanometer-sized polymer spikes, so the surface would need to be washed with soapy water every once in a while to remove dead microbes, he said.

Other authors of the paper are Jayanta Haldar, a postdoctoral associate in chemistry, and former MIT affiliates Deqiang An and Luis Alvarez de Cienfuegos.

The research is funded by the U.S. Army, through MIT's Institute for Soldier Nanotechnologies, and also by the National Institutes of Health.



PHOTO / DONNA COVENEY

Dwight Williams, an award-winning nuclear engineer and a Martin Luther King Jr. Visiting Professor, in his lab.

### MLK prof explores radiation, nuclear monitoring

Sasha Brown  
News Office

Dwight Williams, an award-winning nuclear engineer and a Martin Luther King Jr. Visiting Professor, always had a passion for science. But it didn't completely click until he took physics during his senior year in high school.

"My love of science predates my abilities," Williams said with a laugh. "Had I not taken physics, I might have been an accountant. That was when the light bulb all of a sudden turned on."

A native of Washington, D.C., who has worked for the Department of Defense since 2000, Williams has come to MIT to share his work and research with MIT's Department of Nuclear Science and Engineering (NSE).

Williams spends half his time at MIT and the other half in Washington con-

tinuing his research, which is classified. Even though the commute is difficult, it is worth it to be part of MIT NSE, which Williams called "the best department in the country."

The timing of his visiting professorship is particularly appropriate, said Williams: His expertise is in environmental radioactivity and monitoring nuclear weapons, both topics that have made headlines in the past few months in relation to North Korea and Iran. "Of all the times in the world I could have been at MIT, this seems just perfect," Williams said.

Earlier this fall, he gave a talk on the issues and also developed a paper. "I was thrilled to draw some attention to the department," he said. "My expertise really does have a home here."

In the spring, Williams will co-teach

See **WILLIAMS**

Page 6

## AAAS honors four from MIT

The American Association for the Advancement of Science (AAAS) has named 449 new fellows, including four MIT faculty members.

Fellows are recognized for their efforts advancing science applications that are deemed scientifically or socially distinguished. New fellows will be presented with an official certificate and the society's gold and blue (representing science and engineering, respectively) rosette pin on Feb. 17, at the 2007 AAAS annual meeting in San Francisco.

The following people from MIT are new AAAS fellows:

Gregory C. Fu, a professor in the Department of Chemistry, was cited for "contributions to organic chemistry, particularly for studies of transition-metal catalysis and organocatalysis."

Steven R. Tannenbaum, a professor in

the Division of Biological Engineering, was named for "key discoveries concerning the formation and reactions of nitrogen oxides in biology and for molecular approaches to understanding carcinogenesis."

Mujid S. Kazimi, a professor in the Department of Nuclear Science and Engineering, was cited for his "outstanding contributions to the design and safety analysis of current and advanced nuclear power reactors and to nuclear engineering education."

Susumu Tonegawa, the Picower Professor of Biology and Neuroscience in the Departments of Brain and Cognitive Sciences and Biology, was honored for "outstanding contributions to our understanding of behavior at the molecular, cellular and systems level, with particular attention to learning and memory."



Susumu Tonegawa

## Engineer, ESG director distills debate on curricular change

Alexander Slocum performed his poem, "Free the Endorphins!" (right) at the Nov. 29 faculty meeting. In his introduction, the MacVicar Faculty Fellow noted, "This poem is the author's attempt to distill many opinions he has heard and things he has observed. It is a dynamic poem meant to get folks to think. If you feel strongly about something and you think the poem should evolve, please do not throw stones at me through the office window. Please open the window and invite me to tea to chat." Slocum has also noted, there is a hidden message in his text.

## WILLIAMS

Continued from Page 5

Principles of Nuclear Radiation Measurement and Protection. "The course is a lecture/lab that aims to familiarize students with varying types of radiation, radiation interactions with matter and radiation detection/protection," Williams said.

Williams saw the opportunity at MIT as the chance to broaden an already blooming career. At the Pentagon, Williams serves as principal nuclear physicist in the Defense Intelligence Agency's Science and Technology Brain Trust within the Directorate for Measurements and Signatures Intelligence and Technical Collection.

He earned the B.S. and M.S. degrees in nuclear engineering from North Carolina State University and his Ph.D. in nuclear engineering from the University of Maryland.

In February, Williams received one of nine awards from the Office of the Director of National Intelligence for his work starting a nuclear lab in New Mexico. This was the first year the awards were presented. The award came with a \$200,000 research grant, which Williams plans to use for unclassified research.

His research will focus on using acoustic waves to detect uranium and using DNA attached to the semiconductor chips that nuclear workers wear to detect radiation exposure. "The best thing about the research is that it is unclassified," said Williams, who is looking forward to university collaborations. Williams added that he is grateful to the many people who helped bring him to the Institute.

"This (the Martin Luther King Visiting Professorship) is a great program," Williams said.

## DUSP

Continued from Page 3

ests, she suggests. "If there's a private security patrol that makes me feel safer as a pedestrian tourist in Capetown, that's a good thing."

And although BIDs may function largely as cheerleaders and focus largely on perceptions, she adds, "they're removing real trash and real crime from the streets."

For the New Orleans project, Hoyt's students, along with those in Professor Karl Seidman's Course 11.437 (Financing Economic Development), have been working with Virginia Boulet, chair of the Retail Development Task Force appointed by New Orleans mayor Ray Nagin.

They have traveled to New Orleans to meet with all stakeholders in the French Quarter. "They've got a lot of divergent perspectives," Hoyt says with a chuckle that suggests diplomatic understatement.

The good news is that however divergent the views, everyone understands that New Orleans' infrastructure is in bad shape and that the city needs help with things like public safety and code enforcement. "And they know they aren't going to get it from general revenues," Hoyt says.

At the beginning of the course, Hoyt's students had to digest a lot of "heavy academic readings," she says. Now theory is being put into practice.

"Now they're grappling with a really tough situation. I love it that way. It makes the work I do a bridge between theory and practice," she says.

## Free the Endorphins!

Yeah I come to MIT with a yearning  
Given I have a passion for learning  
Granted I am the best of the best  
Forget about herding me with the rest

My parents pay a lot of money  
To send me to the land of geeks and honey  
So even though I might think I know what I want to do  
Excellent advising is what I most need to shepherd me through

Kindle a fire in my belly for all kinds of physics and not just a few magic tricks  
Succulent applications make me yearn to learn and not just for kicks  
Quell apathy with engineering, scientific and artistic advances and applications in math  
Tantalize me with problems from the subatomic to a forming universe's wrath

Perhaps of most fundamental importance is chemistry  
Love can inspire me to erase its mystery  
Verily show how biology is the key to all life  
Teach us with passion and we will learn it to help end the world's strife

Love can make the GIRs all run like a thoroughbred horse  
Fun problem-solving sessions should be led by all departments for each and every course  
Kindly cross pollinate GIR teachers from within each and every school  
Now I will be able to make a better decision about where to tool

And when I am in a class and getting bored  
It does no good to threaten me with a grading sword  
Instead empower and motivate me with a financial aid UROP  
Knowledge with a purpose can reap a whole new supergeek crop

Nothing may broaden the mind like the arts, social sciences and humanities  
Assuredly they can teach us to better understand our parts, compliances and vanities  
Yea they are not supposed to be like 18.02 or 8.01  
Kaleidoscopic creative class productions are the real keys to learning and fun

Kindly entice us to think in many a bold and creative new way  
Good thoughts can make the world better each day  
Each and every course must teach us to have compassion  
But not just what happens to be in fashion

Extra endorphins are the keys to enhance the rigor of many a HASS course  
Then to really make our minds pull like a draft horse  
Aid us in our analysis of real complex problems and solution construction  
Have us show it all with a giant FreshX created theatrical production

Unflinchingly a FreshX course can sing the praise of renewable energy at \$2/watt  
Making electric power for the U.S. may seem like a lot  
Actually it can cost less than a big misguided war  
Now is the time to sing, "Imported oil no more!"

Eudemonism teaches us to create happiness and not hate  
Now then empower us to truly and deeply think and create  
Deliciously enlighten and challenge us to think of how to better live  
Onward for humanity we will most certainly give

Really we truly thank the committee for their seemingly thankless job  
Page after page the report made our hearts pound and throb  
Happily we the enlightened see it not as just a simple list  
It is actively a very powerful catalyst

Now it does not mean that the faculty will have to spar  
For it can even leave the GIR requirements as they are  
Rightly the committee's fine work has opened our eyes  
Especially true, it really should be no surprise

Do let us strongly consider Winston's call for a really BOLD policy change  
Optimally let's work together to examine Ely's creative solutions' range  
Mesters of 7 weeks length could allow for many more GIR courses to be taken  
Rendering students' curiosity and confidence stirred and not shaken

Indeed we can also start better teaching now  
Graciously free the faculty to figure out how  
Heartily provide each one with more time and \$25K/year of money  
Trust them and they will make GIRs as sweet as honey

Now is the time for the GIRs to begin their evolution  
Original creative thinking can prevent bitter interdepartmental revolution  
Wisdom will guide us to rationally implement GIR morphins  
It's time to free the endorphins

-- Alexander Slocum (S.B. 1982), professor, mechanical engineering

## MEETING

Continued from Page 3

fits-all set of rules and how much to take it on ourselves to advise the students to pursue individual educational paths," he said.

Robert J. Silbey, dean of science and chair of the curriculum task force, said one example that points to the need for the curriculum to be updated is that students can graduate from MIT in 2007 without having been exposed to a number of important fundamental topics, for example, quantum mechanics. "I think that's a shame," he said.

Several faculty members expressed concern that MIT's strong foundation in science and engineering would lose its punch. Thomas J. Greytak, professor of physics, said that maintaining MIT's high level of rigor would require continued vigilance.

Patrick A. Winston, Ford Professor of Engineering in the Department of Electrical Engineering and Computer

Science, said that as a member of the Class of 1965, he and his classmates recalled a specific tricky exam question 44 years after the fact. "We're losing a common experience and we should separate ourselves from that shared common experience with great reluctance. Soon there will be nothing people have in common," he said.

Winston and others said the proposed changes didn't feel "bold enough." Adding a year or more to the typical four-year undergraduate experience, moving to a system of more than two semesters, and teaching physics, chemistry and humanities as an integrated subject would have been bolder moves, some said.

Peter H. Fisher, professor of physics, said he has talked informally with students about the proposed changes, and that he has "a lot of confidence that no matter how much we screw this up, they will do just fine. A lot of this, when you get right down to it, is tinkering in the margins. These students are really bright and they will figure it out."

## CLASSIFIED ADS

TechTalk runs classified ads in the first issue of each month. Members of the MIT community may submit one classified ad each issue. Ads should be 30 words maximum; they will be edited. Submit by e-mail to [ttads@mit.edu](mailto:ttads@mit.edu) or mail to Classifieds, Rm 11-400. Deadline is noon Wednesday the week before publication.

### FOR SALE

Nintendo GameCube, 3 yrs old, good condition, with games including Batman Returns, 007 Nightfire, 1080 Avalanche. \$50. E-mail [shwright@mit.edu](mailto:shwright@mit.edu).

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### VEHICLES

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2003 Saturn Ion-3, 41K, 4 door, white, all-wheel ABS brakes, FWD, dual airbags, 5-speed manual transmission, power everything, 6-CD changer, premium sound, cruise control, \$9,285/B.O. Contact 617-694-1929 or [saturn2003@mit.edu](mailto:saturn2003@mit.edu).

1998 Saturn SL2, \$3900/B.O. < 75,000 miles, very reliable, automatic, power locks, power windows, cruise control, dual front airbags, new CD player. Massachusetts registration. E-mail [jonlock@mit.edu](mailto:jonlock@mit.edu).

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### HOUSING

1 bedroom for rent immediately, near Inman Square. Backyard, brand-new windows, hrdwd floors, eat-in kitchen, free laundry in basement. \$600/month, plus utilities. Call Amy at 617-699-8432.

No. Andover, young top floor, spacious & immaculate 2 BR. 2 full baths, private setting, LR w/ dbl doors to large balcony, form. dining rm c/a, all appliances, hrdwd floors, 30' storage rm. \$318,900. Call Elaine at 978-502-2552.

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### MISCELLANEOUS

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Project Rescue of Amazon Youth is building a medical lab for communities in the Brazilian Amazon. If your workplace could donate any used or new lab supplies/equipment, please contact [jina.may@gmail.com](mailto:jina.may@gmail.com).

# Hard drives will evolve into soft hearts ... or not

## CSAIL debate on machine consciousness ends in a draw

**Stephanie Schorow**  
News Office Correspondent

The topic of the Nov. 30 debate—the limits of intelligent machines—might have been ripped from classic science fiction. The format echoed a presidential campaign slugfest. Nobody won a round, but the audience scored insight from two of the brightest minds in the field of artificial intelligence, Ray Kurzweil and David Gelernter.

Held to mark the 70th anniversary of Alan Turing's 1936 groundbreaking paper, "On Computable Numbers," the debate at MIT's Stata Center explored the possibility of human-like intelligence, emotional intuition and even consciousness in computers. Or: "Can we build super-intelligent machines or are we limited to building super-intelligent zombies," as moderator Rodney Brooks, director of the Computer Science and Artificial Intelligence Laboratory, put it.

Taking the position that machines will achieve a level of human intelligence was Kurzweil, a prodigious inventor, winner of the 1999 National Medal of Technology and author of "The Age of Intelligent Machines" and "The Age of Spiritual Machines."

Taking an opposing "anticognitivist" viewpoint was Gelernter, Yale professor of computer science, chief scientist at Mirror Worlds Technologies and contributing edi-

tor at the Weekly Standard.

A key point of contention was defining consciousness, or even whether it could be defined. "There's no consciousness detector that we can imagine creating ... that doesn't have some philosophical assumptions built into it," Kurzweil said. But Gelernter insisted that "you can't possibly understand the human mind if you don't understand consciousness."



**Ray Kurzweil**



**Rod Brooks**



**David Gelernter**

While Gelernter agreed with Kurzweil that emotional intelligence was a key component of human intelligence, he argued that building a conscious machine "out of software seems to be virtually impossible."

Software, by definition, can be peeled away and run on another computer platform, but "the mind cannot be ported to any other platform or even to an instance

of the same platform," Gelernter said. Innovation may create "powerful unconscious intelligence but I can't see it creating a new node of consciousness. I can't even see where that node would be—floating in the air in someplace?"

Human mental states are privately circumscribed, hidden from analysis, unlike software codes, he said. As for spirituality—which Gelernter defines as a "thirst

for the living God"—"Can we build a robot with a physical need for a nonphysical thing? Maybe, but don't count on it. And forget software."

"That's because we're thinking of software as it is today," Kurzweil countered. Not only is informational technology expanding exponentially, but research on the brain is yielding new information on

brain chemistry and neural functions, he said.

Indeed, a brain that shuffles chemicals is not that different than a computer that shuffles symbols, Kurzweil said.

Consciousness is an "emergent property of a complex system. It's not dependent on substrates," he said. However, "there's no way ... to measure the subjective experience of another entity. We assume that each other are conscious."

Certainly consciousness is an emergent property, Gelernter said; but one could run hugely complex programs, with billions of processes, and "I don't have any reason to believe that consciousness would emerge."

If true intelligence involves emotion, keep in mind that "you don't just think with your brain, you think with your body," Gelernter said. "We don't have the right to dismiss out of hand the role the chemical makeup of the brain plays in creating the emergent property of consciousness."

An audience member wondered if "everything" had consciousness and whether humans could learn to communicate with machines. Kurzweil responded that history was filled with examples of humans who didn't accept the consciousness of other human races and cited current debates over animal consciousness and hence animal rights.

After the debate, Brooks said neither party had won, adding with diplomatic aplomb, "I disagreed with both of them."

## Talk summarizes research on women in science

**Sasha Brown**  
News Office

Great strides have been made for women in science and engineering, but much more must be done in terms of overall perception of women's value, said Professor Mary Wyer of North Carolina State University during a Nov. 30 talk at MIT.

Wyer, a National Science Foundation (NSF) Advance Leadership Award winner, professor of psychology and women's and gender studies at North Carolina State University, spoke about her research on attracting women to study science. The talk was hosted by Ruth Perry, professor of literature and founder of the MIT Women's Studies Program.

One difficulty with drawing women into science is that histories of science and engineering rarely mention women's contributions, Wyer said in her hour-long lecture, held in Room 4-149. "If women are not visible in the curriculum, then there is a silent reiteration of the generic 'he,'" Wyer told the group of roughly 30 people. "We don't see images of women scientists enough."

Wyer spoke of advances women have made over the years, noting the Equal

Opportunity in Science and Technology Act from 1980 as well as the increase in women in the sciences. Yet, she said, data that seemed to show a nearly even split between women and men who earn bachelor's degrees in the sciences have been "skewed" by psychology, a scientific field women enter more than, say, math, computer science, engineering or physics, where their numbers have "declined or remained flat," said Wyer. "The education equation is still scientist equals man," Wyer said.

In her studies of course work in the sciences, the image of the male scientist in his white lab coat prevails, Wyer said. To see how this might be changed, Wyer and several colleagues at N.C. State conducted an experiment, funded by the NSF, that integrated material from women's studies courses into a required N.C. State ecology class over three different semesters with three groups of students.

At the beginning of the semester, each class was given a survey designed to assess their knowledge of women scientists and their personal beliefs regarding women and science. Over the three semesters, one class received significant supplemental material on women's scientific contributions and on biases against women in science. The material was reinforced with lectures, quizzes and class activities.

A second course had similar material, but on a smaller scale. The third course acted as the control and had only surveys at the beginning and the end of the course.

As predicted in the hypothesis, by the end of the three semesters, students in the control course showed minimal attitude change towards women, while the other two courses showed changes commensurate with the amount of intervention they had.

The researchers concluded that limited curriculum from women's studies courses does not make a huge difference in attitudes. They also found that men and women have very different attitudes, with men less likely to feel comfortable with women in science.

To Wyer, these results showed a general ignorance of gender inequality and the "practices that perpetuate them."

"If we are to increase the visibility of women in science, we are going to have to educate the educators as much as the students," Wyer said.

## Humans grieve for the 'given' world

**Robin Ray**  
News Office Correspondent

How are human beings reacting to displacement of their natural, or "given," world by a built world? This question lay at the heart of a talk given by Professor Rosalind Williams on Nov. 27, the last in a series of fall colloquia titled, "The Big Questions," presented by the Program in Science, Technology and Society (STS).

Williams, the Bern Dibner Professor of the History of Science and Technology and president of the Society for the History of Technology, observed that humans are struggling even to find a language with which to discuss the sweeping changes that are occurring in the physical world.

"To call it 'the conquest of nature' is triumphalist and inaccurate," she noted, because the phrase puts humankind outside the realm of nature and sets both humankind and nature outside of history. Other formulations, such as the distinction drawn between "first nature" and "second nature," are more helpful, but she finds this language too coarse-grained to tease out the complex stages and manifestations of the human-built environment.

In her research as a historian, Williams has studied the effects of the transformation of the "given" planet into a human-built world. She studied the imagined worlds of 19th-century fiction, especially the many underground (and hence completely human-built) worlds, in her 1990 book, "Notes on the Underground: An Essay on Technology, Society and the Imagination."

This focus on how technology affects humans persists in her latest book, she said. "In 'Retooling: A Historian Confronts Technological Change,' I dealt with the question of whether the digital world is a new environment for human life, and if so, what are the implications for engineering education and practice, especially at MIT," she said.

In 1999, even as the built world was being dismissed as passé relative to the virtual world, MIT was embarking on an ambitious building program. "The iconic image of MIT continues to be the Infinite Corridor," Williams observed wryly.

The galloping growth of the human-built world, she believes, generates feelings of loss and mourning that the word "nostalgia" is inadequate to describe.

To try to get a handle on this emotional process, Williams has turned to the study



**Rosalind Williams**

of literature. Nineteenth-century European writers on both sides of the English Channel were articulate witnesses to three great waves of change: the overthrow of "Neolithic" agriculture; the Second Industrial Revolution; and the end of the Age of Exploration, which was openly discussed as "the end of the world." Out of this revolution in our understanding of the planet, its possibilities and limitations, came a literary figure of key interest to Williams, the prolific French novelist Jules Verne.

Verne is best known for three of his more than 60 works of fiction—"Journey to the Center of the Earth" (1864), "Around the World in Eighty Days" (1873) and "Twenty Thousand Leagues Under the Sea" (1870). One critic has called Verne's works "romances or comedies of globalization."

In her STS talk, Williams focused on "Twenty Thousand Leagues," in which she found a saga of grappling with the end of conventional journeys of exploration and the beginning of a new relationship among humans, science and space. She described Captain Nemo, the misanthropic commander of the fictional undersea vessel Nautilus, as the prototype of a new "info-hero," one who uses science and technology to escape the crowded terrestrial regions and to chart a course into the few unexplored parts of the world. (Verne's Nemo inspired the 2003 animated film, "Finding Nemo.") As Williams put it, "Verne is a revealer of the origins of world alienation," the disaffection of humankind with the built world of its own making.



PHOTO / DONNA COVENEY

Mary Wyer spoke at the Women's Studies Program on Thursday, Nov. 30.



PHOTO COURTESY / BEN WOOD

MIT's first graduate residence was named for Avery Ashdown, housemaster from 1933 to 1962.

## 'Ashdown House' documentary wins student film fest prize

Two graduate students in the School of Architecture and Planning have won a prize for best history documentary at the 2006 CampusMovieFest, the world's largest student film festival, for a video documenting the history of MIT's Ashdown House.

Ben Wood, a candidate for the master of science in visual studies in the Department of Architecture, and Luciana Pereira, a visiting student from Brazil in the Department of Urban Studies and Planning, worked on the project nights and weekends over a period of five months, purely as a labor of love, they said.

"Ashdown House: The Home Where Science and Technology Live" traces the life of the dorm from November 1937, when MIT acquired the Riverbank Court Hotel as a residence for graduate students. For nearly seven decades, students from all around the world have lived there, with many going on to play important roles in shaping the history of the 20th century.

The movie features interviews with a number of those distinguished alums, including Jay Forrester, inventor of RAM, who recalls the invention of the first digital computer; 1990 Nobel laureate in chemistry Elias Corey Jr., who recalls Winston Churchill's address to the student body in 1948; and, in what must be one of the great interview coups of all time, Apollo 9 astronaut Rusty Schweickart, the first lunar module pilot, who reminisces from somewhere in outer space about cleaning toilets to help pay his tuition.

Corey went so far as to say, "I would have given my eyeteeth to remain at the Institute for the rest of my life; to me that was as close to heaven as a human being can get." Corey is now the Sheldon Emery

Professor of Chemistry at Harvard.

The project also includes interviews with a number of resident housemasters and memories of many more, including Vernon and Beth Ingram, possibly the only university housemasters ever to have an asteroid named for them (Asteroid 6285 Ingram).

For executive producer Pereira, the project was an exploration of an entirely new field of endeavor. Pereira recently finished her third semester at MIT as a visiting student from the University of Sao Paulo, working with Professor Alice Amsden on her Ph.D. dissertation about industrialization in developing countries. Inspired by the interdisciplinary spirit at MIT, she took on the role of producer even though she had never before been involved in production of any kind.

For Wood, the work was closer to home. As a student in the visual arts program, Wood works with Professor Krzysztof Wodiczko in video and new media, often focusing on hidden histories of the built environment.

Except for the on-camera interviews, the video is made up almost entirely of archival footage and photos from MIT, NASA and archive.org. It is fluidly edited and features music by Irving Berlin, Rosemary Clooney and Bing Crosby. The film premiered at the MIT Museum in November with support from the dean for student life, the dean for graduate students and Ashdown housemasters Ann and Terry Orlando.

"Ashdown House: The Home Where Science and Technology Live" can soon be viewed online at [mitworld.mit.edu](http://mitworld.mit.edu). For more information, contact Wood at [benwood@mit.edu](mailto:benwood@mit.edu).

## Famous optics people



*This crossword puzzle, featuring renowned optics researchers, was created by Gabriel Popescu and Kate Bechtel, both postdoctoral scientists at MIT's George R. Harrison Spectroscopy Laboratory. It is reprinted from the Fall 2006 issue of The Spectrograph, the lab's newsletter. Answers will appear in the Dec. 13 issue of Tech Talk.*

### ACROSS

- 1 Formulated the uncertainty principle
- 6 Discovered the effect of inelastic photon-phonon interaction
- 7 Derived the formula for far-field diffraction
- 8 Invented holography
- 12 Introduced a mathematical transformation used in Kramers-Kronig relationships
- 14 Polarization vector
- 15 His equations are on the first page of optics textbooks
- 17 Invented the HeNe laser
- 19 His transform applies in optics, too
- 20 Defined the principle of minimum action in geometrical optics
- 22 Approximated the spherical wave front with a parabola
- 23 Discovered scattering from tiny particles
- 24 Worked with Perot

### DOWN

- 2 Received the 2005 Nobel Prize in physics for "his contribution to the quantum theory of optical coherence"
- 3 Performed with Morley the famous "failed experiment" on ether
- 4 Invented phase contrast microscopy
- 5 The wave equation in the frequency domain bears his name
- 9 The polarization sphere is named after him
- 10 Gave the law of black body radiation
- 11 Although he got the refraction wrong, has an equation named after him in geometrical optics
- 13 Explained the photoelectric effect
- 16 Discovered the effect of polarization rotation due to magnetic fields
- 18 Introduced a complex matrix formalism for describing polarization
- 21 Wrote first theory of microscope imaging