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TechTalk
SERVING THE MIT COMMUNITY

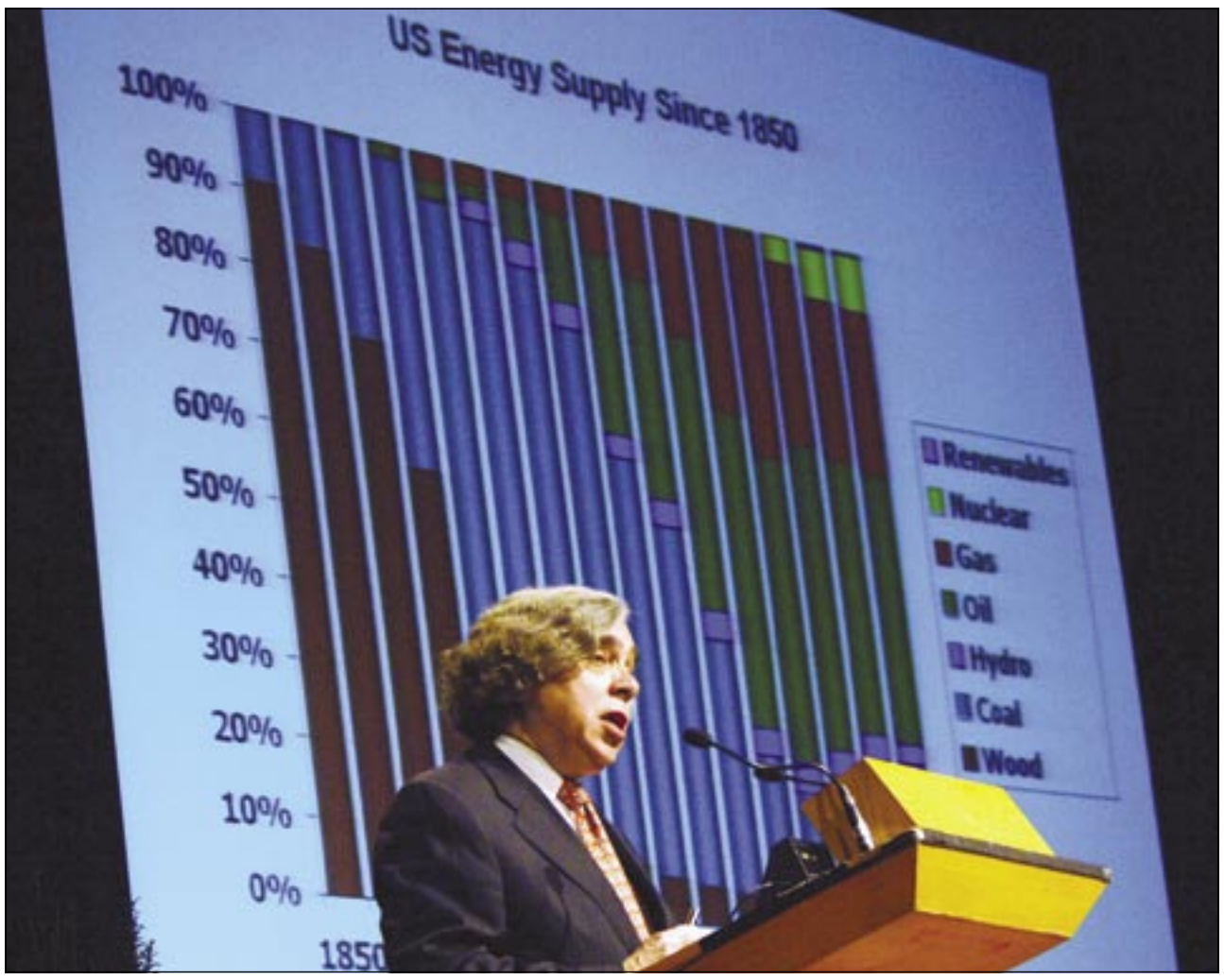

PHOTO / **DONNA COVENEY**

Professor Ernest J. Moniz, co-chair of MIT's Energy Research Council, provides some history on U.S. energy use during his overview of the ERC report at the 'MIT Energy Forum: Taking on the Challenge.'

Energy Forum fires up MIT

Event launches major initiative

Deborah Halber
News Office Correspondent

MIT took an expansive look at the energy landscape — from generation and storage to climate change and public policy — at the daylong "MIT Energy Forum: Taking on the Challenge," held Wednesday, May 3.

"It is time to consider measures that will improve the world's energy infrastructure," MIT President Susan Hockfield said in opening the event to a packed Kresge Auditorium full of representatives from corporations, government and the MIT community.

The public debate on energy has been focused on "patchwork solutions" targeting isolated problems, Hockfield said. "At MIT, starting today, we intend to redirect this debate toward the entire energy system."

Nineteen MIT faculty members spoke at the forum, which was held in conjunction with the release of a report by MIT's Energy Research Council (ERC). The ERC was charged by Hockfield in June 2005 with exploring how MIT could help meet the global energy challenge.

Speakers included members of the council and others whose research spans MIT's many energy-related contributions in science, technology and policy.

The day's panel sessions focused on three aspects of the energy crisis.

The first, "Science and Technology for a Clean Energy Future," laid out a vision for what the long-term solutions to the world's energy woes might be. Faculty members

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PHOTO / **DANIEL BERSAK**

'It is time to consider measures that will improve the world's energy infrastructure,' said MIT President Susan Hockfield in her opening remarks at the May 3 MIT Energy Forum.

Gast named new president of Lehigh U.

Sarah H. Wright
News Office

Alice P. Gast, vice president for research and associate provost, has been appointed president of Lehigh University in Bethlehem, Pa. She will assume leadership there on Aug. 1, 2006.

"It is a tremendous honor to be asked to serve Lehigh University as its next president. I am extremely excited about the trajectory and momentum of this university. I will miss MIT and all the wonderful colleagues who have made my work here so gratifying, and I will carry with me some of the MIT culture of merit and excellence that permeates the Institute," Gast said.

Alice P. Gast

MIT President Susan Hockfield described Gast as an "exceptionally talented academic leader and a wonderful colleague. Her leadership on issues relating to research policy and organization, faculty governance, and intellectual property, to name a few, is more than impressive, as is her ability to bring people with different interests together around a common agenda. All of these qualities will serve her — and the university — very well as Lehigh's next president."

A chemical engineer specializing in complex fluids and colloids, Gast came to MIT in 2001. She also served as the Robert T. Haslam Professor of Chemical Engineering.

In her administrative role, Gast coordinated policy regarding research and the licensing of copyrights and patents, and oversaw policies and processes regarding

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Scrabble spells sweet success for sophomore

Sasha Brown
News Office

The game of Scrabble played by MIT sophomore Jason Katz-Brown bears little resemblance to the parlor game played by word lovers the world over.

But then, Katz-Brown is the No. 1 Scrabble player in the country. He officially claimed the top ranking during the April 28-30 Boston Area Scrabble Tournament in Westford, Mass.

"The typical American who plays in their living room is terrible," Katz-Brown said with a smile. He carries a dog-eared copy of the official Scrabble dictionary — a compilation of four main American dictionaries — around in his pocket.

"I know all of the words in here," he said. (There are roughly 80,000.)

For Katz-Brown, the highlight of last week's win was the last game he played against one of his favorite players,

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NEWS

RESEARCH

Broad receives $18 million grant

The Broad Institute of MIT and Harvard has received an award of more than $18 million from the National Heart, Lung and Blood Institute (NHLBI) to support studies aimed at unveiling the genetic variations that underlie common human diseases.

The funds will help build a common data resource for the entire biomedical community that systematically combines genetic analyses of heart, lung, blood and sleep disorders with detailed information about disease characteristics in a range of patient groups.

"The research funded by this award should result in new insights into how genetic variation contributes to health and disease," said Stacey Gabriel, principal investigator of the grant and director of the genetic analysis platform and the National Center for Genotyping and Analysis at the Broad Institute. "We will work together with other members of the candidate gene association resource, or CARE, network to combine new methods for measuring genetic variation with an unprecedented collection of large, well-characterized clinical cohorts."

CARE will survey the DNA of 50,000 individuals, using large-scale genotyping technologies and advanced informatics, to highlight the differences contained in specific genes of interest. These "candidate" genes represent a prioritized list of the likely sources of inherited variation that are most relevant for human disease.

The sheer scale of this project with genetic data collected from as many as 50,000 participants allows for more in-depth analyses of diseases across multiple races and ethnicities," said NHLBI Director Elizabeth G. Nabel, M.D.

While inherited differences within our genes likely play roles in common diseases that affect major organ systems, such as the heart, lung and blood, their contributions appear to be complex and multifaceted, and therefore difficult for scientists to identify. The sequencing of the human genome and recent completion of the Haplotype Map ("HapMap"), a comprehensive catalog of common genetic differences in humans, has laid the groundwork needed to begin this task.

NEWS YOU CAN USE

Discussion on imagery

The Committee on Campus Race Relations (CCRR) is holding a panel discussion on "Visual Imagery and Its Cultural Implications" on Thursday, May 11, at 4 p.m. in Room 32-123.

The discussion will be moderated by CCRR co-chair Melissa Nobles, associate professor of political science. The panelists are: John Maeda, CCRR co-chair and the E. Rudge and Nancy Allen Professor of Media Arts and Sciences; Sandy Alexandre, assistant professor of literature; Nasser Rabbat, the Aga Khan Professor of Islamic Architecture; and David Ciarlo, assistant professor of history.

Bufferd reception

A reception will be held to honor retiring MIT Treasurer Allan Bufferd on Monday, May 15, in Walker Memorial. Bufferd, who announced his retirement last August, has served at the Institute for more than 33 years. For more information, visit web.mit.edu/newsoffice/2005/bufferd.html.

The MIT community is invited to attend the reception, which will be held from 4 to 6 p.m.

Tech Talk awards issue

Tech Talk is gearing up for its annual awards issue, which will be published June 7 to be available at Commencement.

Please submit information on your department's annual award winners by Wednesday, May 17, at 8 p.m. (Do not submit Infinite Mile Awards or awards from outside organizations.)

All submissions should be made online at web.mit.edu/newsoffice/awards.html. For more information, contact Kathryn O'Neill at kathryno@mit.edu or x8-5401.

CEOs keep eyes on the big picture

Claire Greene
MIT Leadership Center

Business managers seeking to encourage ethical and socially responsible behavior should constantly refer to their organization's core mission.

That was the message from two CEOs who spoke at MIT on Tuesday, May 2. Each works in an industry that faces tremendous pressure both to respond to society's needs and to earn profits for shareholders.

Lord John Browne, group chief executive of BP, and Dr. Daniel Vasella, chairman and chief executive officer of Novartis AG, spoke at the MIT Faculty Club. MIT President Susan Hockfield moderated the session, which was sponsored by the MIT Leadership Center.

Hockfield noted that MIT can "bring knowledge to bear on the world's great challenges. In addressing these issues, we seek not just to analyze problems but to solve them."

Two of those challenges are energy and health, which affect the daily lives of billions of people. BP is the world's second largest oil company and the seventh largest company in the world. Novartis holds leadership positions in patented and generic pharmaceuticals.

Expanding on the theme for the meeting, BP's Browne said, "Business is part of society. Its permission to be around is only granted when it serves human needs. If we remind ourselves that's what we're doing and doing it really well, we can make wealth for everybody."

Vasella discussed the role of the CEO in establishing a climate for corporate social responsibility, noting you can "impact the organization in a larger way."

Browne advised the audience to focus on the big picture and "remind people of purpose."

PHOTO / **L. BARRY HETHERINGTON**

Lord John Browne, group chief executive of BP, center, discusses issues of principle and profit with David Morgenthaler, founding partner of Morgenthaler, left, and Daniel Vasella, chairman and CEO of Novartis AG, at the MIT Faculty Club on Tuesday, May 2.

Deshpande Center names new director

The Deshpande Center for Technological Innovation at MIT has named Leon Sandler as its new executive director.

Sandler takes on the executive director role with more than 25 years of experience in general management, marketing, finance and business development at companies including Boston Consulting Group, Eastman Kodak, Texas Instruments and Digital Equipment.

"Thanks to the remarkable success of the Deshpande Center during its first four years, we were fortunate to have had an outstanding pool of candidates for this role. With its next phase upon us, it is time to innovate anew. We are extremely excited to bring someone with such extraordinary talent as Leon Sandler on board, and look forward to his leadership in the years ahead," said Charles Cooney, faculty director of the Deshpande Center.

Leon Sandler

Previously, Sandler ran his own consulting firm, Monmouth Group, where he transformed more than 20 growing businesses in a variety of technology sectors. Sandler has also served as the CEO of several startups and has assisted many other ventures as an interim executive or advisor.

Sandler's experience in the business and technology sectors and his work with startups will further enhance the Deshpande Center's leadership as a catalyst for innovation and entrepreneurship and as a bridge between the laboratory and marketplace.

Sandler also has experience within the MIT community, through his years of work with the MIT Venture Mentoring Service and MIT Enterprise Forum. He holds bachelor of science and master of science degrees in chemical engineering from Natal University in South Africa, and an M.B.A. from Stanford Business School. He is the inventor of the Texas Instruments Financial Investment Analyst calculator and a recipient of the Wall Street Journal Finance Award.

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Founded three years ago with an initial $20 million gift from Jaishree and Desh Deshpande, the Deshpande Center provides resources to help leading-edge MIT research emerge from labs to the marketplace.

Since its inception, the center has funded 51 projects with more than $6 million in grants. Nine projects have developed into independently funded companies, having collectively raised more than $40 million in financing from top-tier venture capitalists.

Each spring and fall, the Deshpande Center awards $50,000 Ignition Grants to fund proof-of-concept explorations, and Innovation Grants, which range from $50,000 to $250,000, to MIT research teams that want to assess and reduce the technical and market risks associated with their innovations.

Additional information on the Deshpande Center's grant program, research portfolio and other entrepreneurial resources can be found at http://web.mit.edu/deshpandecenter/index.html.

Architecture head Yung Ho Chang wins prize

Yung Ho Chang, head of MIT's Department of Architecture, will receive an Academy Award in Architecture from the American Academy of Arts and Letters at its annual award and induction ceremony in May. The award, which includes an honorarium of $7,500, is given to an American architect whose work is characterized by strong personal direction. Other winners for 2006 are Marwan Al-Sayed and Jeanne Gang.

An exhibit of the winners' work will be on view May 18 through June 4 at the Academy's galleries in New York City at Audubon Terrace, 155th Street and Broadway.

Chang completed his master's degree in architecture at the University of California at Berkeley in 1984. In 1993 he returned to China, where he was born, and started the country's first private architectural firm, Atelier FCJZ, now considered one of China's hottest design firms. He has received many awards, including the 2000 UNESCO Prize for the Promotion of the Arts. In 1999 he founded the Graduate Center of Architecture at Peking University, and in 2002 and 2003 he held the Kenzo Tange Chair at Harvard's Graduate School of Design. He has been head of MIT's Department of Architecture since 2005.

The American Academy of Arts and Letters was founded in 1898 to "foster, assist, and sustain an interest in literature, music and the fine arts." Each year, the Academy honors more than 50 artists, architects, writers and composers (who are not members) with cash awards. The amounts of these prizes range from $5,000 to $75,000.

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Town meeting planned on undergrad commons

Sasha Brown
News Office

Professor Robert Silbey, chair of the Task Force on Undergraduate Educational Commons, will share a number of the likely recommendations of the task force with the MIT community during a town meeting today from 3 to 5 p.m. in Room 32-123.

At this meeting and others being held this month, Silbey and members of the task force are seeking feedback from faculty and students prior to the preparation of their final report.

A little more than two years ago, the Task Force on the Undergraduate Educational Commons began a review of the General Institute Requirements (GIRs) and other aspects of the common undergraduate experience with a view to recommending changes to improve and strengthen the undergraduate experience.

In April, Silbey presented the major recommendations to the Academic Council. Silbey also met recently with undergraduate faculty officers in two meetings "specially designed to get reaction from the faculty most responsible for their department's curriculum," according to Peggy Enders, senior associate dean for undergraduate education and executive officer of the task force.

Today, Silbey and other task force members will present their likely recommendations at both the department heads' lunch and at the town meeting. The task force plans to submit its final report to President Susan Hockfield and to the faculty early in the fall.

Currently, all undergraduates are required to take six science core subjects — two each in physics and calculus, one in chemistry and one in modern molecular biology. Students are also required to satisfy a laboratory requirement, take two additional subjects in science, mathematics or technology, and take at least eight subjects in the humanities, arts and social sciences (HASS).

In addition, a four-subject communication requirement is satisfied through specific subjects in HASS and in the major.

Although the current system is "basically sound," according to Silbey's recent presentations to the faculty undergraduate officers, its content "can be broadened." The recommended new structure for the GIRs will include subjects in computation and engineering, as well as freshman year project-based subjects in engineering, science and/or design.

A new structure for the humanities, arts and social sciences requirements that features a more common experience for first-year students will be proposed.

Other aspects of the forthcoming report that will be discussed at today's town meeting include recommendations to improve undergraduate advising and mentoring; to increase the numbers of undergraduates who have an international experience during their four years at MIT; and to improve the teaching and learning of MIT's undergraduates.

SCRABBLE—

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a man called "GI Joel Sherman."

Until three years ago, when Katz-Brown read "Word Freak" by Stefan Fatsis, he had only played Scrabble with his family. "I never really liked it then," he said.

The book highlighted Sherman's success and piqued Katz-Brown's interest in the skill and potential glory of the game.

Last week's game against Sherman proved to be a legendary one, Katz-Brown said. During the course of the game, the players had seven "bingos" — a rare event in which a player uses all seven of his tiles in one word for bonus points. "It is just very unusual for that to happen," said Katz-Brown, who won the game with the word "unvisited."

The two players used such words as "alienors" ("one that transfers ownership of property to another," according to dictionary.com) and "moating" ("a deep wide ditch," according to dictionary.com).

Thus far, Katz-Brown's favorite word ever used in a game has been "waybills." He used it during the national Scrabble tournament in August 2005, earning 107 points. "That word won the game," he said.

Although Katz-Brown has been known to use some obscure words in papers at MIT, the meanings of the words are not the most important part of Scrabble, he said. "All the words are just letter strings that I use to gain points."

Katz-Brown spends hours poring over spreadsheets created from the official dictionary. He started a Scrabble group at MIT along with graduate student Aaron Bader, who is also a nationally ranked Scrabble player.

"He (Bader) is the only one I will play at MIT," Katz-Brown said.

For Katz-Brown, the game is part luck and a large part strategy. "Each rack is a new challenge," he said.

The key for anyone who wants to be decent at the game is to acquire the two-letter words first, Katz-Brown said.

The word "aa" ("lava having a rough surface," according to dictionary.com) can be played, as can "qi" ("the circulating life energy that in Chinese philosophy is thought to be inherent in all things," according to dictionary.com).

PHOTO / **DONNA COVENEY**

MIT sophomore Jason Katz-Brown recently took over the No. 1 ranking among Scrabble players in the United States.

"You want to try to play the Q off as soon as you can," Katz-Brown said.

But the key to winning championships is memorization, he said. Katz-Brown plans to spend between three and four hours a day on memorization once his classes end.

"My goal is to be the best Scrabble player in the world," he said.

For more information on Scrabble visit www.scrabble-assoc.com or join the MIT Scrabble Club by e-mailing Katz-Brown at jasonkb@mit.edu.

2.007 victor shares advice for 2006

Sarah H. Wright
News Office

MIT's 36th annual festival of extreme engineering, the famed robot competition that takes its name — 2.007 — from a sophomore mechanical engineering course, will be held on May 16 and 17 in the Johnson Athletic Center. The contest begins at 6 p.m. both nights.

About 150 students are participating in the course, which began in February and concludes next week with the nail-biting, 45-second elimination-round tournament. Each student designs and builds a robot from a bin of parts, taking it from concept to computer model and then engineering and "shipping" their machines.

"I Have To Fantastically Pass" (IHTFP), the 2006 iteration of 2.007, offers a benign, even hospitable-looking playing field, compared to past competitions. All the robots must gather balls of varying weights and sluice them downhill into bins of varying widths. The wider the bin, the lower your "grade," with the narrowest bin representing "A."

But gravity is not the automatic friend of this year's contestants, according to Mark Cote, a junior in mechanical engineering and winner of last year's contest, "Tic Tech Toe."

Cote, who has been working as an undergraduate teaching assistant (UA), helping the 2006 contestants, shared a former victor's perspective on "IHTFP."

As in 2005, "robots must score quickly and precisely while navigating a challenging course. Maneuverability is the key this year, since aligning a 'shot' from the top level will be fairly tricky. Robots that are versatile enough to navigate the entire board will do quite well," Cote said.

The contest is a challenge, but, he said, "you have the best resources in the world around you. My UA's were a huge help — whenever I couldn't figure out how to make something or how to attach a mechanism, they helped me dissect the problem. It's exciting to be a resource to students this year."

As for getting ahead in "IHTFP," Cote advised the 2006 contestants, "Finish early! It takes about two weeks to work out all of the kinks while learning how to drive the robot," he cautioned.

Cote also offered a veteran's view of the odds, 2.007-style.

"The best robot very rarely wins. It's usually the person with the best skill driving their robot. It's like a video game: The practiced students do quite well," he said.

Like generations of 2.007 contestants before him, Cote longs to jump in again. He actually built a sample car earlier in the term, he said.

As for life after 2.007, that's when the "real-world engineering starts. The consequences of poor engineering decisions become collapsed bridges and lawsuits instead of a flipped over RC car," he said. "2.007 is the gateway of a progression from student to engineer."

Twelve journalists selected as Knight Fellows

Martha Henry
Program in Science, Technology and Society

Twelve journalists from the United States, Brazil, Germany, Japan, Kenya and China have been selected to spend the 2006-07 academic year on campus as the 24th class of Knight Science Journalism Fellows.

The incoming fellows, who will be taking classes, attending seminars, visiting labs and conducting interviews at MIT, are part of the Program in Science, Technology and Society. Here is the new group of journalists:

- **Clark Boyd**, technology correspondent for The World, a radio show co-produced by the BBC and WGBH in Boston.
- **Herton Escobar**, science and environment reporter for O Estado de S. Paolo newspaper in Brazil.
- **Richard Friebe**, writer and editor for the Frankfurter Allgemeine Sonntagszeitung in Germany.
- **Lila Guterman**, senior reporter for The Chronicle of Higher Education.
- **Elizabeth Howton**, science and health editor of the San Jose Mercury News.
- **Jeanne Lenzer**, a freelance medical writer.
- **Wycliffe Muga,** who writes about environmental conservation for the Daily Nation newspaper in Kenya.
- **Stephanie Nano**, national desk supervisor and a reporter for the Associated Press.
- **Sora Song**, science reporter for Time magazine.
- **Tetsuro Yamada**, science writer for The Yomiuri Shimbun in Japan.
- **Yanning Luo** is a senior editor and reporter for Sanlian Life Weekly, the largest news weekly in China.
- **Zheng Yu**, desk editor for science and technology at Xinhua News Agency, China's most influential news organization.

Howton and Lenzer will be the first two fellows in the new medical science concentration within the Knight Fellowships.

The new class was chosen by a committee comprising Carey Goldberg, health/science reporter for The Boston Globe and a former fellow; David Mindell, professor in the Program in Science, Technology and Society at MIT; Martha Henry, acting director of the Knight Fellowships; and Boyce Rensberger, director of the Knight Fellowships.

For fuller text, please visit web.mit.edu/newsoffice/2006/knight.html.

Student research in the spotlight

Sasha Brown
News Office

MIT Energy Forum attendees on May 3 ate their sandwiches and salads while exploring the MIT Energy Club-sponsored poster session, which highlighted student energy research, projects and MIT-affiliated startups.

"We wanted to have a good mix," said graduate student David Danielson, president of the MIT Energy Club, which will hold its own energy conference. "The MIT Energy Conference: Energy 2.0 — Solving Tomorrow's Energy Crisis" will be held on Saturday, May 13 from 8 a.m. to 7 p.m. in Wong Auditorium.

Last Wednesday's poster session was a huge success, Danielson said, noting "At an event like this (the energy forum), a poster session paves the way for more two-way dialogue."

Among the dozen or so posters that lined the walls of the Kresge lobby was one featuring the Solar Decathlon 2007 team from MIT. 2007 is the first year MIT will have a team in the annual competition, which is sponsored primarily by the U.S. Department of Energy.

Twenty teams compete to create solar houses that will be transported to the National Mall in Washington, D.C., where they will become part of a temporary "solar village."

The MIT team is working on a design that would be workable for a middle class family, said Corey Fucetola, an electrical engineering and computer science graduate student and a member of the decathlon team. The house will be designed with minimal waste, using pieces that are almost all reusable.

Fucetola and the rest of team said the poster session was an opportunity to meet potential sponsors — and raise awareness about an important topic. "We need help. This is high-profile competition," Fucetola said. "Thousands of people are going to see our design."

Graduate student Arvind Narayanaswamy of mechanical engineering and his research group had a poster on "Nano-engineering for energy applications."

Narayanaswamy said he hoped the poster session would stimulate discussion.

The MIT Energy Club is sponsoring another poster session on Friday, May 12, from 5-7 p.m. on the first floor of the Stata Center.

The May 13 MIT Energy Club conference in Wong Auditorium will feature more than 35 speakers and panelists.

The event is organized around six panel discussions. Panelists will share their views on solar energy, nuclear power, fossil fuels, biofuels, building energy efficiency and transportation. The program includes presentations of emerging energy technologies from the MIT researchers who are working on them.

Keynote speakers will include Professor Ernest J. Moniz, co-chair of MIT's Energy Research Council and former U.S. undersecretary of energy, and Don Paul (S.B. 1967, S.M. 1969, and Ph.D. 1977), the vice president and chief technology officer for Chevron Corp. Moniz will speak during the morning session and Paul will speak at lunchtime. For more information, please visit www.mitenergyconference.com/.

PHOTO / **DANIEL BERSAK**

Graduate student Nicholas McKenna of the MIT Energy Club discusses energy research during a poster presentation at the MIT Energy Forum, held Wednesday, May 3.

ENERGY

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described their latest research on solar and other renewables, nanotechnology, catalysts, batteries and biofuels.

Jeffrey P. Freidberg, professor of nuclear science and engineering, described futuristic fusion energy that may one day turn a pickup-truck-full of seawater into electricity that could power Boston for a year. He said that exploiting fusion's enormous potential is still more than 30 years off.

The second panel, "Improving Today's Energy Systems," centered on enhancing existing technologies — nuclear energy; subsurface science and engineering for enhanced oil recovery; modeling, simulation and energy conversion; electricity systems and policy; public attitudes toward energy sources and paying for cleaner alternatives.

> *What are the implications of millions of windmills, not just a few in Nantucket Sound? We have to think not only of the scale of the problem, but the scale of the solutions and the implications of them.*
>
> **Henry D. Jacoby**
> Professor of management and co-director of the MIT Joint Program on the Science and Policy of Global Change

In the panel "Energy for a Rapidly Evolving World," faculty members talked about the science and policy of climate change; designing more efficient buildings; the future of transportation technologies, fuels and systems; and technology's effect on energy intensity in China.

Amy B. Smith, an instructor in the Edgerton Center, described how a hand-operated press that transforms agricultural waste into cooking briquettes could save lives and trees in developing countries. Smith also described ways of getting energy-related benefits to the billions of people in developing countries who are without electricity.

Henry D. Jacoby, professor of management and co-director of the MIT Joint Program on the Science and Policy of Global Change, brought up one key challenge in searching for solutions to a growing problem. The populations of India and China, already nine times that of the United States, are seeking to achieve the high level of energy consumption now seen in the United States.

"What are the implications of millions of windmills, not just a few in Nantucket Sound?" Jacoby said. "What are the implications of converting millions of acres to growing crops for biofuels? What are the environmental implications of piping around billions of gallons of liquid carbon dioxide and storing it in the ground? We have to think not only of the scale of the problem, but the scale of the solutions and the implications of them."

Hockfield said Wednesday that after a one- to two-month comment period, MIT's new energy initiative will enter the next phase by the fall semester. Fund-raising through government, industry and private sources will be undertaken to fund the report's recommendations, which include the creation of an MIT Energy Council representing all five schools to function as an independent steering organization to carry out MIT's new energy focus.

Future plans aside, ERC co-chair Robert C. Armstrong, Chevron Professor and head of the Department of Chemical Engineering, said Hockfield's initiative had already "added value on campus by bringing together different partners in different schools who had not previously worked together."

To download the ERC report or to see videos of the day's events, visit www.web.mit.edu/erc/.

GAST

Continued from Page 1

academic misconduct. Eighteen of the Institute's large, interdisciplinary research laboratories and centers as well as committees report to her office.

"From the start, MIT was so genuine and welcoming. I was impressed at how these extremely talented faculty were willing to roll up their sleeves and work together on tough problems," she said.

She cited the opening of the Institute for Soldier Nanotechnology (ISN) as an example of MIT's collaborative and innovative spirit. "Senior faculty self-assembled into a new organization. They wrote the proposal, designed a new facility and won the contract. It was a huge success!" she said.

MIT Provost L. Rafael Reif praised Gast for her "extraordinary job" in fostering new interdisciplinary initiatives, including ISN, and for her "wisdom and practical guidance" in areas including research policy, environmental safety and international scholarship in an "era of heightened security concerns."

A native of Texas who spent most of her life in California, Gast, 48, arrived at MIT just after Sept. 11, 2001, when the world and our nation's role in it were drastically altered. Since then, the regulatory environment has changed, especially for research universities, as attempts are made to restrict participation in some research to students of certain nationalities.

"My job is to make the research environment the best it can be. One of the great challenges that research universities face is finding that balance between security and openness. An important role for senior administrators is to fight this battle in Washington, D.C. MIT has been a leader in this area," Gast said.

Gast leads a research group that studies the physical and chemical processes governing the behavior of macromolecular liquids. The group aims to understand molecular forces and their influence on bulk properties through a combination of colloid science, polymer physics and statistical mechanics.

"My work has evolved from a materials focus to a more biological focus. Most recently, I've studied phenomena occurring in certain bacteria, where the cell membrane is fully coated with an organized layer of protein. It looks like a grid covering the cell's surface, and we are trying to understand how it works," she said.

PHOTO / **DONNA COVENEY**

Alice Gast, associate provost and vice president for research, has been named president of Lehigh University. Here, she and Timothy Swager, head of the chemistry department, left, celebrate with Professor Richard R. Schrock, right, after Schrock won the Nobel Prize in Chemistry on Oct. 5, 2005.

Gast was selected as the 2006 winner of the American Chemical Society Award in Colloid and Surface Chemistry, a singular distinction, and she has received many other awards for her work. Yet, true to the MIT spirit, she counts graduate student mentoring as the "highlight of being a professor. We've discovered many interesting things in our research, but the main products of my academic career are my graduate students. I take great pride in helping them learn new methods of problem-solving," she said.

Gast was always interested in chemistry, physics and math. The daughter of a biochemist, she credits her father's influence along with frequent hikes with a California mountain-climbing club composed mainly of engineers with inspiring her to pursue engineering.

She continues to enjoy sports, including cross-country skiing and jogging with her daughter.

Gast joined the Stanford University faculty as a professor of chemical engineering in 1985 after earning her Ph.D. from Princeton University.

A noted teacher at Stanford, she is the co-author of a classic textbook on colloid and surface phenomena. Her scientific achievements have been recognized with an array of honors, including a Camille and Henry Dreyfus Teacher Scholar Award and the Allan P. Colburn Award of the American Institute of Chemical Engineers. She was elected to the National Academy of Engineering in 2001.

Gast received the B.S. in chemical engineering from the University of Southern California in 1980. She went on to earn an M.A. (1981) and Ph.D. (1984) from Princeton. Gast is a member of the American Association for the Advancement of Science, the American Chemical Society, the American Institute of Chemical Engineers and the American Physical Society.

Gast and her husband, a computer consultant, have two children.

Embryonic stem cells reveal secrets

New research promises to help scientists explain the magic behind embryonic stem cells, cells with the extraordinary ability to transform into almost any cell type in the body.

A team of researchers, including several from MIT and the Broad Institute of MIT and Harvard, have discovered unique molecular imprints coupled to DNA in the embryonic stem (ES) cells of mice.

These imprints, or "signatures," appear near the master genes that control embryonic development and probably coordinate their activity in the early stages of cell differentiation. Not only do these findings help to establish the basis for the cells' seemingly unlimited potential, they also suggest ways to understand why ordinary cells are so limited in their abilities to repair or replace damaged cells.

The work is described in the April 21 issue of Cell.

"This is an entirely new and unexpected discovery," said Brad Bernstein, lead author of the study, assistant professor at Massachusetts General Hospital and Harvard Medical School, and a researcher in the chemical biology program at the Broad Institute. "It has allowed us to glimpse the molecular strategies that cells use to maintain an almost infinite potential, which will have important applications to our understanding of normal biology and disease."

Chromatin — the protein scaffold that surrounds DNA — acts not only as a support for the double helix but also as a kind of gene "gatekeeper." It accomplishes the latter task by selecting which genes to make active or inactive in a cell, based on the nearby chemical tags joined to its backbone.

By examining the chromatin in the embryonic stem cells of mice across the genome, the scientists discovered an unusual pair of overlapping molecular tags in the chromatin structure, which together comprise what they called a "bivalent domain," reflecting the dual nature of its design.

These domains reside in the sections of chromatin that control the most evolutionarily conserved portions of DNA, particularly the key regulatory genes for embryonic development.

"These signatures appear frequently in ES cells, but largely disappear once the cells choose a direction developmentally," Bernstein said. "This suggests they play a significant role in regulating the cells' unique plasticity," or adaptability.

The remarkable design of bivalent domains, which has not been previously described, merges two opposing influences — one that activates genes and another that represses them. When combined in this way, the negative influence seems to prevail and, as a result, the genes positioned near bivalent domains are silenced. However, the activating influence appears to keep the genes poised for later activity.

"For genes, this is equivalent to resting one finger on the trigger," said Stuart Schreiber, an author of the Cell paper, the director of the chemical biology program at the Broad Institute, and professor at Harvard University. "This approach could be a key strategy for keeping crucial genes quiet, but primed for when they will be most needed."

Although most people think of heredity in terms of DNA and the genes encoded by it, chromatin also carries inherited instructions known as "epigenetic" information. Thus, the chromatin scaffold (including its bivalent domains) forms a sort of molecular memory that, along with DNA, can be transferred from a cell to its descendants.

Yet ES cells signify the earliest cellular ancestors, leaving the question of how epigenetic history first begins.

The scientists found that bivalent domains coincide with characteristic DNA sequences, indicating that this molecular memory may originate from the DNA itself. "How the initial epigenetic state is established and then altered during development has implications not only for stem cell biology, but also for cancer and other diseases where epigenetic defects are implicated," Bernstein said.

A related study led by Rick Young, an MIT biology professor, member of the Whitehead Institute and an associate member of the Broad Institute, appears in the same issue of Cell and describes new control features found in human ES cells.

This work is funded by the National Institutes of Health, the National Cancer Institute, Massachusetts General Hospital, and the Howard Hughes Medical Institute.

PHOTO / **DONNA COVENEY**

Associate Professor Angelika Amon investigates the specialized cell division process that produces sperm and eggs.

Work aids understanding of life's beginning

MIT researchers have a new understanding of the process cells use to ensure that sperm and eggs begin life with exactly one copy of each chromosome — a process that must be exquisitely regulated to prevent problems such as miscarriages and mental retardation.

The new work reveals how gluelike protein complexes release pairs of chromosomes at precisely the moment of meiosis — the specialized cell-division process that produces sperm and eggs — enabling them to separate properly.

The researchers are led by Angelika Amon, an associate professor in MIT's Department of Biology, a member of MIT's Center for Cancer Research, and a Howard Hughes Medical Institute investigator. The work was published online in the May 3 issue of Nature.

Most cells in the human body — all those other than sperm and eggs — contain 23 pairs of chromosomes. These cells divide through mitosis, a process that creates daughter cells with the same complement of chromosome pairs as the parent. Sperm and egg cells, on the other hand, must contain only half the chromosomes of their parent cells, so that the normal chromosome number will be restored when the sperm and egg unite during fertilization. To achieve this, they are produced through meiosis.

Gluelike protein complexes called cohesins, which hold the members of a chromosome pair together until just the right moment during cell division, are central to both processes. Bound together by cohesins, chromosome pairs must organize themselves in preparation for cell division before they can be released.

According to Amon, a deeper basic knowledge of the mechanism of cohesin loss during meiosis could ultimately improve understanding of the origins of miscarriages and mental retardation due to mis-segregation of chromosomes.

"We first need to understand the key regulatory players and the molecular mechanisms that cause chromosomes to segregate in this very unusual way during meiosis," she said. "Once we have a good enough understanding, then we can ask, for example, what exactly happens to cohesins in older women that make them more likely to give birth to children with an abnormal chromosome number."

Amon's co-authors on the Nature paper are Gloria A. Brar and Brendan M. Kiburz, both graduate students in biology; Forest White, assistant professor in the Division of Biological Engineering (BE); Yi Zhang, a BE graduate student; and MIT affiliate Ji-Eun Kim.

Knowledge about the mechanism of cohesin function has remained sketchy, even though it plays a central role in meiosis. Researchers knew that an enzyme called separase snips apart cohesins, targeting a specific subunit of the cohesin complex called Rec8. Also, Amon said, researchers had found that Rec8 cleavage was promot-

See **AMON** Page 6

Researchers map development of mouse stem cells

David Cameron
Whitehead Institute

How humans manage to develop from a single fertilized egg into the trillions of cells that make up a mature adult remains a poorly understood process. Now, using both human and mouse embryonic stem cells, researchers from MIT, the Whitehead Institute and Harvard have mapped how a key developmental ingredient controls the genome.

The map could be used to guide the fate of stem cells so that they could replace diseased or damaged cells.

The mouse results were published in the April 20 issue of Nature; the human results in the April 21 issue of Cell.

"These papers are a major step forward in our efforts to map the regulatory circuitry of embryonic stem cells — which constitutes the founding circuitry of human beings," said Richard Young, an MIT biology professor and Whitehead member.

His senior colleagues on the work are Rudolf Jaenisch, an MIT biology professor and Whitehead member; David Gifford, an MIT professor of electrical engineering and computer science; and Harvard University's Douglas Melton.

Both papers focus on a set of proteins collectively called Polycomb group proteins. Previous studies have shown that Polycomb proteins are essential for early development. If the genes that code for Polycomb proteins are lost in embryonic stem cells, the cells begin to develop in an uncontrolled fashion and lose their unique properties.

Knowing that Polycomb is key to an embryonic stem cell's identity, Young and Jaenisch realized that catching it in action as it interacts with all its target genes would provide an unprecedented look into how stem cells are wired.

But how could anyone scan all 3 billion letters of the genome to identify several hundred protein/DNA interactions? It's the biological equivalent of poring over satellite images of North America to find all the power stations that feed the electrical grid.

Young's lab has developed a suite of tools that can scan entire genomes to locate certain targeted molecules. However, this is the first time such technology has been used to scan the entire genomes of embryonic stem cells.

A group of researchers — led by postdoctoral scientists Laurie Boyer, Matthew Guenther, Richard Jenner, Tony Lee, Stuart Levine and Kathrin Plath — applied the technology to human and mouse embryonic stem cells. "It required tremendous innovation from this group," Young said. "Careful handling of embryonic stem cells, designing the microarray tools, analyzing the sheer volume of data from the human genome — these experiments were technical feats carried out by an exceptionally talented team in an interdisciplinary environment."

Polycomb, it turns out, represses entire networks of genes that are essential for later development — the same genes that begin to turn on as a stem cell starts to differentiate. That explains why embryonic stem cells immediately grow into specialized cells when Polycomb proteins are lost.

"Polycomb is dynamic, working with other molecules to silence genes and then gradually allowing them to activate during development," Jaenisch said. "It is also the founding ingredient for development, so knowing how it works and which genes it interacts with will be invaluable for understanding these amazing cells."

This work was funded by the National Institutes of Health.

MIT teams rewarded for innovation

Sarah H. Wright
News Office

The Deshpande Center for Technological Innovation has awarded $500,000 in grants to seven MIT research teams working on discoveries that could revolutionize drug development and delivery, surgical procedures and trauma care, safety products in sports, and water purification processes, among others.

"The real-world implications of MIT research are critical to improving life worldwide. We look forward to working with this list of grant recipients to bring their research to fruition," said Charles Cooney, faculty director of the Deshpande Center.

The spring 2006 Deshpande grant recipients are:

• **Rutledge Ellis-Behnke,** a research scientist in the Department of Brain and Cognitive Sciences, is working to develop a new transparent compound that stops bleeding instantly.

• **Angela Belcher,** professor of biological engineering and materials science and engineering, and David Clapham, professor of neurobiology and pediatrics at Harvard Medical School, are working on a nanotechnology-based approach to monitoring key proteins that could open up new drug markets.

• **Paula Hammond,** associate professor of chemical engineering, focuses her research on "smart" drug coatings that can conform to medical devices of any shape and allow the release of multiple drugs at varied times.

• **Michael Cima,** professor of materials science and engineering, is developing a device to deliver medicine that treats bladder disorders from incontinence to interstitial cystitis to cancer.

• **Amy Smith,** an instructor in the Edgerton Center, is designing a new incubator to test for bacterial contamination in water.

• **Michael Stonebraker,** an adjunct professor in the Department of Electrical Engineering and Computer Science, plans to develop a next-generation data transformation tool.

• **Laurence Young,** the Apollo Program Professor of Aeronautics and Astronautics and professor of history of science and technology, is developing designs for improved safety helmets.

In addition to financial support, the Deshpande Center offers a network of entrepreneurs, venture capitalists, and academic and legal experts who help recipients assess the commercial potential of their innovations and make decisions that accelerate progress toward the development of a business plan or licensing strategy.

The Deshpande Center is part of the MIT School of Engineering and was established through an initial $20 million gift from Jaishree Deshpande and Desh Deshpande, the co-founder and chairman of Sycamore Networks.

Nanoparticles may help treat tumors

A new technique devised by MIT engineers may one day help physicians detect cancerous tumors during early stages of growth.

The technique allows nanoparticles to group together inside cancerous tumors, creating masses with enough of a magnetic signal to be detectable by a magnetic resonance imaging (MRI) machine.

The work appears as the cover feature in the May issue of Angewandte Chemie International Edition, one of the world's leading chemistry journals.

The research, which is just moving into animal testing, involves injecting nanoparticles (billionths of a meter in size) made of iron oxide into the body, where they flow through the bloodstream and enter tumors.

Solid tumors must form new blood vessels to grow. But because this growth is so rapid in cancerous tumors, there are gaps in the endothelial cells that line the inside of the blood vessels. The nanoparticles can slip through these gaps to enter the tumors.

Once inside the tumor, the nanoparticles can be triggered to group together by a mechanism designed by the MIT engineers. Specifically, certain enzymes, or proteases, inside the tumors cause the nanoparticles to "self-assemble" or stick together. The resulting nanoparticle clumps are too big to get back out of the gaps. Further, the clumps have a stronger magnetic signal than do individual nanoparticles, allowing detection by MRI.

"We inject nanoparticles that will self-assemble when they are exposed to proteases inside of invasive tumors," said Sangeeta N. Bhatia, M.D., Ph.D., associate professor of the Harvard-MIT Division of Health Sciences & Technology (HST) and Electrical Engineering and Computer Science (EECS). "When they assemble they should get stuck inside the tumor and be more visible on an MRI. This might allow for noninvasive imaging of fast-growing cancer 'hot spots' in tumors." Bhatia also is affiliated with the MIT-Harvard Center of Cancer Nanotechnology Excellence.

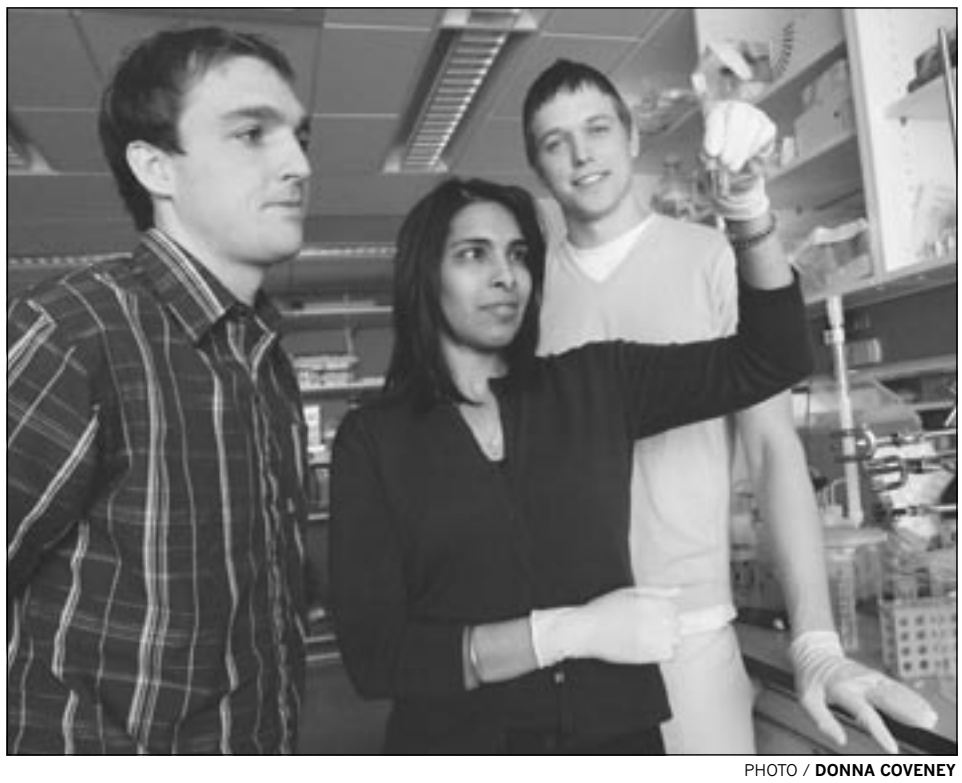

PHOTO / **DONNA COVENEY**

From left, Todd Harris, graduate student in the MIT-Harvard Division of Health Sciences & Technology (HST), Sangeeta Bhatia, professor in HST, and Geoffrey von Maltzahn, graduate student in HST, view two solutions of enzyme-activated nanoparticles. The enzymes cause the nanoparticles to self-assemble into large aggregates that fall out of solution.

The technique initially is being used to study breast tumors. Bhatia added that it eventually may be applied to many different types of cancers and to study the "triggers" that turn a benign mass in the body into a cancerous tumor. Nanoparticles also hold the promise of carrying medicines that could kill cancer cells, replacing radiation or chemotherapy treatments that cause negative side effects such as hair loss or nausea.

The researchers hold a provisional patent on their work.

Co-authors on the paper are Todd Harris and Geoffrey von Maltzahn, HST graduate students; Austin Derfus, a graduate student at the University of California at San Diego; and Erkki Ruoslahti, M.D., Ph.D., a professor at The Burnham Institute in LaJolla, Calif.

The work was supported by the National Cancer Institute, the National Aeronautics and Space Administration and the Whitaker Foundation.

AMON

Continued from **Page 5**

ed by phosphorylation — the addition of chemical phosphate groups — of Rec8.

Researchers also knew that cohesins release chromosome pairs from one another's embrace quite differently during meiosis and mitosis. In mitosis, cohesins release chromosomes along their entire length simultaneously. However, in the initial stage of meiosis, cohesins first release only the "arms" of chromosomes, still holding the chromosomes together at their central connection point, the centromere. Only in a second stage of meiosis that gives rise to haploid sperm or egg cells do centromeric cohesins become cleaved. This precisely controlled centromeric "stickiness" is essential for the accurate segregation of sister chromatids into separate cells.

"The key question we wanted to explore was how this step-wise loss of cohesins in meiosis was regulated," said Amon. "It could be that the enzyme separase was the key regulatory player, or it could be that it was the phosphorylation of cohesins that was central."

To find out, the researchers experimented with yeast cells, selectively mutating the Rec8 subunit so that it could not be phosphorylated. They then studied how the cell's inability to phosphorylate Rec8 affected meiosis. Those experiments showed that phosphorylation is, indeed, important for governing the step-wise loss of cohesins, said Amon.

Amon and colleagues found that phosphorylation was not the only process essential for cohesion removal. Recombination — an exchange of DNA between chromosomes that promotes genetic diversity — is also needed for the initial removal of cohesin from the chromosome arms, they found.

In meiotic recombination, after each member of a chromosome pair has replicated to produce identical sister chromatids in the initial stage of meiosis, the chromosomes exchange arm segments. Only after this exchange, or recombination, do the cells proceed to the second stage of meiosis — dividing without chromosome replication to produce haploid sperm or egg cells. Recombination is essential for cohesins to get removed from chromosome arms before they are removed from centromeres, Amon said.

"For a long time, people did not think that recombination played any role in establishing the step-wise cohesin loss pattern," she said. "But our experiments showed that recombination is absolutely essential to remove cohesins from chromosome arms during the initial meiotic stages, and if you don't have recombination that does not happen properly."

Amon emphasized that the discovery of the importance of phosphorylation and recombination is only the beginning of understanding the intricate, critical process of cohesin loss. "There are no doubt other mechanisms at work in cohesin loss, but at this point we don't know what they are," she said.

This work was funded by the National Institutes of Health and the National Science Foundation.

CLASSIFIED ADS

Classified ads appear in Tech Talk every other week. Members of the MIT community may submit one classified ad each issue. Ads can be resubmitted, but not two issues 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

Female summer law intern seeks single apartment or sublet in MIT area w/ private bath for 6/1 through 8/1 or 8/5. Non-smoker, no pets. Internet access required. Desired rent: $600/mo+/-. Contact He Shan at walnuthe@hotmail.com.

Bedford near Lexington: Beautiful new 1450 sq ft., 2BR, 2BA, w/d, hdwd flrs, a/c, cable, utilities inc., nr conservation & Minute Man Trail, Middlesex College, bus, $1650/month. Beth at 781-687-9672, bamarcus@alum.mit.edu.

Seeking roommate for 2BR apartment in Arlington. Avail. immediately. $600 + utilities. Nr Mass. Ave., #77 & 79 buses to Harvard & Alewife. ~7 mile drive to Lincoln Lab. Contact David at dheggestad@ll.mit.edu, 781-316-1729 or 781-981-2329.

Cambridge - Porter Square. 1800 sq.ft. duplex condo for sale - 2-3 BR, 2 BA, office, big yard, parking. 10 min. walk to T, elementary school, playground, gyms, shopping. Custom-built bookshelves in 3 rooms. Call Adam 617-694-8553.

Billerica: spacious Colonial. Approx. 20 min to Lincoln Lab. 3BR, 1.5BA, lg lot w/ fenced bkyd. Convenient to schools, shopping, town center. Hdwd flrs, new roof, new side deck, finished bsmt. Easy access to RT3, 128, 495. $459,900. Call Chris at 978-663-0664.

VACATION

Martha's Vineyard: 3+BR Chappaquiddick house 1 mile to beach & golf, 3 miles from Edgartown. Only some June & September weeks available. Due to cancellations $150 discount. $700 to $900 weekly. Contact David at 781-981-5087 or 603-654-5513.

Northeast Vermont: 2-3BR fully equipped cabins provide scenic views, ideal hiking, biking, fishing & hunting. 56 private acres, surrounded by 10,000+ acres of state wildlife area. 802-563-2033 or 781-893-5224.

Gloucester: 2BR home rental. July 9-August 5 (4 weeks). Off street parking for 2-3 cars; steps from water; ten minute walk to town or train. $2000. Contact: melody@MelodyTheArtist.com

VEHICLES

1996 Windstar LX, 114K. Drivable (as is) or could be repaired or used for parts. Call to find out what it needs. Driven daily. Priced for quick sale $1,450. 617-258-3458 days or 978-535-0270 nights.

FOR SALE

14' aluminum boat w/ 20hp Johnson motor & trailer - $1,500/bst. Captain-style queen waterbed frame w/ bookcase headboard and mirrored canopy - $250/bst. Cheryl at 617-258-5673 or Cheryl@mit.edu.

Tickets for China National Symphony Orchestra, 1st time in Boston, May 14, 7 p.m. Symphony Hall. Program includes Shostakovich's Festive Overture, Rachmaninoff's Piano Concerto No. 2, others. Tickets $25-$100. Call 617-253-2590.

MISCELLANEOUS

Free Soloflex with attachments. Must pick up. x3-9456 or 617-718-7704.

Looking for someone to develop a web site. Please contact Rachel Kelly for info. rgkelly@mit.edu or 617-460-5369.

STUDENT EMPLOYMENT

Student needed to help develop overall program vision, strategy & logistics. Assist in marketing to entrepreneurs, fundraising, providing technical assistance to program participants, training services, direct community outreach, update website, www.ncvkitchen.org, etc. Qualificiations: Strong people skills, ability & desire to work w/ people of different cultural, ethnic & socio-economic backgrounds, self motivated w/ ability to work independently, language skills in Spanish a plus, understanding of Word, Excel & accounting principles a plus. $10/hr. Contact Cary Wheaton at 617-522-7900.

SUMMER 2006 - Media and Technology Charter High School (MATCH) seeks committed, caring & enthusiastic individuals to tutor in Summer Academy. Seeking English, math, science & history tutors. The Summer Academy runs July 17 to Aug. 17. Mandatory training, one full day & one 3-hour session, prior to start of the Academy. Summer Academy meets 4 days/week, Monday-Thursday, 7:45 a.m. - 1 p.m. $17/hr. Contact bob.hill@matchschool.org.

PHOTO / **COLIN DILLARD**

Lamine Touré, lecturer in music and theater arts, will perform with Rambax on Saturday, May 13 in Kresge Auditorium.

MIT hosts world music

Lynn Heinemann
Office of the Arts

MIT will be a world music capital this week, with three concerts representing four non-Western cultures.

Drummers from Egypt and Japan

Master percussionists Karim Nagi on Egyptian tabla and Elaine Fong on Japanese taiko will demonstrate their respective instruments, then offer a joint performance on Thursday, May 11 at 7 p.m. in Room E25-111.

Fong is founder and artistic director of Odaiko New England and a member of Marco Lienhard's group, Taikoza.

Nagi, a native Egyptian who has lived in Boston for 20 years, performs Arabic, Turkish and Andalusian hand percussion. He is part of the SHARQ Arabic Music Ensemble.

"Tabla" and "taiko" are the Arabic and Japanese words, respectively, for drum.

MIT students organized the May 11 drumming event to complement a series of discussions on post 9-11 civil liberties issues during times of national security.

"The idea was to celebrate the cultures. Blending the art forms came about as we were examining the politics," says Ken Oye, associate professor of political science.

Senegalese Sabar drumming

MIT's Senegalese drumming ensemble, Rambax, will perform on Saturday, May 13, at 8 p.m. in Kresge Auditorium.

Led by Senegalese master drummer Lamine Touré, lecturer in music and theater arts, and Patricia Tang, associate professor of music and theater arts, Rambax explores the drumming and dance traditions of Senegal.

For this concert, Rambax will stage a folkloric presentation of the "ndeupp," a Senegalese healing ceremony. Ndeupp uses drumming and dance to "appease the spirits and bring balance back into the spiritual realm," says Tang.

The show will feature a number of guest artists, including Senegalese master dancers Pape Ndiaye, Mariama Basse and Demba Sene, and master drummer Thiokho Diagne.

South Indian classical vocalist

Carnatic music, also known as Karnataka Sangeetha, is an ancient string-instrument-based classical music from south India.

One of India's most celebrated Carnatic musicians, Mangalampalli Balamuralikrishna, will perform in an MIT Heritage of the Arts of Southasia (MITHAS) Gala Concert, with B. Raghavendra Rao on violin and H. Ramakrishnan on mridangam, the classical drum of South India, on Sunday, May 14 at 4 p.m. in Kirsch Auditorium in the Stata Center.

Tickets range from $10 to $50 and are available at the door or at www.sulekha.com/mithas.

Memoir exposes perils of Soviet-style science

Robin H. Ray
News Office Correspondent

It is unlikely that there are many MIT professors who have climbed out of windows to escape a "friendly" lunch with a team of KGB agents, but Loren Graham, professor of the history of science in the Program in Science, Technology and Society (STS), is one of them.

The story of that lunch and many other gripping episodes from his long, distinguished career of studying Soviet science appear in his new memoir, "Moscow Stories" (Indiana University Press, $29.95).

Almost any memoir dealing with the Soviet era in Russia includes its share of surreal scenes, and "Moscow Stories" is no exception. Graham was courted by intelligence services on both sides and had to get used to the omnipresence of "minders," even on his long jogging route through the Moscow neighborhoods. (His minders were always outfitted in identical blue tracksuits.)

The contents, categorization and availability of materials in the libraries where he did his work shifted with the political winds, sometimes from one day to the next. In the august halls of Soviet academe, he writes, "Standard equipment for the most distinguished scholar in the library was a small roll of toilet paper tucked away in a pocket, for the toilets contained none."

Government meddling

More substantively, Graham's memoir charts his years of research, much of it in Moscow and St. Petersburg, into the successes, failures and cultural meanings of Russian science. His studies revealed the perils, both to science and to scientists, of government meddling in science.

In the USSR, the self-dealing and ambitious biologist Trofim Lysenko, "the most infamous scientist of the 20th century," falsified results in the field of livestock breeding, setting the country on a disastrous path of denying (and persecuting those who insisted on) the significance of DNA in genetics.

Lysenko's sway over official science not only had tragic consequences for the country's agriculture, including ruining the country's breeding stock, but also sent dozens of reputable geneticists to exile and death in Siberia. One of the most riveting chapters in "Moscow Stories" tells the tale of Lysenko, and Graham's dogged and ultimately successful attempt to interview him.

In an e-mail from Moscow, Graham commented that the lessons learned from the Soviet experience with Lysenko are applicable to other countries: "When the president of the country, as George Bush has done, makes his own comments on the validity of certain scientific views — such as biological evolution, global warming, etc. — this is a very dangerous precedent."

Soviet science has a lot to teach engineering students as well. "Much social damage can be done by keeping engineering education too restricted, without adequate attention to subjects like political economy, the humanities and the social sciences," Graham writes.

Neglect of these areas in Russian education led to notorious industrial planning failures, which Graham outlined in his previous book, "The Ghost of the Executed Engineer" (1993). He adds, "After studying these mistakes, one can draw conclusions that are important for engineering education everywhere, including in the United States and at MIT."

PHOTO / **DONNA COVENEY**

Mural memorial

Andrew "Zoz" Brooks, left, graduate student in electrical engineering and computer science, watches as TATS CRU graffiti artist Sotero "BG183" Ortiz completes a mural in memory of MIT night watchman James "Big Jimmy" Roberts Sr., who died in 2005.

Wind Ensemble performs world première

The MIT Wind Ensemble, directed by Frederick Harris, Jr., presents the world première of Guillermo Klein's "Solar Return Suite," with tenor saxophonist, Bill McHenry, in a concert on Friday, May 12, at 8 p.m. in Kresge Auditorium. Admission is $5 at the door.

"Guillermo is one of the most gifted young composers working today. I was excited to see what he would do with all of these colors. He's turned out an amazing 30-minute work that I'm certain will have a life beyond our première. His music is deep, spiritual, inventive and cuts straight to the heart," says Harris, who noted that Klein had never before composed for wind ensemble.

Klein, a native of Argentina, and McHenry, a native of Maine, will be on campus the week of the concert, teaching and lecturing in music classes. They will discuss their creative process in a pre-concert lecture demonstration at 7:15 p.m.

Both Klein, who composed a piece for MIT's Festival Jazz Ensemble during a 2001 residency here, and McHenry have received recognition for their musical achievements.

The New York Times and The Chicago Tribune selected Klein's latest CD, "Una Nave" (with his ensemble, "Los Guachos"), as one of the best jazz recordings of 2005.

Guillermo Klein

"Whether he appears to be drawing from boleros, baroque music, ragas or Wayne Shorter, he's risking a bit, and going after the transcendental moment," music critic Ben Ratliff wrote of Klein in The New York Times.

McHenry is an emerging voice on the New York jazz scene. "Any musician who works so effectively against a common language and uses cliché so little in the process, is worth listening to," Ratliff wrote.

At the May 12 concert, the MIT Wind Ensemble will also perform Michael Gandolfi's "Vientos y Tangos," Bernstein's "Profanation" from "Jeremiah, Symphony No.1," and Grainger's "Colonial Song" and "Handel in the Strand."

For more information, call x3-2826.

Endicott House invites MIT to party

MIT Endicott House is winding up its 50th anniversary celebration on Saturday, May 13, with a "Block Party" open to all members of the MIT community.

The Block Party, scheduled to run from noon to 5 p.m., will feature the music of Liberty Street Band and fun for children, including balloon sculptures, juggling and a parade headed by Tim the Beaver.

Other activities will include a cooking challenge with Isaac Colbert, dean for graduate students, and MIT Police Sgt. Cheryl Vossmer; and house and garden tours.

Food will be available and is free for students.

MIT Endicott House is located in Dedham. Free transportation is being provided to and from campus with shuttle buses running on the half hour. Pickup will be in the circle in front of the former campus police station on Mass. Ave. Free parking will also be available.

"We expect it to be tremendous fun for everyone," said Mike Fitzgerald, Endicott House general manager.

MIT EVENT HIGHLIGHTS MAY 10-14

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

Of bats and men

This still is from 'Echoes of Bats and Men,' an experimental animation film by Jo Dery. It will be shown with other short films by Dery at a 'Chicks Make Flicks' screening on Thursday, May 11, at 7 p.m. in Room 6-120.

WEDNESDAY
May 10

"Winning the Olympic Bid: Inside London's Successful Bid for 2012"
Humrorous talk by Dennis Luckett of British Telecom giving a "behind the scenes" look at the lead up to the final presentation and the nail-biting vote for the 2012 Olympic bid. 3–4 p.m. Room E51-151. 253-4592.

SAA Spring Art Sale
Student Art Association's annual sale of ceramics and other arts. May 10 and 11. 9 a.m.-5 p.m. Lobby 10. 253-7019.

THURSDAY
May 11

"Powering the Planet: The Challenge for Chemistry in the 21st Century"
Talk by Daniel Nocera, professor of chemistry. 4–5 p.m. Room E40-496.

"Middle East Meets Far East: Tabla and Taiko Drumming"
Master percussionists Karim Nagi and Elaine Fong demonstrate Egyptian tabla and Japanese taiko, and then offer a joint performance. 7 p.m. Room E25-111.

The Center for 21st Century Energy Seminar Series
Talk by Sébastien Candel of École Centrale Paris. 4:15-5:30 p.m. Room 37-212.

MIT Dance Troupe Spring Concert
Dances choreographed by students, from hip-hop to ballet. May 11-14. $7 in advance, $10 at the door. May 11-13 at 8 p.m. May 13 at 4 p.m. May 14 at 2 p.m. Kresge Little Theater.

FRIDAY
May 12

Gallery Talk
Talk by Bill Arning, curator of the List Visual Arts Center, presented in conjunction with "9 Evenings," at the List Visual Arts Center May 4-July 9. 6 p.m. List Visual Arts Center. 253-4400.

Opening Reception: Student Mural Competition
The winning work will be on view for one year. 3-5 p.m. Stata Center Student Street. 253-8089.

MIT Energy Poster Session
The poster session, sponsored by the MIT Energy Club, will showcase MIT energy research in science, technology, policy and entrepreneurship. 5-7 p.m. First floor, Stata Center. 512-2646

MIT Wind Ensemble Concert
World première of Argentinian-born Guillermo Klein's "Solar Return Suite" with Bill McHenry, tenor saxophone. $5. 8 p.m. Kresge Auditorium. 253-2826.

SATURDAY
May 13

MIT Endicott House 50th Anniversary Celebration Block Party
Celebration for members of the MIT community. Noon-5 p.m. Endicott House. 253-5211.

Student Recital
Molly Bright, oboe; Brian Kardon, violin; Jennifer Grucza, viola; Marianne von Nordeck, cello; Daniel Molkentin, tenor; Jean Rife, harpsichord. 2 p.m. Killian Hall. 253-2826.

MIT Ballroom Dance Social
Hosted by the MIT ballroom dance team. 8 p.m.-midnight. Morss Hall.

Rambax, MIT Senegalese Drum Ensemble
Lamine Touré and Patricia Tang, co-directors. 8 p.m. Kresge Auditorium. 253-2826.

SUNDAY
May 14

MIT Women's Chorale Spring Concert
Nancy Kushlan Wanger, director. 2 p.m. Killian Hall.

MITHAS Gala Concert
M. Balamuralikrishna, Carnatic vocal; B. Raghavendra Rao, violin; H. Ramakrishnan, mridangam. $40. 4 p.m. Kirsch Auditorium. 258-7971.

Chamber Music Society Student Recitals
5 p.m. and 7 p.m. Killian Hall. 253-2826.

MIT Concert Band
Works by Dello Joio, Prokofiev, Chaminade, Khachaturian, Halvorsen, Mellilo and de Meij. 2 p.m. Kresge Auditorium.

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

TOWN MEETING — *May 10*
Professor Robert Silbey, chair of the Task Force on Undergraduate Educational Commons, will discuss the group's recommendations.
Room 32-123
3-5 p.m.

PLAYWRIGHTS IN PERFORMANCE — *May 11*
Original plays by MIT students, directed by Associate Provost for the Arts Alan Brody. May 11-13.
Kresge Rehearsal Room B
8 p.m.

MIT ENERGY CONFERENCE — *May 13*
Talks by and panels with leaders of energy technology, policy and industry, discussing solutions to the world's looming energy crisis.
Wong Auditorium
8 a.m.-7 p.m.

Students untie mysteries of Incan knots

Robin H. Ray
News Office Correspondent

In 1561, the vice regal court of Los Reyes (now Lima), Peru, heard testimony from the town of Xauxa, listing the items that the Spanish conquistador Francisco Pizarro and his soldiers had taken or looted from the Inca imperial storehouses. The list was read not from a manuscript or a tablet, but from a bundle of knotted strings called a khipu, which the Incas used for a wide variety of record-keeping, from the state census to the genealogies of Inca kings.

On Tuesday, May 2, a giant facsimile of a segment of the Xauxa khipu was unveiled in the fifth-floor lobby of Building 16. More than 50 students and faculty gathered for the opening, which was presided over by Heather Lechtman, Professor of Archaeology and Ancient Technology in the Department of Materials Science and Engineering.

PHOTO / **DONNA COVENEY**

Students in Heather Lechtman's class in 'Materials in Human Experience' designed and constructed a portion of a khipu, a bundle of knotted strings used by the Incas to keep records.

The khipu was one of several products made by the students in Course 3.094, "Materials in Human Experience," a class that Lechtman taught jointly this semester with Professor Linn Hobbs. The course deals with how people select, manipulate, and use materials.

"It puts people at center stage," Lechtman said. In each of three case studies — in metal, fiber and ceramics — the students not only studied the materials themselves, but also the human context in which people "turn materials of nature into items of culture."

Lechtman points out that there are many unsolved issues still surrounding the khipu. "The cords were made according to strict rules and protocols, the colors and the use of Z or S knots were deliberately chosen," she says. The position and type of each knot and the color and twist of each cord conveyed meaning, but that meaning is for the most part lost.

Archaeologists are currently investigating some 600 remaining khipu, in an effort to determine whether any of the khipu may have constituted a system of writing. Nevertheless, it is clear that the khipu played a central role in the cohesion of the Inca state, "the last Andean empire and the largest in the Americas before the Spanish invasion," Lechtman observes. It allowed important information to be communicated in a society that apparently had no writing system, she adds.

In all of this, the maker and interpreter of the khipu — called a khipu kamayuq — emerges as a central figure. "The maker was also its guardian," she says. It is known that the Incas calculated using base 10: In the MIT khipu, the top row of knots on the pendant cords represents items numbering 10^4, the next row 10^3, and so on down to single units.

Sean Morton, a sophomore in materials science and engineering, was on hand to demonstrate the students' cord-making technique. For the khipu project, students studied the mechanical properties, such as the tensile strength of the fibers favored by the Incas, which included cotton and camelid wool. They learned how to create different types of cord, with different color patterns and thicknesses, as well as the various kinds of knots the khipu kamayuq used to distinguish among many categories and numbers of recorded items. Through experimentation, Morton explained, they calculated that you lose 20 percent to 30 percent of the length of a cord when you ply cords together, and that the strength is proportional to the ply.

Morton may speak for many of the 3.094 students in saying he was attracted by the "hands-on methods" used in the course.

But beyond addressing the physical properties of khipu materials, the course also delved into their cultural meanings. Fiber was to the Incas what metal or stone was to other societies, such as the ancient Greeks and Romans.

PHOTO / **DONNA COVENEY**

Sean Morton, a sophomore in materials science and engineering, and teaching assistant Elizabeth Cooney attach cords to create a replica of an Incan khipu.

"When Andean peoples had a problem that needed to be engineered," says Lechtman, "they turned to fiber." Thus the Incas used fiber to make suspension bridges, hunting and fishing gear, roofing, portage containers, weapons, and even armor — and, of course, khipu — so fiber objects consequently became "tools of power and politics" in the Inca state.