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TechTalk
SERVING THE MIT COMMUNITY

Mad cow culprit linked to stem cell health

David Cameron
Whitehead Institute

What does mad cow disease have in common with stem cell research? MIT and Whitehead Institute scientists have found that the same protein that causes neurodegenerative conditions such as bovine spongiform encephalopathy (mad cow disease) is also important for helping certain adult stem cells maintain themselves.

"For years we've wondered why evolution has preserved this protein, what positive role it could possibly be playing," says MIT professor of biology and Whitehead member Susan Lindquist. "With these findings, we have our first answer."

Lindquist, Harvey Lodish (also an MIT biology professor and Whitehead member), and colleagues are co-authors on a paper to be published online in the Proceedings of the National Academy of Sciences during the week of Jan. 30.

For more than 10 years, researchers have known that a protein called PrP (shorthand for "prion protein") causes mad cow disease and its human equivalent, Creutzfeld-Jakob disease. PrP is a prion, a class of proteins that has the unusual ability to recruit other proteins to change their shape. This is significant, because a protein's form determines its function. When a prion changes shape, or "misfolds," it creates a cascade in which neighboring proteins all assume that particular conformation. In some organisms, such as yeast cells, this process can be harmless, even beneficial. But in mammals, it can lead to the fatal brain lesions that characterize diseases such as Creutzfeld-Jakob.

Curiously, however, PrP can be found throughout healthy human bodies, particularly in the brain where it's highly abundant. In fact, it's found in many mammalian species, and only on the rarest occasions does it result in disease. Clearly, scientists have reasoned, such a widely conserved protein also must play a positive role.

Chengcheng Zhang, a postdoctoral researcher in Lodish's lab, was studying hematopoietic (blood forming) stem cells

See **MAD COW**
Page 4

Experts report world economy in good health

Sarah H. Wright
News Office

Two MIT economists agreed on the generally vigorous health of the global economy in an Independent Activities Period presentation held Tuesday, Jan. 24, in E51-325.

The presentation, "The State of the World's Economy," drew a standing-room-only crowd to hear Robert Solow, 1987 Nobel laureate in economics, and Olivier Blanchard, professor and former department head of economics, report on the vital signs.

Blanchard described these as "good economic times," noting the high growth rate, high productivity and relatively low unemployment in the United States. Europe, he said, is "emerging from a long slump," though it still faces low productivity and high unemployment; Japan is also emerging from its 15-year slump. China and India are growing robustly.

Reasons to worry, said Blanchard, include global imbalances due to the United States' "enormous deficit versus the surpluses in Japan, China and the Middle East" and the consequences if other countries cease to find investing in the United States as attractive as they do now. This is especially important since the foreign investment in the United States, previously made by individuals, is now largely made by central banks and governments.

Blanchard also marked a "nonevent — the macroeconomic effect of the price of oil" — as significant to current economic health. He contrasted the "nonevent" of the past few years to the oil crisis, inflation and economic ills of the 1970s.

"This time, the change in oil prices was a nonevent, thanks to better monetary policies and weaker bargaining power by workers. Last time, workers tried to keep their purchasing power through higher wages, despite higher oil prices. This time, workers appear to have had no alternative than to accept lower wages," he said.

Solow diagnosed with more caution,

See **ECONOMY**
Page 7

PHOTO / **DONNA COVENEY**

Hot stuff

Electrical engineering and computer science junior Alex Werbos tries his hand at blacksmithing on Wednesday, Jan. 25, during an Independent Activities Period session taught by Toby Bashaw in the basement of Building 4.

Researchers use logistics to fight flu vaccine woes

Ken Cottrill
Center for Transportation and Logistics

Although the flu causes tens of thousands of deaths each year in the United States, vaccine to fight the illness is often in short supply when the flu season is at its peak.

Now MIT-affiliated researchers have come up with some ways to get the vaccine where it's needed in a timely fashion. Implementing these recommendations could make future influenza outbreaks less deadly.

The vaccine supply chain study is led by Prashant Yadav, professor of supply chain management at the Zaragoza Logistics Center (ZLC), which is a partner in the MIT-Zaragoza International Logistics Program, a research and education collaboration among the MIT Center for Transportation and Logistics, the University of Zaragoza (Spain), the government of Aragón, Spain, and industry partners.

A study carried out by Yadav and David Williams, a recent graduate of logistics and supply chain management at Zaragoza, has identified a number of ways to make the vaccine supply chain more efficient.

At the heart of the vaccine shortage problem are imbalances between supply and demand, they said. On the supply side, manufacturers have opted out of the unpredictable vaccine market, causing a chronic shortage of production capacity. Only two manufacturers now produce the vaccine.

Demand-side factors are just as erratic, Yadav said. The type of vaccine required changes from year to year depending on the strain of virus that hits populations. And there are market mechanisms that compound the uncertainty. Some buyers, such as hospitals, over-order to cover

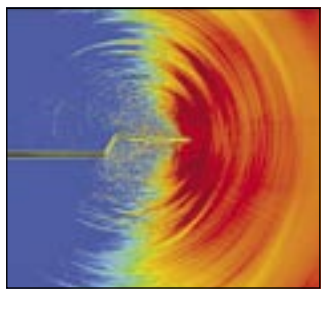
See **FLU**
Page 5

RESEARCH

NEW LINE OF THINKING

A simulation of cracks forming and spreading leads to a new theory of how cracks propagate.

Page 4



FUNGUS AMONG US

Researchers at the Broad Institute have helped determine the genomic sequence of three aspergilli.

Page 5

MOONSTRUCK

Using data from observations last summer, astronomers conclude that Charon, Pluto's moon, has no atmosphere.

Page 5

NEWS

TEAM SPIRIT

Faculty mentors build connections with student athletes.

Page 3

'SEAMLESS' PAIRING

Technology and fashion share the runway tonight at an event curated by MIT Media Lab graduate students.

Page 7

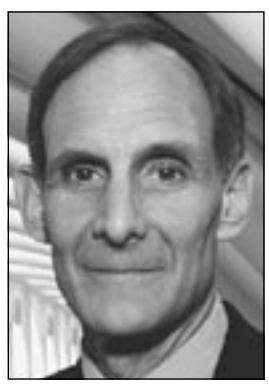
Royal Dutch Shell sends senior scientist to MIT

Nancy Stauffer
Laboratory for Energy and the Environment

MIT and Royal Dutch Shell today announced that Richard A. Sears, most recently Shell's vice president for exploration and deepwater technical evaluation, has joined MIT's Laboratory for Energy and the Environment (LFEE) as a visiting scientist. This three-year appointment, a first for the company, will strengthen ties between the MIT and Shell research communities and enhance opportunities for developing innovative solutions to the world's mounting energy problems.

"MIT has a long tradition of working with technology-based industry," said Ernest J. Moniz, the Cecil and Ida Green Professor of Physics and Engineering Systems at MIT, co-director of the LFEE, and former undersecretary for the U.S. Department of Energy (1997 to 2001).

"The relationship is most effective when there is active dialogue between the parties," he said. "Having Rich Sears here for an extended period will provide practical insight for our faculty and students into the research needs of an international energy company and will provide Shell with opportunities to broaden its research portfolio."



Richard Sears

The Sears appointment dovetails with a major new Institute-wide energy initiative at MIT, announced by President Susan Hockfield in her May 2005 inaugural address. A 16-member Energy Research Council (ERC) has been working to help determine how MIT scientists, engineers and social scientists can best address such issues as increased global energy consumption and new routes to renewable and sustainable energy.

"The challenge to sustainably meet growing global demands for energy will require the integration of leading-edge technologies," said John Darley, Shell Exploration and Production's executive vice president for technology. "Both MIT and Shell have a proud heritage of technical excellence, and this new appointment will further enhance an effective working relationship between the two organizations."

Shell has committed approximately $4 million in research funding to MIT in areas related to exploration and production. The research draws on MIT expertise in fields ranging from geology, geophysics and seismology to artificial intelligence and biotechnology.

In his role as visiting scientist, Sears will bring his industry perspective to the lab and will serve as a resource to MIT faculty and research staff.

"I'm looking forward to being in the MIT environment," Sears said. "The technical breadth and depth of MIT will offer new perspectives and fresh approaches that will broaden our understanding and impact on the future of energy in the world."

Sears has significant domestic and international experience in oil and gas exploration and discovery, and he is a leading expert in the search for and development of new hydrocarbon resources in the deep ocean (water depths of more than 500 meters). Since joining Shell in 1976, he has held technical and management positions in the United States and Europe.

The LFEE is a focal point for energy and environmental activities at MIT. Home to more than a dozen centers, groups and programs, the lab brings together collaborating faculty and staff in 13 departments to carry out multidisciplinary research relating to energy and the environment.

PHOTO / **DONNA COVENEY**

Making the most of a little snow

There hasn't been much snow this winter, but some enterprising folks found enough material to build two snow people on Killlian Court, drawing the curious gaze of a dog on Tuesday, Jan. 24.

Belcher awarded new Germeshausen Professorship

Angela M. Belcher, professor of materials science and engineering and biological engineering, has been awarded the Germeshausen Professorship for a five-year period effective Dec. 1, 2005.

Kenneth Germeshausen established the professorship in 1968 "to support MIT's strong interests in combining humanitarian advance with technological progress."

Germeshausen set up the fund to support one faculty member, but in the nearly 40 years since the professorship was established, his fund has been invested as part of MIT's endowment and its value has grown along with the overall stock market. The fund now produces enough income each year to support an additional professor.

Belcher thus joins Professor Roger Kamm of the Department of Mechanical Engineering and the Biological Engineering Division, the other holder of the Germeshausen Professorship.

The Germeshausen Foundation, through which Germeshausen made his gift to MIT, agreed recently to modify the terms of the Germeshausen Professorship in order to allow MIT to award this prestigious honor to more than one faculty member at a time. This change provides additional flexibility to MIT in the use of its resources and allows MIT to recognize additional faculty members for their commitment to world-class teaching and research.

Germeshausen was a member of the MIT Class of 1931. After graduation, he formed a partnership with Professor Harold E. "Doc" Edgerton to study high-speed photographic and stroboscopic techniques and their applications.

In 1934, they were joined by Herbert E. Grier of the Class of 1933, and together they went on to form EG&G, a technology company whose work was considered fundamental in the development of radar and other electronic technologies.

Germeshausen served as chairman of EG&G until his retirement in 1972.

Sigma Xi honors Alan Lightman

Alan Lightman, adjunct professor of humanities, has been chosen to receive Sigma Xi's 2006 John P. McGovern Science and Society Award.

Lightman is a physicist, essayist, educator and best-selling novelist. His essays on science, reviews and short fiction have appeared in The New Yorker, Smithsonian, Discover, Harper's, Nature and The New York Times. His 1993 novel, "Einstein's Dreams," was an international bestseller.

Another Lightman novel, "The Diagnosis," was a finalist for the 2000 National Book Award in fiction. His newest book, "The Discoveries: Great Breakthroughs in 20th Century Science," was named by Discover Magazine as one of the 10 best books on science in 2005.

Lightman has twice been a juror for the Pulitzer Prize, for general nonfiction in 1994 and for fiction in 2004.

The John P. McGovern Science and Society Award, presented annually since 1984 for contributions to science and society, consists of a medal and $4,000. Lightman will receive the award and deliver the John P. McGovern Science and Society Lecture at Sigma Xi's annual meeting in November in Detroit.

MIT recipients of the award include Institute Professor Mario Molina in 2002 and Institute Professor Philip Morrison in 1994.

Irvine named to professorship

Darrell J. Irvine, assistant professor of biological engineering and materials science and engineering, has been selected as the inaugural holder of the Eugene Bell Career Development Professorship of Tissue Engineering for a three-year term beginning Jan. 1, 2006.

This chair was recently established by Eugene Bell, a professor emeritus of biology, who said he and his wife, Millicent, decided to establish the chair because "building replacement parts for the human body answers the body's need to support and prolong the good life that is endlessly compromised by aging, disease, accident and genetic destiny."

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Survey gauges teens' view of tech future

Gasoline-powered automobiles, compact discs and desktop computers are headed toward the technology scrap heap, according to a recent survey of American teenagers.

The 2006 Lemelson-MIT Invention Index, which gauges Americans' attitudes toward invention and innovation, found that a third of teens (33 percent) predict the demise of gasoline-powered cars by the year 2015. One in four teens (26 percent) expects compact discs to be obsolete within the next decade, and roughly another one in five (22 percent) predicts desktop computers will be a thing of the past.

Teens are also optimistic that new inventions and innovations will be able to solve important global issues, such as clean water (91 percent), world hunger (89 percent), disease eradication (88 percent), pollution reduction (84 percent) and energy conservation (82 percent).

"Perhaps more than any preceding generation, today's young people are completely comfortable with rapid technological change," Lemelson-MIT Program Director Merton Flemings said. "The rate of innovation, as reflected in U.S. patent applications, has more than doubled during their lifetime."

Flemings added, "Teens' belief that science and technology may hold the answers to our biggest societal challenges is encouraging, but it also begs the question: Is this generation properly equipped and motivated to invent solutions to these mind-boggling challenges?"

The Lemelson-MIT Invention Index found that teens believe they have developed some of the critical skills that will be needed to address these problems. More than three out of four teens surveyed (77 percent) believe they have learned problem-solving skills well while in school. They also feel prepared to work in teams (72 percent), think creatively (71 percent) and lead others (61 percent). However, they fall short when it comes to budgeting money. Only 32 percent of teens said they feel they learned that skill well while in school.

Other studies suggest, however, that teens in high school may have a limited frame of reference to assess how well they are truly prepared. For example, a February 2005 report by Achieve Inc. found that 55 percent of college instructors were dissatisfied with their students' abilities to apply what they learn to problem-solving.

And while teens are optimistic that societal problems can be solved through invention and innovation, the Lemelson-MIT Invention Index raises questions about whether teens are interested in personally solving these problems.

When asked to select the career field in which they are most interested, arts and

See **TEENS** Page 4

PHOTO / **DONNA COVENEY**

Dean for Undergraduate Research J. Kim Vandiver greets MIT basketball player Willard J. Johnson '09 as he comes off the court on Tuesday, Jan. 24. Vandiver is the team's faculty mentor.

They've got game

Faculty mentors team up with student athletes

Sasha Brown
News Office

As a once nationally ranked swimmer and rower, Professor Leigh Royden of earth, atmospheric and planetary sciences knows the challenges of balancing academics and varsity athletics.

"I basically majored in crew," said Royden, recalling with a laugh her undergraduate years spent rowing for Harvard University. "It is easy for faculty members to forget what it is like to be their age," she added, referring to the undergraduate students.

As part of the Varsity Sport Faculty Mentor Program, Royden uses her personal knowledge to mentor both the men's and women's swimming teams.

Launched in January 2005, the program is designed to build a bridge between the academic and athletic lives of student athletes. "We had been looking for a way to engage the student athletes with faculty members," said John Benedick, assistant director of athletics for sports administration.

Currently, 20 of the 41 varsity teams at MIT have faculty mentors. "We want to continue to expand it," Benedick said.

"If we could get 10 percent of the faculty to do this, then we would have a critical mass of faculty who understand the importance of varsity athletics in the scheme of things," said J. Kim Vandiver, dean for undergraduate research and one of the faculty mentors for men's basketball.

"Historically, varsity athletics were sometimes considered a nuisance," Vandiver said. Due to the inevitable scheduling conflicts between athletics and academics, many faculty members took a dim view of sports, he said.

Current research finds that sports are a vital part of the "total health and wellness package," Vandiver said. "Exercise is great for stress control, and student athletes are generally better at managing their time."

Faculty mentors can share that perspective with others, Vandiver said. "We are able to bring to the table a new point of view that varsity athletics make an important contribution to the overall performance and health of our students," Vandiver said.

Vandiver sees the program as opening the lines of communication between athletics and academics; advisors can get to know their advisees better and be better equipped to help them succeed.

For the coaches, that link is also helpful, said swimming coach Dawn Gerken. "It is great to have that connection. The MIT faculty is very supportive, but having a faculty member connected to us really helps cement that bond," she said.

For Royden, who participates in many of the swim practices, the program offers an opportunity to get to know students in a different way. "When I am in the pool, I want to break down the barrier I have in the classroom," she said.

"A lot of students go through MIT and never get to know a faculty member well," Royden said, adding that the program "basically brings together the two sides of Mass. Ave."

As Vandiver said, "The intimidation factor (between students and faculty) is greatly reduced."

PHOTO / **DONNA COVENEY**

Freshmen Melissa Tanner and Julie Bharucha join sophomore Juan Prajogo in chatting with Class of 1959 alumni Alfredo Kniazzeh and David Packer at a luncheon held Tuesday, Jan. 24, in the Mezzanine Lounge of the Stratton Student Center.

Class of '59 connects with freshmen

Sasha Brown
News Office

Despite the generational differences, four members of MIT's Class of 1959 found common ground with the roughly 15 current MIT students who came to the annual Class of '59 luncheon held in the Mezzanine Lounge in the student center on Tuesday, Jan. 24.

The Academic Resource Center sponsored the luncheon as part of an Independent Activities Period (IAP) series designed to help freshmen make the transition into more-rigorous sophomore year.

Class of '59 attendees included Dr. Michael Drew, Alfredo Kniazzeh, David Packer and Richard Sampson.

"MIT provides a very valuable background," said Kniazzeh (S.B. 1959; S.M. 1961 and Ph.D. 1966), highlighting the importance of the connections he formed at MIT.

The four men, all of whom were the best and brightest in their high school classes, spoke of feeling overwhelmed when they arrived at MIT — a theme many of the freshmen echoed. "I may have been the smartest person in my high school, but I felt like the dumbest person" in the first course he took at MIT, Drew said. Eventually, he said, he found his niche.

"For me, MIT was a starting point," he said. "I wouldn't change a thing."

Many of the students wondered what the Institute was like 50 years ago and were surprised that among all the changes — increased gender diversity, greater support services for freshmen — many things have remained the same. "What hasn't changed is the sense of curiosity and the sense that you can learn whatever you want to learn," Drew said.

"It is still a great place," Packer said. "MIT has been with me all my life in some way."

Researcher sees big impact of little cracks

Deborah Halber
News Office Correspondent

An MIT researcher's atom-by-atom simulation of cracks forming and spreading may help explain how materials fail in nanoscale devices, airplanes and even in the Earth itself during a quake. This work, which could impact a wide range of scientific and engineering disciplines, appears in the Jan. 19 issue of Nature.

"Classical theories of crack dynamics are only valid in a small range of material behavior," said author Markus J. Buehler, principal investigator in the Atomistic Mechanics Modeling Group in MIT's Department of Civil and Environmental Engineering. "Our results represent a major breakthrough in understanding how cracks propagate in a variety of brittle materials, and our theory helps explain experimental and computational observations that have been poorly understood so far."

Past experiments show that cracks start out slow, creating a straight, clean slice across a flat-as-a-mirror surface. As the crack gains speed, at a certain point it starts to gyrate like an out-of-control snake, leaving in its wake an increasingly rough, uneven surface that eventually creates a chaotic branching pattern.

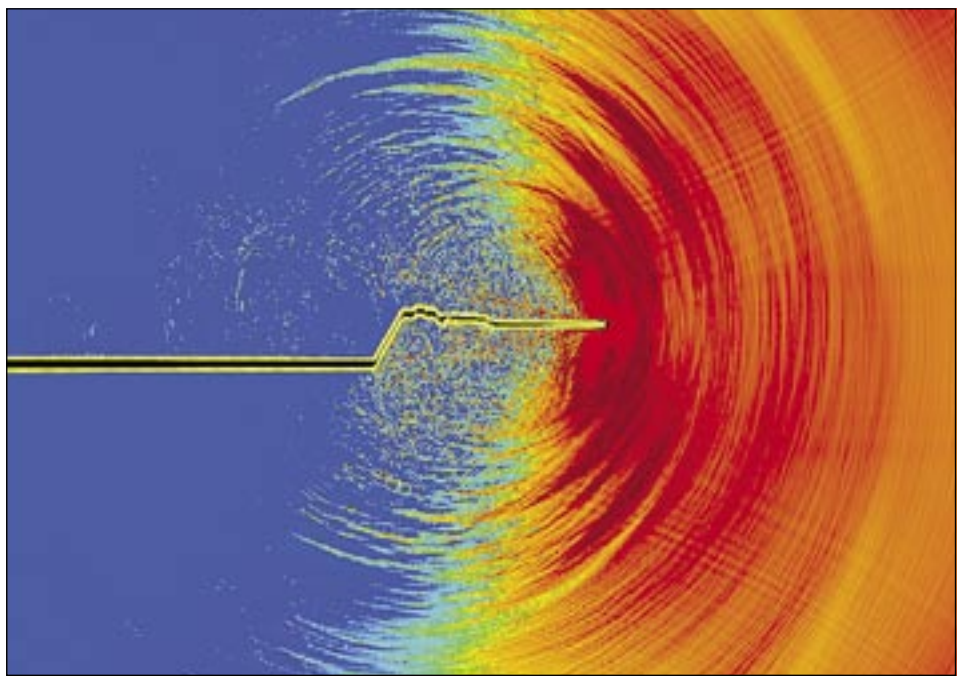
Surprisingly, this phenomenon happens in many different classes of brittle materials, including glasses, ceramics, polymers and semiconductors, but no one has fully understood the physics behind it.

Buehler and Huajian Gao of the Max Planck Institute for Metals Research in Stuttgart, Germany, and now at Brown University, simulated the action of atoms to study how materials behave under extreme conditions. Using massively large-scale molecular dynamics simulations, they uncovered the physics behind fractures and formed a new theory of how cracks propagate in brittle materials.

The researchers discovered that making sense of conflicting studies requires thinking of the material's behavior as hyperelastic, meaning the atomic bonds are close to the breaking point.

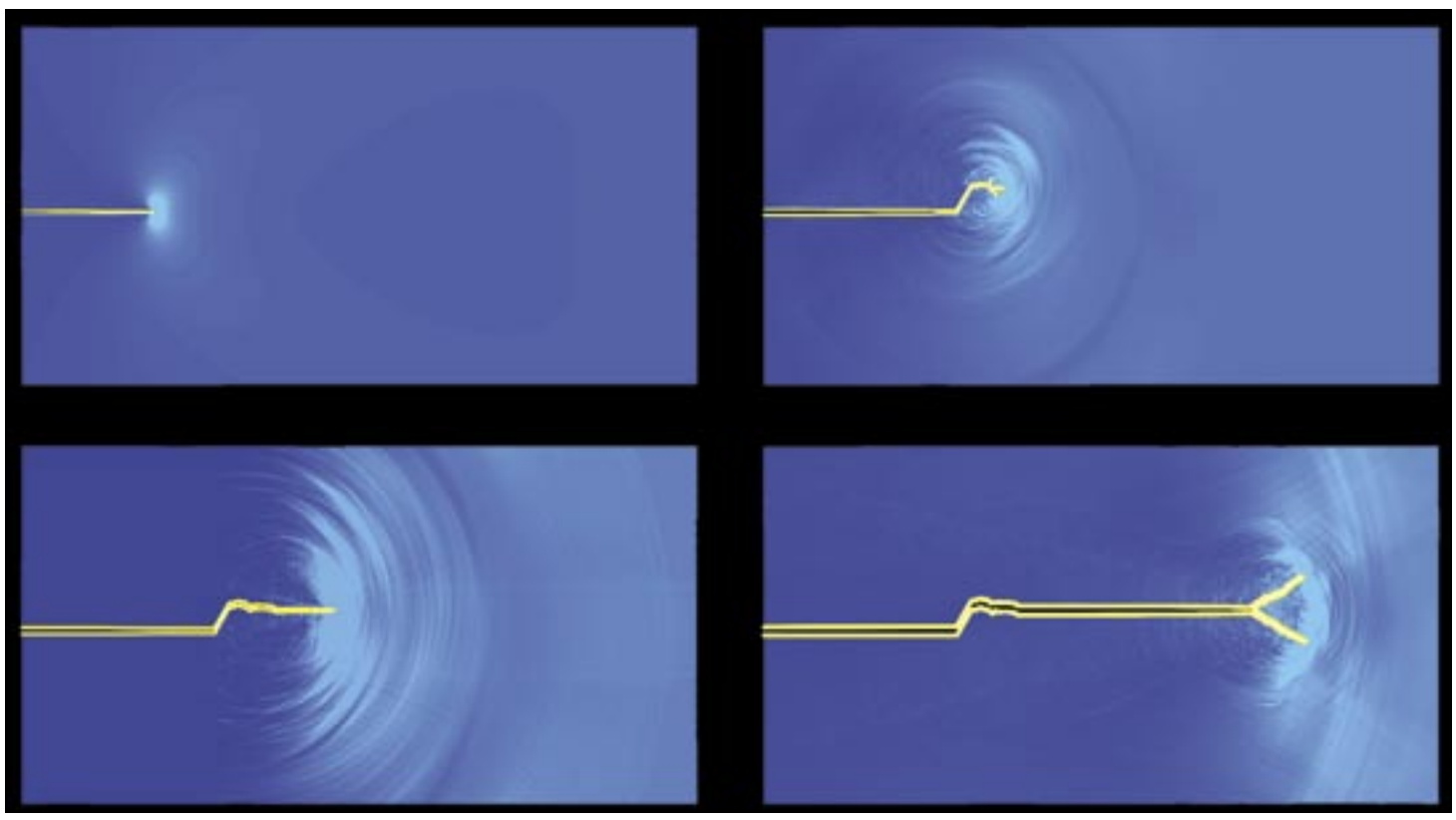
"Hyperelasticity, which stems from atoms interacting according to the laws of quantum mechanics, has been neglected in most existing fracture theories," Buehler said. "Our results suggest that it is key to unresolved experimental observations in dynamic fracture.

"An important consequence of hyperelasticity is that elastic stiffening behaviors such as those in rubbery materials can have a dramatic effect on the instability dynamics of cracks," Buehler said. The new study shows that cracks in stiffening materials can suppress the chaotic pattern of spreading cracks and move faster than the speed of sound while creating flat-as-a-mirror surfaces.



PHOTOS / **MARKUS J. BUEHLER, MIT**

These simulations show a crack spreading through a brittle material. First the crack creates a clean slice across the surface, but as it gains speed it starts to gyrate, and the crack's path becomes increasingly uneven.



TEENS

Continued from Page 3

medicine were teens' top choices (17 percent each). Teen girls were significantly more likely to be interested in medicine or health-care careers than teen boys (25 percent vs. 9 percent). Engineering was the third most-attractive career choice (14 percent of all respondents), but it was significantly more popular with teen boys than girls (24 percent vs. 4 percent). Only 9 percent of respondents chose science and only 8 percent chose business as their top career choices.

"The relative lack of interest in science and technology-oriented fields is alarming," Flemings said. "This year's Invention Index found that nearly half of teens view invention as a way to contribute to society and be creative. Yet we continue to fall short, particularly with respect to teenage girls, when it comes to presenting these fields as viable and attainable career options. We need to do more to make science and technology more attractive to today's youth."

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>
> **Merton Flemings**
> Lemelson-MIT program director

The Lemelson-MIT Program aims to enable and inspire young people to pursue creative lives and careers. It particularly encourages young people to engage in invention and to pursue sustainable new solutions to real-world problems. It accomplishes this mission through outreach activities and annual awards, including the $500,000 Lemelson-MIT Prize, the largest single award in the United States for invention.

Jerome H. Lemelson, one of the world's most prolific inventors, and his wife Dorothy founded the Lemelson-MIT Program at the Massachusetts Institute of Technology in 1994. It is funded by The Lemelson Foundation, a private philanthropy committed to honoring the contributions of inventors, innovators and entrepreneurs and to inspiring ingenuity in others. For more information, visit web.mit.edu/invent.

NOTE: The 2005-2006 Lemelson-MIT Invention Index survey was conducted by the Opinion Research Corp. from Nov. 17-20, 2005. A nationally representative sample of 1,030 adults and 500 teens was used. The margin of error was +/- 4 percent for teens and +/- 3 percent for adults.

IAP class focuses on energy issues

Deborah Halber
News Office Correspondent

Off the coast of the fictitious Isle of Murph, there are four natural gas fields under 400 feet of water. The wells, platforms, pipelines and plants necessary to get at the gas will cost $4 billion and will take years to develop. Should a company invest in this project and drill for the natural gas?

This question was posed to 10 MIT students in the Independent Activities Period class "Energy: Science, Technology and Sustainable Development," which met Jan. 23-27.

Engineers and scientists working on a project such as this must address the science, technology and sustainable development aspects of the project.

The students, mostly chemical engineering and earth science majors, had the opportunity to design and present their plans for developing this multibillion-dollar offshore natural gas project with the potential to supply energy to more than 3 million households.

Aron Walker, a junior in earth, atmospheric and planetary sciences, helped present his team's recommendation: Go for it, with a plan that benefits all stakeholders and addresses concerns about the project's impact on the environment and local communities. Other student teams recommended further detailed study prior to making a major investment in this project.

David Patrick Murphy of Shell Exploration and Production, who co-taught the class, said that the students did an outstanding job in grasping the breadth of a project of this scope. Murphy's fellow teachers were James C. Roberts of Shell International Exploration and Production and Richard A. Sears, a visiting scientist in MIT's Laboratory for Energy and the Environment.

While the search is on at MIT and elsewhere for alternative fuel sources, Sears pointed out that oil and gas are going to be with us for the foreseeable future. "If the switch from conventional hydrocarbons started now, it would take nearly half a century to get there," he said.

MAD COW

Continued from Page 1

in mouse fetal tissue when he discovered that PrP was expressed abundantly on the surfaces of these stem cells. "I found that while not all blood cells with PrP on their surface were stem cells, any cell that lacked PrP was definitely not a stem cell," says Zhang.

Zhang teamed up with the Lindquist lab's graduate student Andrew Steele, an expert in prions, to discover what role PrP might play in stem cell biology. Zhang and Steele took bone marrow from mice in which PrP had been knocked out, and transferred that marrow into normal mice whose blood and immune systems had been irradiated. The new bone marrow took hold, and these mice flourished, although all their blood cells lacked PrP. Zhang and Steele continued the experiment, this time taking bone marrow from the newly reconstituted mice, and transplanting it into another group of mice. They repeated this process again and again — transplanting bone marrow from one group of mice to another like passing a baton.

Soon they noticed that with each subsequent transplant, the stem cells began to lose their ability to reconstitute. Eventually, the scientists ended up with mice whose hematopoietic stem cells completely lacked the ability to generate new cells. However, in the control group, where they mimicked the experiment with bone marrow abundant with PrP, each transplant was as good as the next, and at no point did stem cells lose their efficacy.

"Clearly, PrP is important for maintaining stem cells," says Lodish. "We're not sure yet how it does this, but the correlation is obvious."

"PrP is a real black box," Lindquist says. "This is the first clear indication we have of a beneficial role for it in a living animal. Now we need to discover its molecular mechanism."

This research was funded by the National Science Foundation, the National Institutes of Health, the Ellison Medical Research Foundation and the Leukemia and Lymphoma Society.

Broad researchers help sequence fungal genome

We now know more about the fungus among us.

Humans have a love-hate relationship with the aspergilli, a group of about 185 different species of fungus: several species are human pathogens, while others are the basis for the production of human food and industrial enzymes.

Now, an international team of scientists, including researchers at the Broad Institute of MIT and Harvard, have determined and compared the genome sequences of three aspergilli — *Aspergillus fumigatus,* a potentially deadly human pathogen, *A. oryzae*, used in the production of soy sauce and sake, and *A. nidulans*, a model genetic organism. Their findings, published in three papers in the Dec. 22 issue of Nature, advance our understanding of the molecular basis of Aspergillus infection, provide insight into the forces driving genome evolution, and identify new genomic functional elements.

"The comparison of these organisms gives us a wealth of information about gene regulation and genome evolution that apply to the study of all eukaryotes, including humans," said James Galagan, associate director of microbial genome analysis and annotation at the Broad Institute. (Eukaryotes are organisms made up of cells with nuclei and organelles.)

"We were most excited about being able to relate genome evolution to sexual reproduction, a very specific – and important – physiological difference between the three aspergilli," Galagan said. Unlike *A. nidulans*, which has a sexual cycle, *A. oryzae* and *A. fumigatus* were believed to be asexual, but the comparative analysis suggests that both species maintain the genetic wherewithal for sexual reproduction.

If confirmed, this raises the potential for developing powerful genetic tools for both organisms, with far reaching implications for medicine (*A. fumigatus*) and industry (*A. oryzae*).

Broad Institute scientists and their colleagues determined the genome sequence of *A. nidulans* and, led by Galagan, performed comparative analysis of the three aspergilli. The direct genome sequence comparison of three species of aspergilli is of particular interest to scientists, given the long evolutionary history of these species as well as their different effects on human welfare. The genome sequences of *A. oryzae* and *A. fumigatus* are described in two additional papers in the same issue of Nature.

"Scientists have relied on *A. nidulans* to teach us about how eukaryotic cells work," said Bruce Birren, co-director of the genome sequencing and analysis program at the Broad Institute and the leader of the *A. nidulans* sequencing project. "Now the genome sequences are accelerating that process, and are also helping us understand what makes one fungus indispensable for food production, while its relative can cause fatal disease."

Although all three aspergilli species are considered close relatives, their respective genome sequences demonstrate remarkable diversity. Indeed, proteins compared across the aspergilli species show only about 65 percent to 70 percent amino acid identities, or about the same as that seen between humans and fish. In addition, the sizes of the genomes vary. Extensive rearrangement of all three genomes reflects the long evolutionary history of the fungi.

Despite these differences, or because of them, significant areas of similarity leap out from the analyses. Of particular note are highly conserved non-coding sequences, which presumably are genomic elements critical to the control of protein-coding genes. In the Nature article, the scientists computationally identify many such control elements, including a class of elements likely to play a significant role in regulating protein production in all eukaryotes.

FLU

Continued from Page 1

themselves in case of future shortages, and then cancel the surplus.

Sellers use these supply/demand imbalances to push up prices, Yadav said. "There is a great deal of gaming and price gouging."

These market ambiguities often lead to midseason shortages of vaccine and end-of-season excesses, said Yadav. For example, when the U.S. flu outbreak was in full swing in 2004, there was much heated debate over vaccine scarcities, "but at the end of the season there was an excess of about 5 million doses," he said.

> *There is a great deal of gaming and price gouging.*
>
> **Prashant Yadav**
> MIT-Zaragoza International Logistics Program

The study makes several recommendations to address these problems:

- Create an online clearinghouse for information on vaccine supply and demand to provide a market overview and help to eliminate order gaming and price gouging.
- Give health-care providers some tools to help them better estimate how much vaccine they will need.
- Set up regional vaccine redistribution pools to shift supplies from areas with surpluses to areas experiencing shortages.

Cutting the time taken to produce and deliver vaccine would also eliminate many supply problems. Using a human cell line to manufacture vaccine, rather than chicken eggs, could cut lead times by more than half, the researchers found.

The influenza season in the northern hemisphere runs from October to March. Influenza causes some 35,000 deaths and 100 million lost working days annually in the United States. About 20 percent of the population is affected, at a total cost of about $12 billion to $15 billion.

There has been much debate in the United States over the inadequacies of the country's vaccine supply, but little attention has been paid to the idea of mending the network by curing its supply chain ailments. "The problem is that people such as policymakers who have studied the problem are not supply chain experts," said Yadav.

The ZLC research team is beginning to collaborate with researchers at UCLA and other centers around the world that are also looking at this problem. "These supply chain solutions will not cure all flu vaccine supply problems, but by eliminating many of the uncertainties, they will save lives, alleviate much suffering, and reduce the immense cost of flu outbreaks," said Yadav.

The Centers for Disease Control are already embracing practices similar to some of the team's recommendations.

PHOTOS / **DONNA COVENEY**

Fun with chemistry

Chemistry sophomore Chawita Netirojjanakul, left, and chemistry/chemical engineering junior Bobby Liu demonstrate how lighting a fire in a beaker consumes the air, creating a vacuum strong enough to pull an egg into the beaker. Chemistry sophomore Amanda Shing, right photo, demonstrates suspension: Something that is not a solid or a liquid, but demonstrates properties of both. The three were in an Independent Activities Period session called 'Want to Be a Chemistry Magician?" held Friday, Jan. 27.

Pluto's moon Charon found to lack atmosphere

If you want to learn something about a place that's billions of miles away, it helps to be in the right place at the right time.

Astronomers from MIT and Williams College were lucky enough to watch as Pluto's largest moon, Charon, passed in front of a star last summer. Based on their observations of the occultation, which lasted for less than a minute, the team reports new details about the moon in the Jan. 5 issue of Nature.

A second paper from another group, led by French astronomer Bruno Sicardy, also appears in this issue of Nature.

The MIT-Williams team was able to measure Charon's size to an unprecedented accuracy and determine that it has no significant atmosphere.

"The results provide insight into the formation and evolution of bodies in the outer solar system," said lead author Amanda Gulbis, a postdoctoral associate in MIT's Department of Earth, Atmospheric and Planetary Sciences.

Specifically, the team found that Charon has a radius of 606 kilometers, "plus or minus 8 kilometers to account for local topography or possible non-sphericity in Charon's shape," Gulbis said. That size, combined with mass measurements from Hubble Space Telescope data, show that the moon has a density roughly one-third that of the Earth. This reflects Charon's rocky-icy composition.

The team also found that the density of any atmosphere on the moon must be less than a millionth of that of the Earth. This argues against the theory that Pluto and Charon were formed by the cooling and condensing of the gas and dust known as the solar nebula. Instead, Charon was likely created in a celestial collision between an object and a proto-Pluto.

"Our observations show that there is no substantial atmosphere on Charon, which is consistent with an impact formation scenario," Gulbis said. Similar theories exist about the formation of the Earth-moon system.

The success of the MIT-Williams team in observing the Charon occultation bodes well for future adaptations of the technique the researchers used.

"We are eager to use (it) to probe for atmospheres around recently discovered Kuiper Belt objects that are Pluto-sized or even larger," said James Elliot, co-author of the Nature paper and a professor in MIT's Department of Earth, Atmospheric and Planetary Sciences and in the Department of Physics. Elliot has been observing stellar occultations by bodies in the solar system for more than three decades.

Jay Pasachoff, Williams College team leader and a professor in its Department of Astronomy, said, "It's remarkable that our group could be in the right place at the right time to line up a tiny body 3 billion miles away. The successful observations are quite a reward for all of the people who helped predict the event, constructed and integrated the equipment and traveled to the telescopes."

In addition to Elliot and Gulbis, members of the MIT team were Michael Person, Elisabeth Adams and Susan Kern, with support from undergraduate Emily Kramer. The Williams College team included Pasachoff, Bryce Babcock, Steven Souza and undergraduate Joseph Gangestad.

IAP course delivers Hebrew in hours

Sasha Brown
News Office

The IAP Hebrew literacy marathon held Jan. 25 and 26 promised to teach 25 students what it takes many a child in Hebrew school five or six years to learn — to read Hebrew out loud.

Initially, I had my doubts.

Taught by Hasia Richman, a native of Israel who is now a Boston-based Hebrew teacher, the class was divided into two, four-hour sections, each lasting from 4-8 p.m. in the Small Dining Room of W11.

With varying degrees of experience, my classmates and I were a diverse mix of current MIT students, alumni and MIT staff members.

Senior Victoria Chou, an electrical engineering and computer science major, had never taken a Hebrew class and did not know the Hebrew alphabet, or "aleph-bet" as it is known in Hebrew.

"It just seemed like a good way to broaden my horizons," said Chou who was reading close to comfortably by the end of the class. While Chou was not surprised that the class delivered on its promise, others were.

"I am so impressed by the people with no Jewish heritage who took this course and learned so much," said Sasha Devore, a Ph.D. candidate in the speech and hearing bioscience and technology program.

As a child, Devore learned a couple letters of the alphabet, but decided to come to the marathon to "reconnect" with the Jewish side of her family. She was surprised by how quickly she picked up the reading. "This has been a lot of fun," she said.

I had studied some Hebrew, but that was years ago. Since then, I've barely seen the language, so I was amazed how quickly it came back. By the end of the first four hours, I was reading Hebrew and, after completing the homework, was able to recite the alphabet as though I had never forgotten it.

Aided by cookies, dried fruit and clementines in the center of the large table we squeezed around, each of us was called upon to read and practice. No one was exempt, and we all learned quickly.

"Honestly, I was skeptical at first," said Rachel Shiffrin, MIT Hillel's program director who helped bring the class back to MIT for another session. Last year, the Hebrew marathon was offered in the fall, but was taught by someone else.

The first day, all 25 of us learned parts of the "Aleph-bet," although not in order. We also learned the vowels — dots and lines that surround the letter and aid the pronunciation. The vowels in Hebrew are not part of the alphabet and are not commonly used in Israel or in religious texts. The idea is to eventually understand Hebrew well enough not to need the vowels, but that takes years. Since we only had eight hours, all of our reading included the vowels.

By the end of the second day, all of us — even those who had never glanced at a Hebrew text — were reading common phrases and Jewish prayers with very little coaching.

Richman does not understand why Hebrew school students take years to learn to read, she said. To her, an eight-hour marathon is the ideal way to start.

Five minutes into the class on Jan. 25, Richman promised, "You will not be able to speak or understand spoken Hebrew, but you will be able to read." By Jan. 26, she had delivered.

Independent days

Denise Zhang, left, and Scott Wurler paint flowers on Wednesday, Jan. 25, in the Independent Activities Period (IAP) class 'Chinese Brush Painting: Flowers and Birds I.' Xiao Fan, right photo, works on his juggling during an IAP class at the Zesiger Center held Tuesday, Jan. 24.

PHOTOS / **PATRICIA A. SAMPSON/MIT EECS**

Lab puts poverty programs to the test

The executive director of MIT's Abdul Latif Jameel Poverty Action Lab will discuss how scientific methods are being used to measure the impact of poverty reduction policies in an Independent Activities Period session, "Testing the Effectiveness of Anti-Poverty Programs," to be held today from 10:30 to 11:30 a.m. in E51-151.

Lab director Rachel Glennerster will describe how the lab is working to build a base of evidence on what actually works to improve people's lives. Nations and agencies could use such evidence to allocate resources effectively.

"Many aspects about what works in reducing poverty have to be taken with a certain amount of skepticism," said Glennerster, who will lead the session. She will describe how the lab goes about quantifying outcomes that have been mainly anecdotal.

MIT economists Abhijit Banerjee and Esther Duflo co-founded the Poverty Action Lab in 2003; their goal was to reduce world poverty by ensuring that policy decisions are based on scientific evidence. The lab was renamed for Jameel last year.

The lab has studied how computer-assisted learning affects the performance of grade-school children in India; how women village leaders affect decision-making; and what are the most effective ways to reduce the spread of AIDS.

"To give a sense of what this involves in practice, I will discuss a few examples in more detail, including a large evaluation in Sierra Leone of a program designed to help repair trust in post-conflict communities. The Sierra Leone research provides an example of how we at the lab are designing ways to measure noneconomic outcomes such as trust and social capital in a rigorous quantitative way," said Glennerster.

— Sarah H. Wright

Facilities retiree dies

George E. Carney, a retired longtime supervisor in facilities, died Jan. 22 at his Lowell home. He was 72.

Carney retired in 1996 after 32 years with the Department of Facilities.

The husband of the late Ruth I. (Turcotte) Carney, he is survived by three sons, Wayne, Christopher and James, all of Lowell, Mass.; three daughters, Vickey Ann Carney of Lowell, Michelle Graham and her husband, Joseph Graham, of Lowell, and Bernadette DiPiano of Virginia; a sister, Teresa Ann Bennett of Alabama; and 14 grandchildren.

A funeral Mass was celebrated Friday, Jan. 27, at St. Theresa Church, Billerica.

Donations may be made to the Lowell General Hospital Cancer Center, 295 Varnum Ave., Lowell, MA 01854.

MIT physicist dies

John W. Coleman, a retired MIT research physicist, died Jan. 22. He was 77.

Coleman worked at MIT for 20 years and in later years was science director of Solar Now Inc.

He is survived by two daughters, Melissa Birtwell of Beverly and Crystal Coleman of Seattle, Wash.

For donation information, visit web.mit.edu/newsoffice.

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

Paris-Marais. Spacious, sunny, fully furnished 2BR apartment. Five months minimum. $2100/month. Call (617) 247-2922.

FOR SALE

Set of tires and rims for Saab 9-3 convertible. Best offer. Call 781-981-2671.

Upright piano, Ivers & Pond. Beautiful rich tone, cabinet. Moving. $700. Call 781-581-9689 or e-mail jundzilo@mit.edu.

MISCELLANEOUS

The MIT Police Department is posting this ad in compliance with Mass. General Law Chapter 135, section 8, regarding abandoned and unclaimed property. Any member of the community that has recently lost or had property stolen please contact Detective Bill Boulter at x8-9724. Be prepared to give a detailed description of the missing property.

Math tutor wanted: Looking for an MIT student who likes to teach middle school math, ~2 hours a week, ongoing, for my 13-year-old son, in Newton, nights or weekends, compensation negotiable. Contact diam@med.mit.edu.

‘Seamless’ show pairs fashion and technology

Sarah H. Wright
News Office

”Seamless: Computational Couture,” a runway fashion event curated by MIT Media Lab graduate students, will present its second annual collection of technologically experimental clothing at the Museum of Science today at 7 p.m.

Christine Liu and Nicholas Knouf, graduate students in media arts and sciences, collaborated with Lisa Monrose, director of Brainy Acts at the museum, to gather and present original couture by students from MIT, Rhode Island School of Design, Parsons School of Design and New York University, as well as by other young designers.

According to Liu, the show will display “innovative works that reinvent how we think about clothing and the body. The designs offer new perspectives on the deep, creative resonance among the art, technology and fashion communities.”

Knouf said, “We want to showcase an alternative view of the future of fashion, one that combines technology and clothing in an engaging and aesthetically pleasing way.”

Chris Csikszentmihályi, the Muriel R. Cooper Career Development Professor of Media Arts and Sciences and head of the Computing Culture Group at the MIT Media Lab, is the “Seamless” master of ceremonies. Lars Blackmore of MIT Dance Mix Coalition will provide music.

Featured works by MIT designers include:

- **“Exhausted,”** by Marisa Jahn, graduate student in architecture and planning. This garment is a pair of vests joined by a bellows-like tube. Individuals wear the vests while facing each other, with the bellows contracted. As they pull away, their movements generate sound. When fully extended, the bellows reveal the word “exhaust.” As the pair embraces, the air is expelled.
- **“The Gather Skirt,”** by Kate James, graduate student in architecture and planning. This is a skirt made entirely of pockets with magnets mounted on the bottom layers. It gathers metal scraps and remnants – a must for the urban scavenger.
- **“Muk.luk.flux,”** by Amanda Parkes, graduate student in media arts and sciences. These boots change shape based on the speed of the wearer. An accelerometer inside tracks the user’s speed and expands the boots.
- **“DarkWatch,”** by John Rothenberg, graduate student in architecture and planning. This gadget counts dark intervals of time. Rothenberg programmed his “darkWatch” to cycle every 261 seconds – the rate at which people are dying in Darfur. “Keeping this information close to our bodies can be both a personal call to action and a form of public protest,” he said.
- **“Arabiia,”** by Ayah Bdeir, graduate student in media arts and sciences. This convertible outfit reflects opposing images of the Arab woman – the sexualized belly dancer and the veiled woman. Equipped with two servo-motors and a switch, it enables the wearer to flip between stereotypes.
- **“Taptap,”** by Leonardo Bonanni, graduate student in media arts and sciences. This is a wearable system to record and play back touch to remind the wearer of a loved one. In scarf form, it is made of two layers of felt – a gray layer that faces the public and a warm pink layer that contains modules that “touch” the wearer’s head. “Simply place the modules where you want to feel the touch and wrap the scarf tightly,” said Bonanni.
- **“Endangered Senses,”** by Gemma Shusterman, graduate student in media arts and sciences. This costume is designed to empathize with elephants’ senses. It has telescoping sleeves that connect to the floor and contains a sensor to pick up vibrations that elephants perceive. That signal is sent to a synthesizer and broadcast via amplified speakers so humans can hear it.

Tickets for “Seamless: Computational Couture” cost $10 and include a dessert reception. Advance purchase is strongly recommended. Tickets may be purchased by phone at (617) 723-2500, or online at www.mos.org/art.

For more information, e-mail seamless-producers@sigtronica.org.

PHOTO / **SIGTRONICA**

Marisa Jahn’s garment, dubbed ‘Exhausted,’ is worn by two individuals facing each other. As they pull away, their movements generate sound. When fully extended, the bellows reveal the word ‘exhaust.’

PHOTO / **JOHN ROTHENBERG**

PHOTO / **KATE KUNATH**

Above, DarkWatch, featured in today’s hi-tech fashion show, is programmed to cycle every 261 seconds — the rate at which people are dying in Darfur. The watch was created by MIT graduate student John Rothenberg. Right, ‘Endangered Senses,’ by MIT grad student Gemma Shusterman, is designed to empathize with elephants’ senses. Its trunk-like sleeves contain sensors that pick up vibrations that elephants perceive, and then convert them into amplified sounds for human hearing.

AWARDS & HONORS

The American Institute of Aeronautics and Astronautics has named Professor **Ian Waitz** of aeronautics/astronautics an AIAA Fellow. The distinction is presented by the AIAA and its board to members who have made “notable and valuable contributions to the arts, sciences or technology thereof in aeronautics and astronautics.”

The studio led by **Arindam Dutta** and **Mark Goulthorpe**, associate professors of architecture, has won the 2006 Rotch Travelling Studio grant. The grant was established to augment the education of architecture students at the highest level of scholarship within a studio format. The studio will be traveling to Cairo, Egypt, and Samarkand, Uzbekistan.

Jacob Fox, a senior in mathematics, received the 2006 Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student. The Morgan Prize is presented annually by the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics. According to the award citation, Fox’s research “exhibits a formidable ability to get to the heart of the issues in the problems at hand, and the ability to develop extremely ingenious and novel techniques.”

John R. Williams, professor of information engineering and civil and environmental engineering and director of the Auto-ID lab, was named one of the 50 most powerful people in networking by Network World magazine in its Dec. 26, 2005, issue.

Rodney Brooks, director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) and professor of robotics, was named a 2005 fellow of the Association for Computing Machinery. Brooks was recognized for his contributions to artificial intelligence and robotics.

NEWS YOU CAN USE

In search of ideas

The Deshpande Center is providing the opportunity for MIT faculty members, research staff and students to pitch their innovative technology ideas at its annual IdeaStream Symposium on April 13. Applications are due by noon on Feb. 28. To learn more and download an application, visit web.mit.edu/deshpandecenter/ideastream2006/showcase.html.

Energy talk slated

Lee Lynd, professor of engineering at Dartmouth’s Thayer School of Engineering, will give a talk on “The Role of Biomass in America’s Energy Future,” from 4 to 6 p.m. on Thursday, Feb. 2, in Bartos Theater. His talk on converting biomass to energy is one of a series of colloquia sponsored by the MIT Energy Research Council.

ECONOMY

Continued from Page 1

predicting U.S. growth would be “OK, but not splendid” and Europe’s growth would be slow, due to bad policies and an imperfect adaptation to technology. He also noted that U.S. workers’ wages are “paying for increases in oil prices.”

“The failure of the U.S. to invest more in renewable energy resources is a piece of stupidity. The risks of a sharp rise in oil prices are very great,” he said.

Solow characterized the NASDAQ boom of the 1990s as a “fit of madness” that yielded the 2001 recession. The rise in real equipment spending over the past three years indicates the recession is passing, said Solow.

Solow said he anticipates that central banks will continue to find investment prospects in the United States attractive, but warned against generalizing.

“The best economists can do is try to predict the consequences of small events,” he said.

MIT EVENT HIGHLIGHTS FEBRUARY 1-5

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

IMAGE COURTESY / **MEL ZIEGLER**

"Camouflaged History," by Mel Ziegler, is part of a new exhibit, "America Starts Here — Kate Ericson and Mel Ziegler 1985-1995." The exhibit opening is 5:30 to 7:30 p.m. on Thursday, Feb. 9 at the List Visual Arts Center.

WEDNESDAY February 1

Kosher Chocolate Taste Test
Sample unique flavors of American, Israeli and European kosher varieties. Noon. 20 Chimneys. 253-2982.

Israeli Dancing Beginner's Night
8–11 p.m. Lobby 13. 253-FOLK.

THURSDAY February 2

"Amorous Intent: Looking for Love at MIT"
Curated exhibition exploring the cynical, the sweet, the humorous, the melancholy, the fuzzy, the bitter and any other interpretation on the theme of love at MIT. 24 hours. Wiesner Student Art Gallery. 253-7019.

"Lean Engineering: Doing the Right Thing Right"
Talk by Professor Earll M. Murman. 2–3:30 p.m. Room 33-206. 253-2279.

IDEAS Competition Project Consulting
6-8 p.m. Room 4-402.

"Urinetown"
Musical Theatre Guild production. Feb. 2-4. $12; $9 MIT faculty and staff, senior citizens and students; $6 MIT and Wellesley students. 8 p.m. Sala de Puerto Rico. 253-6294.

FRIDAY February 3

"Christian Marclay: Mixed Reviews (American Sign Language)"
American Sign Language (ASL) interpreter Jonathan Kovacks signs a long collaged text by artist Christian Marclay from reviews of musical performances. On view 24 hours. Media Test Wall, Whitaker Building 56. 253-4400.

"Arnold Newman: 20th Century Photographs"
Forty photographs on exhibit. 9:30 a.m.-5 p.m. Room 10-150. 253-4444.

"Aircraft Fire and Explosion? How Safe Are You in the Friendly Skies?"
Multimedia presentation by Albert Moussa. 2–3:30 p.m. Room 33-206. 253-2279.

Karate Practice
6:30–8 p.m. Room W31-225.

SATURDAY February 4

"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.

Ballroom Social Dance (participatory)
Evening of social dancing including ballroom and Latin dances, along with favorites such as salsa, hustle and merengue. $6 students; $10 general. 8 p.m. Morss Hall in Walker Memorial.

Grads on Ice
Skate party for Jewish grad students from all over Boston. 9-11:30 p.m. Johnson Ice Rink. 253-2982.

SUNDAY February 5

"Deep Frontiers: Ocean Engineering at MIT"
Exhibit. 9 a.m.-8 p.m. Hart Nautical Gallery. 253-5942.

"Scopes, Station Wagons and Solder: Unexpected Images From the Rad Lab and RLE Collections"
Collection of photographic negatives from the MIT Radiation Laboratory and the MIT Research Laboratory of Electronics. $5 adults; $2 students; free with MIT ID. Noon-5 p.m. MIT Museum. 253-4444.

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

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

EDITOR'S CHOICE

KOREAN DANCING AND DRUMMING — *Feb. 4*
All-day workshop in traditional Korean folk music, rituals, dance and acrobatics, with guest instructor MeSook Ko. $25. Register by Feb. 3.
W16
9 a.m.

"THE OLD LAW" — *Feb. 9*
Dramashop production of Thomas Middleton's 1618 play. Feb. 9-11 and 16-18. $8, $6 students.
Kresge Little Theater
8 p.m.

ANNUAL MLK JR. BREAKFAST — *Feb. 9*
Talk by Donna Brazile, chair of the Democratic National Committee's Voting Rights Institute. Reservations required. Call x3-5001.
Morss Hall
7:30-11 a.m.

MIT EVENT HIGHLIGHTS FEBRUARY 6-12

MONDAY February 6

2006 MIT Technology Fair
Companies from across the country pitch products and share what's hot. 11 a.m.–4 p.m. Kresge Auditorium and Rockwell Cage.

Physical Chemistry Seminar
Russell Hemley of the Carnegie Institute of Washington speaks. 4:30 p.m. Room 56-114. 253-1803.

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

Introduction to Self Defense
Jiu-Jitsu class covering basic self-defense skills. 9-11 p.m. DuPont Wrestling Room.

TUESDAY February 7

"Controversies in the Early History of Trigonometry"
Talk by Glen Van Brummelen, fellow at the Dibner Institute. Noon-2 p.m. Room E56-100. 253-6989.

Varsity Women's Basketball vs. Worcester Polytechnic Institute
6 p.m. Rockwell Cage. 258-5265.

"Patience or Bunthorne's Bride" Auditions
MIT Gilbert & Sullivan Players production. Prepare one song in English and bring a copy of the sheet music for the accompanist. 7-10 p.m. Feb. 7-9. Student Center, Room 491. 253-0190.

WEDNESDAY February 8

Computation for Design and Optimization Distinguished Speaker Series
Talk by Ignacio E. Grossmann of Carnegie Mellon University. 4–5 p.m. Room 1-390. 253-9313.

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.

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.

MIT Women's Chorale First Rehearsal for Second Semester
New members welcome at open rehearsals. 7:45 p.m. Room 10-340.

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. 7 p.m. Room 7-431. 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

"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.

"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.