

Unraveling the heparin mystery

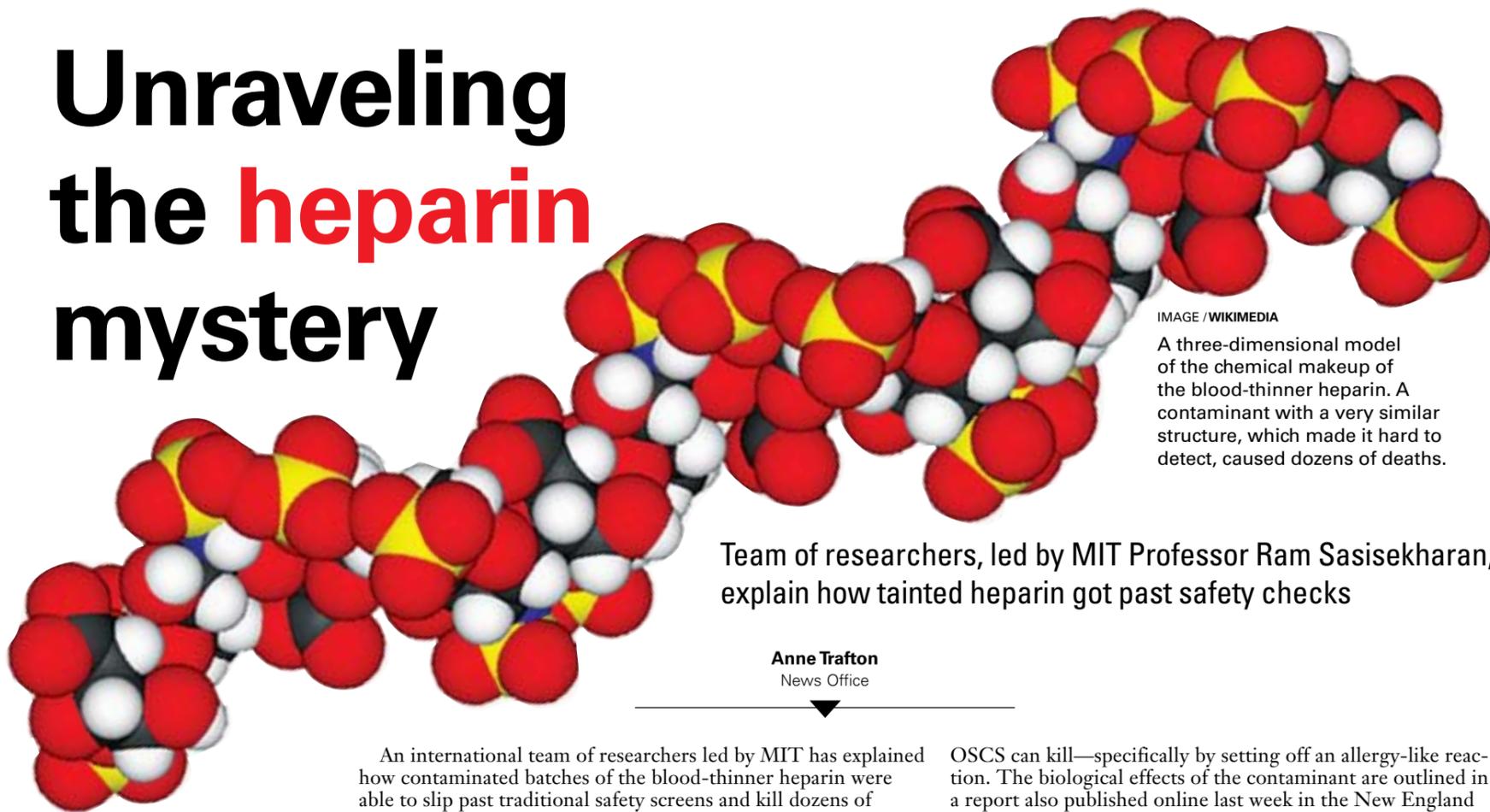


IMAGE / WIKIMEDIA

A three-dimensional model of the chemical makeup of the blood-thinner heparin. A contaminant with a very similar structure, which made it hard to detect, caused dozens of deaths.

Team of researchers, led by MIT Professor Ram Sasisekharan, explain how tainted heparin got past safety checks

Anne Trafton
News Office

An international team of researchers led by MIT has explained how contaminated batches of the blood-thinner heparin were able to slip past traditional safety screens and kill dozens of patients recently in the United States and Germany.

The team, led by MIT Professor Ram Sasisekharan, identified the chemical structure of the contaminant, known as oversulfated chondroitin sulfate (OSCS). The researchers present their findings and offer new approaches to detecting the contaminant in a report that appeared last week in the online edition of *Nature Biotechnology*.

Another team led by Sasisekharan has shown exactly how

OSCS can kill—specifically by setting off an allergy-like reaction. The biological effects of the contaminant are outlined in a report also published online last week in the *New England Journal of Medicine*.

“Sophisticated analytical techniques enabled complete characterization of the contaminant present in heparin. Further, this study also provides the scientific groundwork for critical improvements in screening practices that can now be applied to monitor heparin, thus ensuring patient safety,” said Sasisekharan, senior author of the papers, the Underwood Prescott Professor

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Mapping Earth's water cycle

Entekhabi to lead science team for NASA satellite mission

Denise Brehm
Civil and Environmental Engineering

Professor Dara Entekhabi will lead the science team designing a NASA satellite mission to collect global soil moisture measurements and other data seen as key to improving weather, flood and drought forecasts and predictions of agricultural productivity and climate change.

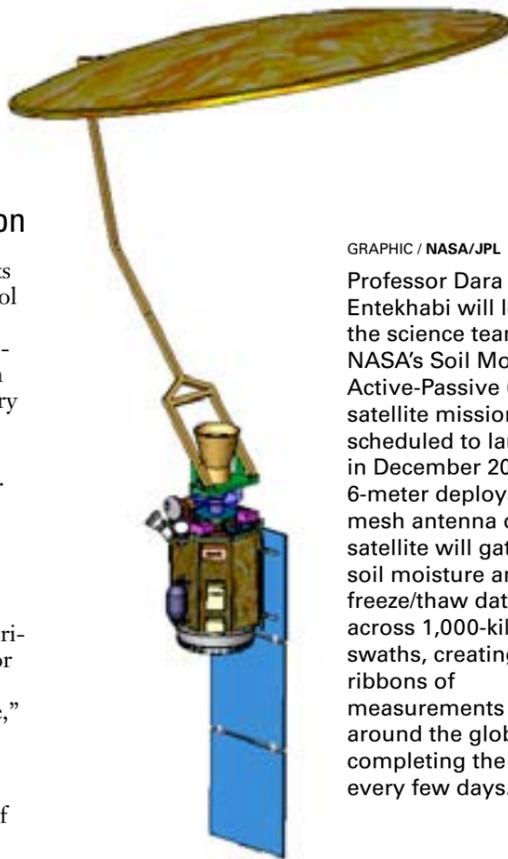
At present, scientists have no network for gathering soil moisture data as they do for rainfall, winds, humidity and temperature. Instead, that data is gathered only at a few scattered points around the world. But NASA's Soil Moisture Active-Passive mission (SMAP), scheduled to launch in December 2012, aims to change that.

“Soil moisture is the lynchpin of the water, energy and carbon cycles

over land. It is the variable that links these three cycles through its control on evaporation and plant transpiration. Global monitoring of this variable will allow a new perspective on how these three cycles work and vary together in the Earth system,” said Entekhabi, the Bacardi and Stockholm Water Foundations Professor.

“Additionally, because soil moisture is a state variable that controls both water and energy fluxes at the land surface, we anticipate that assimilation of the global observations will improve the skill in numerical weather prediction, especially for events that are influenced by these fluxes at the base of the atmosphere,” added Entekhabi, who holds joint appointments in MIT's Department of Civil and Environmental Engineering and the Department of Earth, Atmospheric and Planetary

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GRAPHIC / NASA/JPL

Professor Dara Entekhabi will lead the science team for NASA's Soil Moisture Active-Passive (SMAP) satellite mission, scheduled to launch in December 2012. A 6-meter deployable mesh antenna on the satellite will gather soil moisture and freeze/thaw data across 1,000-kilometer swaths, creating ribbons of measurements around the globe and completing the cycle every few days.

New MIT study validates hurricane prediction

Provides confirmation that climate change intensifies storms

David Chandler
News Office

Hurricanes in some areas, including the North Atlantic, are likely to become more intense as a result of global warming even though the number of such storms worldwide may decline, according to a new study by MIT researchers.

Kerry Emanuel, the lead author of the new study, wrote a paper in 2005 reporting an apparent link between a warming climate and an increase in hurricane intensity. That paper attracted worldwide attention because it was published in *Nature* just three

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PEOPLE

Ross named CISR director

Jeanne Ross will head the MIT Center for Information Systems Research.

PAGE 3



RESEARCH

A solar revolution

MIT given \$10 million gift by the Chesonis Family Foundation to help make solar energy America's primary carbon-free fuel.

PAGE 8



NEWS

Double major program OK'd

Faculty approves changing the dual degree program to a double major program and makes CMS's SB offering permanent.

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▶ OBITUARIES

Edward Lorenz, father of chaos theory and butterfly effect, 90

Edward Lorenz, a meteorologist who tried to explain why it is so hard to make accurate weather forecasts and wound up unleashing a scientific revolution called chaos theory, died April 16 of cancer at his home in Cambridge. He was 90.



Edward Lorenz

A professor at MIT,

Lorenz was the first to recognize what is now called chaotic behavior in the mathematical modeling of weather systems. In the early 1960s, Lorenz realized that small differences in a dynamic system such as the atmosphere—or a model of the atmosphere—could trigger vast and often unexpected results.

These observations ultimately led him to formulate what became known as the butterfly effect—a term that grew out of an academic paper he presented in 1972 entitled: “Predictability: Does the Flap of a Butterfly’s Wings in Brazil Set Off a Tornado in Texas?”

Lorenz’s early insights marked the beginning of a new field of study that impacted not just the field of mathematics but virtually every branch of science—biological, physical and social. In meteorology, it led to the conclusion that it may be fundamentally impossible to predict

weather beyond two or three weeks with a reasonable degree of accuracy.

Some scientists have since asserted that the 20th century will be remembered for three scientific revolutions—relativity, quantum mechanics and chaos.

“By showing that certain deterministic systems have formal predictability limits, Ed put the last nail in the coffin of the Cartesian universe and fomented what some have called the third scientific revolution of the 20th century, following on the heels of relativity and quantum physics,” said Kerry Emanuel, professor of atmospheric science at MIT. “He was also a perfect gentleman, and through his intelligence, integrity and humility set a very high standard for his and succeeding generations.”

Born in 1917 in West Hartford, Conn., Lorenz received an AB in mathematics from Dartmouth College in 1938, an AM in mathematics from Harvard University in 1940, an SM in meteorology from MIT in 1943 and an ScD in meteorology from MIT in 1948. It was while serving as a weather forecaster for the U.S. Army Air Corps in World War II that he decided to do graduate work in meteorology at MIT.

Lorenz was a member of the staff of what was then MIT’s Department of Meteorology from 1948 to 1955, when he was appointed to the faculty as an assistant professor. He was promoted to professor in 1962 and was head of the department from 1977 to 1981. He became an emeritus professor in 1987.

Lorenz, who was elected to the National Academy of Sciences in 1975, won numerous awards, honors and honorary degrees. In 1983, he and former MIT Professor Henry M. Stommel were jointly

awarded the \$50,000 Crafoord Prize by the Royal Swedish Academy of Sciences, a prize established to recognize fields not eligible for Nobel Prizes.

In 1991, he was awarded the Kyoto Prize for basic sciences in the field of earth and planetary sciences. Lorenz was cited by the Kyoto Prize committee for establishing “the theoretical basis of weather and climate predictability, as well as the basis for computer-aided atmospheric physics and meteorology.” The committee added that Lorenz “made his boldest scientific achievement in discovering ‘deterministic chaos,’ a principle which has profoundly influenced a wide range of basic sciences and brought about one of the most dramatic changes in mankind’s view of nature since Sir Isaac Newton.”

An avid hiker and cross-country skier, Lorenz was active up until about two weeks before his death, his family said.

Lorenz is survived by three children, Nancy, Edward and Cheryl, and four grandchildren.

Funeral arrangements are still being finalized, and a memorial service is being planned at MIT.

for nuclear physics, instruments used to determine the energy spectrum of nuclear particles.



Harald Enge

Born in Fauske, Norway, in 1920, Enge earned the equivalent of a master’s degree in electrical engineering from Trondheim University in 1946. Before graduating, he spent a year helping the Norwegian Underground Resistance as a

secret radio repairman during World War II.

He earned a PhD in physics from the University of Bergen in 1954, based mostly on nuclear physics research he did at MIT in 1950 and 1951. He returned to MIT in 1955 as an assistant professor and became a full professor in 1959.

Enge held more than 20 patents for inventions in a wide range of fields, including magnetic and electric optics, accelerators, power supplies and mass separators. He also wrote a popular textbook called “Introduction to Nuclear Physics.”

He won the Tom W. Bonner Prize in Nuclear Physics from the American Physical Society in 1984.

Enge retired from MIT in 1986 to spend more time with his first wife, Grete, who passed away in 1988. He is survived by his second wife, Alice (Williams); three sons, Kjell of Carlyle, Pa., Per of Mountain View, Calif., and Eric of Southborough, Mass.; a stepson, John Emery of Washington; a stepdaughter, Jeanne Bassett of Sandia Park, N.M.; seven grandchildren and five great-grandchildren.

Funeral arrangements are private.

Harald A. Enge, retired physics professor, 87

Harald A. Enge, retired professor of physics and member of the Laboratory for Nuclear Science, died April 14 of respiratory failure. He was 87.

Enge was director of MIT’s Van de Graff Research Group for many years and was an acknowledged world leader in the design of magnetic spectrometers

AWARDS & HONORS



PHOTO COURTESY OF JÁNOS MIKLÓS BEÉR

MIT Professor Emeritus János Miklós Beér is awarded the Hungarian President’s Award by the President of the Hungarian Academy of Sciences, Dr. Szilveszter Vizi (right), at a ceremony at the academy in Budapest, Hungary.

MIT Professor Emeritus of Chemical and Fuel Engineering **János Miklós Beér** was recently awarded the Knight’s Cross of the Order of Merit of the Hungarian Republic, which was recommended by the Hungarian Academy of Sciences and the Hungarian Power Industries. He was presented with the award on March 17. The citation of the award mentions Beér’s support of Hungarian higher education and research, among his other lifelong work.

The journal *Science*, published by the nonprofit American Association for the Advancement of Science, recently announced plans to expand its online journal, *Science Signaling*, which focuses on new insights for combating disease as well as understanding normal human biology, and named **Michael B. Yaffe**, associate professor of biology and biological engineering at MIT, as chief scientific editor for *Science Signaling*.

Edward B. Roberts, the David Sarnoff Professor of Management of Technology at the MIT Sloan School of Management, is the fourth recipient of the annual Adolf F. Monosson Prize for Entrepreneurship Mentoring. He was presented this

prestigious award by Kenneth P. Morse, managing director of the MIT Entrepreneurship Center, at the April 17 reception for CEOs of the MIT Entrepreneurship Laboratory (E-Lab) host companies. Roberts was awarded for his extensive mentoring of aspiring entrepreneurs in the classroom and seasoned entrepreneurs active in the business world.

Environmental engineering junior **Allison St. Vincent** won a \$5,000 Simpson Gumpertz & Heger (SGH) Scholarship on April 7 at the annual “Student Night” of the Boston Society of Civil Engineers Section of the American Society of Civil Engineers. The event, hosted by students in MIT’s Department of Civil and Environmental Engineering and sponsored by the department, brought together more than 60 engineers from industry and Boston-area universities for dinner at the MIT Faculty Club. This year the engineering firm SGH awarded its annual scholarship for the best essay proposing how the civil-engineering industry can address environmental concerns in a global market. In her winning essay, St. Vincent called for an interdisciplinary approach across the subdisciplines of the civil and environmental engineering fields to help insure that engineers implement sustainable solutions.

Michael Metzger, a research assistant in the MIT Engineering Systems Division’s Center for Engineering Systems Fundamentals and a PhD student in MIT’s Operations Research Center, received second-place honors for his research on strategies for hurricane preparedness and response at the second annual Department of Homeland Security University Network Summit. The event, held March 19-20 in Washington, showcased key research and education priorities of DHS Centers of Excellence, the Science and Technology Directorate and the Department of Homeland Security at-large.

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Allison St. Vincent



PHOTO COURTESY OF THE LEMELSON-MIT PROGRAM

Martin Fisher, co-founder of the KickStart program, has been awarded the \$100,000 Lemelson-MIT Award for Sustainability for his work in developing and marketing tools—such as a low-cost, human-powered irrigation pump he is shown using here—that have enabled hundreds of thousands of Africans to rise out of poverty. Fisher will accept the award and deliver a speech during MIT’s second annual EurekaFest from June 25 to 28.

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Striving for excellence is a central theme at MIT. One group at the Institute that is visibly and enthusiastically working toward this goal is the support staff through the

Working Group on Support Staff Issues (WGSSI). With professional development a value held in high esteem by Human Resources Vice President Alison Alden, it is no surprise that these two groups are collaborating on the second annual Professional Development Toolkit event to occur June 12.

"Events such as the Toolkit are about making an investment back into every employee," said Alden. "It was clear that last year's event was so worthwhile and well received that we wanted to do it again."

The first Toolkit highlighted the professional development services available from HR to support staff. Michele Hudak, a member of the WGSSI's Professional Development Task Force, said that this year the task force reflected on the first Toolkit and made suggestions to HR about sessions that would build on last year's event while keeping the focus on hot topics of interest to staff.

"Another idea was to team interested support staffers with HR, and we hope this collaboration results in a successful, useful event," Hudak said.

This year's event will cover the following topics in one-hour workshops: "Promotion and Transfers at MIT," "Tips for Time Management," "Professional Self-Esteem," "Surviving a Bad Day," "Communicating Upward" and "Intro to Mentoring."

This annual event is one of a number of activities that focus on professional development for support staff. For example, HR will be piloting a mentoring program for new support staff. "The idea for the mentoring program—to assist new support staff with their ongoing orientation to MIT—came out of request from the Working Group," Alden said. The goal is to have this program up and running in the fall.

Advancing your career

Meanwhile, the Professional Development Task Force "has been assembling an inventory of the resources that are available to support staff to enhance current skills and provide the skills necessary to advance careers," explains Sally Chapman, the chair of the task force. "Currently we are moving into the next phase of the project, which will be surveying the support staff to find out what they feel is needed for professional development."

In addition, HR is pleased to announce a new pilot program focused on the administrative officer (AO). The "AO Fundamentals Program" is a five-month learning and development experience that introduces the essential aspects of being an administrative officer. The program is open to employees in good standing who have worked at MIT at least three years.

Also, stay tuned in the next couple of months for the redesigned and renamed Workforce and Career Planning web site, "Career and Talent Management," on the HR site.

The Support Staff Toolkit in June is coupled with the annual Support Staff Appreciation Luncheon, hosted by WGSSI and funded by HR. Each of these activities requires a separate registration and is open to all support staff, but you must register ahead of time.

The direct link for registering for the lunch will be live on May 21 until June 2 at <http://web.mit.edu/membership/lunch.html>.

The link to register for the Support Staff Toolkit will go live May 5. Go to <http://web.mit.edu/sapwebss> and click the training tab and then "Training Catalog and Registration." Click "Career Management and Employee Benefits" and look for "Support Staff Toolkit Introduction."

Edwards, at student-run global poverty conference, urges students to make themselves heard

The global problems of climate change, population growth and severe poverty are so enormous that no one country can solve them alone, former Democratic presidential candidate John Edwards said in one of the opening keynote addresses at a student-organized conference on global poverty.

"We face enormous challenges that literally go to the survival of the planet," Edwards said, adding that the problems are "connected to each other, and connected to all the uncertainty, instability and danger in the world today."

"It is required, absolutely necessary, that we work in a cooperative, coordinated way," the former North Carolina senator added. "That's why we need visionary leadership."

Edwards spoke April 18 at Kresge Auditorium during the three-day Millennium Campus Conference, which brought together more than 1,400 students from around the country to discuss ways of fighting the problems of poverty in the world. The event was organized by MIT's Global Poverty Initiative, created just a year ago.

Specific things the nation should be doing to alleviate poverty, he said, include universal health care, an increase in the minimum wage, strengthening of the rights of unions, initiatives to help people build assets such as matching savings accounts, and better access to education. "Young people can play such a crucial role" in bringing about such changes, he said.

"We have to develop a political will to take action," he said. Asked by a student what the most important thing is that young people can do to help achieve these goals, he emphasized "advocacy, making your voice heard. Organize rallies, be part of the

movement, support candidates" who are working to improve conditions.

At a news conference following his address, Edwards declined to comment when asked whether he supported Sen. Barack Obama or Sen. Hillary Clinton for the Democratic presidential nomination. However, in his speech he signaled he had made some kind of decision on the matter, saying "I have a preference."

Edwards has urged all the remaining presidential candidates to create a new cabinet-level antipoverty position, he said, and both Clinton and Obama have agreed to the idea. Meanwhile, Edwards himself will continue to work with the new student group: Organizers announced that he has agreed to join the Global Poverty Initiative's board of advisors.

The other opening keynote was given by the Administrator of the U.S. Agency for International Development, Henrietta Fore. She enthusiastically endorsed the new group's agenda, saying "you've launched a very promising endeavor. I consider this the beginning of a partnership."

USAID oversees a budget of almost \$40 billion in development aid.

"Economic growth is at the heart of any effort to alleviate global poverty," she said. "From the largest cities to the smallest farms, growth lifts families."

The student group, comprised of chapters on dozens of campuses, was formed to support the United Nations Millennium Development Goals, which include cutting world poverty in half by 2015. "America looks forward to the contributions you all will make," Fore told the students.



PHOTO / DONNA COVENEY

Former Sen. John Edwards was the keynote speaker at the Millennium Campus Conference held at MIT.

Ross named director of MIT CISR

Jeanne Ross will become director of the MIT Center for Information Systems Research with overall responsibility for the center's activities, MIT Sloan School of Management Dean David Schmittlein announced this month.

Peter Weill, who has been director since June 2000, will become chairman of MIT CISR and focus on international activities.

MIT CISR was established in 1974 and is currently funded by more than 65 corporate sponsors and patrons. The center undertakes practical research on how firms generate business value from IT, disseminating its findings through research briefings, journal articles, books, workshops and executive

education. In 2007, Ziff Davis and eWeek described MIT CISR as "the most influential IT academic research center."

Ross has been at MIT CISR since 1993. As director, Ross will oversee the center's research agenda, coordinate research activities, manage U.S.-based sponsor relationships, provide linkages between MIT CISR and Sloan, host sponsor events in the United States and manage the center's business model. She will sustain MIT CISR's research focus on how companies manage IT for business value and increase efforts to make that research accessible to non-IT executives.

In his new role, Weill will lead MIT CISR's international initiatives. As global commerce and operations increase in importance, he will coordinate research on how firms successfully use IT to generate business value globally, focusing particularly on how companies can achieve both local responsiveness and global scale.

Submissions needed for the 2008 Institute Awards issue

Tech Talk will publish the 2008 Institute Awards issue in print and online on June 4 this year. The annual special section lists the names of winners of annual awards, by department, along with photographs where available.

Complete information on how to submit awards is available at <http://web.mit.edu/news-office/awards.html>, but please note that the deadline is 5 p.m. on Friday, May 16, in order to be included in the awards issue. Do not submit Infinite Mile Awards or awards from outside organizations.

All text submissions for the awards issue can be made online at the web site listed above, or e-mailed to Patrick Gillooly at gillooly@mit.edu.

Any and all photographs are also welcomed and can be e-mailed to gillooly@mit.edu. Please send them as attachments, in .jpg format with a resolution of 300 dpi if possible. Please clearly identify the subjects and include the name of the photographer, as we cannot run any photographs without that information.



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MIT research sheds new light on cell division

Work could impact study of miscarriages, birth defects

Anne Trafton
News Office

Proteins that control cell division play a far more nuanced role than researchers previously thought in the process that gives rise to reproductive cells, according to new findings by MIT biologists.

The work, reported in the April 18 issue of *Cell*, could help scientists understand why errors occur so often during this process, known as meiosis. Meiotic mistakes are a leading cause of miscarriage and birth defects such as mental retardation.

Authors of the paper are Angelika Amon, MIT biology professor and Howard Hughes Medical Institute investigator, and biology graduate student Thomas Carlile.

Meiosis is a critical part of the reproductive cycle, producing reproductive cells with only one set of chromosomes (eggs and sperm in humans, spores in yeast, the organism the researchers studied).

Meiosis is more complex than the other type of cell division, mitosis, which occurs when a cell splits into two "daughter cells," each identical to the original.

Both meiosis and mitosis are controlled by proteins known

as cyclin-dependent kinases (CDKs). In humans, there are 11 different types of CDKs, and in yeast, there are nine.

During mitosis, the CDKs are largely interchangeable. Until now, researchers had assumed that the same was true during meiosis.

This study shows that different CDKs have different roles during meiosis, which occurs in two stages, meiosis I and meiosis II. The researchers found that a protein called *clb1*-CDK stimulates meiosis I, and

clb3-CDK promotes meiosis II.

"For the first time, we're beginning to understand that maybe in mitosis it doesn't matter (which *clb*-CDKs are present), but when you start doing complicated things, it starts to matter which type of CDK is active and how it's regulated," said Amon, also a member of the David H. Koch Institute for Integrative Cancer Research at MIT.

During meiosis, chromosomes line up along the cell's equator before being pulled

into one of the resulting reproductive cells. Mistakes during that process lead to an extra or missing copy of one chromosome, which results in fatal defects or mental retardation, such as Down Syndrome.

Amon's work could help provide a foundation for understanding why such errors occur so often (it is estimated that 10 to 15 percent of human conceptions end in miscarriage, often because the fetus has the wrong number of chromosomes).

"You have to understand the process in detail before you can go on and find out what's wrong with it," Amon said.

Part of the reason that no one has observed these different roles for CDKs before is that it is very difficult to get yeast cells to undergo meiosis in synchrony. Amon and Carlile, lead author of the paper, developed a technique to do just that, allowing them to see the novel behavior for the first time.

Eventually the researchers hope to discover whether meiosis in humans is controlled in a similar manner.

The research was funded by the National Institutes of Health.

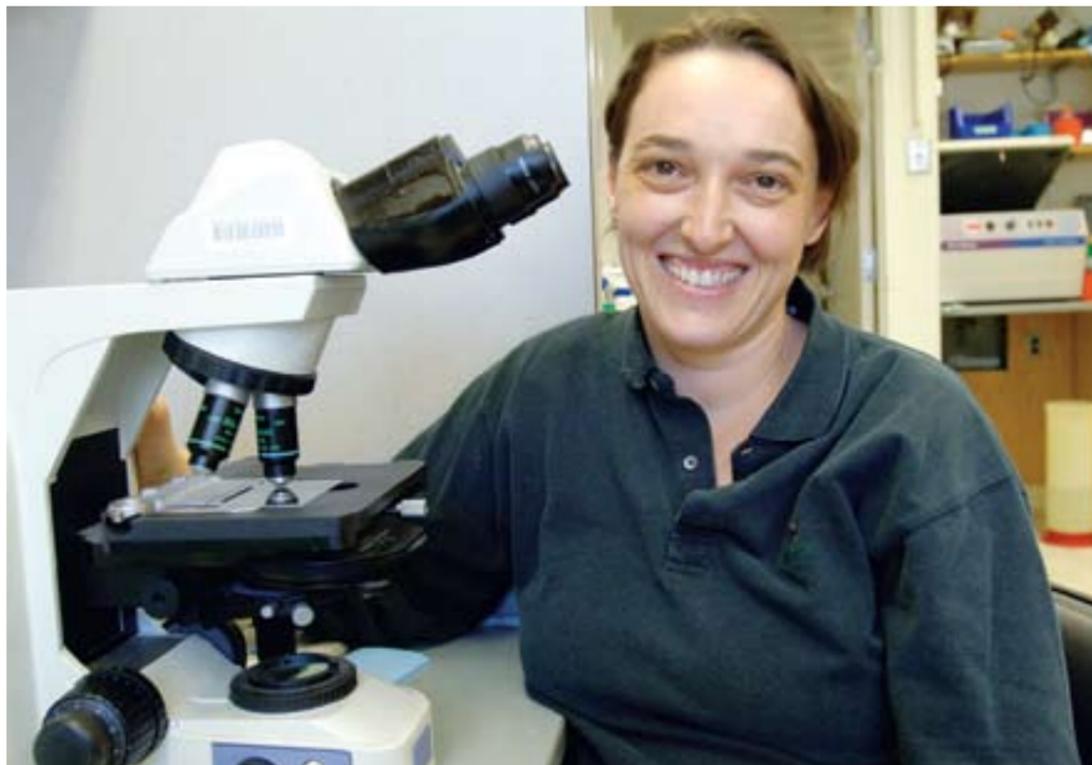


PHOTO / DONNA COVENEY

Professor of Biology Angelika Amon reports new insight into how cells divide, a process important to the study of birth defects.



Live-animal nerve regeneration study gets a boost

An MIT team has improved upon its landmark technology reported last year in which the researchers used a fingernail-sized lab on a chip to image, perform surgery on and sort tiny worms to study nerve regeneration.

The team, led by Mehmet Fatih Yanik, MIT assistant professor of electrical engineering and computer science, has found a unique way to immobilize the still-awake animals for several minutes with unprecedented stability, which then allowed the researchers to conduct fast, detailed three-dimensional imaging and to perform high-resolution laser nanosurgery on the animals.

The advance, which builds on a technology first reported last year, could ultimately help researchers better understand the genetic underpinnings of regeneration and degeneration in the nervous system—not just in the worm but in more-complex organisms including humans. That, in turn, could help in treatments of neural injuries and diseases such as Parkinson's and Alzheimer's.

The latest discovery was reported in the April 2 advanced online issue of the journal *Lab on a Chip*. The work involves the *C. elegans* worm, one of the tiniest multicellular organisms known. The worm is considered a key model for investigating a variety of biological phenomena such as aging, fat metabolism and neurological diseases.

"This new technology is allowing us to study the entire genome of the animal in very short periods of time," Yanik said. "We are currently combining it with genetic and drug screens to study neural regeneration on these animals."

Team develops safe, effective RNA interference technique

Method holds promise for treating cancer and infection

Anne Trafton
News Office

A team of researchers from MIT and Alnylam Pharmaceuticals has developed safe and effective methods to perform RNA interference, a therapy that holds great promise for treating a variety of diseases including cancer and hepatitis.

"RNA interference is a tool that has a lot of people excited, and one reason for the excitement is that we hope it will provide a new method to control almost any gene in your body," said Daniel Anderson of the David H. Koch Institute for Integrative Cancer Research at MIT and the senior author of a paper on the work that appeared as the cover story in *Nature Biotechnology* on Sunday.

Scientists see RNA interference (RNAi)

as a way to turn off specific disease-causing genes. Despite this potential, researchers studying the technique have been stymied by one major problem: How to deliver RNAi agents to target tissues.

Now, the MIT/Alnylam team has developed a library of new molecules that successfully delivered RNA interference agents in several animals, including mice, rats and cynomolgus monkeys. The team hopes to test the delivery materials in human clinical trials within the next few years.

RNAi works by disrupting the flow of genetic information from a cell's nucleus to the protein-building machinery of the cell. Gene expression can be turned on or off by interfering with messenger RNA, which carries that information.

One way to deliver RNAi is to package siRNA (short interfering RNA) inside nanoparticles that can deliver it directly to the target cell.

In previous studies, lipids (fat-soluble molecules such as fats, waxes and cholesterol)

have shown promise as RNAi delivery agents. However, only a limited number of different materials had been developed when those studies were conducted.

Using a new synthesis scheme that allows for high-speed production, the researchers created a huge library of lipid-like molecules called lipidoids. A major advantage of these chemical methods is that they facilitate production of a large variety of different molecules, which could be customized for different RNAi therapies and drug-delivery problems.

The MIT team found several lipidoids that successfully delivered siRNA to the liver, which may provide a therapy for diseases ranging from cancer to viral infection, Anderson said. They also demonstrated siRNA delivery to the lungs, where it blocked genes expressed by respiratory syncytial virus that had infected the lungs. The lipidoids were also able to deliver siRNA to immune cells called macrophages.

In some cases, the effects of a single RNAi injection lasted up to four weeks. The researchers also showed that they could block two genes at once, raising the possibility of treating diseases that involve multiple genes.

The delivery system also proved effective with another type of RNA interference, which involves disrupting microRNA (very short strands of RNA that help control gene expression).

"For the first time, we've got a lot of formulations to choose from," Anderson said. "In the next five years, we expect to push this technology forward in a number of different clinical and drug-delivery applications."

The first author of the paper is Akin Akinc, who received a PhD in chemical engineering from MIT in 2003 and is now at Alnylam. Andreas Zumbuehl, now at the University of Geneva; MIT students Michael Goldberg, Elizaveta Leshchiner, Valentina Busini, Sergio Bacallado, David Nguyen and Jason Fuller; and Institute Professor Robert Langer are also authors of the paper.

The research was funded by the National Institutes of Health.

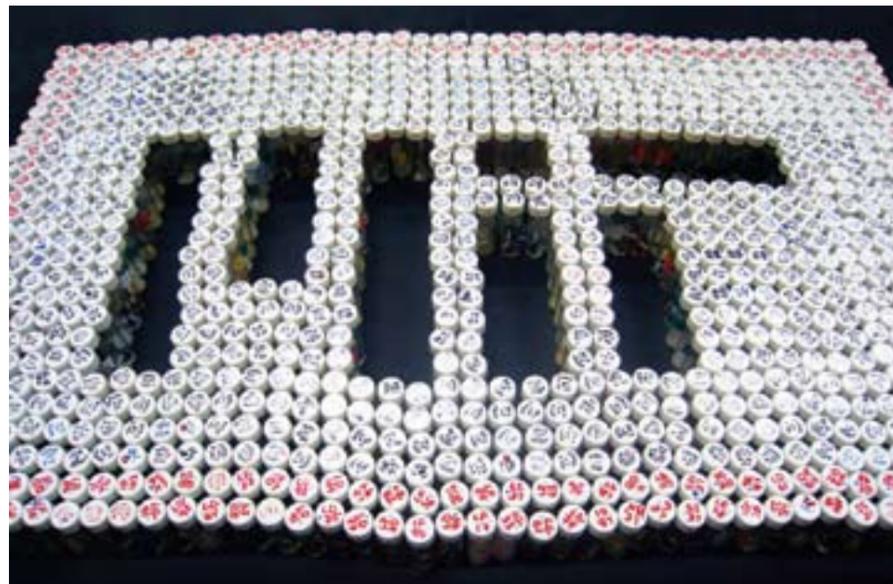


PHOTO / KEVIN LOVE

Dozens of vials of lipid-like molecules, developed by a team from MIT and Alnylam Pharmaceuticals, are arranged to create the MIT logo. Some of the compounds have successfully delivered RNA interference agents in animals.



An earthquake's aftermath

David Chandler
News Office

Last August, Peru was shaken by a devastating magnitude 8 earthquake. In the coastal town of Tambo de Mora, not far from the epicenter, about 90 percent of the houses were damaged or destroyed by the quake and very few have yet to be rebuilt.

Students and faculty from MIT's CityScope class visited the town of 5,200 people during this year's spring break to learn about the devastated city's needs and how MIT ingenuity might be harnessed to help. They were looking at a whole range of infrastructure issues including restoring water supplies, sewerage and health-care delivery, as well as projects for rebuilding a sense of community.

At least 300 families are still living in tents on a nearby hillside, unable to return to their homes. Some houses were completely destroyed by the quake, but many others have been condemned by authorities and slated for demolition. In many cases, the owners dispute that assessment and say they want the chance to go back and make repairs.

"There are red Xs on most of the houses" signaling that they are to be demolished, said Kari Williams, a freshman in that class. "But most people are saying no, they can be repaired. It's uncertain what their fate is."

The people are still feeling devastated by their losses and many have told the local health service that they need psychological help to cope with it. But they gave the MIT class a warm reception. "They were all very friendly, very easy to talk with," Williams said.

The trip was focused on getting to know how MIT people might best be able to help out, by making it clear that "we need to know what you need, how you want to proceed," said Dorian Dargan, another freshman in the class.

As pressing as many of their needs are, the lost sense of community seems to weigh heavily. As in many Latin American towns, the central town square, or plaza, was a vibrant center of civic life where residents would socialize,



PHOTOS / DANIELLE MARTIN

Images of some of the areas in Tambo de Mora, Peru, that were hardest hit by last year's magnitude 8 earthquake.

sell their wares or produce, or just hang out. But the plaza's concrete paving was deeply broken and buckled by the quake and more than half a year later it remains unrepaired. When the class held a group meeting for the residents, "The first thing they said was, 'Fix that town square,'" Williams says. "It's not a pleasant place to be anymore."

Repairing the cracked concrete may not be something that the class can help with, but a variety of other needs were evident in their discussions with residents, and some graduate students from the class will be returning there this summer to carry out plans that they have been developing as a result of the on-site visit.

"There were a lot of pre-existing problems," Dargan said, which were exacerbated by the earthquake damage. "There is a significant Afro-Peruvian population who felt marginalized." Because their community was on the other side of the river from the rest of the town, and there was no working bridge, the CityScope group had a separate meeting with that community.

"We got some ideas of what they wanted," Dargan said. Now, the MIT group is working in cooperation with the Universidad del Pacífico, a few hours away in Lima, "to bring these projects to fruition."

Among the projects is developing a community garden, both in order to help meet the food needs of the impoverished town and to help build a sense of community. "They get most of their produce from other places, when they could very well be self-sufficient," he says.

Water was less of a problem than they had anticipated, as the city sits near the mouth of a river. Water quality from wells in parts of the city and surroundings, however, might benefit from improved filtration, such as the systems pioneered by MIT senior lecturer Susan Murcott, Williams says.

Another project the class is looking into is a design for a pedal-powered washing machine, which could be built locally and provide not only better hygiene but a potential new business for local people.

Williams plans to major in mechanical engineering, but says this class has already influenced her thinking about what she wants to do with her life. She's interested in product design and likes the idea of working with MIT's D-Lab on products that have real social consequences.

"After this, I'm looking at some kind of social justice track, something that can really help," she says of her experience in Peru. "It really made me want to do something positive for the Third World."



HEPARIN: MIT researcher and team find contaminant

Continued from Page 1

of Biological Engineering and Health Sciences and Technology at MIT and at the David H. Koch Institute for Integrative Cancer Research at MIT.

Heparin, a blood thinner often used during kidney dialysis or heart surgery, is normally produced from pig intestines. FDA officials say the contaminated heparin came from factories in China that manufacture the drug for Baxter International.

Baxter recalled its heparin in February after dozens of deaths were reported, dating back to November. The tainted heparin has been blamed for 81 U.S. deaths so far, and last week the FDA announced that contaminated batches were also found in 10 other countries.

The New England Journal of Medicine study offers the first potential link between the contaminant and the reported deaths. The researchers found that the contaminated heparin activates two inflammatory pathways, causing severe allergic reactions and low blood pressure.

"These results provide a potential link between the presence of chemical contaminant in heparin and the clinical symptoms observed in affected patients. Our findings also suggest that a simple bioassay could help protect the global supply chain of heparin, by screening heparin lots for the presence of polysulfated contaminants that may have unintended pharmacological consequences," said Sasisekharan.

Heparin consists of a long, complex chain of repeating sugar molecules. The contaminant, which is derived from animal cartilage, has a structure very similar to that of heparin and thus cannot be identified with the tests normally used to inspect batches of heparin.

It is unclear whether the contaminant got into the heparin during the manufacturing process, or how and where contamination could have occurred during the process. More investigations are needed to address this issue.

Traditional heparin safety screens test only for contaminants such as protein, lipids or DNA and thus would not detect the presence of sugar chains that do not belong. Sasisekharan's laboratory has played a key role in developing new technologies for analyzing complex sugars. Using the new technology, the research team was able to detect the presence of the faulty sugars.

"In addition to being vital for public health, identifying the recent impurity in heparin was a chemical triumph," said Jeremy M. Berg, director of the National Institute of General Medical Science, which supported the work. "The research team accomplished this difficult task by using a unique combination of scientific techniques that might in the future be used to detect other impurities in pharmaceutical materials."

More than 100 patients have experienced adverse reactions after receiving the tainted heparin. Symptoms include extremely low blood pressure, swelling of the skin and mucus membranes, shortness of breath and abdominal pain.

The researchers found that the contaminant activates two inflammatory pathways: one that initiates blood clotting and dilation of the blood vessels, and one that produces anaphylactic toxins. The first leads to a dangerous decrease in blood pressure, the second to a serious allergic reaction. In blinded laboratory tests, the contaminated heparin activated the biological pathways, while normal heparin did not.

Sasisekharan emphasized the remarkable willingness of dozens of scientists across the globe to work together to rapidly resolve what might otherwise have left people with serious uncertainties about drug safety.

"The generosity and willingness of people to do whatever they could to help solve this problem was unlike anything I'd experienced before. It is extremely satisfying to see how teamwork has resulted in the application of rigorous, peer-reviewed science that helps to keep our medicines safe," he said.

Sasisekharan expressed his hope that such effective teamwork will extend to other dimensions of public health, in which rigorous team-based science leads not only toward safer drugs, but also toward safer foods and a safer environment.

Researchers from the FDA, Momenta Pharmaceuticals of Cambridge, Mass., Rensselaer Polytechnic Institute and the Istituto di Recherche Chimiche e Biochimiche of Milan, Italy, also contributed to the Nature Biotechnology paper.

Researchers from the FDA, Momenta Pharmaceuticals, Virginia-Maryland College of Veterinary Medicine at Virginia Tech, and Brigham and Women's Hospital contributed to the New England Journal of Medicine paper.

Feynman play 'QED' to be performed this week

Sarah H. Wright
News Office

"QED," a play that showcases the warmth and genius of Nobel laureate Richard Feynman '39, will be performed today through Sunday, May 4, as part of the Cambridge Science Festival.

Written by American playwright Peter Parnell, "QED" was inspired by Feynman's own writings, including his popular science book, "QED: The Strange Theory of Light and Matter." Its title also refers to quantum electrodynamics, the field in which Feynman won the 1965 Nobel Prize, and to "quod erat demonstrandum," the Latin phrase used in mathematics meaning, "That which was to be demonstrated."

The play offers a Saturday with Feynman in 1986. Alone in his office at Caltech, he rehearses for his bongo-playing role in a Caltech student production of "South Pacific," works on a lecture, debates the final report on the Challenger disaster, guides Russian tourists and weighs what to do with the ominous news that his terminal abdominal cancer has spread.

It's a poignant scene—Feynman died in 1988—but Parnell keeps the focus on Feynman the fun-ster, Feynman the host, Feynman the generous teller of tales: As he bops his bongos and fields phone calls, Feynman reflects aloud on his Manhattan Project work at Los Alamos and he recalls his best pranks, including the plate-spinning that inspired his work on how electrons spin, leading to his Nobel prize-winning research.

"QED" premiered in Los Angeles in 2001, with Alan Alda as Feynman. The upcoming performances, produced by Catalyst Collaborative at MIT, a collaboration between MIT and the Underground Railway Theater, will star Keith Jochim as the physics Nobelist.

Danielle Kellermann will play the role of a young woman student who visits Feynman in act two of "QED." Jon Lipsky will direct.

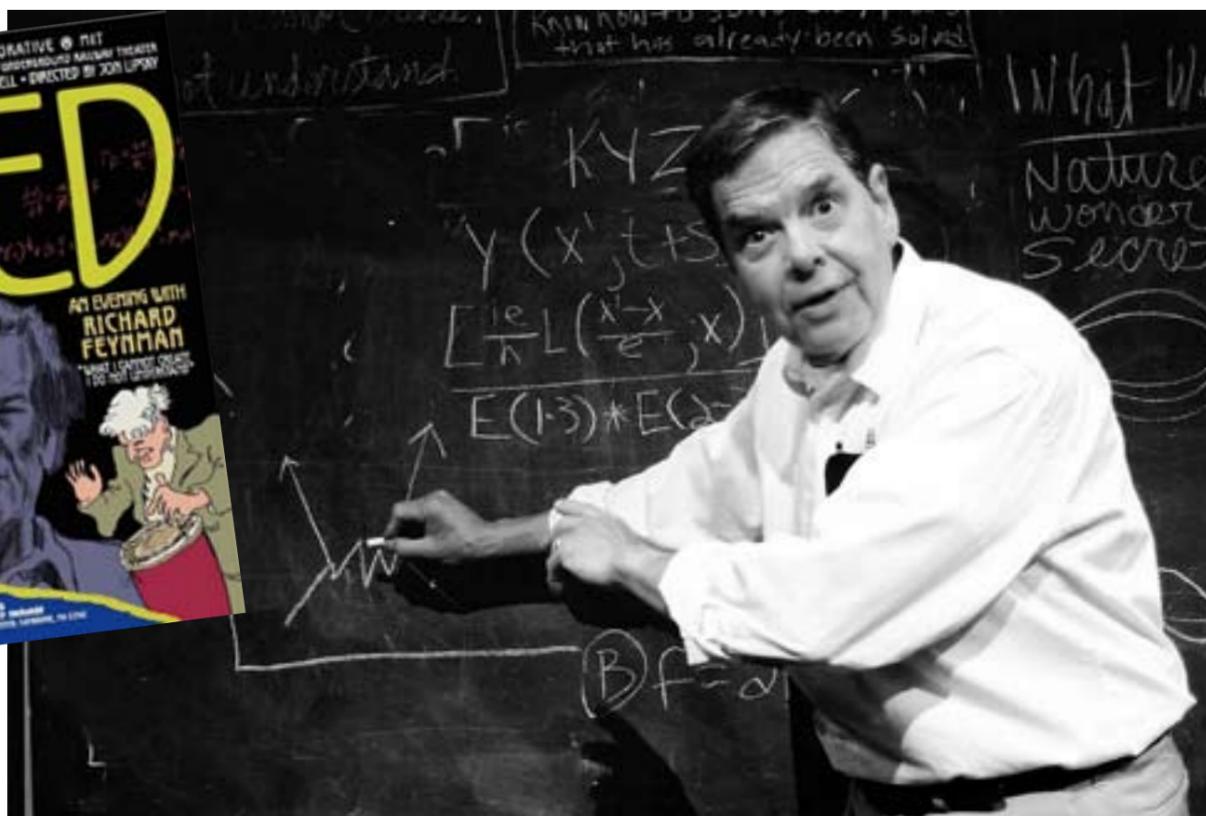
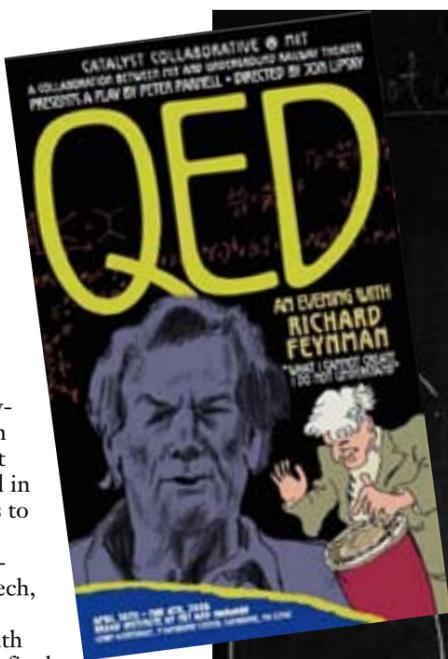


PHOTO / SALLY COHN

Keith Jochim as Richard Feynman in 'QED' at the Vineyard Playhouse.

MIT physics and humanities faculty and a professor of playwriting from Boston University will moderate public discussions following each of the "QED" performances.

The "QED" moderators are "Einstein's Dreams" author Alan Lightman, physicist, adjunct professor of humanities (April 30); Robert Jaffe, Jane and Otto Morningstar Professor of Physics (May 1); physicist Jerome Friedman, Institute professor emeritus and Nobel laureate (May 2); David Kaiser, associate professor in the program in Science, Technology and Society and lecturer in physics (May 3); and Kate Snodgrass, professor of

playwriting, Boston University, and artistic director, Boston Playwrights' Theatre (May 4, matinee).

The spring preview performances of "QED," which are part of the 2008 Cambridge Science Festival presented by the MIT Museum, will take place in the Broad Institute's Lobby Auditorium. "QED" is scheduled to reopen in summer 2008 as the first production at the new Central Square Theater.

Tickets are \$20 general admission or \$12 for students/seniors. To purchase tickets, please visit www.undergroundrailwaytheater.org, or call (866) 811-4111.

Q&A with Kerry Emanuel, MIT professor

Professor Kerry Emanuel's latest paper on hurricanes and climate change attracted widespread media attention. We asked him about the new results and the media coverage.

Q: How did the new results differ from your 2005 paper?

A: I got results with a mixed message. On the one hand, it pretty much backed up the conclusions from what had happened earlier: There was a big increase in storm power. On the other hand, when that technique was used to go forward in time, the increase in hurricane power was much more modest.

Q: How do you feel about the media coverage of the new paper?

A: I thought [the Houston Chronicle story] wasn't bad except for the title ["Hurricane expert reconsiders global warming's impact"]. The actual content was okay. In other cases, the people you expect to put a spin on it, put a spin on it. Skeptics' blogs reported that I'd reversed my position. Other blogs latched onto the fact that we're still predicting a very substantial increase. There's a lot to spin.

How do you write a paper that you know could be spun both ways? You just put out a paper that lays it out as best you can.

Q: Were you surprised by the reaction?

A: It is treacherous. Most of what I publish is not subject to public scrutiny; I'm writing for fellow scientists. But in this charged atmosphere [on global warming], most of what you write gets dissected by people outside the community [The Chronicle story] was clever to point out that people who are crowing [over the claim of a reversal] are in effect crowing over the same climate models that they spend most of their time criticizing.

When Fox News called me up, they started from the premise that I'd reversed myself. I said that's really not true, it's just that things are more complicated. It was a very short interview. I guess that's what happens when people don't spin things the way they think.

See <http://web.mit.edu/newsoffice> for more Q&A with Kerry Emanuel.

HURRICANE: New study confirms climate change strengthens storms

Continued from Page 1

weeks before Hurricane Katrina slammed into New Orleans.

Emanuel, a professor of atmospheric science in MIT's Department of Earth, Atmospheric and Planetary Sciences, says the new research provides an independent validation of the earlier results, using a completely different approach. The paper was co-authored by postdoctoral fellow Ragoth Sundararajan and graduate student John Williams and appeared in the *Bulletin of the American Meteorological Society* this month.

While the earlier study was based entirely on historical records of past hurricanes, showing nearly a doubling in the intensity of Atlantic storms over the last 30 years, the new work is purely theoretical. It made use of a new technique to add finer-scale detail to computer simulations called Global Circulation Models, which are the basis for most projections of future climate change.

"It strongly confirms, independently, the results in the *Nature* paper," Emanuel said. "This is a completely independent analysis and comes up with very consistent results."

Worldwide, both methods show an increase in the intensity and duration of tropical cyclones, the generic name for what are known as hurricanes in the North Atlantic. But the new work shows no clear change in the overall numbers of such storms when run on future climates predicted using global climate models.

However, Emanuel says, the new work also raises some questions that remain to be understood. When projected into the future, the model shows a continuing increase in power, "but a lot less than the factor of two that we've already seen," he says. "So we have a paradox that remains to be explained."

There are several possibilities, Emanuel says. "The last 25 years' increase may have little to do with global warming, or the models may have missed something about how nature responds to the increase in carbon dioxide."

Another possibility is that the recent hurricane increase is related to the fast pace of increase in temperature. The computer models in this study, he explains, show what happens after the atmosphere has stabilized at new, much higher CO₂ concentrations. "That's very different from the process now, when it's rapidly changing," he says.

In the many different computer runs with different models and different conditions, "the fact is, the results are all over the place," Emanuel says. But that doesn't mean that one can't learn from them. And there is one conclusion that's clearly not consistent with these results, he said: "The idea that there is no connection between hurricanes and global warming, that's not supported," he says.

The work was partly funded by the National Science Foundation.

MOISTURE: Entekhabi to lead science team for NASA satellite mission

Continued from Page 1

Sciences and is also director of the Parsons Laboratory for Environmental Science and Engineering.

The SMAP mission is based on an earlier satellite project led by Entekhabi that had been selected by NASA from among 20 proposals and scheduled for a 2009 launch. However, the Hydrosphere State Mission (Hydros) was cancelled abruptly in 2005 when funding for NASA's earth sciences missions was diverted. But in July 2007, the National Research Council recommended that NASA make the soil moisture measurement project a top priority and place it on a fast track for launch. The Jet Propulsion Laboratory in Pasadena, Calif., is the lead NASA center for the project.

SMAP's launch in 2012 is feasible in part because Entekhabi and other scientists continued to develop the mission, even when NASA's support was withdrawn in 2005.

The instruments that will be deployed in SMAP will gather both passive and active low-frequency microwave measurements on a continuous basis, essentially creating a map of global surface soil moisture. A 6-meter deployable mesh antenna on a satellite will gather data across a swath of 1,000 kilometers, creating ribbons of measurements around the globe and completing the cycle every few days.

In addition to measuring soil moisture, the satellite will detect if the surface moisture is frozen. In forests, the freeze/thaw state determines the length of the growing season and the balance between carbon assimilation into biomass and the loss of carbon due to vegetation respiration. The result of this balance can tell scientists if a forest is a net source or net sink of carbon.

One mission obstacle that Entekhabi and team solved last year was integrating the two types of measurements the satellite would gather: passive measurements collected by radiometer and active collected by radar. The radiometer measurements provide highly accurate data at a coarse resolution of 40 kilometers. The radar measurements provide much higher resolution (3 kilometers), but with less sensitivity. The combination of the two measurements through algorithms designed by the SMAP science team will result in accurate mapping of global soil moisture at 10 kilometers.

On gossamer wings

Record-breaking Daedalus project marks 20th anniversary

David Chandler
News Office

Twenty years ago, a team of MIT students, faculty and alumni succeeded in a project that set a pair of aviation records still standing to this day. On April 23, 1988, a lightweight airplane called Daedalus—completely under human power—flew across the Mediterranean Sea from the Greek island of Crete to just a few meters from the shore of the island of Santorini.

The plane was named for the character in Greek mythology who escaped from King Minos of Crete by flying away with the help of wings made of feathers attached to his arms with wax. The modern Daedalus used a set of bicycle pedals and a chain transmission to power a large, slow-moving propeller. Made largely of carbon-fiber composite and Mylar, the plane weighed just 69 pounds.

On its record flight, Daedalus traveled



PHOTO / NASA

Daedalus' final flight at NASA's Dryden Flight Research Center on March 7, 1988.

115 kilometers (about 71.5 miles) across the sea before being buffeted by winds, breaking its tail spar and crashing into the waves just 7 meters offshore from its destination. The pilot (and power plant), champion cyclist Kanellos Kanellopoulos, swam to shore unhurt, and the wreckage of the craft was sent to the Smithsonian, where it remains in storage. An identical craft used in the initial tests is on display at Boston's Museum of Science.

The flight set the all-time records for

duration (3 hours and 54 minutes) and distance of a human-powered flight, handily beating the previous record of just under 36 kilometers set by Gossamer Albatross in a crossing of the English Channel in 1979. And in the process, the testing and development of the craft, including a series of tests at NASA's Dryden Flight Research Center in California's Mojave Desert, produced information that helped to bring about new technology for high-altitude, long-endurance aircraft, according to NASA.

Faculty OK double majors, CMS SB program

Sarah H. Wright
News Office

The faculty voted unanimously to allow double majors and to make Comparative Media Studies a permanent SB program at its April 16 meeting.

They also heard reports from the Committees on Nominations, the Committee on Discipline and the Edgerton Award Committee and a proposal to establish a new Master of Finance degree program.

Jesus del Alamo, Donner Professor of Electrical Engineering and Computer Science, presented the slate of nominees for chair of the faculty and members of standing faculty committees. Del Alamo's report prompted a discussion on the value of inclusiveness and transparency in the nominations process.

Professor June Matthews of physics presented the Edgerton

Award to Jay Scheib, associate professor of theater.

The Edgerton Committee citation described Scheib as possessing the "unique type of excellence associated with Professor Edgerton, capturing the imagination of the wider public with his innovative, experimental approach to theater and embodying all the outstanding qualities we admire at MIT."

In accepting the award, Scheib said, "It's inspiring to collaborate here—to move from experimental theater to aeronautics and astronautics. I thank MIT. I'm a little bit flabbergasted."

In other business, Andrew Lo, Harris and Harris Group Professor and director of the Laboratory for Financial Engineering, presented a proposal to establish a new Master of Finance degree program within the MIT Sloan School of Management.

Lo outlined the proposed 12-month, June-to-June program, emphasizing MIT's tradition of groundbreaking research in finance and predicting that the Master of Finance program would "change the model of business education."

Dean David Schmittlein of MIT Sloan endorsed Lo's proposal. "We need to own the high ground of finance. This program is central to the mission of Sloan and of MIT," he said.

Professor George Apostolakis of nuclear science and engineering presented the Committee on Discipline's report of 2006-2007. In summary, plagiarizing from Internet sources comprised most academic misconduct, he noted.



PHOTO / MICHAEL FEIN/CAMBRIDGE SCIENCE FESTIVAL

It's Alive!

MIT alum John Dolhun creates 'Science Comes Alive' during the Cambridge Science Festival this past weekend. Dolhun worked with a team from the MIT Club of Boston on a standing-room-only demonstration at the festival's Saturday kickoff at City Hall.

Landsman gifts LEES, EECS with \$4 million

A \$4 million gift by Emanuel E. Landsman '58, SM '59, ScD '66 and his wife, Sheila E. Landsman, to the Laboratory for Electromagnetic and Electronic Systems (LEES) and the Department of Electrical Engineering and Computer Science (EECS) will provide a career development professorship, fellowship support and UROP funds in the fields of power electronics and electric energy-related engineering.

The Landsmans previously established another career development professorship in EECS first held by Associate Professor David Perreault of LEES. Associate professors Karl Berggren and Luca Daniel have been named the current Landsman Career Development Professors.

LEES, an interdisciplinary research lab, provides the theoretical basis as well as the component, circuit and system technologies required to develop advanced electrical energy applications. Private financial support for the work that LEES performs is vital since work the lab does is at the forefront of innovation.

"This generous gift provides us the resources to initiate research into new areas and concepts that are not sufficiently developed to generate sponsored support," said LEES Director John Kassakian.

Spring Picnic May 5 to celebrate Benedict

President Susan Hockfield, the Undergraduate Association and the Graduate Student Council are hosting a Spring Picnic on May 5 to celebrate Larry G. Benedict upon his retirement from MIT as dean for student life.

The picnic is open to the MIT community and will run from noon to 1:30 p.m. in Killian Court.

CLASSIFIED ADS

Members of the MIT community may submit one ad each issue. 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.

FOR SALE

Medium size white Kenmore microwave oven \$45 5,200 BTU; Frigidaire window air conditioner \$50; Box fan \$10 Good working condition. For more info call 617-258-3458 days, 978-535-0270 nights.

Used once! Victorinox (Swiss Army) black wheeled laptop briefcase, \$150. Exc. cond. Many compartments. Great for traveling/business. Photo available. Contact: x2-5687, forsale@media.mit.edu.

Chromcraft square/round 5 pc kitchen set, medium oak finish with laminated wood top 40"x40" plus 18" leaf. Swivel/tilt wood chairs w/fabric. Excellent condition, pictures available. Paid \$1,000 selling \$475. lohehir@mit.edu.

Pristine Nikon D200 and 18-200mm f/3.5-5.6G ED-IF VR II lens, one year old, extended warranty, condition 10+, like new, <3500 shutter actuations, all accessories, \$1,600, call Seth, 253-8041, or seth@speech.mit.edu

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RENTALS

Brewster, Mass.—Sweet house on lake, 15 minutes to ocean beaches. Sleeps 6, abuts conservation forest. Private beach, fireplace, screened porch, separate studio/bedroom in the woods. Some June, July, Aug weeks still available. \$1,200/week. Andy, 617-876-6257

Nantucket rental available Aug. 17 through mid-September. Historic Centre Street 'cottage' with big yard and porch. Sleeps 10 (6 BR, 3 1/2 baths). \$3,500/week. Great for multigenerational group. Sandymorgan@alum.mit.edu. 860-561-3124.

BUDAPEST, lovely apartment for rent, \$650/week. Sunny, third floor, two bedrooms, kitchen, bath. Phone, Cable TV, DSL, Mac, printer. Excellent location near Opera. Easy access to subway, streetcar. Tom at 617 823-9722, laygtom@yahoo.com

Belmont—Large elegant four bedroom, two baths (whirlpool tub), hardwood floors, dishwasher, disposal, washer, dryer. Parking. Convenient public transportation. Excellent Schools. \$3,500/month furnished. Available in June or July 1. Lease. Call 617-489-2403 or e-mail stewart@wi.mit.edu.

Lincoln—Studio apartment for rent in private home. Attractive & very quiet. Separate entrance. Parking and utilities included. \$1000/mo. Please call 781-259-8988

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

Craigville Beach, Cape Cod—3bdm, 2 bath, fully furnished home .5 mile to beach. Weeks available June and Sept 700/wk. Includes free parking at Barnstable beaches. Debbie at 978-276-0158 or dhanly@comcast.net.

WANTED

Flagstones, preferably free and w/in 25 miles of Acton. I can pick up. Ginny Siggia, siggia@mit.edu.

Launching a solar revolution

MIT gets \$10M gift from Chesonis Family Foundation to advance solar technologies

Promising to transform solar power from a “boutique” option to an affordable, dependable, mainstream energy solution, MIT and the Chesonis Family Foundation last week launched a “solar revolution” with the ultimate aim of making solar energy America’s primary carbon-free fuel.

The Solar Revolution Project (SRP), funded by a \$10 million gift from the foundation, will explore new materials and systems that could dramatically accelerate the availability of solar energy. The SRP will complement and interact closely with other large solar projects at MIT, creating one of the largest solar energy clusters at any research university.

The Chesonis gift will allow MIT to explore bold approaches that are essential for transforming the solar industry. Specifically, it will focus on three elements—capture, conversion and storage—that will ultimately make solar power a viable, near-term energy source.

“Solar is thought of as an ultimate energy technology off in the distant future. The goal of SRP is to move this timeframe nearer to the present. The SRP will make solar a practical alternative, by committing a 10-year timeframe for establishing the new base of scientific knowledge it will take to draw a market-competitive energy supply from the sun,” said Daniel Nocera, the Henry Dreyfus Professor of Energy and Professor of Chemistry at MIT, who will direct the SRP. “With SRP, think ‘solar’ and think ‘now.’ This is the revolution that is implied in the project name.”

Professor Ernest Moniz, director of the MIT Energy Initiative (MITEI), said, “Climate change makes the search for more environmentally benign sources of energy urgent and hugely important. Many experts have concluded that solar energy is a key, if not the key answer to our global energy challenges in the long term.

“The Chesonis investment—large, flexible, empowering of highly creative MIT faculty and students—embodies this conclusion,” Moniz continued. “We applaud the vision, generosity and confidence in MIT that this extraordinary gift demonstrates.”

Most solar research focuses on known materials and systems, but, thus far, these approaches cannot be implemented on a large scale. The SRP will allow researchers to explore entirely new materials and systems that could transform solar power into a viable, widely deployed and

affordable source of energy.

A unique feature of the SRP is its flexibility: The gift’s unrestricted funding is aimed at creating a “no holds barred” research environment that will inspire innovations in the field.

The SRP will initially support 30 energy fellowships for students on a range of solar-related studies, from the development of novel materials for energy conversion and storage to using solar energy to produce hydrogen fuel from water.

Each fellowship will span five years, which allows for significant continuity and greater impact. The gift from the foundation will also help support an integrated study on the future of solar energy, building on the success of two earlier MIT interdisciplinary reports on the future of coal and of nuclear energy in a carbon-constrained world.

“We are at a breakpoint, both in energy supply and environmental consequences. Solar energy has enormous promise as the ultimate answer to our energy problems,” said Arunas Chesonis, benefactor of the foundation. “Solar energy is widely distributed and the fuel cost for solar power is zero. It is our hope that by investing in the people at MIT and giving them the freedom to take risks in the lab, we will enable them to be true game-changers—advancing the state of the art to a point where solar power is cheaper and more reliable than electricity from coal.”

The foundation will also contribute to the MITEI Energy Seed Fund Program (ESFP), which solicits and funds innovative energy proposals from across the MIT campus. The first round of solicitations for the ESFP (and the related Ignition Grant program for junior faculty) provided close to \$2 million to fund 20 outstanding proposals. The Chesonis gift will provide an additional \$500,000 to supplement funds from MITEI industry partners.

Other large solar projects at MIT include the Eni-MIT Solar Frontiers Center, the MIT-Fraunhofer Center for Sustainable Energy Systems, the Masdar Foundation solar project and a range of solar research grants to MIT from the U.S. Department of Energy and other federal agencies.

Boost the economy, heal the planet

Governor says Massachusetts can reap benefits from clean energy

David Chandler
News Office

Massachusetts Gov. Deval Patrick, making his second appearance at MIT this month, told an enthusiastic crowd at Kresge Auditorium last week—on the 39th anniversary of the first Earth Day—that clean energy has the potential to bring about an economic bonanza for the commonwealth at the same time that it improves the planet’s well-being.

“If we get this right, the whole world will be our customer,” Patrick said of his plans to make Massachusetts a hotbed of both innovation and implementation in solar, wind and other clean-energy alternatives.

Patrick said state regulations must be updated to give renewable energy projects a fair shake. At present, he said, there are “built-in biases” that favor fossil fuel. For example, a provision that allows the state to override local objections and permit the construction of new power plants only applies to large plants, and thus almost exclusively affects fossil-fuel plants. “Ironically,” he said, “the only [renewable] plant large enough to be affected by this law is the most controversial—Cape Wind, which I enthusiastically support.”

Despite strong opposition to that offshore wind project from most of Massachusetts’ political leaders, Patrick said that if it does get built, as the nation’s first major offshore wind installation, it would be a powerful symbol of a new direction in energy policy.

A new energy reform bill now being hammered out in a state legislature conference committee, Patrick said, “will revolutionize energy policy in this state.” One of the reforms he wants to see incorporated in the bill is a restructuring of electric utility regulation to promote energy efficiency—“the cleanest energy of all,” he said.

Currently, rate structures “reward our utilities for selling as much as they can,” but that must be changed in order to reap the enormous benefits of efficiency. Changing that policy will be “good news for consumers, and good news for renewable energy,” he said.

In addition, to promote the development of solar energy, Massachusetts has forged “the first alliance of utilities and solar manufacturers in the whole country,” Patrick said. One sign of that alliance is the recent announcement of Evergreen Solar—a manufacturer of solar panels that was a spin-off of MIT research—to triple its manufacturing capacity in the state, creating 1,000 jobs. In addition, state rebates will pay up to 60 percent of homeowners’ costs for installing photovoltaic panels.

“Thanks to places like MIT, with its Energy Initiative, Massachusetts is becoming a center of solar research,” he said. Noting an overall U.S. trend away from manufacturing jobs and toward information-based work, he said that “Clean energy is one knowledge-based technology that produces jobs across the spectrum”—everything from construction trade work to manufacturing, managerial, academic and research positions.

Patrick said that while some might find it odd to spend Earth Day talking about the building of a new industry, it really isn’t. “I hope everyone will help us build, right here in Massachusetts, a clean-energy industry that saves the world,” he said, to a resounding standing ovation.

