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TechTalk

SERVING THE MIT COMMUNITY

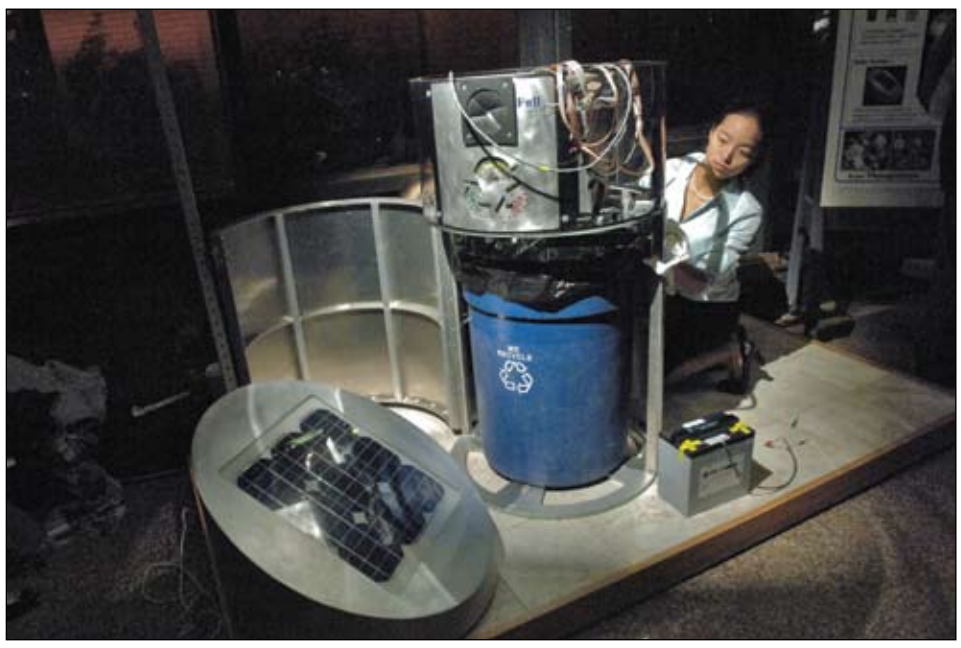

PHOTO / **DONNA COVENEY**

Cynthia Lin, a senior in mechanical engineering, demonstrates a solar-powered bottle and can sorter that she and classmates built as part of last semester's 2.009 Product Engineering Processes class.

Students unveil eco-product prototypes

David Chandler
News Office

The assignment was wide open: Design something based on the principles of reduce, reuse and recycle, and develop it into a prototype product. The results ranged from simple mechanical devices to complex electronic machines, but all served that central purpose in original ways.

To meet the challenge, seven teams of 18 students in last semester's 2.009 Product Engineering Processes class, taught by David Wallace, came up with a wide variety of ingenious ideas, which they presented last month at a packed session attended by about 150 outside engineers and product developers.

"A big part of it is figuring out a good problem to solve," said Wallace, the Esther and Harold E. Edgerton Associate Professor of Mechanical Engineering and engineering systems co-director of the MIT CADlab. "Otherwise, you could do a really nice thing that's irrelevant. So the first thing is deciding where to put your energy."

Some of the projects resulting from the class are already being tried in real-world settings and could become commercial products. One of these is a solar-powered bin that automatically sorts the recyclable bottles and cans dumped into it.

The bin, called Recycl-o-sort, is being tested in Boston's Codman Square area as part of Family, Inc.'s recycling awareness campaign and a citywide antilitter campaign. The self-contained device uses a turntable to pass each item through three different sensors, whose readings can differentiate between glass, plastic and aluminum containers, or nonrecyclable trash, directing each type into a separate storage bin.

> *The first thing is deciding where to put your energy.*
>
> **David Wallace**
> **Esther and Harold E. Edgerton Associate Professor of Mechanical Engineering**

Another team addressed the problem of poorly insulated houses in Pakistan, where winter temperatures can be severe in the north. They came up with a way of making insulation panels out of old plastic bottles, of which about a half million are discarded each year in the city of Karachi alone. The cost of panels sufficient to insulate a typical home would be paid back in fuel savings after one year, the students calculated, and in the process would create jobs for local people while reducing local fuel needs and the amount of waste sent to landfills.

Also working to help with developing nations' needs, one team developed a way of processing the West African shea nut into a butter that can be used both for cooking oil and cosmetics, using a bicycle-powered grinding machine. The device replaces the traditional mortar-and-pestle method or higher-priced, centralized mills, and can be built from locally available materials and labor.

The team took its prototype to Ghana in January for field-testing at a local women's co-op. People from various villages will be invited to watch the tests, and microfinancing through local institutions will be arranged for those who want to put the system to work.

Another project that could help developing-world farmers is a system for sorting coffee beans, which must be sorted to a uniform size before roasting. Aimed at the estimated 20 million or more small-scale coffee farmers worldwide, the device,

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Computer vision may not be as good as thought

Cathryn M. Delude
McGovern Institute

For years, scientists have been trying to teach computers how to see like humans, and recent research has seemed to show computers making progress in recognizing visual objects. A new MIT study, however, cautions that this apparent success may be misleading because the tests being used are inadvertently stacked in favor of computers.

Computer vision is important for applications ranging from "intelligent" cars to visual prosthetics for the blind. Recent computational models show apparently impressive progress, boasting 60-percent success rates in classifying natural photographic image sets. These include the widely used Caltech101 database, intended to test computer vision algorithms against the variety of images seen in the real world.

However, James DiCarlo, a neuroscientist in the McGovern Institute for Brain Research at MIT, graduate student Nicolas Pinto and David Cox of the Rowland Institute at Harvard argue that these image sets have design flaws that enable computers to succeed where they would fail with more-authentically varied images. For example, photographers tend to center objects in a frame and to prefer certain views and contexts. The visual system, by contrast, encounters objects in a much broader range of conditions.

IMAGE / **NICOLAS PINTO**

The human brain easily recognizes that this car is the same object, but the variations in the car's size, orientation and position are a challenge for computer-vision algorithms.

"The ease with which we recognize visual objects belies the computational difficulty of this feat," explains DiCarlo, senior author of the study in the Jan. 25 online edition of PLoS Computational Biology. "The core challenge is image variation. Any given object can cast innumerable images onto the retina depending on its position, distance, orientation, lighting and background."

The team exposed the flaws in current tests of computer object recognition by using a simple "toy" computer model inspired by the earliest steps in the brain's visual pathway. Artificial neurons with properties resembling those in the brain's primary visual cortex analyze each point in the image and capture low-level information about the position and orientation

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PHOTO / **WILLIAM LITANT**

Snow board

Unknown innovators turned an undeveloped patch of land in front of Building 33 (Aero-Astro headquarters) into an environmentally friendly, self-erasable blackboard. On it is written Tsiolkovsky's equation, which determines the performance of a rocket.

COMMUNITY

IRAQ: THE HUMAN COST

New CIS web site provides resources to come to terms with the violence in Iraq.

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NINETY-DEGREE TURN

Institute Professor Emeritus Nevin Scrimshaw celebrates his 90th birthday—on the ski slope.

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Hilts named new Knight Fellowships director

Philip J. Hilts, the author of six books and a prize-winning health and science reporter for The New York Times and The Washington Post, has been named director of the Knight Science Journalism Fellowships program. He will succeed Boyce Rensberger, who retires this summer after 10 years in the job.

Philip Hilts

Hilts, whose journalism career began in 1968, was the Times reporter who broke the story of the tobacco industry's 40-year cover-up of its own research showing that tobacco was harmful and addictive. His most recent book, "Rx for Survival: Why We Must Rise to the Global Health Challenge," was a New York Times Notable Book of the Year.

A long-time teacher of science journalism at Boston University, Hilts will also take over Rensberger's teaching role in MIT's Graduate Program in Science Writing.

Hilts said he was thrilled to have the chance to lead the program, especially during the rapidly changing economic environment in journalism and the rise of new media that are altering the craft, possibly in fundamental ways.

"This is the best program of its kind anywhere, and has for decades been the source of enthusiasm and high standards that science journalists look to," he said. "Now it has got even more to do, helping journalists launch themselves into the electronic future, again with enthusiasm while maintaining high standards.

"MIT is the liveliest place for science training on the planet, and it will be a pleasure to give more journalists the chance to come here to catch up on the latest and best," Hilts said.

Dean Deborah Fitzgerald of the School of Humanities, Arts, and Social Sciences, who chaired the search committee, said Hilts would use his "extraordinary experience and energy" to support the many science journalists who come to MIT each year.

"The Knight Fellowships program is a major part of MIT's effort to improve the public understanding of science and technology, and I'm confident that Phil will take the program to even greater heights," she said.

The Fellowships program, which will celebrate its 25th anniversary in February, is the nation's leading program for advanced education in science for mid-career journalists. Each year, 10 to 12 reporters, editors and producers are chosen to spend an academic year on campus, taking courses. The program also stages three shorter workshops each year for additional groups of science, medical and environment reporters.

Funded chiefly by an endowment from the John S. and James L. Knight Foundation, the program is a component of the Science, Technology and Society Program in the School of Humanities, Arts, and Social Sciences. It began in 1983 as the Vannevar Bush Fellowships in the Public Understanding of Technology and Science, founded by Victor K. McElheny, who retired in 1998.

PHOTO / **DONNA COVENEY**

Making a splash

Senior Doria Holbrook flies skyward as she practices diving at the Zesiger Center. Holbrook, a mechanical engineering major, was a top high school pole-vaulter, but foot problems led her to switch to diving when she arrived at MIT. Her new athletic career rekindled her competitive nature, she says. "Even though everyone had been telling me that I would never be a collegiate diver, I didn't really have a choice. I had to do it anyways." Now, four years into a rigorous training regimen ("no whining," she says), she has set herself a soaring goal: to qualify for the Olympic trials in June. Follow her story as she blogs about her experiences at scripts.mit.edu/~newsoffice/stringers.

OBITUARIES

Kenneth A. Wright, longtime researcher at MIT, 88

Kenneth Wright '47, SM '55, a physicist who spent more than 60 years at MIT researching the effects of radiation, died Jan. 7. He was 88.

Markus Zahn, the Thomas and Gerd Perkins Professor of Electrical Engineering, worked with Wright at the High Voltage Research Laboratory (HVRL) and was his neighbor and friend. Zahn said he remembered Wright as a skilled collaborator on many diverse projects applying ionizing radiation to radiation oncology and to physical, biological and chemical systems, including radiation sterilization of foods and body-tissue materials; use of radiation to prolong the life of polyethylene material used in hip replacements; disinfection of waste water sludge by electron-beam radiation; and use of radiation to examine cargo containers for dangerous materials.

Wright's area of expertise was in determining the radiation doses required to sterilize, pasteurize and modify materials, and in verifying the effects of these doses on irradiated materials.

Wright came to MIT from the U.S. Army, where he worked on radar during World War II. Between 1947 and 1985, he worked as a physicist staff member of the HVRL in the Department of Electrical Engineering. In 1985, he became a half-time staffer in HVRL and in 1995 moved to part-time. During his career, he authored or co-authored more than 70 research papers.

Wright is survived by his wife, Marguerite (Fleming) Wright, four daughters, six grandchildren and two great-grandchildren. A memorial service was held Jan. 12 in Lexington, Mass., where he lived. In lieu of flowers, donations in his memory may be made to any of the following: DeCordova Museum, Lahey Clinic, Church of Our Redeemer, Sandy Bay Yacht Club (Education Fund) or Haverford College.

Akiva Yaglom, research fellow, 86

Akiva Yaglom, a research fellow in the Department of Aeronautics and Astronautics and an expert in turbulence theory, passed away Dec. 12 following a brief illness. He was 86.

Yaglom was born in 1921 in Kharkov, Ukraine, and moved to Moscow in 1926. He worked at the Institute of Atmospheric Physics, Academy of Sciences, and was a full professor in the Probability Theory and Statistics Department of Moscow University.

Yaglom received a doctor of science degree—the highest scientific degree in the Soviet Union—in 1955 for work on theories of stochastic processes and their application to turbulence theory.

In 1988, he received the American Physical Society's Otto Laporte Award for his "fundamental contribution to the statistical theory of turbulence and the study of its underlying mathematical structure."

In 1992, Yaglom came to the United States and MIT. He was subsequently granted permanent resident status.

Yaglom authored six books and some 120 papers. Most of his materials have been published in English and many other languages and are regarded as engineering classics. They include the two-volume set Statistical Fluid Mechanics, published by MIT Press.

Yaglom had been scheduled to receive the European Geosciences Union's Lewis Fry Richardson Medal next spring honoring his work in nonlinear geosciences.

He is survived by his wife and several children.

Robert Weber, MIT physicist, 81

Physicist and astronomer Robert Weber SM '59, who worked at Lincoln Laboratory for more than three decades and helped develop a way to detect asteroids that might pose a threat to Earth, died at his home Jan. 2. He was 81.

Weber grew up in Brooklyn and New Jersey. Under his father's influence, he became a teen expert in radio communications when he enlisted in the Army in 1944. He was assigned to Japan and honorably discharged in March 1945. He served as a technical advisor in Korea for the U.S. War Department while working for RCA from 1945 to 1949.

After receiving a master's degree in physics from MIT, Weber worked for Lincoln Laboratory for 34 years starting in 1962. During his career, he co-developed the Lincoln Near Earth Asteroid Research (LINEAR) project, which detects and tracks asteroids near Earth. As a result of his research, Weber and his team discovered seven asteroids in the mid-1990s. Weber also led the team that developed the U.S. Air Force's deep-space satellite tracking network.

Weber met his late wife, Chung-Hi "Helen" Koh, in Korea. They raised seven children together: Robert G. Weber, Lesley Gustafson and Teresa Weber of Northboro, Mass.; William Weber of Columbus, Ohio; Linda Weber of New Hartford, N.Y.; Anthony Weber, predeceased; and Carl Weber of Biddeford, Maine. Memorial donations may be made to the Gladden Community House, 183 Hawkes Ave., Columbus, Ohio.

Robert P. Greene, 74

Robert P. Greene '55, who spent more than 20 years working for MIT until his retirement in 1996, died Dec. 18. He was 74.

Greene's career at MIT focused mainly on two major international energy assessments and international programs and projects that included activities in India, Germany, Thailand, Malaysia and Ireland. His appointments were in the schools of Engineering, Management, and Architecture and Planning.

Greene spent nearly eight years representing MIT on overseas assignments in Indonesia and Egypt. His final 11 years at MIT were spent with the Media Lab, retiring in 1996 as the associate director for administration, finance and operations.

He is survived by his wife of 51 years, Edith (Richards) Greene, three daughters and four grandchildren. Donations in his memory may be made to MIT's Independent Residence Development Fund in Robert Greene's memory: MIT Alumni Fund, Att: Bonny S. Kellermann, MIT Room E19-370.

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MIT nutrition scientist celebrates a milestone

David Chandler
News Office

It's not every day that one of MIT's Institute Professors Emeritus—the elite of the faculty—celebrates a 90th birthday. But Nevin S. Scrimshaw, who founded MIT's Department of Nutrition and Food Science (now disbanded), reached that milestone Jan. 20.

Dr. Scrimshaw, who holds a PhD in physiology from Harvard, an MD from the University of Rochester and later an MPH from Harvard, began teaching at MIT in 1961. Scrimshaw, the first recipient of the James R. Killian faculty award, continued here until his retirement in 1988. He remains very active in nutrition research, as well as advising and consulting for organizations around the world devoted to food and nutrition, including many that he helped to establish. He is president of the Boston-based International Nutrition Foundation.

"I'm pretty much as active professionally as ever," he says. He has ongoing research projects in Syria, Bangladesh and Ghana, among other countries, and last year ran workshops on nutrition and research management in India, Thailand, Ghana and Taiwan. He continues to publish research papers, including one last year in the Proceedings of the National Academy of Sciences, and is doing follow-up studies on the effects of lysine supplements in lowering stress and reducing diarrhea in Ghana and Bangladesh.

In 1991, he was awarded the World Food Prize in recognition of his tireless efforts and significant contributions to fighting malnutrition in dozens of countries. Beginning in the 1950s, he researched the causes of kwashiorkor, a deadly protein-deficiency disease that affects children throughout the developing world. He came up with a variety of inexpensive, protein-rich nutritional supplements to combat the disease, based on locally available produce in different parts of the world, which remain in widespread use.

Nevin Scrimshaw

He has put his knowledge of nutrition to use to create a regime of diet and exercise that he credits with helping to sustain his own good health. "I had a wake-up call that I hadn't been getting either the diet or the exercise that I knew to be important," he says, referring to a triple bypass operation he had 25 years ago. "I said this was not going to happen again," and besides a longstanding love of hiking and downhill skiing he now has tri-weekly strength-training workouts, and is careful about maintaining a nutritious diet and appropriate weight.

"The diets of people today are, by and large, not sufficiently varied: They're too calorically dense and portion sizes are too large," he says, which helps account for the epidemic of obesity and associated chronic diseases. Eating better doesn't require specialized knowledge, but it does require emphasizing vegetables and fruits along with seafood and poultry and minimizing red meat, fatty foods and high-calorie desserts, he says. "Common sense!"

He has written or edited more than 20 books and hundreds of papers on nutrition, food science and public health. A member of the National Academy of Sciences and the Institute of Medicine, he has received dozens of awards, including a gold medal as "Hero of Public Health" from President Vicente Fox of Mexico, and a knighthood from the king of Thailand.

Scrimshaw says that during his years at MIT, the Department of Nutrition and Food Science came to "serve as a model for other departments around the U.S. and the world," and its graduates have become leaders of major international nutrition organizations and national institutes in many countries. "I'm grateful for the tremendous amount of support I received from MIT all those years," he says. "For me, it was a very happy and productive time."

Scrimshaw now lives in the White Mountains of New Hampshire with Mary, his wife of 67 years, and still enjoys skiing in the area, often in the company of some of his five children and eight grandchildren. He was out on the slopes five times last week, including on his birthday. One of his sons, also named Nevin, earned his PhD in mathematics at MIT in 1985. His daughter, Susan C. Scrimshaw, also a renowned public health specialist (and a fellow recipient of Mexico's presidential gold medal), is the president of Simmons College in Boston.

Schoolteachers get a 'lift' at MIT Lincoln Laboratory

Program spurs students to pursue scientific careers

Dan Gabriner asks students to solve a quadratic equation in his Weston High School class. A voice of discontent issues a challenge familiar to math teachers everywhere: "What can you do with this stuff anyway?" That's when Gabriner tells his class what he did over the summer. The students are surprised to learn that their teacher worked beside MIT Lincoln Laboratory scientists to produce an algorithm to control airport runway warning lights, minimizing the chance that two airplanes approach the same runway simultaneously. After hearing Gabriner describe his work, the students begin solving equations with new vigor.

> *Demand for science and engineering workers has grown at four times the rate of the U.S. workforce.*
>
> **Metro Southwest Regional Employment Board**

To encourage high-school students to pursue careers in science, technology, engineering and math, Lincoln Laboratory hires local teachers every summer to work alongside seasoned scientists. This public, private and education sector partnership is possible through the Leadership Initiatives for Teaching and Technology (LIFT2) Program, is sponsored by the Massachusetts Department of Education and is funded through the No Child Left Behind Act.

LIFT2 teachers immerse themselves in various fields, including biotechnology, nanotechnology, information technology and process manufacturing. Through the five- to eight-week externship, the teachers gain experience with the skill sets needed in a technical profession, thereby enabling them to prepare their students for a career in such a field. Students are more likely to hear about exciting real-world uses of science, making a career in science and engineering more desirable and accessible.

Gabriner, mentored by James Kuchar, an aeronautical engineer and assistant head of Lincoln Laboratory's Surveillance Systems group, evaluated data for the Runway Status Lights project. He analyzed the scenario of two planes simultaneously approaching a runway intersection at high speed, and researched the algorithm logic that controls the warning lights.

"My teaching style relies on applying math to real-world problems," explains Gabriner. "These stories are more effective when I can say that I used the math myself. The Runway Status Lights project uses multilateration, quadratics, probability and statistics. I can show my students how each type of math was used to create a system that prevents airplanes from crashing into one another while landing."

The long-term goals of LIFT2 are to entice students to pursue a technical career and help teachers apply information technology to science and math classes. Gabriner says, "After I've had a recent engineering experience, I can develop better projects based on real-world situations … plus, the animations of runway incursions are cool!"

Mark Zagaeski, a Lexington High School physics teacher, says he'll draw on the experience of his externship to convey the importance of collaboration in science. Zagaeski was mentored by Tom Jeys, a senior staff member in Lincoln Laboratory's Laser Technology and Applications group, while working on bioaerosol detection. With a team of scientists, they built a sensor that can detect harmful particles in the atmosphere. "Students often perform alone, but in real-life research situations, people work in teams," he says. "Each team member brings different specialties—they can solve problems together that might be too difficult for one of them alone."

The time at Lincoln Laboratory "reinvigorated my passion for science," Zagaeski says. The LIFT2 Program hopes that enthusiasm is transferred to the students, drawing them into the technical workforce and easing the national shortage of scientists and engineers. Such an influx of young talent is sorely needed. According to the Metro Southwest Regional Employment Board, which runs LIFT2, over the past two decades the number of students receiving technical degrees at U.S. universities "has remained unchanged" while "demand for science and engineering workers has grown at four times the rate of the U.S. workforce." In fact, China now graduates six times more engineering students than the United States. By participating in LIFT2, MIT Lincoln Laboratory hopes to strengthen U.S. engineering by leading youths to become the next generation of inventors, scientists and engineers.

PHOTO / **JON BARRON**

Dan Gabriner, a Weston High School math teacher, sits with Maria Picardi Kuffner of the Laboratory's Surveillance Systems group.

MIT In The World

Pumping up desert agriculture

David Chandler
News Office

The parched landscape of Sudan, on the southern edge of the Sahara desert, is among the world's driest regions, with a nine-month dry season and a highly unreliable rainy season. Large-scale farmers there manage to grow about half of the impoverished nation's food production with the help of motorized irrigation pumps, but for individual subsistence farmers and their families—about two-thirds of the nation's 40 million people—growing crops mostly means hauling water by hand in buckets.

PHOTO COURTESY / **MUSTAFA DAFALLA AND ZAHIR DOSSA**

A Sudanese farmer operates a treadle-powered foot pump.

That's a method that's inefficient and unreliable, often leading to crop failures that add to Sudan's burden of malnutrition and poverty. But thanks to a new venture set up by two MIT students, with a little bit of help from small grants from the MIT Public Service Center and Legatum Center, some of those farmers will soon get a chance to improve their crops, their livelihoods and the health of their families.

Mustafa Dafalla, a third-year student in civil and environmental engineering whose parents come from Sudan and who has visited there often, and Zahir Dossa, a fourth-year student at MIT Sloan School of Management, have created a new nonprofit organization called Selsabila to bring a simple technological solution to the region: inexpensive treadle-powered water pumps, developed and produced by a company in India.

"There are plenty of programs in place to help large farmers," Dafalla says, "but nothing for low-income farmers."

The students began the project during last year's IAP, when they traveled to Sudan to find local supervisors and managers for the project, and to India to test the pumps and make arrangements with the manufacturer. After working over the course of the year to set up their company and finalize their plans, this month they will be visiting villages to promote the pumps and take orders. They aim to get the first 100 or more of the $100 pumps into the hands of Sudanese farmers by this May, with the help of local microfinance institutions in that country.

The pumps are expected to pay for themselves within the first year, through increased output—they should triple the average farmer's food production. At the same time, the venture will create new local businesses in the nation, as they set up stores to sell and service the pumps in local marketplaces.

Ultimately, Dossa and Dafalla hope to turn over the whole company to local people, where it would provide a source of revenue to help the country's struggling economy.

The organization's name, Selsabila, comes from the Koran, Dafalla explains. It means "a river that springs forth in heaven," he says. "It's an upbeat name—when people hear it, they would think of flowing water. A lot of these farmers are in despair, and we want to make people feel hope."

In The World is a new column that explores the ways people from MIT are using technology—from the appropriately simple to the cutting-edge—to help meet the needs of local people in places around the planet. If you know of a good example and would like the News Office to write about it, please e-mail dlc1@mit.edu.

Why men are more prone to liver cancer

Anne Trafton
News Office

A fundamental difference in the way men and women respond to chronic liver disease at the genetic level helps explain why men are more prone to liver cancer, according to MIT researchers.

"This is the first genome-wide study that helps explain why there is such a gender effect in a cancer of a nonreproductive organ, where you wouldn't expect to see one," said Arlin Rogers, an MIT experimental pathologist and lead author of a paper that appeared last month in the journal Cancer Research.

Men develop liver cancer at twice the rate of women in the United States. In other countries, especially in Asia, the rate for men can be eight or 10 times that for women.

Liver cancer is the fifth most common cancer in the world and the third-biggest killer. Rates in the United States are lower than those in other countries but are rising rapidly, in part due to high hepatitis C infection rates during the 1970s from blood transfusions and IV drug abuse. Obesity and type 2 diabetes are additional risk factors of current concern.

"It's an epidemic waiting to happen," said Rogers, a principal research scientist in MIT's Division of Comparative Medicine.

Male and female livers are inherently different, with most of the differences arising during puberty when male livers are exposed to periodic bursts of growth hormone. This prompts male livers to express different genes than female livers, which explains why men and women can have different reactions to certain antibiotics and other medications.

The MIT team studied mice, which also have higher liver cancer rates among males. The mice were infected with Helicobacter hepaticus, which produces the same hepatitis symptoms characteristic of human hepatitis B and C.

In humans and mice, healthy males and females both can respond to acute toxins and other stresses. But the male liver is less well equipped to cope with the chronic inflammation induced by certain infectious agents.

When the male mice developed chronic hepatitis, some masculine liver genes were upregulated and others turned off. At the same time, some feminine genes were reactivated. This resulted in an unpredictable gene profile termed "liver-gender disruption."

"There's no rhyme or reason to it. There's just a complete scrambling of masculine and feminine genes," said Rogers.

When the researchers mapped the sex-specific genes, they found intimate associations with inflammatory pathways. In males with chronic hepatitis, some gender-specific genes were overexpressed and others underexpressed, the liver was unable to maintain normal metabolic function and cancer emerged in a significant number of the animals.

The authors propose that adult females are less vulnerable to liver-gender disruption because there is no requirement for the active signaling needed to maintain a masculine gene profile. Because the female liver follows the "default" developmental pathway, a greater disturbance is required to initiate the cancer process, said Rogers.

The researchers had expected that castrating male mice at one year of age when they had chronic hepatitis, but not cancer, would have a protective effect. They also gave some mice a powerful androgen to see if that would promote tumors. Neither treatment had any effect, demonstrating that male sex hormones such as testosterone do not directly promote liver cancer in adults.

PHOTO / **DONNA COVENEY**

Arlin Rogers, principal research scientist in the Division of Comparative Medicine, and colleagues have discovered why men are more susceptible to liver cancer than women.

These results could be relevant to cancers of other organs, such as the stomach and colon, which also are associated with chronic inflammation and are more common in men.

"This study was a collaboration between the Division of Comparative Medicine and Center for Environmental Health Sciences. It would not have been possible without the expertise and team-oriented philosophy of the wonderful scientists we have here," said Rogers.

Authors of the paper are Elizabeth Theve, postdoctoral fellow in the Division of Comparative Medicine (DCM); Yan Feng, research scientist in DCM; Rebecca Fry, assistant scientific director for the Center for Environmental Health Sciences (CEHS); Koli Taghizadeh, research scientist in CEHS; Kristen Clapp, research technician in DCM; Chakib Boussahmain, technical assistant in DCM; Kathleen Cormier, supervisor of histology in DCM; and senior author James Fox, director of DCM and a professor in MIT's Department of Biological Engineering.

The research was funded by the National Institutes of Health.

MIT imaging shows culture influences brain function

Cathryn M. Delude
McGovern Institute

People from different cultures use their brains differently to solve the same visual perceptual tasks, MIT researchers and colleagues report in the first brain imaging study of its kind.

Psychological research has established that American culture, which values the individual, emphasizes the independence of objects from their contexts, while East Asian societies emphasize the collective and the contextual interdependence of objects. Behavioral studies have shown that these cultural differences can influence memory and even perception. But are they reflected in brain activity patterns?

To find out, a team led by John Gabrieli, a professor at the McGovern Institute for Brain Research at MIT, asked 10 East Asians recently arrived in the United States and 10 Americans to make quick perceptual judgments while in a functional magnetic resonance imaging (fMRI) scanner—a technology that maps blood flow changes in the brain that correspond to mental operations.

The results are reported in the January issue of Psychological Science. Gabrieli's colleagues on the work were Trey Hedden, lead author of the paper and a research scientist at McGovern; Sarah Ketay and Arthur Aron of State University of New York at Stony Brook; and Hazel Rose Markus of Stanford University.

Subjects were shown a sequence of stimuli consisting of lines within squares and were asked to compare each stimulus with the previous one. In some trials, they judged whether the lines were the same length regardless of the surrounding squares (an absolute judgment of individual objects independent of context). In other trials, they decided whether the lines were in the same proportion to the squares, regardless of absolute size (a relative judgment of interdependent objects).

In previous behavioral studies of similar tasks, Americans were more accurate on absolute judgments, and East Asians on relative judgments. In the current study, the tasks were easy enough that there were no differences in performance between the two groups.

However, the two groups showed different patterns of brain activation when performing these tasks. Americans, when making relative judgments that are typically harder for them, activated brain regions involved in attention-demanding mental tasks. They showed much less activation of these regions when making the more culturally familiar absolute judgments. East Asians showed the opposite tendency, engaging the brain's attention system more for absolute judgments than for relative judgments.

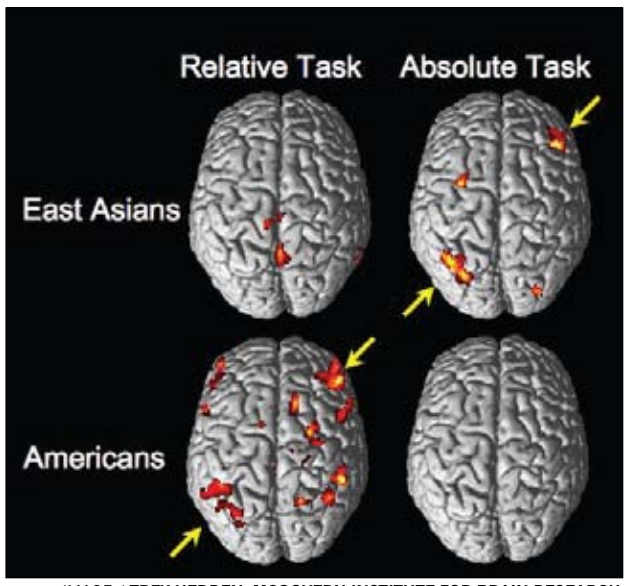


IMAGE / **TREY HEDDEN, MCGOVERN INSTITUTE FOR BRAIN RESEARCH**

The image above shows brain activity in East Asians and Americans as they make relative and absolute judgments. The arrows point to brain regions involved in attention that are engaged by more-demanding tasks. Americans show more mental activity while making relative judgments than absolute judgments. East Asians show the opposite pattern.

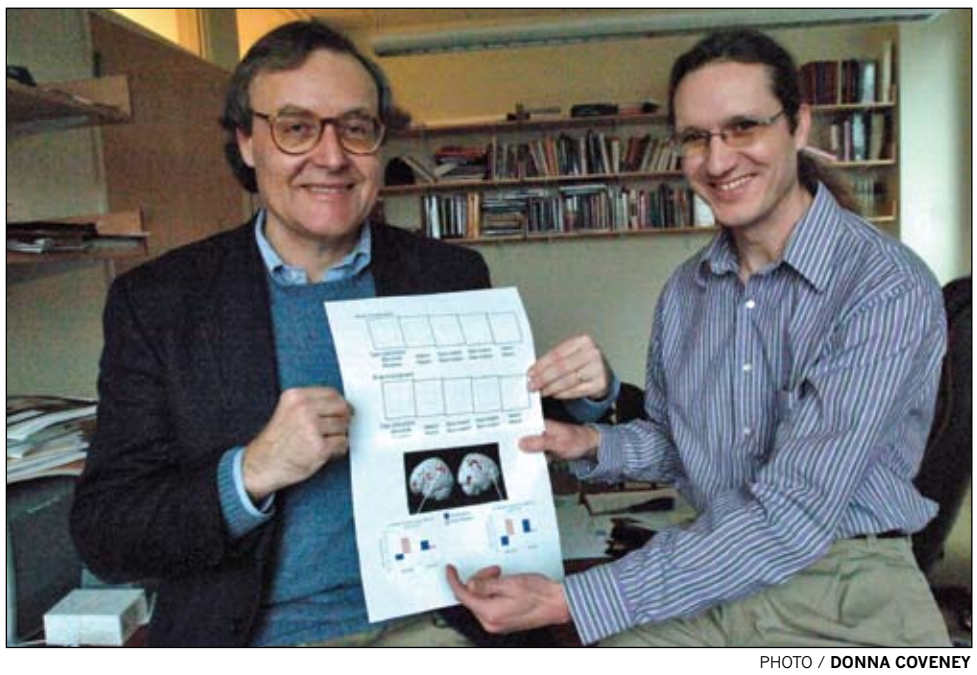


PHOTO / **DONNA COVENEY**

John Gabrieli, the Grover Herman Professor of Health Sciences and Technology and Brain and Cognitive Sciences, left, and McGovern Institute research scientist Trey Hedden display the results from their recent psychological study.

"We were surprised at the magnitude of the difference between the two cultural groups and also at how widespread the engagement of the brain's attention system became when making judgments outside the cultural comfort zone," says Hedden.

The researchers went on to show that the effect was greater in those individuals who identified more closely with their culture. They used questionnaires of preferences and values in social relations, such as whether an individual is responsible for the failure of a family member, to gauge cultural identification. Within both groups, stronger identification with their respective cultures was associated with a stronger culture-specific pattern of brain activation.

How do these differences come about? "Everyone uses the same attention machinery for more-difficult cognitive tasks, but they are trained to use it in different ways, and it's the culture that does the training," Gabrieli says. "It's fascinating that the way in which the brain responds to these simple drawings reflects, in a predictable way, how the individual thinks about independent or interdependent social relationships."

Gabrieli is the Grover Herman Professor of Health Sciences and Technology and Brain and Cognitive Sciences, and holds an appointment at the Harvard-MIT Division of Health Sciences and Technology. This study was funded by the National Institutes of Health and supported by the McGovern Institute.

Team IDs weakness in anthrax bacteria

Anne Trafton
News Office

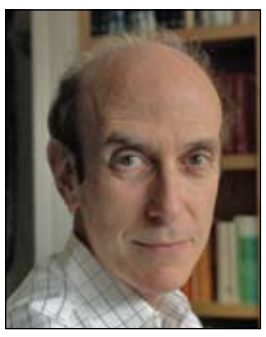
MIT and New York University researchers have identified a weakness in the defenses of the anthrax bacterium that could be exploited to produce new antibiotics.

The researchers found that nitric oxide (NO) is a critical part of Bacillus anthracis's defense against the immune response launched by cells infected with the bacterium. Anthrax bacteria that cannot produce NO succumb to the immune system's attack.

Stephen Lippard, the Arthur Amos Noyes Professor of Chemistry at MIT and an author of a paper on the work, said antibiotics developed to capitalize on this vulnerability could be effective against other bacteria that employ the same defense system. Those bacteria include Staphylococcus aureus, which commonly causes infections in hospitals and can be extremely drug-resistant.

The paper appeared in the Jan. 21 online edition of the Proceedings of the National Academy of Sciences.

Anthrax occurs naturally around the world and can infect all warm-blooded animals, including humans. Treatment usually includes large doses of intravenous and oral antibiotics, but the disease can often be fatal—especially if treatment is not started right away.



Stephen Lippard

In the human immune system, specialized cells called macrophages are the first line of defense against anthrax infection. Macrophages engulf the bacteria and bombard them with reactive oxygen and nitrogen species, which create chemical reactions toxic to the bacteria.

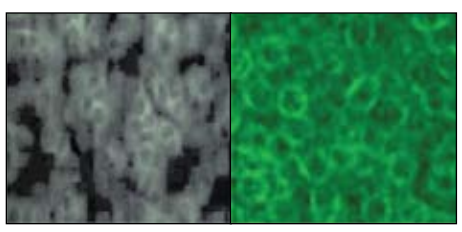
The research team found that NO produced by the bacteria pre-emptively defends against attack by reactive oxygen species produced by the macrophages soon after infection. Twelve hours later, when the macrophages release NO to join in the attack, it is too late—by then the bacteria have taken over and eventually destroy the macrophages.

When the gene for the enzyme that synthesizes NO is knocked out in the bacteria, they cannot defend against early attack by the macrophages, which can then survive the infection.

"With the aid of an intracellular probe developed in our laboratory, which fluoresces in the presence of NO, our collaborators Evgeny Nudler and his group discovered a completely new target for the next generation of antibiotics," said Lippard.

With this knowledge in hand, the researchers are now using the fluorescent probe to screen libraries of chemicals for compounds that could potentially interfere with the bacterium's ability to synthesize NO, said Lippard. Such compounds could eventually be developed into new antibiotics.

Lead author of the paper is Konstantin Shatalin of the New York University School of Medicine. The research was funded by the National Institutes of Health and the National Science Foundation.



IMAGES COURTESY / **STEPHEN LIPPARD**

MIT and NYU researchers used a fluorescent probe to detect the presence of nitric oxide (NO) in macrophages infected with anthrax. The anthrax bacteria in these images have lost the ability to produce NO, a critical component of its infectious attack. Two hours after infection (left image), very little NO is present. Eighteen hours after infection, the macrophages have produced their own NO to combat the anthrax.

New 'DICE-K' technique used to probe brain circuits

Revolutionary process helps researchers understand how memories are formed

Deborah Halber
News Office Correspondent

It's no secret that Susumu Tonegawa is an ardent fan not just of the Boston Red Sox but also of compatriot and pitcher Daisuke Matsuzaka. But now that admiration has been immortalized in a groundbreaking tool that allows researchers to see—for the first time—the effect of blocking and unblocking a single neural circuit in a living animal.

Tonegawa and fellow researchers at the Picower Institute for Learning and Memory reported in the Jan. 24 online edition of Science that they invented a method called doxycycline-inhibited circuit exocytosis-knockdown, or DICE-K—a not-so-subtle tribute to the ace Sox pitcher from Japan.

This revolutionary process allowed the researchers to see how bypassing a major memory-forming circuit in the brain affected learning and memory in mice.

"Our data strongly suggest that the hippocampal neural pathway called the trisynaptic pathway, or TSP, plays a crucial role in quickly forming memories when encountering new events and episodes in day-to-day life," said Tonegawa, Picower Professor of Biology and Neuroscience. "Our results indicate that the decline of these abilities, such as that which accompanies neurodegenerative diseases and normal aging in humans, is likely to be due, at least in part, to the malfunctioning of this circuit."

DICE-K, the product of several cutting-edge genetic engineering techniques, allows researchers for the first time to induce and reverse a blockade of synaptic transmission in specific neural circuits in the hippocampus.

"The brain is the most complex machine ever assembled on this planet," Tonegawa said. "Our cognitive abilities and behaviors are based on tens of thousands of molecules that compose several billion neurons, as well as how those neurons are connected.

"One effective way to understand how this immensely complex cellular network works in a major form of cognition like memory is to intervene in the specific neural circuit suspected to be involved," he said.

Computing memories

The hippocampus, a seahorse-shaped brain region, plays a part in memory and spatial navigation. In Alzheimer's disease, the hippocampus is one of the first regions to suffer damage; memory problems and disorientation are among the disease's first symptoms.

The hippocampus is made up of several regions—CA1, CA3 and the dentate gyrus—that are wired up with distinct pathways.

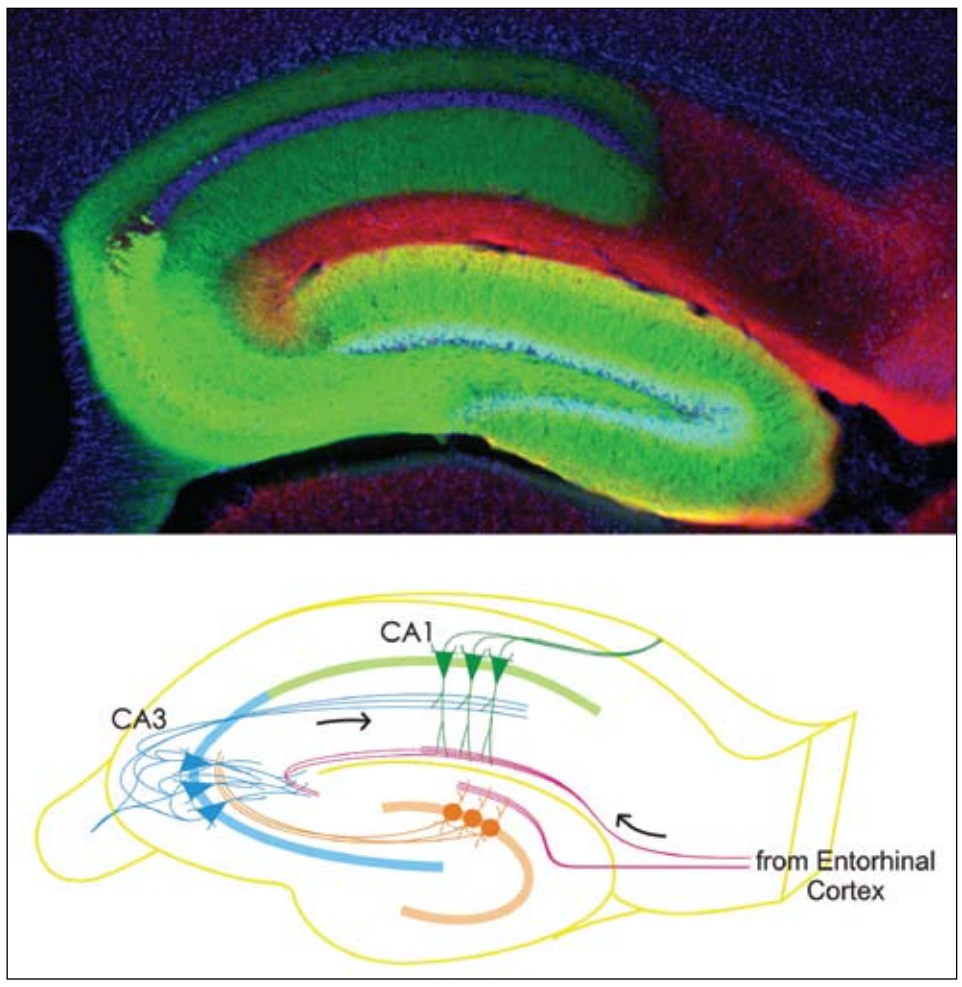


IMAGE COURTESY / **TOSHIAKI NAKASHIBA**

The green-stained section of this mouse hippocampus represents where the new DICE-K technique blocked the neural-signal transmission in one of the hippocampal circuits of the brain.

The MIT study sought to determine how the interactions between neural pathways and the hippocampal regions affect learning and memory tasks.

Imagine that the three hippocampal regions are computers, and neural pathways are the conduits through which the computers get data from all over the brain. The computers perform different tasks, so the types of data processing will depend on which conduits the data travels through.

The hippocampus has two major, parallel information-carrying routes: the trisynaptic pathway (TSP) and the shorter monosynaptic pathway (MSP). The TSP includes data processing from all three hippocampal regions, whereas the MSP skips through most of them.

Using DICE-K, the researchers were surprised to find that mice in which the major TSP pathway was shut down could still learn to navigate a maze. The shorter MSP pathway was sufficient for the job.

However, the maze is a task that is slowly learned over many repeated trials. When the mice were tested with a different task in a new environment that required rapid learning and memory formation, the researchers found that the mice with TSP shut down could not perform the task. Thus, the TSP pathway is required for animals to quickly acquire memories in a new environment. "This kind of learning results in the most sophisticated form of memory that makes animals more intelligent and is known to decline with age," Tonegawa said.

In addition to Tonegawa, a Howard Hughes Medical Institute investigator, authors include Picower Institute research scientist Toshiaki Nakashiba; postdoctoral associate Jennie Z. Young; research scientist Thomas J. McHugh; and HHMI staff affiliate Derek L. Buhl.

This work is supported by the National Institutes of Health and the RIKEN Brain Science Institute.

Short bacterial protein is surprisingly versatile

Anne Trafton
News Office

MIT researchers have discovered why an unusually short bacterial protein can have many more interactions than would normally be expected of something its size, a finding that could have implications in the fight against cancer.

The team, led by biology professor Graham Walker, found that the protein, UmuD, belongs to a recently discovered class of proteins called intrinsically disordered proteins.

Walker said the fundamental principles discovered in the research should help scientists understand the control of human translesion DNA polymerases, a kind of enzyme that helps with DNA replication. The enzymes are important because some help to prevent cancer and others contribute to the disease.

Proteins, which consist of chains of amino acids, locally fold themselves into one of two structures—a helix or a pleated sheet. In contrast, intrinsically disordered proteins lack such well-defined local structures.

The lack of formal structure probably allows such proteins to bind to a wider variety of proteins, Walker said.

"They have some structure, but not the way we're used to thinking about it," said Walker, senior author of a paper on the work, which appeared in the Proceedings of the National Academy of Sciences the week of Jan. 14.

Normally, proteins form a specific structure with binding sites where other proteins can attach. The larger the protein, the more binding sites it can have. A protein like UmuD, which is made of fewer amino acids, would not be expected to have enough binding sites to interact with very many other proteins.

"If you think of it as two jigsaw puzzle pieces, it's hard to see how you could fit much more than one or two pieces together," said Walker, American Cancer Society research professor.

Previous structural studies carried out at high concentrations had shown that UmuD predominantly folds into sheets. However, the MIT researchers used a technique called circular dichroism spectroscopy to reveal that at concentrations similar to those in living bacteria, UmuD appears as a random coil.

As the intrinsically disordered proteins bind with other proteins, they may change their shape, allowing them to then interact with different proteins, potentially creating a chronological sequence of interactions as proteins bind and then are cast off.

UmuD usually is found in groups of two, which implies that it must have some kind of stable protein structure, said Sharotka Maria Simon, lead author of the paper and an MIT PhD recipient now at Brandeis University.

"Even though we call it disordered, UmuD must have enough structure to consistently form a pair," she said.

The new finding sheds light on UmuD's role in the bacterial SOS system, which is called into action when DNA is damaged. In a paper published in Molecular Cell in December, Walker and others reported that UmuD had an unexpected role involving yet another protein in the SOS system.

The SOS system helps activate and control translesion polymerases, enzymes that copy damaged DNA. The system, which is called upon as a last resort when DNA has lesions that regular repair mechanisms can't fix, keeps the cell alive by maintaining its DNA, at the cost of preserving potentially harmful mutations.

UmuD's ability to interact with multiple partner proteins allows it to control the function of two translesion polymerases, coordinating their action with DNA replication.

Other authors of the PNAS paper are F.J.F. Sousa and R. Mohana-Borges of the Universidade Federal do Rio de Janeiro. The research was funded by the National Cancer Institute and a Cleo and Paul Schimmel Fellowship.

High-level panel gives advice to MIT Energy Initiative

David Chandler
News Office

The MIT Energy Initiative received critical input, advice and insights in the first meeting of its External Advisory Board. Meeting in mid-January, the board, chaired by former U.S. Secretary of State George Shultz, was "very supportive of what we're trying to do," said MITEI Director Ernest Moniz.

At its inaugural meeting, the 21-member board "emphasized the importance of an international focus," said MITEI Deputy Director Robert Armstrong, and they "encouraged us to form more international linkups to advance our program." In addition, the board also reinforced "the importance of continuing to develop our communications and outreach into the public discourse about energy issues," Armstrong said. In terms of specific areas of research, the board agreed that a critical area that deserves increased attention is improvements in efficiency, especially in the design of buildings.

MIT President Susan Hockfield established the board to review MITEI's approach to global energy solutions and its current portfolio of activities, and to provide input on policy trends, needs, gaps and opportunities in energy, business, technology and the environment.

The board encompasses diverse backgrounds in energy supply, industry, academia, environmental groups and government, including former MIT professor and Nobel laureate Mario Molina; best-selling author Daniel Yergin of Cambridge Energy Research Associates; former Senator Sam Nunn, CEO of the Nuclear Threat Initiative; Tony Hayward, CEO of BP; and Frances Beinecke, President of the Natural Resources Defense Council.

Others on the board are Stephen Bechtel of SD Bechtel Jr. Foundation; Susan Cischke of Ford Motor Company; Rafael del Pino of Grupo Ferrovial SA; Arthur Goldstein of Ionics; Baba Kalyani ME '72, chair of Bharat Forge; Anne Lauvergeon of Areva; Lawrence Linden ME '76 of Linden Trust for Conservation; Leonardo Maugeri, senior vice president of Eni S.p.A., which recently announced a $50-million grant to the Energy Intiative; Internet pioneer Robert Metcalfe EE '68 of Polaris Venture Partners; Robert Millard of Lehman Brothers; John Reed, retired chair of Citigroup; Kenan Sahin of TIAX LLC; Philip R. Sharp of Resources for the Future; Institute Professor Emeritus Robert Solow; and James Wolfensohn, former head of the World Bank.

"It's an extraordinarily experienced and knowledgeable group," Moniz said. "Their discussions and suggestions were very stimulating. We've got quite a lot to digest and prioritize, and to benefit from their guidance as to how the work we do can best be leveraged to influence public policy."

MIT and ABB announce energy research partnership

Five-year partnership to help develop green technologies, train grad students

MIT and Switzerland-based ABB, a global leader in power and automation technology, have formed a partnership on energy research to help meet the world's need for clean electricity and energy efficiency.

ABB will join MIT's Energy Initiative (MITEI) and will support research in a variety of areas, including nanofluids, power electronics, intelligent robotics and equipment heat management. As a Sustaining Member of MITEI, ABB will have a seat on the MITEI governing board, which provides key input on the direction and success of the Initiative's research portfolio.

"A MITEI partnership with ABB creates enormous opportunities to provide technology solutions to global energy challenges," said MITEI Director Ernest J. Moniz. "The ABB corporate portfolio offers a range of potential research focus areas in which MIT has substantial research capability and could make a major contribution. ABB's commitment to sustainability, energy efficiency and reducing greenhouse-gas emissions is especially exciting from a research perspective."

"This partnership is another significant step in ABB's strategy of combining our leading industrial-technology competence with cutting-edge international research," said Peter Terwiesch, ABB's chief technology officer. "New technology is the key to tapping the potential of energy efficiency in the face of the soaring demand and increasing env ironmental concerns."

ABB spends some $1.1 billion per year on research and development. Technology plays a crucial role in meeting energy and environmental challenges. Soaring energy demand has also placed a premium on energy efficiency, a key area of ABB's research and development activity, comprising about half of its research investment.

In addition to supporting the research program, ABB's five-year, $5-million collaboration will support graduate fellowships and MITEI's energy research "seed fund." The fund was set up to promote the development of a broad range of innovative energy technologies and concepts from researchers across the Institute.

MITEI Deputy Director Robert Armstrong noted that "over the length of this partnership, ABB will support 10 graduate energy fellowships at the Institute, the ABB-MIT Energy Fellows. ABB's commitment to developing the next generation of energy technologists will help nurture and develop young energy researchers to meet the global energy challenges of the next several decades."

MITEI is an Institute-wide initiative designed to help transform the global energy system to meet the challenges of the future. The MIT Energy Initiative includes research, education, campus energy management and outreach activities, and an interdisciplinary approach that covers all areas of energy supply and demand, security and environmental impact. For more information, please visit web.mit.edu/mitei.

ABB (www.abb.com) is a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs more than 110,000 people. For more information on ABB's energy-efficiency activities, please visit www.abb.com/energyefficiency or www.abb.com/news.

2.009

Continued from Page 1

which can be locally manufactured and should pay for itself in two months, will be field-tested in January in Guatemala.

Addressing both water shortages and the cost of water heating, one team designed a shower system that automatically reduces the water flow while a person is lathering up. It does this by using photocells to detect when the person reaches for the soap.

Another team came up with a way of avoiding the cost of constantly replacing batteries in remote controls for television sets and other electronics, as well as the environmental cost of constant battery disposal. They came up with a remote that can be powered for a couple of hours by just pulling a trigger. The team calculates that if one out of 100 remotes in the U.S. were replaced by their units, five million batteries would be saved every year.

And finally, to alleviate the pollution caused by the disposal of old oil filters clogged with dirty oil, one team came up with a device that can extract the oil and allow it to be reused as a lubricant. The team's research showed that 450 million oil filters are discarded every year, mostly in landfills, and that a single dirty filter could contaminate 62,000 gallons of drinking water.

While these projects may end up as real products—and many of those from past classes have indeed gone commercial—Wallace says that's not the course's primary goal. "We want to teach people what it takes to be a technical innovator," he says. The results, which can be viewed at web.mit.edu/2.009, show that they have indeed.

PHOTO / **DONNA COVENEY**

Nicolina Akraboff, left, works on an MIT product engineering course project while Roderick La Foy looks on. The two mechanical engineering seniors were part of a team that sewed discarded, flattened plastic bottles together to create insulation for thin walls in Pakistani homes.

Reality meets fantasy in Sloan students' site

Two MIT Sloan MBAs are spicing up prime-time television with a web site that injects a little fantasy into reality.

The site, TVLeagues.com, brings together two recent pop-culture phenomena: fantasy sports leagues and so-called "reality" TV shows.

TVLeagues.com invites users to create or join virtual leagues. Just as fantasy sports league participants get points when their athletes perform well on the field, TVLeagues.com users gain points by correctly predicting which contestants will be eliminated from reality shows such as "American Idol," "America's Next Top Model," "Dancing with the Stars," "Survivor" and "Project Runway."

"We created TVLeagues as a fun way for people already watching and talking about reality-TV shows to interact and compete against one another," said co-founder and second-year MBA student Eric Hanover. "Our game engages communities of fans in a more interactive viewing experience."

The site was launched in November, just as television networks were ordering up even more reality shows as a result of the Writers Guild of America strike, which began that month.

Co-founder David Hui MBA '05 said the decision to launch was based on the demand for reality TV, although the strike contributes to the popularity of the site. In fact, he said, it was the popularity of one specific show—the fashion reality program "Project Runway"—that led to the creation of TVLeagues.com.

"My colleagues used to watch 'Project Runway' all the time. It was a common conversation piece at work," Hui said. "One day, we decided to compete to see who could best predict the losers of each show. We enjoyed the competition, but there wasn't a convenient vehicle to organize our picks and results. I spoke about this problem with the other TVLeagues founders, who are big fans of reality TV and fantasy sports. After a couple months of refining the game and developing the site, we launched TVLeagues.com."

For more information, visit www.tvleagues.com or e-mail info@tvleagues.com.

HR @ Your Service

In a significant milestone for MIT Benefits, a member of the MIT community recently became the first person to benefit from the Institute's new Adoption Assistance Program, which provides up to $5,000 per finalized adoption for all benefits-eligible MIT employees.

The program was born from the recognition that there are many way to build families. "We wanted MIT employees to know that we're friendly to all ways of having children," explains Vice President for Human Resources Alison Alden. In the early days of Alden's tenure at MIT, she met with the Council on Family and Work, which advocated for the benefit and dedicated time and energy to seeing it come to fruition. The primary objectives of the council, currently co-chaired by Suzanne Flynn and Marc Jones, are to identify and evaluate family- and work-related issues, and to develop recommendations for MIT's senior administration. It consists of faculty, staff and student members. "I was struck by the passion with which the council supported this program," notes Alden, who, after hearing about the proposal, championed it to its Jan. 1 start.

Adoption resources for MIT employees

Along with the Council on Work and Family, Adoptive Families at MIT (AFMIT) was also instrumental in facilitating the creation of the Adoption Assistance Program. AFMIT was created in 2000 by two MIT adoptive parents and has since grown to include more than 140 families in the Greater Boston area.

AFMIT members Rachel Jellinek, Professor Sally Haslanger and Diane Betz Tavitian note the important step MIT has taken to affirm family-building through adoption: "This long-awaited measure bridges the gap in equity between non-adoptive and adoptive families and will positively impact prospective adoptive parents and the children they bring into their families." (Visit web.mit.edu/adoption/about/index.html for more information on AFMIT.)

In addition to AFMIT, the Center for Work, Family and Personal Life provided support for creation of the benefit and offers information on adoption resources at MIT as well as confidential consultations on adoption or issues related to adoption. (E-mail worklife@mit.edu or call 617-253-1592).

Below are some specific details on how the new Adoption Assistance Program works.

Who is eligible?

All benefits-eligible employees may apply for the benefit upon adopting a child under the age of 18. Employees must be actively employed, or on approved paid or unpaid leave, at the time the expenses take place and at the time the adoption is finalized. The plan is open to couples, single individuals and same-sex couples. If two adoptive parents are MIT employees, only one employee is eligible for reimbursement per adoption. The child being adopted may not be the child of an employee's spouse or domestic partner.

What is the benefit?

The program provides a benefit of up to $5,000 per finalized adoption for eligible expenses, not to exceed a lifetime benefit of $20,000 per employee.

Examples of expenses

Eligible expenses are those considered necessary expenses, consistent with federal income tax guidelines and include: agency and placement fees; travel expenses, such as transportation, lodging and meals; medical expenses for the child not otherwise covered by insurance; temporary foster care provided before the placement of the child in the employee's home; immigration, immunization and translation fees; and court costs and legal fees.

The program has been designed to take advantage of certain federal income tax provisions regarding such reimbursements. Special provisions have been made for qualified adoption expenses that occurred in 2007 before the program start date of Jan. 1, 2008. For more details on these provisions and the Adoption Assistance Program, please visit hrweb.mit.edu/benefits/adoption/index.html.

HR @ Your Service is a monthly column from Human Resources

AWARDS AND HONORS

JoAnne Stubbe, Novartis Professor of Chemistry and professor of biology, has been awarded the National Academy of Sciences Award in Chemical Sciences.

The $15,000 prize is awarded annually for "innovative research in the chemical sciences that, in the broadest sense, contributes to the better understanding of the natural sciences and to the benefit of humanity."

Stubbe was cited for her work on the mechanisms and regulation of enzymes called ribonucleotide reductases, which control the cellular concentration of deoxyribonucleotides, or single units of DNA.

The National Academy of Sciences described the work as "a compelling demonstration of the power of chemical investigations to solve problems in biology."

Wallpaper, a prestigious international design magazine, has listed two MIT graduate students in architecture and a 2006 alumnus of MIT's master's program in architecture in its global directory, "110 Up and Coming Graduates" in art and design.

Wallpaper cited MIT graduate students **Pholkrit Sangthong** and **Peter DePasquale**, along with **Ahmed El-Husseiny** MArch '06, among nine young architects to watch. The Wallpaper directory also features images of their work.

"Having three architecture students in the Wallpaper directory confirms we are a major design force," said Yung Ho Chang, professor and head of MIT's department of architecture.

VISION

Continued from Page 1

of line boundaries. The model lacks the more sophisticated analysis that happens in later stages of visual processing to extract information about higher-level features of the visual scene such as shapes, surfaces or spaces between objects.

The researchers intended this model as a straw man, expecting it to fail as a way to establish a baseline. When they tested it on the Caltech101 images, however, the model did surprisingly well, with performance similar or better than five state-of-the-art object-recognition systems.

How could that be? "We suspected that the supposedly natural images in current computer vision tests do not really engage the central problem of variability, and that our intuitions about what makes objects hard or easy to recognize are incorrect," Pinto explains.

To test this idea, the authors designed a more carefully controlled test. Using just two categories—planes and cars—they introduced variations in position, size and orientation that better reflect the range of variation in the real world.

"With only two types of objects to distinguish, this test should have been easier for the 'toy' computer model, but it proved harder," Cox says. The team's conclusion: "Our model did well on the Caltech101 image set not because it is a good model but because the 'natural' images fail to adequately capture real-world variability."

As a result, the researchers argue for revamping the current standards and images used by the computer-vision community to compare models and measure progress. Before computers can approach the performance of the human brain, they say, scientists must better understand why the task of object recognition is so difficult and the brain's abilities are so impressive.

One approach is to build models that more closely reflect the brain's own solution to the object recognition problem, as has been done by Tomaso Poggio, a close colleague of DiCarlo's at the McGovern Institute (Tech Talk, Feb. 28, 2007).

This study was supported by the National Eye Institute, The Pew Charitable Trust and The McKnight Foundation.

For the birds? Hardly

Student sculpture a reminder of world beyond MIT

Sarah H. Wright
News Office

When Samantha Cohen welded scrap-metal parts—rake tines, garden table legs—to form the nameless bird hanging in a stairwell near Lobby 10, she had more than a flight of fancy in mind.

The bird is her response to Associate Professor Wendy Jacob's assignment for Introduction to Sculpture students: Design a public art installation to promote social change.

Cohen, a freshman from Hackensack, N.J., built her anonymous avian in hopes of inspiring people to widen their imaginations—even if it's just to dream up a bird's name.

"The most amazing thing about art is, people can take inspiration from what they see and then make it into something else. The act of creating is one of the most important things we can perform in life: Every single person has a different perspective on the world," she said.

She also hopes her bird will remind people to keep in mind a world beyond the Infinite Corridor, she said.

"I decided to make metal birds and put them indoors to remind people that there is a world outside MIT that is beautiful and free. During my first semester, I felt suffocated: All the work I had to do affected my outlook on life. I wanted to make something that would remind people there is much more to life than work," she said.

Cohen was new to some of the welding and forging processes she used to construct her birds, but she already had arc-welding experience: In high school, she made a car out of bicycle parts.

Like many of her peers, Cohen found that coming to MIT meant combining skills she had with new skills and new ideas.

"I have been involved in creative processes since I was very little. I work in photography, painting, drawing, music making and, now, metalworking. I will definitely continue sculpting with metal," she said.

Students in Jacob's sculpture course also made chairs to sit on the steps outside of the Student Center; a hot-cocoa hut in the East Campus courtyard; a free gumball machine that required two people to operate; and a well-made bed outside of 10-250.

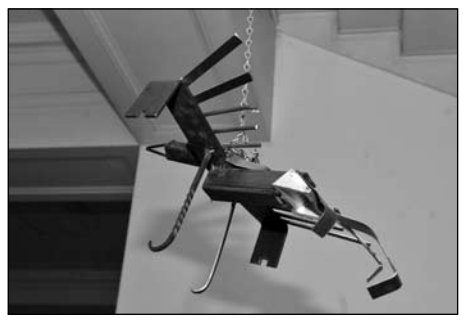


PHOTO / **DONNA COVENEY**

Shown hanging from a stairwell near Lobby 10, freshman Samantha Cohen's nameless metal bird appears frozen in flight.

the human cost

Sarah H. Wright
News Office

As the war in Iraq approaches its fifth anniversary, a new web site from the Center for International Studies aims to provide an accurate account of living conditions, as well as civilian injuries and deaths due to political violence, throughout the Middle Eastern state.

The site, Iraq: the Human Cost, focuses on tracing the Iraqi death toll and on portraying political violence accurately. It offers links to a mortality study commissioned by the Center for International Studies (CIS) that set Iraqi deaths due to the war's violence at 600,000 as of July 2006 and to several updated humanitarian agency field reports of death and distress.

"It's remarkable how few sources provide information about refugees, the status of women and the numbers of people injured and killed," said John Tirman, the center's executive director and an expert on international security and human rights. "Most journalists are in Baghdad—and even relying on morgue reports there means you don't know what, or who, you're not counting."

But even the best numbers don't complete the portrait Tirman hopes to paint. The Human Cost is also about analyzing the causes of violence in Iraq, particularly as it has escalated since the 2003 invasion.

"We're interested in what's driving the political violence, and that's why the household survey reported in The Lancet or reports from people in the smaller urban centers are so valuable: You can get at the mechanics of violence not necessarily related to war. Revenge killings, tribal killings—these arise from deeply felt grievances, from people who believe they're defending their families and their communities. They used to say they were defending against the U.S., but ethnic and sectarian differences have grown so powerful, the waves of violence seem to feed on themselves," Tirman said.

So—why click on the Human Cost, if all is lost to a cycle of violence, but better reported?

"The site aims to raise the issues and to try to answer important questions. The long-term prospects for Iraq are pretty bleak, but it won't necessarily become a failed state. Because of its oil, the role of outsiders is and will be very potent, and I argue that many Americans, given full information, would support better policies in the future than the ones that got us here," Tirman said.

As to what those policies might be, Tirman offered the perspective of the 1975 Helsinki Accords, the 35-nation diplomatic pledge of mutual respect in European security, economic cooperation and human rights issues.

"The U.S. could convene a regional forum in the Middle East and follow a Helsinki-like process, putting the issues of security, trade and human rights in 'baskets' for discussion. But that's for the next administration," he said.

A former reporter for Time magazine and the author or co-author of 10 books and dozens of articles on topics related to violence, security and humanitarian consequences of war, Tirman has been at MIT since 2004.

The Human Cost web site includes an essay by Tirman on the importance of grasping the extent and the roots of violence within Iraq; links to field reports produced by the United Nations and humanitarian agencies; and an essay, in English and in Arabic, on the war's impact by Iraqi journalist Huda Ahmed.

The site also features Anja Niedringhaus's photographs of Iraq. MIT HyperStudio designed the web site for CIS.

Please visit web.mit.edu/humancostiraq for more information.

In the May 2004 image above, a tearful Iraqi woman waits outside the Abu Ghraib prison for word on the status of a loved one. The photo is one of several by Associated Press photographer Anja Niedringhaus on display at the new CIS site, Iraq: the Human Cost. (AP/Anja Niedringhaus)