



Volume 50 – Number 16
Wednesday – February 8, 2006

TechTalk

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

Researchers fired up over new battery

Deborah Halber
News Office Correspondent

Just about everything that runs on batteries — flashlights, cell phones, electric cars, missile-guidance systems — would be improved with a better energy supply. But traditional batteries haven't progressed far beyond the basic design developed by Alessandro Volta in the 19th century.

Until now, work at MIT's Laboratory for Electromagnetic and Electronic Systems (LEES) holds out the promise of the first technologically significant and economically viable alternative to conventional batteries in more than 200 years.

Joel E. Schindall, the Bernard Gordon Professor of Electrical Engineering and Computer Science (EECS)

and associate director of the Laboratory for Electromagnetic and Electronic Systems; John G. Kassakian, EECS professor and director of LEES; and Ph.D. candidate Riccardo Signorelli are using nanotube structures to improve on an energy storage device called an ultracapacitor.

Capacitors store energy as an electrical field, making them more efficient than standard batteries, which get their energy from chemical reactions. Ultracapacitors are capacitor-based storage cells that provide quick, massive bursts of instant energy. They are sometimes used in fuel-cell vehicles to provide an extra burst for accelerating into traffic and climbing hills.

However, ultracapacitors need to be much larger

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New sensor makes splash counting fish

Anne Trafton
News Office

Researchers at MIT have found a new way of looking beneath the ocean surface that could help definitively determine whether fish populations are shrinking.

A remote sensor system developed by Associate Professor Nicholas Makris of mechanical engineering, along with others at MIT, Northeastern University and the Naval Research Laboratory, allows scientists to track enormous fish populations, or shoals, as well as small schools, over a 10,000-square-kilometer area — a vast improvement over conventional technology that can survey only about 100 square meters at a time.

"We're able to see for the first time what a large group of fish looks like," said Makris, who compared the dramatic improvement to the difference between seeing everything on a television screen and seeing only one pixel.

The new sensor system, described in the Feb. 3 issue of *Science*, could allow government agencies to figure out what's really happening to fish populations, which many environmentalists and scientists believe are in rapid decline.

"The world's fish stocks are being depleted at a horrible rate," said Makris, who attributed declining populations to overfishing, a problem that has been abetted by inaccurate fish counts. "One of the reasons (for the inaccurate counts) is the darkness in the ocean. You don't know what's going on."

Current surveying methods depend on highly localized observations taken from slow-moving research vessels, which provide only a small amount of data about a large shoal, Makris said. "It would be like watching 'Casablanca' and you're seeing one pixel moving across the screen, and that's all you get. You can't figure out what's going on, it's way too slow," he said.

Both the new and old methods rely on sonar, which locates objects by bouncing sound waves off of them. With the old technique, survey vessels send high-frequency sonar beams into the ocean, where they dissipate much like the light from a flashlight shining into a darkened room.

In contrast, the new system uses low-frequency sonar that can travel much greater distances and still return use-

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PHOTO / MATT GRUND

Treasures of the deep

MIT researchers were among a team of scientists who used an autonomous underwater vehicle (AUV) to take images of an ancient shipwreck off the coast of Chios, Greece, last July. Pictured recovering the AUV are, from left, Kostas Katsaros and Aggelos Malios from the Hellenic Centre for Marine Research and Chris Roman from the Woods Hole Oceanographic Institute. Story, additional photos on Page 4.

New images capture virus in extraordinary detail

Anne Trafton
News Office

Fifty years after MIT researchers pioneered the use of electron microscopy to study viruses, MIT scientists have helped produce the most detailed images yet of the tiny infectious agents.

The images, which show for the first time a virus poised to inject its genetic material into a host cell, grace the cover of the Feb. 2 issue of *Nature*.

Scientists have known for decades that viruses infect cells by injecting their genetic material, either DNA or RNA, into host cells, but even with electron microscopy, "we could

never see the details of that aspect of it," said Jonathan King, an MIT professor of biology and one of the authors of the paper.

The researchers, led by Wen Jiang and Wah Chiu of the National Center for Macromolecular Imaging at Baylor College of Medicine, focused on viruses that infect bacteria, known as bacteriophages. Their paper diagrams the structure of a virus that infects *Salmonella* bacteria.

The photographs clearly show a long coil of DNA dangling inside the viral shell, waiting to be ejected via a protein channel just inside the shell exterior.

"Now you can see the end of the DNA. You can see the cylinder holding it, poised to go into the cell," said King.

To create the detailed images, the researchers photographed about 15,000 virus particles and ran them through a complex computer program that compared the photographs and constructed a 3-D model based on common features shared by the images.

The researchers also improved image quality by rapidly freezing the viruses before photographing them. The amorphous ice that forms as a result of the rapid freezing protects and preserves the virus structure, unlike regular crystallized ice, King said.

This project builds on a long legacy of

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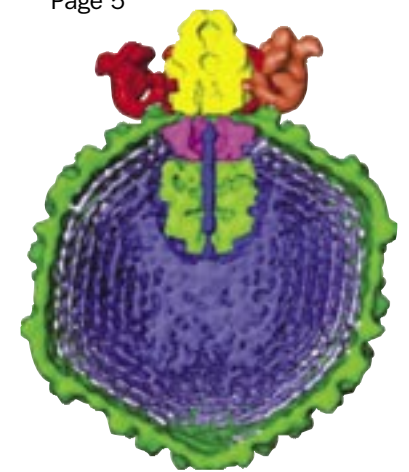


IMAGE COURTESY / WAH CHIU

Structure of a virus that infects *Salmonella*. One end of the DNA genome (blue) is poised for injection into a host cell.

PEOPLE

NEW VICE PRESIDENT

Kirk D. Kolenbrander, senior advisor to the president, has been named vice president for Institute affairs.

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Students research biodiesel and wind projects during an IAP seminar on climate change policy in Cambridge.

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Kirk Kolenbrander named VP for Institute affairs

President Susan Hockfield yesterday announced that Kirk D. Kolenbrander, senior advisor to the president, has been named vice president for Institute affairs. He has also been nominated to become the new secretary of the Corporation, replacing Kathryn A. Willmore, who will step down from that post and from the vice presidency at the end of the academic year.

The Executive Committee of the Corporation last week unanimously approved Kolenbrander's appointment and voted to recommend his election as secretary to the full Corporation. His nomination will be brought to the trustees' quarterly meeting in March.

He is slated to assume both positions on July 1.

"Kirk has demonstrated a deep commitment to MIT during his 16 years here," Hockfield said in her announcement, which was sent to the community by e-mail. "He draws on wide-ranging experience as both an administrator and a member of the faculty, and his service

to our community has been recognized by Institute-wide awards for distinction in undergraduate teaching and for contributions to student life."

Kolenbrander has served as senior advisor to the president, acting as chief of staff and policy advisor, since December 2004.

As vice president for Institute affairs, Kolenbrander will have overall responsibility for MIT's internal communications activities and for coordination of policy issues within the senior administration.

Conference Services, Special Events, the Information Center, the Publishing Services Bureau and the Reference Publications Office will report to him.

As secretary of the Corporation, he would be ex officio a member of the board of trustees. He would oversee



Kirk Kolenbrander

the administration of the full range of its operations including membership, quarterly meetings, standing committees and the activities of 30 visiting committees. He is also expected to serve as secretary of the Executive Committee, and in that role manage the flow of issues and decisions between the administration and trustees.

"Over the course of my time here, I have truly fallen in love with MIT," Kolenbrander said. "It is a great privilege to have this new opportunity to serve the Institute, and to work with President Hockfield and the chairman of the Corporation, Dr. Dana G. Mead. The shared focus of these new responsibilities is the wonderful people of the MIT community — trustees, faculty, students and staff alike. I have been fortunate to learn much from Kathryn Willmore since I joined the administra-

tion, and it is an honor to succeed her in these roles."

Hockfield has also announced that a search will soon begin to fill a new position in the administration: vice president for external relations. "This individual will take a leading role in coordinating MIT's communications with external constituencies and audiences including government and the media," she said.

Kolenbrander, who came to MIT as a faculty member in the Department of Materials Science and Engineering in 1990, moved into the chancellor's office in 1998, serving as associate dean and then interim dean for student life. He became special assistant to the president and the chancellor in 2001, before taking on his present position.

Kolenbrander holds a B.A. in chemistry from Central College in Pella, Iowa, and received the Ph.D. in chemistry from the University of Illinois at Urbana-Champaign in 1988.

Kolenbrander and his wife, Terri, and their two daughters live in Belmont.

Ambassador from Saudi Arabia set to give talk

Prince Turki Al-Faisal, Saudi Arabia's ambassador to the United States, will present a talk, "Saudi Arabia and the Global Community," at 4 p.m. on Thursday, Feb. 16, in Bartos Theater.

The event is a special Starr Forum, hosted by the Center for International Studies and moderated by Institute Professor John Deutch.

Prince Turki, 61, has held several national and international leadership and diplomatic roles.

A member of the Saudi royal family, he was appointed an advisor to the Royal Court in 1973. He advanced to serve as director general of the kingdom's main foreign intelligence service, the General Intelligence Directorate, from 1977 to 2001.

Prince Turki received wide media attention in 1998 when he sought unsuccessfully to have Osama bin Laden, whom he had met in the 1980s, extradited from Afghanistan to Saudi Arabia.

In 2002, he was appointed ambassador to the United Kingdom, and in 2005, he was appointed ambassador to the United States.

Prince Turki speaks frequently on relations between Saudi Arabia and other nations, on terrorism and on developments within Saudi Arabia.

In a major 2005 speech, he described oil as a "strategic global commodity, vital to world economic stability. The kingdom's commitment to maintaining balance in this market is an intrinsic part of its commitment to fairly playing its part in world affairs."

— Sarah H. Wright



Prince Turki



PHOTO / L. BARRY HETHERINGTON

On plane to Spain

The first five students to participate in the new MIT-Madrid Undergraduate Program sponsored by the Study Abroad Office left for Spain on Sunday, Feb. 5, to begin their semester overseas. They are, from left, sophomore Nicole Koullisis, junior Maria Elisa Rossi, junior Heather Coffin, sophomore Manisha Manmohan and junior Devan Kestel.

Carter to lead Engineering Outreach

Anne Trafton
News Office

Dedric A. Carter has been named the new executive director of the School of Engineering's Engineering Outreach Program, effective April 1, 2006.

Carter will replace Karl Reid, who became director of the Office of Minority Education and assistant to the chancellor and associate dean for undergraduate education last fall.

Carter was a member of the MIT Corporation from 2000 to 2005 and currently serves on the visiting committees for the Engineering Systems Division and for music and theater arts. He is also a member of the board of directors of the MIT Club of Washington, D.C.

Carter, who holds an S.B. and M.Eng. (1999) in electrical engineering and computer science from MIT, has 10 years of

experience in business and information technology, said Dean of the School of Engineering Thomas Magnanti, who announced the appointment in late January.

Carter participated in the 1993 MITES summer program, which is part of the Engineering Outreach Program. The outreach program also includes the Saturday Engineering Enrichment and Discovery (SEED) Academy and Science Technology Engineering Math (STEM), a program for Boston middle school students.

"Dedric's experience in developing educational training programs, his deep understanding of the issues, and his passion for improving K-12 education in the U.S. will be critical as we grow and improve our outreach activities," Magnanti said.

Magnanti also thanked Reid for his work in the outreach program. "We are grateful that Karl plans to maintain a strong connection to the school and our students, advising, motivating and inspiring us all," he said.

SHASS names 31 students as Burchard scholars

Thirty-one sophomores and juniors have been selected as Burchard Scholars in the School of Humanities, Arts and Social Sciences (SHASS) for 2006.

The awards, named after the school's first dean, John Ely Burchard, are given to students who demonstrate unusual abilities and academic excellence in the areas embraced by the school. According to Kenan Sahin Dean Philip S. Khoury, co-founder of the Burchard Program and chair of the selection committee, the students selected in the 20th year of competition for the awards "are from exciting and diverse backgrounds and are a remarkable group of gifted young scholars."

The Burchard Scholars and a rotating group of faculty will be invited to a series of dinners, beginning this month, at which an MIT faculty member or visiting scholar will present work in progress, followed by a discussion.

This will allow students and faculty members to mix and will give students an opportunity to engage in the kind of intellectual exchange that characterizes scholarship in the humanities, arts, and social sciences.

In addition to Khoury, the selection committee consisted of Professors Margery Resnick of foreign languages and literatures and the new director of the Burchard Scholars Program; Deborah Fitzgerald of science, technology and society and associate dean of SHASS; John Hildebidle of literature; Thomas Levenson of writing and humanistic studies; Lowell Lindgren of music and theater arts; Roger Petersen of political science; and Janet Sonenberg of music and theater arts.

The Burchard Scholars are:
Juniors: Dhruvatej Boddupalli, Kimberly K. Boddy, Tabitha F. Bonilla, Waseem S. Daher, Jacqueline J. Greene, Daphne Hao, Lori B. Huberman, Minyoung Jang, Silpa Kaza, Sophie F. Rapoport, Lyel L. Resner, Earl Taylor Roan, Shyamli Sinha, Gerardo Trejo, Xiaolu (Erin) Wei, Stella D. Young.

Sophomores: Jean Chang, Gayle J. Denman, Irene Fan, Michael S. Fleder, Molly M. Jabas, Itamar Kimchi, Erqi Liu, Sean C. Morton, Caroline E. Rubin, Ellen E. Sojka, Marie Y. Thibault, Samantha F. Weiss, Ali S. Wyne, George S. Zaidan, Elizabeth R. Zhang.

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Printed on recycled paper

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Tech Talk is published by the News Office on Wednesdays during term time except for most Monday holiday weeks. See Production Schedule at <http://web.mit.edu/newsoffice/techtalk-info.html>. The News Office is in Room 11-400, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA, 02139-4307.

Postmaster: Send address changes to Mail Services, Building WW15, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139-4307.

Subscribers may call 617-252-1550 or send e-mail to mailsvc@mit.edu.

TechTalk is distributed free to faculty and staff offices and residence halls. It is also available free in the News Office and the Information Center.

Domestic mail subscriptions are \$25 per year, non-refundable. Checks should be made payable to MIT and mailed to Business Manager, Room 11-400, MIT, 77 Massachusetts Avenue, Cambridge, MA 02139-4307.

Periodical postage paid at Boston, MA. Permission is granted to excerpt or reprint any material originated in Tech Talk.

Professor sizes up competition in new book

Sarah H. Wright
News Office

American companies will find the avenues to success in the global economy both wider and less dependent on cheap labor than media reports suggest, according to a new book based on an MIT study of 500 international companies.

The book, "How We Compete: What Companies Around the World Are Doing to Make It In Today's Global Economy," summarizes five years of international research by 13 social scientists and engineers at the MIT Industrial Performance Center.

Suzanne Berger, who is the Raphael Dorman and Helen Starbuck Professor of Political Science and director of the MIT

International Science and Technology Initiatives (MISTI), is the lead author of "How We Compete."

Berger and the MIT team examined businesses where technology changes rapidly, such as electronics, and more traditional sectors, such as automobiles and textiles. Their global sample of company strategies came from Apple, Cisco, Dell, Liz Claiborne, the Gap, Benetton, Sony and many others; the team visited countries throughout the world.

"We wanted to understand how globalization is changing our society and economy and what we can do about it," Berger writes in a preview of the five-year MIT Globalization Study — a study that took the 13-member team on a journey through the United States, Mexico, France, Germany, Romania, China, Taiwan, Japan and

elsewhere to conduct 700 interviews.

"As far as I know, this is the first large-scale analysis of globalization that starts with a view from the trenches — the people under great pressure to respond to new challenges in hundreds of companies around the world. Using this bottom-up approach, we have tried to figure out how much choice remains in a world under globalization," Berger writes.

As for competition through ever-decreasing wages, the team found that to be a counterproductive choice, one that ends in "competitive jungles where victories are vanishingly thin," the book states. "The activities that succeed over time are those that build on continuous learning and innovation."

Other MIT faculty on the MIT Industrial Performance Research Team include

Akintunde (Tayo) Akinwande, professor of electrical engineering and computer science; Richard K. Lester, professor of nuclear engineering and director of the Industrial Performance Center; Charles Sodini, professor of electrical engineering and computer science; and Edward S. Steinfeld, associate professor of political science.

The MIT Commission on Industrial Productivity produced the "Made In America" study in 1989.



Suzanne Berger

Student leader Velasco earns Mitchell Scholarship

Sasha Brown
News Office

Political science graduate student John Velasco, a well-known campus leader, has become the first MIT student to receive the George J. Mitchell Scholarship, which will provide him with one year of graduate work in Ireland.

Currently enrolled in the five-year S.B. and S.M. program in political science at MIT, Velasco will earn a second master's degree in international studies at the University of Limerick during the 2006-2007 school year.

The Mitchell Scholarship program started in 1998 with an endowment from the Irish government. The award recognizes outstanding young Americans by funding a year of study at universities in Ireland and Northern Ireland. Velasco is one of 12 scholars nationwide to receive the 2006-2007 award.

Velasco's combination of interests and involvement made him an ideal candidate for the Mitchell award, which seeks to honor those who "exhibit superior records of academic excellence, leadership and public service," according to the scholarship web site.

A native of La Mesa, Calif., Velasco's work ethic was honed over years of chopping, peeling and flipping in his family's restaurant. "I did a little bit of everything," said Velasco with a laugh.

The youngest of nine children and the first in his family to finish college, Velasco first learned of MIT through the Chicano Latino Youth Leadership Conference for young Latinos in California, and decided to apply "on a whim."

He decided to come east after his first campus visit. "I had this magical feeling the first time I walked into Lobby 7," said Velasco, who said he was won over by "the enthusiasm and drive of the people here."

Since 2003, Velasco has worked with the MIT Public Service Center in many ways, serving as fellow, volunteer and staff member. In 2003, he created a math outreach program called imath that links Cambridge Public School eighth graders

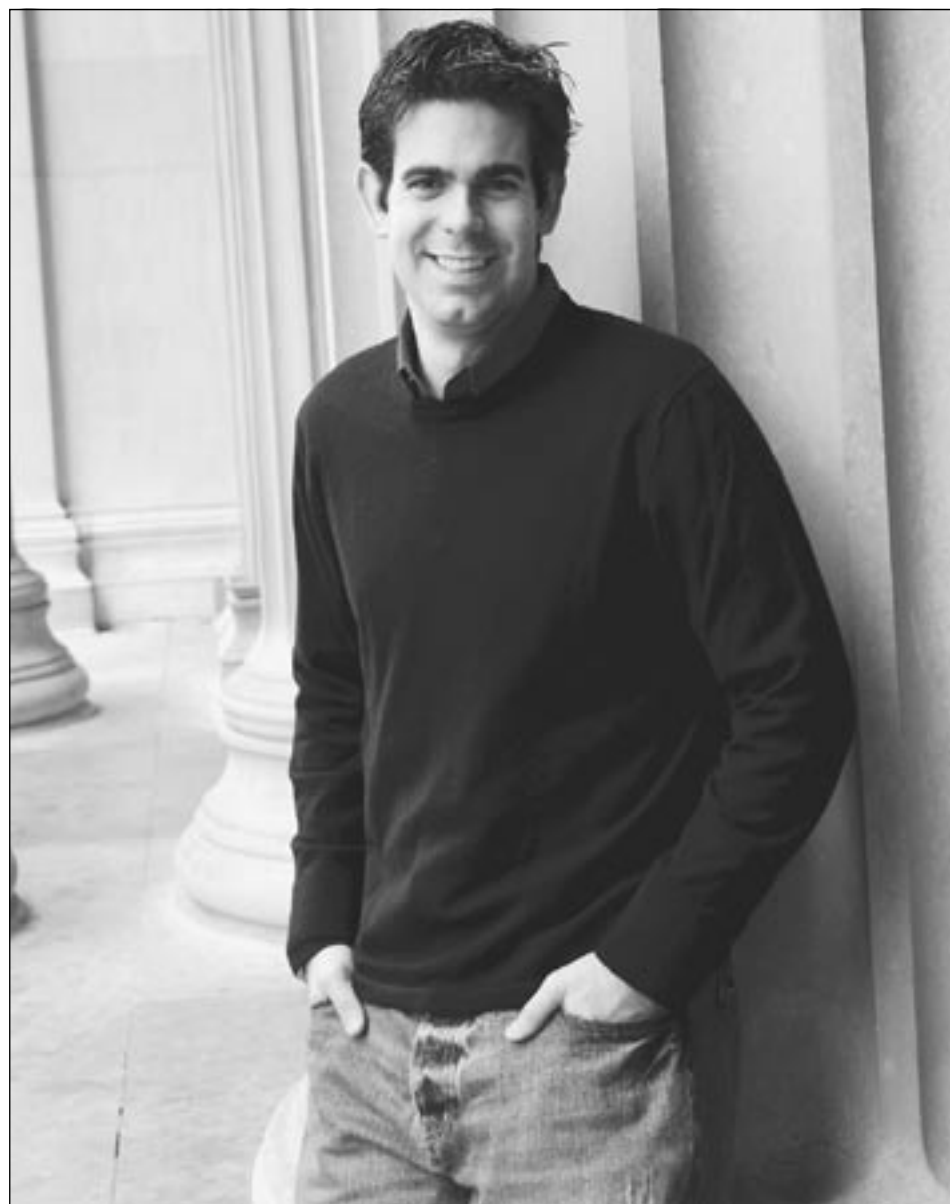


PHOTO / L. BARRY HETHERINGTON

John Velasco, who is in the last year of the five-year S.B. and S.M. program in political science at MIT, is the first MIT student chosen to receive the George J. Mitchell Scholarship.

with MIT students.

Between 2003 and 2005, the program grew from two schools with 20 eighth graders to five schools with 80 students.

Because of his work with imath, Velasco was one of five students honored nationwide with the Howard Swearer Student Humanitarian Award last year.

"He's a creative thinker, an outstanding communicator and an organized presence in what is often a chaotic business," said Assistant Dean Sally Susnowitz, director of the Public Service Center.

"John demonstrates the power of combining humanitarianism and practical knowledge with exceptional talents," Susnowitz said.

Reaching beyond school is what education is all about, said Velasco, who describes MIT as a school that is "not just about the academics."

Velasco has been involved in diverse projects. During the 2004 presidential election, he traveled to Cleveland as part of the "Race at Case," taking part in a national student debate that aired on CNN and C-Span one night before the national vice presidential debate.

In August 2003 Velasco traveled to Scotland for a month to serve as an MIT student representative to the Cambridge-MIT Institute Enterprisers Program.

In 2005, he spent two weeks in Haifa, Israel, as part of Hibur, a campus organization that links MIT with the Technion-Israel Institute of Technology. Velasco has also served as the campus liaison to the American Israel Public Affairs Committee.

A leader on campus as well, Velasco serves as a student representative to the MIT Task Force on the Educational Commons. Among other things, he hopes to encourage more students to focus on study-abroad opportunities, he said.

Velasco also served a term as vice president of the senior class in 2005. He took part in the MIT LeaderShape conference in 2004 and served as assistant facilitator for the same conference last year.

Velasco plans to use his time in Ireland to observe the Irish education system firsthand. "They (the Irish) do a good job of funding their education," said Velasco. He said he is also looking forward to exploring Ireland and traveling around Europe.

"It is a generous program," Velasco said of the Mitchell scholarship, which provides tuition, room, board and stipends, including one exclusively for travel. "I am really looking forward to it."

Student-founded Hibur connects MIT with Israeli university

Sasha Brown
News Office

In Hebrew, the word "Hibur" means connection — an appropriate name for a program designed to create a connection between MIT and the Technion-Israel Institute of Technology in Haifa, Israel.

Hibur: An MIT-Technion Link is an MIT-Hillel-sponsored program started by students last year.

"We see the Technion and MIT as a perfect match," said third-year electrical engineering and computer science major Chaim Kutnicki, one of Hibur's co-founders.

Kutnicki was interested in studying at the Technion following his freshman year at MIT. While exploring the possibility, he found that many professors had formed personal relationships with the Technion

over the years, but that "there were no institutional frameworks in place," he said.

Kutnicki went to Israel on his own, but when he returned, he and co-founders Maxim Shusteff (S.M. 2003) and Sam Korb (S.B. 2005) sought funding for a program that would make it easier for future students to study at the Technion and vice versa.

"Hibur really started as a grassroots effort," said Kutnicki.

The three secured funding for Hibur's first year from the Combined Jewish Philanthropies Boston-Haifa Connection, Avi Chai Grants of International Hillel, MIT Hillel's Israel Initiative and the Technion.

In its first year, 2005, the program attracted 18 MIT members, including both graduate and undergraduate students.

Over the course of the year, students bonded through a pen-pal program, video conferencing and conference calls and

then finally, groups from each university visited the other's campus.

MIT participants were matched with 14 Hibur members in Haifa. They exchanged weekly e-mails, becoming friends through the exchange of ideas, photos and personal anecdotes.

Sophomore Talia Gershon of materials science and engineering played matchmaker, trying to connect students with similar interests. It was a success, she said. "The relationships became more than just professional."

Kutnicki agreed. "There are a number of people who are actually pretty good friends now," he said.

Students and faculty used technology to deepen the bond, holding a series of video lectures simultaneously in Haifa and Cambridge.

MIT speakers at the lectures included Institute Professors Robert Langer and

Joel Moses as well as Frederick Salvucci, a senior lecturer in the Center for Transportation and Logistics and the former Massachusetts secretary of transportation, and members of the Technion faculty.

During the video conferences, MIT students were able to sit facing a screen showing the Technion students, with the speaker in the middle. After months of corresponding via e-mail, "it was very exciting to virtually meet," said Miriam Rosenblum, Jewish chaplain and director of MIT Hillel. Rosenblum has served as advisor to Hibur.

The conferences also afforded students and faculty a chance to glimpse the cutting-edge research at each other's schools.

"The presentations were fascinating and informative," said Rosenblum, who

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Speaker touts biomass potential

Deborah Halber
News Office Correspondent

We'll be filling our tanks with ethanol made from prairie grass while producing no greenhouse gases and improving agricultural soil in the bargain, if Lee R. Lynd has his way.

Lynd, a professor of engineering and biology at Dartmouth, spoke to an overflow crowd in Bartos Theater last week about how to create an environmentally sustainable future by replacing fossil fuels with biomass-derived fuels for transportation.

Lynd spoke on "The Role of Biomass in America's Energy Future," presenting results from an ongoing multi-institution project by the same name. The study is looking at two dozen scenarios in which biomass fuels could become cost-competitive with gas over a range of oil and power prices.

The mass energy yield of oil is very high, almost 80 units per 100 processed. "To make a serious dent in oil refining, the results would have to be impressive," Lynd said.

Cellulosic ethanol produced from native prairie perennial switchgrass, plus agricultural forestry and municipal residues such as wood chips and paper sludge, has the greatest potential to become a viable primary transportation sector energy car-

rier, he said. Lynd said that it is "likely that cellulosic ethanol can eventually be produced on an unsubsidized basis at costs comparable to the cost of gasoline production." Among its benefits are essentially zero net emissions of greenhouse gases and improved fertility from the carbon that switchgrass replaces in the soil as it grows.

The researchers investigating biomass chose to focus on switchgrass, not corn or soy, because food crops are not necessarily the most productive energy sources. Yet in future scenarios, Lynd said, farmers would rotate switchgrass with food crops.

"In my view, people have underestimated the importance of biomass in the context of using limited earth space to produce human needs such as food and energy," Lynd said.

Even if the United States and other countries embrace this vision as a goal, a lot will have to happen before it becomes a reality. Continued technological innovation to make biomass more productive, coupled with new, highly efficient vehicles and farmers agreeing to grow switchgrass or other "energy crops" as part of the overall agricultural system, would all be necessary for a transition from fossil fuels to biomass fuels.

And this is for an alternative fuel that rarely gets lip service, although Lynd pointed out that President Bush mentioned biomass in his State of the Union

address last week.

During the Industrial Revolution, resources were plentiful and people scarce. Now that the opposite is true, we need a second Industrial Revolution to create the technology to fix the mess we've gotten ourselves into, Lynd said.

"Our best chance of successfully navigating the sustainable resource transition is based on aggressive and effective efforts devoted to innovation and increased resource utilization efficiency," Lynd said. "Without both of these complementary strategies, we are far less likely to be successful in this endeavor."

Biomass conversion to fuel depends on fermentation and hydrolysis, among other techniques. Lynd said results would come faster with the help of genetically engineered plants. "This is a challenging job for metabolic engineering. That kind of energy hasn't been brought to this field, but some really elegant things have been done in pharmaceuticals. If we've done that, we can do this."

Lynd noted that "there are also very important questions about effective policy formulation and the willingness of society to make the changes needed to accommodate this, or any other, path to a sustainable and secure energy future."

Lynd's talk was the second in a series of colloquia sponsored by MIT's Energy Research Council and the Laboratory for Energy and the Environment.

IAP seminar explores MIT's energy options

Deborah Halber
News Office Correspondent

Generating electricity from wind turbines that look like rooftop box fans and converting used cooking oil into biodiesel fuel are among the energy innovations that MIT may pilot in the not-too-distant future.

On Feb. 2, for the fourth Independent Activities Period (IAP) in a row, students and instructors took part in a continuing experiment in collaborative education involving the Laboratory for Energy and the Environment (LFEE), the Department of Urban Studies and Planning (DUSP) and the city of Cambridge.

In 2002, the Cambridge City Council adopted a plan to reduce in-city greenhouse gas emissions to 20 percent below 1990 levels by 2010. This year, five students from MIT and Wellesley researched biodiesel and wind projects during a monthlong seminar. The projects could be piloted at MIT and applied throughout the

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Deep-sea robot photographs ancient Greek shipwreck

Deborah Halber
News Office Correspondent

Sometime in the fourth century B.C., a Greek merchant ship sank off Chios and the Oinoussai islands in the eastern Aegean Sea. The wooden vessel may have succumbed to a storm or a fire, or maybe rough weather caused the cargo of 400 ceramic jars filled with wine and olive oil to shift without warning. The ship went down in 60 meters (about 200 feet) of water, where it remained unnoticed for centuries.

The classical-era ship might never have divulged to archaeologists its clues to ancient Greek culture, except for a research team from MIT, the Woods Hole Oceanographic Institute (WHOI), the Greek Ministry of Culture, and the Hellenic Centre for Marine Research (HCMR). They used a novel autonomous underwater vehicle (AUV) to make a high-precision photometric survey of the site last July. Using techniques perfected by MIT and WHOI researchers over the past eight years, the robot accomplished in two days what would have taken divers years of effort.

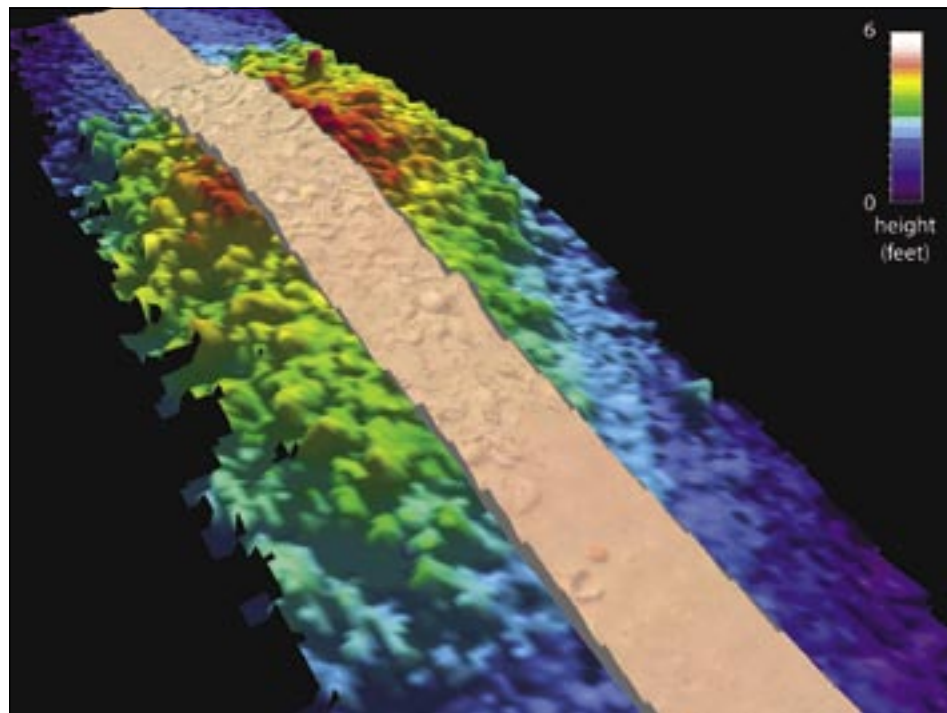
Last week the researchers released a few of the photographs showing detailed images of some of the remnants of the ship's cargo lying on the ocean floor, where it's been since about 350 B.C. The researchers took more than 7,000 images, which will eventually be combined into one mosaic of the entire wreck site.

The project marks the beginning of a long-term research project of the MIT/WHOI team collaborating with the Greek Ministry of Culture and HCMR.

The Deep Submergence Laboratory of WHOI has for years been a leader in building submersible robotic vehicles for a variety of underwater environments, including the ARGO vehicle that found the Titanic and the JASON II vehicle that explores the sea floor today. The robotic vehicle used at Chios is an AUV called SeaBed. WHOI scientist Hanuman Singh and his research team designed and built the AUV specifically for imaging the sea floor.

At Chios, Singh and his engineering team programmed SeaBed to run slow, precise tracklines over the shipwreck site, which had been located by a sonar scan performed by the Greek Ministry of Culture in 2004.

The AUV scanned the scattered cargo and created a topographical sonar map while collecting thousands of high-resolution digital images, without ever physically touching the shipwreck. In all, 7,650 images were collected on four dives.



This image shows a sample of the data collected by the SeaBed autonomous underwater vehicle as it swam over the Chios shipwreck in July 2005. The 3-D color mesh represents a topographic map of the sea floor, created using data collected by multibeam sonar. The brown strip shows the area captured in digital images, which were used to create the photomosaic of the wreck.

WHOI archaeologists and engineers are assembling those images into mosaics that depict the minute features of the shipwreck with unmatched clarity and detail.

The Chios wreck is playing a critical role in exploring how advanced technology can dramatically change the field of underwater archaeology. The long-term project is the brainchild of expedition co-leaders Brendan Foley, a researcher at WHOI who is a 2003 Ph.D. graduate of MIT's Program in Science, Technology and Society (STS), and David Mindell, the Dibner Professor of the History of Engineering and Manufacturing and professor of engineering systems at MIT.

Mindell develops high-precision sonar navigation systems that control undersea robots in very deep water to create the world's most accurate three-dimensional maps of the ocean floor. Mindell and Foley founded MIT's DeepArch research group, which has been laying the intellectual, methodological and technical foundations for archaeology in the deep sea for the past eight years.

Robotic technology is the only way to reach deep shipwrecks like the one at Chios, but the systems can also be applied to shallower sites.

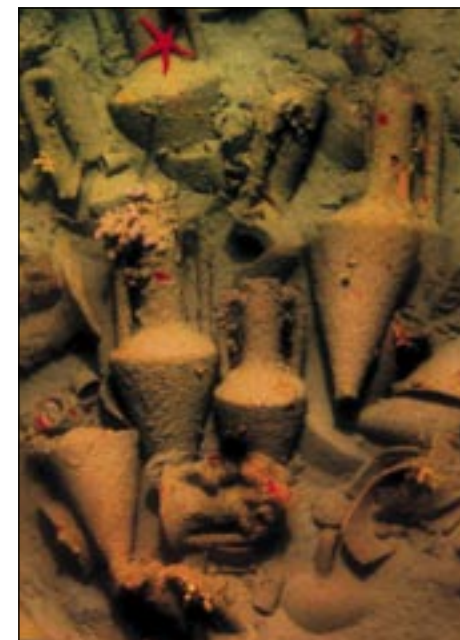
"By using this technology, diving

archaeologists will be freed from mundane measuring and sketching tasks, and instead can concentrate on the things people do better than robots: excavation and data interpretation," said Singh, an engineering and imaging scientist. "With repeated performances, we'll be able to survey shipwrecks faster and with greater accuracy than ever before." These new techniques produce results very quickly.

As soon as SeaBed surfaced with the first images from the Chios wreck, taken July 7 and 8, 2005, Foley and the Greek archaeologists began interpreting the data.

Much of the true value in cargo ships such as the Chios wreck is the information they provide about the networks that existed among the ancient Greeks and their trading partners. The wreck is "like a buried UPS truck. It provides a wealth of information that helps us figure out networks based on the contents of the truck," said Mindell.

Foley, Mindell, Singh and their collaborators are using the latest technology to create "ways of learning about the past that you couldn't achieve any other way. We're not looking for footnotes any more. We're looking to write new chapters," Foley said.



IMAGES / CHIOS 2005 SHIPWRECK SURVEY — WHOI, HELLENIC MINISTRY OF CULTURE; EPHORATE OF UNDERWATER ANTIQUITIES, HELLENIC CENTER FOR MARINE RESEARCH

Detail from photomosaic strip showing ancient ceramic storage jars at the Chios shipwreck site.

The new research project will last 10 years or more, focusing on uncovering evidence of ancient trade in the Mediterranean, particularly of the Minoan and Mycenaean cultures and their trading partners in the Bronze Age (2500-1200 B.C.).

"This was a home run for us," Mindell said. "There's a lot riding on it." The team will be back in Greece to explore more wreck sites next season.

"This is real research — slow, serious, scientifically rigorous and painstaking work," Foley said. "It will go in strange directions, produce ambiguous results along the way, and raise a lot of new questions, but we're convinced that in 10 to 15 years, we will change history."

In addition to Foley, Mindell and Singh, the American team for the Chios expedition included Professor Brian Bingham from the Franklin W. Olin College of Engineering; Richard Camilli, Ryan Eustice and Chris Roman from WHOI; and Professor David C. Switzer from Plymouth State University. The Greek science and technical team was led by HCMR geologist Dimitris Sakellariou. The Greek archaeology team was headed by Katerina Delaporta, director of the Ministry of Culture's Ephorate of Underwater Antiquities.



PHOTO / DONNA COVENEY

Above, freshman Esther Chung of architecture and urban planning works on a fish late last month for the 'S.O.S.-Fish' installation at Stata. Below, an artist works on another fish for the installation.



PHOTO / DONNA COVENEY



PHOTO / DONNA COVENEY

Artist-in-residence Cindy Snodgrass shows off some painted fish that are part of her installation about water in the Stata Center. The exhibit is called 'S.O.S.-Fish.'

Stata Center's in the swim with instructive fish art

Something fishy has been happening at the Stata Center.

Look up from the Student Street, and you'll see brightly colored mobiles of fish, birds and turtles spinning in the air currents, each mobile carrying a message about water as a globally threatened resource.

Created by members of the MIT community and others, under the direction of artist-in-residence Cindy Snodgrass, this temporary installation, "S.O.S.-Fish," is designed to embody a simple message: "Water unites us. We are the quality of our water," Snodgrass said.

Some of the messages on the fish include, "Around the world, women and children spend hours each day transporting water from its sources to their homes"; "Air is water with holes in it"; and "The largest monster in the world's water closet is Abrupt Climate Change."

Snodgrass, who said she thinks art can be an "engine of community, of discourse and of action," said she hopes the take-home message from the exhibit will be to "research for yourself about water. What comes out of your faucet is not all you need to be looking at."

"S.O.S.-Fish" debuted at MIT during the Alumni Association's family weekend in October, and the community and passers-by have expanded the exhibit throughout its time at Stata. There have been a number of informal drop-in painting events in Stata's Taiwan Semiconductor Manufacturing Company Lobby, and a lobby table is set up to invite passers-by to contribute facts and opinions about water for the mobile's informational "bubbles."

An Independent Activities Period course, "Assist the Fish — Environmental

Art Installation/Mentoring," was also held in the lobby. Undergraduates in that class mentored children's groups contributing to the exhibit.

"S.O.S.-Fish" will remain on display until the first week in March.

"The fish make me smile every time I go by them," said Associate Professor Daniela Rus, who works in Stata. "My little girls, 4 and 6, were really excited to have a chance to paint a fish and they brought the safe water message to their respective schools."

Debra Kedian, who manages the Stata Center space through the Campus Activities Complex, said she has received consistently positive feedback about the fish, with many remarking that the mobiles have given a "real sense of life" to the space. "Cindy's work is deserving, and the more people who know, the greater hope there is for a future full of clean water for us all," Kedian said.

Snodgrass has received support from the National Endowment for the Arts, the Heinz Foundation and the Mid-Atlantic Arts Foundation, among others, and she has a distinguished international career of community environmental art (www.wind-sphere.org). At MIT, her work has been sponsored by the Campus Activities Complex, the Edgerton Center and the Council for the Arts at MIT.

Snodgrass said she hopes to continue to develop the fish-mobiles as "cultural and environmental ambassadors for water."

Comments about the exhibit and quotes about water may be sent to SOSFish@mit.edu.

This story was reported by Virginia Rich, a graduate student in the Joint Program with the Woods Hole Oceanographic Institute.

BATTERY

Continued from Page 1

than batteries to hold the same charge.

The LEES invention would increase the storage capacity of existing commercial ultracapacitors by storing electrical fields at the atomic level.

Although ultracapacitors have been around since the 1960s, they are relatively expensive.

They have inherent advantages — a 10-year-plus lifetime, indifference to temperature change, high immunity to shock and vibration, and high charging and discharging efficiency — but physical constraints on electrode surface area and spacing have limited ultracapacitors to an energy storage capacity around 25 times less than a similarly sized lithium-ion battery.

The LEES ultracapacitor has the capacity to overcome this energy limitation by using vertically aligned, single-wall carbon nanotubes — one thirty-thousandth the diameter of a human hair and 100,000 times as long as they are wide. How does it work? Storage capacity in an ultracapacitor is proportional to the surface area of the electrodes. Today's ultracapacitors use electrodes made of activated carbon, which is extremely porous and therefore has a

very large surface area. However, the pores in the carbon are irregular in size and shape, which reduces efficiency. The vertically aligned nanotubes in the LEES ultracapacitor have a regular shape, and a size that is only several atomic diameters in width. The result is a significantly more effective surface area, which equates to significantly increased storage capacity.

"This configuration has the potential to maintain and even improve the high performance characteristics of ultracapacitors while providing energy storage densities comparable to batteries," Schindall said. "Nanotube-enhanced ultracapacitors would combine the long life and high power characteristics of a commercial ultracapacitor with the higher energy storage density normally available only from a chemical battery."

This work was presented at the 15th International Seminar on Double Layer Capacitors and Hybrid Energy Storage Devices in Deerfield Beach, Fla., in December 2005.

The work has been funded in part by the MIT/Industry Consortium on Advanced Automotive Electrical/Electronic Components and Systems and in part by a grant from the Ford-MIT Alliance.

FISH

Continued from Page 1

ful information with signals far less intense. This effectively "illuminates" vast areas of the ocean, about a million times larger than what could previously be studied. The images can be updated every minute, offering a chance to continuously monitor the shoals as they change in size and shape over time.

The new technology works best along the continental shelf, so the researchers focused their attention on the waters south of Long Island, New York. When they first started, they weren't looking for fish at all — they wanted to see if their device could locate ancient riverbeds under the ocean floor. But when their reconnaissance images did not match the riverbeds, the researchers went back with a new approach, and determined that they were seeing fish — tens of millions of fish.

This marks the first time scientists have been able to see the patterns formed by large fish populations. Makris found that fish often

congregate in an hourglass pattern, also found among other animals, with a thin "bridge" connecting the two ends. The researchers also observed that the same shapes seen in a small scale appear on larger scales — tens of meters vs. tens of kilometers — displaying a fractal pattern.

Population density patterns could be a means of communication, Makris said. His team observed "waves" of population density that spread quickly through a shoal. "We have a situation where information can be very rapidly transmitted with these waves," he said.

Co-authors on the paper are Deanne Symonds, Srinivasan Jagannathan and Sunwoong Lee of MIT's Center for Ocean Science and Engineering; Purnima Ratilal of Northeastern University; and Redwood Nero of the Naval Research Laboratory.

The research was funded by the Office of Naval Research, the Alfred P. Sloan Foundation and the National Oceanographic Partnership Program, and is a contribution to the Census of Marine Life.

IAP class offers help to campus leaders

Sasha Brown
News Office

When Jordan Fabyanske was elected vice president of the InterFraternity Council in late 2004, he found he had a lot to learn. "There was a lot I wished I'd known before coming into office," he said.

He ended up filling a journal with the "practical lessons" he gained as vice president, and it grew to be 100 pages long. Eventually, he started to think about ways he — and others like him — might use those lessons.

After meeting with MIT Leadership Center Director Mary Schaefer and Associate Director Jonathan Lehrich, Fabyanske, now a senior, launched a pilot Independent Activities Period (IAP) course, "Leading and Changing Campus Organizations," which was held for the first time this year.

The goal of the three-week course, sponsored by the MIT Leadership Cen-

ter, was to teach students the practical skills they need to lead organizations effectively.

"There are many leadership learning opportunities," said Lehrich. "But one thing people were really looking for was an opportunity to apply classroom lessons to their current life."

Offered in six 90-minute sessions, the class drew roughly 25 student leaders from several graduate and undergraduate organizations. The classes focused on the skills that make an individual a leader, as well as ways to recruit and engage future leaders. They talked about marketing ideas and how to mobilize group members to take a personal interest in the organization.

The final class discussed how to make a leadership transition — bringing new leaders onboard while maintaining the integrity of the organization.

During the final class, Chris Rezek (S.B. 1999), former board member of the Institute Foundation/Student Resource

Service, spoke about why that group folded in 2001. Joost Bonsen (S.B. 1992 and S.M. 2001), a former leader of the 50K competition, talked about why the 50K continues to thrive.

Bonsen encouraged the students gathered in E51-335 to "keep the big picture in mind," when transitioning out of an organization. "Take pleasure and joy in other people's success," he said.

For students, whose lives are in flux and who typically only spend four years as undergraduates at MIT, the transitions are key to maintaining an organization, said Fabyanske. "One of the main goals [of the IAP course] was to offer something practical," he said.

The class was considered a great success and may be offered next year for credit, said Lehrich.

"My hope is that you will empower your emerging leaders," Fabyanske told the students in the class as they left. "I hope you will encourage people to take courses like this in the future."

ENERGY

Continued from Page 4

city if successful.

"This initiative uses the creativity and energy of the students to investigate a local response to one of the city's most prominent environmental goals: climate protection," said "Energy and Climate in Cambridge" co-instructor Beth Conlin, LFEE education program coordinator.

The students' proposals would prototype energy technology on campus for possible use in the wider community. Wind turbines that perch on the edge of a roof would work best on the Green Building, Johnson Athletic Center, the Wood Sailing Pavilion or the Pierce Boathouse, reported first-year student Jing Han. Han investigated a product called Architectural Wind being developed by AeroVironment of Monrovia, Calif.

"For the wind project, we are seeking a grant from the Massachusetts Technology Collaborative to do a full feasibility study, including site measurements of the available wind resource, economic analysis and other technical and nontechnical issues," such as the effect on birds and noise level, said Peter L. Cooper, manager of sustainability engineering and utility planning in the MIT Department of Facilities. If the project seems promising, a construction grant would allow the wind turbines to be installed a year or more down the road.

A biodiesel conversion facility on campus would take between one and two-and-a-half years to break even, reported Elizabeth Ricker, a junior in brain and cognitive sciences. Ricker worked with Joseph Roy-Mayhew, a sophomore in chemical engineering, and Hailun Wu and Christianne Roach, students at Wellesley College. The team investigated the feasibility of using waste vegetable oil to produce a clean-burning, biodegradable fuel that could help power MIT vehicles and heat MIT buildings.

The students estimated that 5,000 gallons of waste oil could be collected from campus dining facilities and nearby restaurants, saving the Institute money on fuel costs and saving MIT food vendors money spent for waste oil removal. MIT might even build its own processor for the chemical conversion process instead of purchasing one, Roy-Mayhew said.

Steven M. Lanou, deputy director of environmental sustainability, said that the biodiesel facility will also be studied for feasibility. For more information and the results of the IAP seminar, visit lfee.mit.edu/metadot/index.pl?id=2404&isa=Category&op=show.

Research engineer dies

Paul Warren, a research engineer in the Gas Turbine Lab, died Jan. 26 following a brief illness. He was 63.

Warren was an MIT graduate and had lived in Watertown since 1969.

He is survived by his wife, Patricia (Moise) Warren; two sons, Daniel S. Warren of Laconia, N.H., and Everett A. Warren of Leighton, Pa.; his mother, Ila Mae Warren of Hickory, N.C.; a brother, David L. Warren of Hickory, N.C.; and three grandchildren.

Donations may be made to the Tucker Gosnell Gastro-Intestinal Cancer Center, 55 Fruit St., Boston, MA 02114, or to a medical cause of one's choice.

HIBUR

Continued from Page 3

recalled one small quirk: a time delay, which sometimes meant the students on the live side laughed at a joke the other side did not hear for another couple of seconds. "They could tell when something was about to be funny," she said.

Twelve MIT participants made the first campus visit, arriving in Haifa on May 22. In the two weeks they spent in Israel, they toured the Technion, attended classes, visited companies, went on day trips, had dinner in the homes of host families and attended a holiday bonfire on the beach before coming back to the States on June 1. "It was an intense schedule," said Rosenblum.

When the Israeli students came to Boston in September, the schedule was similar. Still, students found the time to form relationships — and potential partnerships — that will last a lifetime. "It was one of the most amazing experiences of my life," said Gershon.

Hibur continues to evolve. At the end of 2005, Hibur accepted applications from MIT students interested in internships in Israel during the summer of 2006. They are currently matching resumes with companies.

"We are working on several different levels," said Kutnicki, who hopes that someday Hibur will become an official MIT program.

In September 2005, Chancellor Phillip Clay spoke at a faculty and administrator dinner held for the Technion students. "Hibur is one of a growing number of programs that allows students to get a taste of what it is like to work in an international setting," he said. "I believe this is an undervalued part of undergraduate education at MIT and one that we should support for more students."

Hibur is currently looking for students interested in joining the 2006 delegation. There will be an information session on Feb. 15 in W20-407. For further information, visit www.hibur.org or contact MIT Hillel at x3-2982.

VIRUS

Continued from Page 1

viral research at MIT, King said. In 1969, MIT Professor Salvador Luria shared the Nobel Prize in physiology or medicine with Max Delbruck and Alfred Hershey for work on the genetic structure and replication mechanisms of viruses.

Luria, who came to MIT in 1959, was the first scientist to show the structure of bacteriophages.

"That really brought these bacterial viruses to the fore, and they've continued to be important for half a century," King said.

Bacteriophages were used in crucial experiments showing that DNA is the genetic material and determining that translation of genetic material into proteins is based on a triplet code.

Luria's legacy at MIT's biology

department is carried on today, said King. Shortly after World War II, the Institute got one of the first electron microscopes in the United States, and Luria molded the direction of the department, said King, who arrived at MIT in 1970 after working with Delbruck at Caltech.

"It was (Luria's) appointment that led to the department having its current character, which is a leader in molecular biology," King said.

MIT research scientist Peter Weigele is also an author on the imaging paper.

Funding for the imaging project was provided by the National Institutes of Health and the Robert Welch Foundation. The electron microscope images were taken at the National Center for Macromolecular Imaging at Baylor College of Medicine.



Toy story

Graduate student Andrew Carvey puts his studies in mechanical engineering to good use in operating the Gummi Bear catapult he built during an IAP Interactive Toy Design class taught by Hayes Raffle.



PHOTOS / DONNA COVENEY



Left, junior and chemistry major Joia Ramchandani shows off her multi-colored butterfly made of pipe-cleaners during the Media Lab's IAP Interactive Toy Design class, which yielded many unique toys. Above, Hayes Raffle, a Media Lab graduate student who taught the course, shows his 16-month-old daughter, Paloma, how her toy rights itself each time it falls.

CLASSIFIED ADS

Members of the MIT community may submit one classified ad each issue. Ads can be resubmitted, but not two weeks in a row. Ads should be 30 words maximum; they will be edited. Submit by e-mail to ttads@mit.edu or mail to Classifieds, Rm 11-400. Deadline is noon Wednesday the week before publication.

HOUSING

Roommate wanted: Melrose, 13 miles north of MIT. Near commuter rail, bus, Routes 93 and 1. Call for details 781-254-1696.

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

VEHICLES

1994 Volvo 850 wagon. Green w/ tan leather interior. High mileage but runs well & looks great. \$2,800 or best offer. Call 617-312-4258 or e-mail mbj@mit.edu.

2002 Honda Accord LX sedan. Silver, 28K. Automatic, well-equipped, excellent condition. Asking \$12,900. Call 258-7372.

LOST AND FOUND

Lost: handknit colorful woolen scarf. Lost Thursday evening, Jan. 26, in or around E25. Contact cmiodica@mit.edu.

Lost 2/1 by Z-center pool: canvas shoulder bag ("Syracuse Food Coop"), denim lunch sack (snails and musical instruments decorations). Reward for lunch sack. levy@mit.edu, 253-7112



PHOTO COURTESY / BRIAN ROBISON

Assistant Professor Brian Robison will perform several pieces on the theremin on Feb. 14, Valentine's Day.

Concert features hands-off music

Lynn Heinemann
Office of the Arts

Forget the roses and violins. In a special noontime concert on Valentine's Day called "Waves of Pleasure," Assistant Professor Brian Robison will wave his hands over a theremin to create other-worldly renditions of popular romantic classics by Handel, Puccini and Rachmaninoff, as well as contemporary favorites by Ellington, Gershwin and Rodgers.

Also featuring lecturer Charles Shadle as piano accompanist, the concert will be held in the Lewis Music Library (Room 14E-109) on Tuesday, Feb. 14 from 12 to 1 p.m.

One of the earliest electronic musical instruments, the theremin is unique in that the performer doesn't touch it while playing. Instead, proximity of the performer's hands to two antennae control the pitch and

volume.

Robison first encountered a theremin in a music store about a decade ago. "I was hopelessly unable to produce any recognizably musical sound," he recalls, but he decided last fall that the instrument was just too much fun not to have one.

Calling the theremin "maddeningly difficult to play accurately," Robison notes that it requires extremely fine motor control. "If your hand drifts just a millimeter or two in space, that motion produces a noticeable change in pitch," he says.

The concert will include an opportunity for adventurous audience members to try the instrument.

"There's something mesmerizing about playing an instrument that responds to your every move, whether you want it to or not," Robison says. "I keep coming back to the theremin — despite the limitations, despite the frustration, despite the humiliation. Much like love."

'America Starts Here' – at List Visual Arts Center

Lauren Maurand
Office of the Arts

The List Visual Arts Center this week opens "America Starts Here: Kate Ericson and Mel Ziegler," a celebration of the decade-long collaboration between two artists who devoted the body of their work to looking at America through the objects and materials it produces. The show opens with a reception tomorrow, Feb. 9, from 5:30 to 7:30 p.m. and an artist's talk with Ziegler on Friday, Feb. 10, at 6:30 p.m.

Ericson and Ziegler worked together from the mid 1980s to the mid-'90s, producing mostly installations and outdoor projects. Their work combines time periods and concepts in pieces such as "Camouflaged History," a house painted in the style of U.S. Army camouflage, using only paints in colors that a local preservation group deemed historic.

Working at a time when a lot of contemporary artists, like Damien Hirst or Jeff Koons, were intentionally shocking the art world and its viewers, Ericson and Ziegler took a subtler approach. Bill Arning, of the List Visual Arts Center, who is co-curator of the show, describes their work as having a "gentle, generous poetic sensibility."

They used humble materials like paint or glass jars to approach lofty ideas. "They always created works that added resources to the community rather than depleting them," wrote Arning in a recent e-mail. Arning worked with Ericson and Ziegler early on in both his career and their collaboration, and he was impressed with their work — impressed enough to bring it to MIT.

After Ericson's death from cancer in 1995 at the age of 39, there was less promotion of the artists' work. Arning hopes that "America Starts Here" will help reignite interest in these two important American artists.

The show is jointly curated by Arning and Ian Berry of the Tang Teaching Museum at Skidmore College, where the exhibit was recently shown. It will later travel to the Austin Museum of Art in Texas; Artspace at the Kansas City Art Institute; and the Contemporary Art Center in Cincinnati.

In conjunction with the show, MIT Press has published a comprehensive 216-page catalog of Ericson and Ziegler's work, filled with images of the products and installations from their collaboration, as well as writings from many of the original curators of their shows.

The 20-piece show will be on view in the LVAC gallery through April 9.

Visiting artist Hafler directs 'The Old Law'

Lynn Heinemann
Office of the Arts

In a room postered with fliers proclaiming, "The old must die," Max Hafler is the only one with gray hair. Directing a cast of MIT students in a rehearsal for Dramashop's production of "The Old Law," a play in which the generation gap is taken to extremes, Hafler alternately bounds onto the stage of Kresge Little Theater, slouches in a front-row seat, or ranges up and down the aisle.

Set in a society that legislates that men over 80 and women over 60 are useless and must be put to death, "The Old Law" has "powerful resonances for now," says Hafler, a visiting artist at MIT.

As soon as the law goes into effect, young rich people gleefully send their parents to be executed. Young wives, hungry for freedom and inheritances, wait impatiently for their old husbands to be put to death. The world goes mad.

Hafler lists the play's themes as "the rule of law, the nature of evil, euthanasia and the value of youth and age."

Proving that today's youth has no advantage over his own age and experience, Hafler jumps onto the stage to instruct his young actors. He staggers across the stage to illustrate how rollicking and rowdy a drunk can be, and intones, bellows, bleats and barks a single line to display the vocal emphases a character could show.

In other cases, he tones down the theatrics. "Try not to use your face so much," he advises senior Helen McCreery, who plays the heroic Hippolyta in Hafler's tragic-comic adaptation of the 17th century play by Thomas Middleton and William Rowley. "You've a great face and you use it a lot. Try to be still, to internalize."

Hafler says he likes to use people to their limit and not just as the role they are assigned to play. Most of the actors have several parts, including statues, old people, hunting dogs, lawyers — even abstract entities in a character's mind.

"Max is more into diction and group work than any director I've had," says freshman Ashley Micks, who's making her Dramashop debut. Because so many of the character representations are stylized and abstract, Micks says, the nonspeaking ensemble parts require as much work as the parts with lines, so the audience will be able to understand what's happening.

"I am very excited by group work and ensemble physical playing," Hafler says. Encouraging his actors to loosen up, he insists that their characterizations be big, even as they internalize the underlying emotions. "I want you to feel brave enough to really take your time."

Each character, he says, has an arc. "You've got to find the journey in this play," he tells his cast, "Even if it's not naturalistic." Then, with proprietary pride, he adds, "There *are* journeys because I put them there."

Hafler first adapted the play for a production at the Lyric Hammersmith in London, earning praise from Irving Wardle for The (London) Independent, who wrote, "the piece connects across four centuries with a powerful jolt of moral electricity."

Hafler has lived in County Galway, Ireland, for more than seven years. He has worked as a director with Galway Youth Theatre and teaches in the theater M.A. program at the National University of Ireland, Galway.

Earlier this year Hafler completed a short residency at MIT, working in ensemble and devising, giving a lecture on Marlowe and doing voice work in Shakespeare class.

"The Old Law" runs Thursday through Saturday, Feb. 9-11 and Feb. 16-18 at 8 p.m. in Kresge Little Theater. Tickets are \$8, \$6 for students. For more information, call x3-2908 or visit web.mit.edu/dramashop/www/.

Doctorow signing slated

Science fiction writer Cory Doctorow will be on campus Monday, Feb. 13, for a lecture and book signing, "Down and Out at MIT: An Evening With Cory Doctorow," starting at 5 p.m. in Bartos Theater, followed by a reception.

A blogger for the web site BoingBoing.net and European affairs coordinator for the Electronic Frontier Foundation (EFF), Doctorow develops his own books from notes and ideas posted on his weblog and prefers to make his books — or "bbooks" — available for free downloads by readers through Creative Commons licenses, now operating in 81 countries.

While at MIT, Doctorow will meet with students in formal and informal settings. He'll also be guest of honor at Boskone, the Boston science fiction convention, to be held Feb. 17-19.



Cory Doctorow

MIT EVENT HIGHLIGHTS FEBRUARY 8-12

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



Cars and stars

Andy Zimmermann is shown here with his multimedia installation, "Cars and Stars," at the MIT Museum. The installation projects digital animation and video onto a three-dimensional sculpture, with accompanying digital sound composition.

WEDNESDAY
February 8

Dinner@Six – Free Dinner with MIT Faculty!

Enjoy a relaxed dinner and conversation with various MIT faculty and administrators. 5:45-7 p.m. W11, Small Dining Room. 253-2982.

Biomedical Engineering Society Distinguished Lecture Series

Talk by Professor Julie Chen: "Nanomanufacturing: Why the federal government (and companies) are funding it and where are we headed?" 7-8:30 p.m. Room 66-110.

Big Dig Concert

Music lecturer Mark Harvey and his Aardvark Jazz Orchestra celebrate the scheduled completion of the Big Dig with the premiere of Harvey's "Dig, Dug, Done." 7:30 p.m. Regatta Bar, Charles Hotel.

THURSDAY
February 9

MIT Chapel Concert
A program of Spanish music from 1470 to 1600. Noon, MIT Chapel. 253-2826.

Opening of "America Starts Here – Kate Ericson and Mel Ziegler 1985-1995"
Co-organized by the MIT List Visual Arts Center and the Tang Teaching Museum at Skidmore College. 5:30-7:30 p.m. List Visual Arts Center. 253-4680.

Chicks Make Flicks
Irena Fayngold and "Hineini: 'Coming Out' in a Jewish High School." 7 p.m. Room 6-120. 253-8844.

"The Old Law"
Dramashop production of mid-17th century play written by Thomas Middleton and William Rowley. Feb. 9-11 and 16-18. \$8, \$6 students. 8 p.m. Kresge Little Theater. 253-2908.

FRIDAY
February 10

"Beauty and the Bourgeoisie: A History of Bland Fruit"
Talk by Suzanne Freidberg of Dartmouth College. 2:30-4:30 p.m. Room E51-095. 253-4965.

Artist's Talk by Mel Ziegler
Presented in conjunction with "America Starts Here – Kate Ericson and Mel Ziegler 1985-1995." 6:30 p.m. List Visual Arts Center. 253-4680.

Opening of "Digital Minimal"
Projects by the MIT SENSEable City Laboratory. Reception at 5:30 p.m. in Wolk Gallery followed by a discussion with William J. Mitchell, Antoine Picon and Carlo Ratti in Room 7-431 at 7 p.m. 258-9106.

SATURDAY
February 11

"Aaron Fink: Elements, and Other Prints"
Exhibition of 22 prints from Aaron Fink's 1984 portfolio called "Elements," as well as six other prints by the artist from the Permanent Collection. The Dean's Gallery. 9 a.m.-5 p.m. 253-4400.

Varsity Women's Gymnastics
MIT takes on Southern Connecticut State College and Rhode Island College. 1 p.m. du Pont Gymnasium. 258-5265.

Comedy Collage
Comedians, many who have appeared in comedy specials on BET, Comedy Central and HBO, perform. \$3. 7-10 p.m. W16. 225-7424.

SUNDAY
February 12

"Shipbuilding in Massachusetts 100 Years Ago"
A series of photographs from the Hart Nautical Collection's Bethlehem Steel Fore River Shipyard Collection. Noon-5 p.m. MIT Museum. \$5 adults; \$2 students, seniors and children 5-18; free with an MIT ID. 253-4444.

International Folk Dancing
Every Sunday. 8-11 p.m. Kresge Rehearsal Room. 253-FOLK.

"Finding Form: The Art of Richard Filipowski"
The work of renowned sculptor and MIT faculty member Richard Filipowski. MIT Museum. Noon-5 p.m. \$5 adults; \$2 students, seniors and children 5-18; free with an MIT ID. 253-4444.

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

EDITOR'S CHOICE

NOAM CHOMSKY
Noam Chomsky presents a panel on terrorism and a film on the Cuban Five, a group of Cuban political prisoners.

Feb. 8
Room 10-250
7-10 p.m.

ANNUAL MLK JR. BREAKFAST
Talk by Donna Brazile, chair of the Democratic National Committee's Voting Rights Institute. Reservations required. Call x3-5001.

Feb. 9
Morss Hall
7:30-11 a.m.

IMPACT CAREER EXPO
A networking event launches this socially and environmentally responsible career fair.

Feb. 13
Room 10-250
7-8:15 p.m.

MIT EVENT HIGHLIGHTS FEBRUARY 13-19

MONDAY
February 13

"Down and Out at MIT: An Evening with Cory Doctorow"
Lecture and book signing by Cory Doctorow, a writer, public speaker, blogger for BoingBoing and European Affairs Coordinator for the Electronic Frontier Foundation. 5-7 p.m. Bartos Theater. 253-5038.

"Images of Sufi Leaders in Ottoman and Safavid Manuscripts"
Lecture by Ethel Sara Wolper of the University of New Hampshire. 5:30 p.m. Room 3-133. 253-1400.

Trivia Night
Must be over 21. ID required. Every Monday night. 8-11:30 p.m. Thirsty Ear Pub. 258-9754.

TUESDAY
February 14

Valentine's Day
 Object Lesson: "Knowing Where You Are Before GPS"
Gallery talk by MIT Museum curators. Noon, MIT Museum. 253-4444.

"Waves of Pleasure" Valentine's Recital: Brian Robison, Theremin & Charles Shadle, Piano
Popular romantic classics by Handel, Puccini and Rachmaninoff. Noon. Room 14E-109. 253-5686.

Valentine's Day Contra Dance
Music by Apple Crisp, friends and sit-ins. \$5, MIT and Wellesley students free. 8-10:30 p.m. Student Center, Room 491. 354-0864.

WEDNESDAY
February 15

\$30,000 Lemelson-MIT Student Prize Press Conference
Press conference to announce the 2006 winner of the \$30,000 Lemelson-MIT Student Prize. 10:30-11:30 a.m. Room W20-306. 253-3352.

"Knowing the Enemy: Jihadist Ideology and the War on Terror"
Talk by Mary Habeck of Johns Hopkins University. Noon. Room E38-615. 253-7529.

Teaching and Educational Technology
Talk by Professor Steven R. Lerman. 5:30-9 p.m. Faculty Club. 308-9795.

Hibur: MIT-Technion Link Information Session
Information on cultural exchange program. 7:30 p.m. Room W20-407. 253-2982.

THURSDAY
February 16

MIT Chapel Concert
Music for flute and harp. Noon, MIT Chapel. 253-2826.

"Has Anyone Ever Seen a Photograph of Rape?"
Geneviève McMillan-Reba Stewart Lecture on Women in the Developing World presented by Ariella Azoulay of the Camera Obscura School of Art in Tel Aviv. 5:30 p.m. Room 32-141. 253-8844.

"The Vagina Monologues"
Benefit production of Eve Ensler's "The Vagina Monologues" for V-Day, a worldwide movement to stop violence against women and girls. Feb. 16-18. \$10, \$8 students. 8 p.m. Room 10-250.

FRIDAY
February 17

"Finding Form: The Art of Richard Filipowski"
The work of renowned sculptor and MIT faculty member Richard Filipowski. MIT Museum. Noon-5 p.m. \$5 adults; \$2 students, seniors and children 5-18; free with an MIT ID. 253-4444.

MIT Guest Artist in Residence Concert
Biava String Quartet with Marcus Thompson, viola. 8 p.m. Kresge Auditorium. 253-2826.

"Baile de Pasion" – A Night of Argentine Tango Dancing
Beginner tango class followed by tango dancing. 8-11:30 p.m. Room W20-Lobdell Hall. 939-7218.

SATURDAY
February 18

"COLLISION box #2: Cars and Stars"
Andy Zimmermann's multimedia installation, "Cars and Stars," projects digital animation and video onto a three-dimensional sculpture, with accompanying digital sound composition. \$5 adults; \$2 students; free with MIT ID. Noon-5 p.m. MIT Museum. 253-4444.

Varsity Women's Basketball vs. Smith College
1 p.m. Rockwell Cage. 258-5265.

hiLaRiUm @ Thirsty Ear Pub
Comedy duo, The Walsh Brothers. 8 p.m. Thirsty Ear Pub. 258-9754.

SUNDAY
February 19

Chantey Sing
Come sing sea music and chanteys with a room full of maritime enthusiasts, professional and amateur singers. 1-4 p.m. MIT Museum.

International Folk Dancing
8-11 p.m. Kresge Rehearsal Room. 253-FOLK.