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TechTalk
SERVING THE MIT COMMUNITY

Fulbright scholar in new adventure

Anne Trafton
News Office

In the 26 years since he first arrived at MIT as a freshman, V.A. Shiva Ayyadurai has earned four MIT degrees and started two multimillion-dollar companies.

This fall, he will use his most recent degree, a Ph.D. in computational systems biology, and a Fulbright Scholarship to explore one of his lifelong interests: the intersection of Eastern and Western medicine.

Ayyadurai's upcoming project is the latest in a series of personal ventures that have spanned fields as diverse as electronic communications, animation and molecular biology. His experience shows what is possible with an MIT education, he says.

"I don't think I could have done this anywhere else," said Ayyadurai, 43. "MIT is a great place to follow your dreams."

Ayyadurai started dreaming as a child in India, where his grandfather was a farmer and his grandmother a shaman, or traditional healer. He became interested in medicine watching his grandmother diagnose and treat patients based on a system of "elements"—earth, water, fire, metal and wood. That approach may seem strange to Westerners, but "you'd see people actually getting healed," he said.

When Ayyadurai started as a freshman at MIT in 1981, he planned to go to medical school but later changed his plans. He found Western medicine, with its dependence on looking up symptoms in reference books, very different from his grandmother's practice. "There was always something sterile about Western medicine," he said. "I got turned off by it."

PHOTO / **DONNA COVENEY**

Shiva Ayyadurai, Ph.D., won a Fulbright scholarship to travel to India and study Eastern medicine.

Now, he wants to explore what Eastern and Western medical traditions can learn from each other. Ayyadurai sees the exchange as a two-way street: He plans to apply Western scientific rigor to testing the long-established traditions of the East, and to study how the Eastern "elements" can inform Western medicine.

He points out that the market for alternative therapies based on Eastern medicine is growing every year, even without scientific evidence to support their usefulness.

"Let's look at glucosamine and see if it really works. Let's look at ginkgo and see if it really works," he said.

Ayyadurai departs for India this month to begin his studies, and he also plans to start raising funds to launch an MIT-affiliated center to study Eastern medicine.

Road to success

Ayyadurai's path to the Fulbright Scholarship has been marked by early and frequent successes in a variety of fields.

He moved to New Jersey with his par-

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Brain's messengers could be regulated

MIT researchers find potential for better understanding of schizophrenia

Deborah Halber
News Office Correspondent

Researchers at MIT's Picower Institute for Learning and Memory have found that tiny, spontaneous releases of the brain's primary chemical messengers can be regulated, potentially giving scientists unprecedented control over how the brain is wired.

The work, reported in the Sept. 16 early online edition of Nature Neuroscience, could lead to a better understanding of neurological diseases like schizophrenia.

Sputtering electrical activity—like a firecracker's leftover sparks after a big bang—was long considered inconsequential background noise compared with the main cell-to-cell interactions underlying thought and memory.

But lead author J. Troy Littleton, Fred and Carole Middleton Associate Professor of Biology at MIT, and colleagues found that the miniscule events that follow a burst of electrical and chemical activity among neurons are far more important that previously thought. A breakdown in this molecular mechanism could be the culprit in schizophrenia and other neurological diseases, the authors reported.

Neurons communicate with one another through chemical junctions called synapses. Key to the system are complexins. These small proteins play a role in the release of the brain's chemical messen-

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MIT, Legatum to create new center

Center to be funded by a structured gift of $50M by Legatum

Legatum, a private firm that invests in the global financial markets and in initiatives that support sustainable development, announced Sept. 17 a structured gift of $50 million to create a new center at MIT. The establishment of the Legatum Center for Development and Entrepreneurship will support aspiring entrepreneurs from the developing world who have a strong commitment to development entrepreneurship, helping them to acquire the knowledge and skills required for successful business development and civic leadership around the world.

"The Legatum Center at MIT has been established to provide a launching pad for a new generation of entrepreneurs who want to develop the technologies and skills necessary to operate innovative businesses in a developing market context," said Mark Stoleson, president of Legatum.

The Legatum Center at MIT will help students develop and commercialize new technologies, while exploring the application of practical, enterprise-based solutions to address deep-rooted problems in developing nations. In addition, the center will provide a venue for competitions and prizes, seminars, workshops, debates and forums, engaging visiting scholars and industry leaders on topics relating to entrepreneurship, leadership and business development.

"MIT has a long and distinguished history of technological innovation and entrepreneurship and is therefore the natural home for this initiative. We hope that over time the Legatum fellows will be considered among the business leaders of the developing world," added Stoleson.

MIT and Legatum share the view that providing students with these skills will give them the knowledge and experience they need to contribute towards the development required to establish prosperity among emerging nations.

The Legatum Center for Development and Entrepreneurship is now seeking applications for Legatum Fellowships for the 2008-2009 academic year from graduate students at MIT. These fellowships will provide support to students who are motivated by a desire to apply their talents to grassroots commercial solutions in developing nations. The Legatum fellows, drawn from across the five MIT schools, will engage in a cross-faculty program

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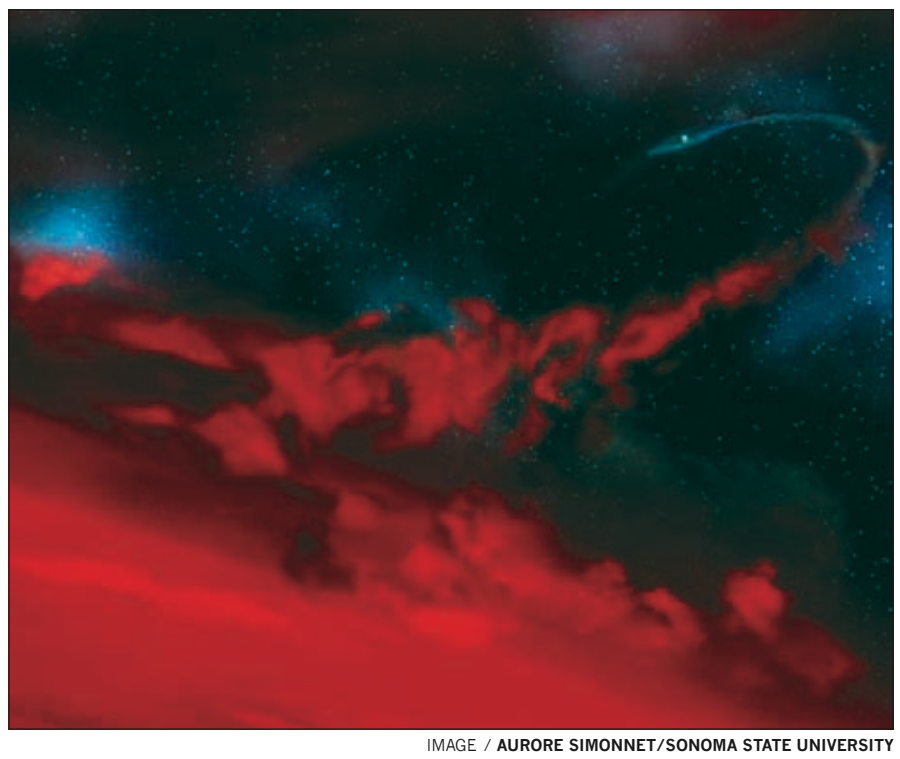

IMAGE / **AURORE SIMONNET/SONOMA STATE UNIVERSITY**

Cosmic dance of death

MIT astronomers played a key role in discovering what NASA calls one of the most bizarre objects in space. To read what it is, please see page 4.

NEWS

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Eugene Bell, 'father of tissue engineering,' to be honored Nov. 19

A memorial service for former Professor of Biology Eugene Bell will be held at noon Monday, Nov. 19, in the MIT Chapel.

Bell, who was renowned for his pioneering work in the field of regenerative medicine, died June 22. He was 88.

Bell recently donated more than $1 million to MIT to establish the Eugene Bell Career Development Professorship of Tissue Engineering. Darrell J. Irvine, the inaugural holder of the professorship, said Bell came to be known as the "father of tissue engineering" as a result of a seminal study he published in the journal Science in 1981.

That study, which has been cited more than 400 times, demonstrated a way to repair skin wounds with artificial skin made from a person's or an animal's own cells.

"This basic demonstration became the basis for an entire generation of studies aimed at regenerating every type of tissue—skin, cartilage, bone, nerve, liver, etc.," Irvine said. "It turns out that many tissues require different approaches and provide unique challenges, but the basic work done by Bell paved the way for what is now referred to as 'regenerative medicine.'"

Irvine noted that some of these attempts—based on strategies similar to Bell's—became commercial products. For example, certain commercial synthetic skin grafts are based on concepts similar to Bell's original design, he said.

Bell was born in New York and enlisted in the Army during World War Two. He saw combat action in the Philippines and in New Guinea and was wounded by a piece of shrapnel that stayed in his hand for the rest of his life.

He began his academic career at MIT in 1956 and became a professor of biology in 1967. While at MIT he laid the groundwork for the field of tissue engineering. Bell held more than 40 U.S. and foreign patents and was the chief author of more than 200 scientific papers.

Bell retired from MIT in 1986, but went on to found two companies that made the technology he helped develop commercially available.

His wife, Millicent, said Bell never lost sight of his youthful ambition to make a positive contribution to the world.

"As a youth he was always someone wanting the world to be a good place. As one grows older, sometimes one puts such thoughts aside—but he never did," she said in an interview.

In addition to his wife, Bell left a son, a daughter, and four grandchildren.

The Nov. 19 memorial service will be followed by a luncheon at the Religious Activities Center (W11). For more information, contact Susan Fugliese at x3-6930.

John M. Buchanan, 89

John M. "Jack" Buchanan, Wilson Professor emeritus of Biology, died June 25 in Lexington, Mass. He was 89.

Buchanan devoted his life and dedicated service to MIT and to his profession. He joined the MIT faculty in 1953 as professor of biology and as director of the newly established Division of Biochemistry. He soon recruited a core group of young and senior faculty to the department, including Gene Brown, Vernon Ingram, Salvador Luria, Paul Schimmel, Phil Robbins and Lisa Steiner. Growing from this nucleus, the Biology Department and the Biochemistry Division soon gained a reputation for being among the outstanding programs in the country.

John M. Buchanan

Buchanan helped attract other leading scientists to MIT, including Cyrus Levinthal, Maurice Fox and Alexander Rich—key appointments that helped boost the biology department's international reputation.

In his autobiography, the late MIT President James Killian observed that bringing Buchanan to MIT was among the most important recruitments of his tenure.

Buchanan completed his undergraduate degree in chemistry at DePauw University in 1938 and earned a master's in biological chemistry at the University of Michigan in 1939. He moved to Harvard Medical School for his Ph.D. work under A. Baird Hastings, where his research contributed to understanding the gluconeogenic pathway from lactic acid. This was one of the pioneering studies on biosynthetic pathways using isotopically labeled precursors, in this case, the extremely short half-life form of carbon, 11C.

After completing his Ph.D. in 1943, he joined the faculty in physiological chemistry at the University of Pennsylvania Medical School, rising to full professor by the time he left for MIT in 1953. Buchanan was awarded a Medical Research Council Fellowship between 1946 and 1948, which he used to work with Hugo Theorell at the Nobel Institute in Stockholm. This was a singularly successful period in Buchanan's career, in which he gained expertise in protein and enzyme chemistry. He also met Elsa Nilsson, who would in due time become Elsa Buchanan, his wife and inseparable companion of 58 years.

Buchanan was honored in 1966 as the first John and Dorothy Wilson Professor at MIT, a chair now held by Dianne Newman of the biology department. In recognition of his career and service, MIT has endowed an annual John M. Buchanan Lectureship and a John M. Buchanan Medal with the inscription, "Discovery, Education, Inspiration, Friendship and Modesty."

Buchanan is survived by his wife, Elsa, sons Steve and Peter, daughters Claire and Lisa as well as many grandchildren.

Howard R. Alker, alum and former professor

Hayward R. Alker, an MIT alumnus and political scientist specializing in international relations, died Aug. 24 at his home in Block Island, R.I., following a cerebral hemorrhage. He was 69.

A New York City native, Alker was a leading scholar on international conflict resolution, widely respected for his integration of mathematical and humanistic research methods. His books include "Journeys Through Conflict" (2001) and "Mathematics and Politics" (1965).

Alker taught at MIT from 1968 to 1995, when he left to teach at the University of Southern California, where he held the John A. McCone Chair in International Relations.

He earned an S.B. in mathematics from MIT in 1959 and his M.A. and Ph.D. degrees from Yale University in 1960 and 1963, respectively. He taught at Yale before he came to MIT.

Alker is survived by his wife, J. Ann Tickner, of Santa Monica, Calif.; his brother, Henry; his sister, Charity; three daughters, Joan, Heather and Gwendolyn; and six grandchildren. In lieu of flowers, contributions may be made to the Middle East Peace Education Program of the American Friends Service Committee in Los Angeles or to the Block Island Conservancy.

Herb Pomeroy, founder of MIT Festival Jazz Ensemble

Jazz icon Herb Pomeroy, who founded the MIT Festival Jazz Ensemble in 1963, died Aug. 11 at his home in Gloucester. He was 77.

Pomeroy, a trumpeter inspired by Louis Armstrong, played with such jazz greats as Charlie Parker, Stan Kenton and Lionel Hampton. When he first came to MIT, he found a jazz ensemble so bad that he called their performance "horrible." He considered telling them he couldn't continue, but instead told the musicians, "Let's roll up our sleeves and get to work."

That work continued for 22 years, until 1985. Under Pomeroy's guidance, the Festival Jazz Ensemble (FJE) was transformed into a top-notch, award-winning group that gained wide recognition through their concerts and festival appearances. The FJE has performed throughout the United States; it was also the first college ensemble to appear at Switzerland's prestigious Montreux Jazz Festival.

"Herb was the real architect of the jazz program at MIT. In the early going of our music program, jazz was one of our flagship activities, even before classical music. Herb was unusual in that he was a wonderful jazz player who liked to and could teach," said composer and Institute Professor John Harbison of MIT's music section.

A celebration of Pomeroy's life and music was held Sept. 9, at Emmanuel Church in Boston. The MIT Festival Jazz Ensemble will conduct a memorial concert next May in Kresge Auditorium.

Hollis M. Lilly, 36

Hollis M. Lilly, staff associate in the Office of Undergraduate Advising and Academic Programming, died on July 28 due to complications from surgery. He was 36.

Lilly came to MIT in October 2003. In his capacity as staff to the faculty Committee on Academic Performance (CAP) and as the coordinator of AP transfer credit and UAAP sponsored study sessions, he worked with both faculty and students.

A resident of Somerville who grew up in Lowell, Lilly previously worked at Harvard University. He is survived by his mother, Roberta Lilly of Lowell; his brother, Jeremiah, and his sisters, Melody Barlay of Haverhill and Hope Lilly of Albany, N.Y., among many others. He was buried Aug. 4 in Tewksbury Cemetery.

Eleanor J. Miller, 84

Eleanor J. Miller, a former staff member and supervisor in the Registrar's Office, died Aug. 20, 2007, at the Bay Path Nursing Home in Duxbury. She was 84.

A native of Kingston, Mass., Miller worked at MIT for 23 years until she retired in 1985.

Miller is survived by six sisters, one brother and many nieces, nephews, and great-nieces and nephews.

Miller was buried Aug. 23 in Mayflower Cemetery in Duxbury. Donations can be made to the Muscular Dystrophy Assoc., 1400 I Street NW, Suite 1220, Washington, DC 20005-2208.

Frank Imbornone, 71

Frank Imbornone, a former employee in building services, died Aug. 26. A U.S. Army veteran, he was 71.

A native of Quincy and a resident of South Weymouth, Imbornone retired from MIT in 1996.

He is survived by his wife, Carol; daughters Christine Imbornone of Woburn, Stephanie Imbornone of South Weymouth, Carolann Deluca-Killinger of Rockland, Patti Spanks of Lynn; son Richard DeLuca of Northbridge; and a sister, Rose M. Burke of Andover.

Interment was at Mt. Hope Cemetery, South Weymouth, on Aug 30.

Donations may be made in his memory to Hospice of the South Shore, P.O. Box 9060, Braintree, MA 02184 or Dana-Farber Cancer Institute, 10 Brookline Place West, Floor 6, Brookline, MA 02445-9924.

▶ NEWS YOU CAN USE

Helicopters on Briggs Field

The MIT Army ROTC program, in conjunction with the MIT Flying Club, will sponsor a training event Wednesday, Sept. 19, from noon to 4 p.m. at Briggs Field that will include the take off and landing of two Rhode Island Army National Guard helicopters during several orientation flights. Interested students and other MIT community members will also have the opportunity to view the aircraft up close and to speak with the flight crews. MIT Dean of Undergraduate Education Daniel Hastings is among the special guests scheduled to fly with the students. For more information, contact Dave Gowel at goweld@mit.edu.

Travel vendor fair

The Ninth Annual Travel Vendor Fair will be held Tuesday, Sept. 25, in Lobby 13 from 10 a.m. to 2 p.m. Invitations will go out to all faculty, staff and support staff during the week of Sept. 17. Individuals who travel on MIT business or are responsible for making travel arrangements will find this event informative.

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Knight Science Journalism fellows arrive on campus

The 25th anniversary class of Knight Science Journalism fellows—a group of 10 writers and editors from six countries—has begun taking classes at MIT. During their year on campus, the journalists will also be visiting labs, interviewing researchers and attending twice-weekly Knight seminars, most taught by MIT faculty members.

The new Knights are:

Pam Belluck, New England bureau chief of The New York Times, who is preparing to specialize in medical coverage.

Cathy Clabby, science reporter of the Raleigh, N.C., News & Observer.

Pere Estupinyà, editor of "Redes," a popular science television program in Spain.

Jonathan Fahey, associate editor at Forbes magazine.

Zarina Khan, who covers science, medicine and the environment for Emirates Today, published in Dubai.

John Mangels, science reporter for the Cleveland Plain Dealer.

Esther Nakkazi, science and medical reporter for The East African, which circulates in Uganda, Kenya, Tanzania and Rwanda.

Julie Robotham, medical editor of The Sydney Morning Herald in Australia.

Keith Seinfeld, science and medical reporter at KPLU, the PBS affiliate in Seattle.

Ivan Semeniuk, New Scientist's U.S. bureau chief, based in Cambridge.

The MIT community is invited to meet the new Knights at a reception Thursday, Sept. 20, from 4 to 6 p.m. in the Faculty Club. It's sponsored by Technology Review magazine, the MIT News Office and the Knight Fellowships.

The Knight Fellowships, part of the Science, Technology and Society program in the School of Humanities, Arts, and Social Sciences, is funded chiefly by an endowment from the John S. and James L. Knight Foundation.

PHOTO / **GRAHAM RAMSAY**

Left to right: Molly Seamans, administrative assistant; Esther Nakkazi; John Mangels; Julie Robotham; Pam Belluck; Boyce Rensberger, director; Ivan Semeniuk; Pere Estupinyà; Keith Seinfeld; Zarina Khan; Catherine Clabby; Jonathan Fahey; Kathy Boisvert, assistant director.

'Wiki City Rome' draws map like no other

Greg Frost
News Office

Residents of Italy's capital glimpsed the future of urban mapmaking this month with the launch of "Wiki City Rome," a project developed at MIT that uses data from cellphones and other wireless technology to illustrate the city's pulse in real time.

The project debuted Sept. 8 during Rome's "Notte Bianca," or white night, an all-night festival of events across the capital city. During that night, anyone with an Internet connection could see a unique map of the Italian capital showing the movements of crowds, event locations, and the real-time position of city buses and trains.

The map was also broadcast on a big-screen display in the heart of Rome, giving Romans real-time feedback on the human dynamics in their immediate surroundings.

Wiki City Rome stemmed from MIT's SENSEable City Laboratory, an initiative directed by Carlo Ratti that studies the impact of new technologies on cities. The project built on the work of "Real Time Rome," presented during the 2006 Venice Architecture Biennale, the prestigious biannual exhibition of contemporary art.

Organizers said Wiki City Rome raises the intriguing prospect of a map drawn on the basis of dynamic elements of which the map itself is an active part. According to researcher Francesco Calabrese of SENSEable City Lab, a person could consult the map to find the most crowded place to drink an aperitivo—and then identify the least congested route by which to reach it.

"Rome's Notte Bianca is all about the city, the people and the events, and Wiki City Rome gave Romans a new awareness of how they move within their city in response to this exceptional pulse of activities," said researcher Kristian Kloeckl, a SENSEable City Lab member who is also working on the project.

"How do people react towards this new perspective on their own city while they are determining the city's very own dynamic? How does having access to real-time data in the context of possible action alter the process of decision-making in how to go about different activities?" Kloeckl asked. "These are among the questions we may be able to answer."

By looking at a city using a "real-time control system" as a working analogy, the Wiki City project studies tools that enable people to become prime actors themselves in improving the efficiency of urban systems. In coming years, the Wiki City project will develop as an open platform where anybody can download and upload data that are location and time sensitive.

"By deploying developments of the 'Web 2.0' and the 'Semantic Web,' Wiki City can be a significant leap forward towards a pervasive 'Internet of things' to support human action and interaction," said Carlo Ratti.

Ratti's team obtains its data anonymously from cell phones, GPS devices on buses and taxis, and other wireless mobile devices. Data are made anonymous and aggregated from the beginning, so there are no implications for individual privacy.

Partnering with the SENSEable City Lab on Wiki City Rome are SEAT Pagine Gialle, Telecom Italia, Telespazio, the Rome public transportation authority ATAC, La Repubblica, and Trenitalia.

In addition to Kloeckl, Calabrese and Ratti, members of the Wiki City Rome team include Assaf Biderman, Bernd Resch and Fabien Girardin.

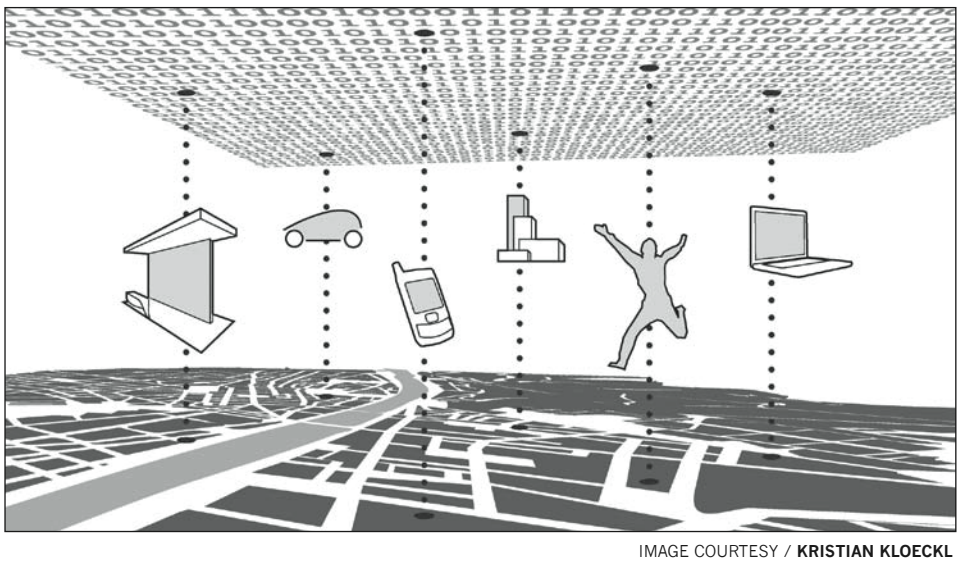


IMAGE COURTESY / **KRISTIAN KLOECKL**

In the 'Wiki City Rome' project, an MIT team obtained data anonymously from cell phones and other devices to map Rome in real time.

FULBRIGHT

Continued from Page 1

ents, a chemist and a mathematician, at the age of 7. When he was 13, he started to work at Rutgers to develop one of the first e-mail systems ever built, which eventually won him a Westinghouse Science Award.

At MIT, Ayyadurai was founder and editor of a newspaper called The Student and an activist who worked to raise awareness of global and campus issues such as apartheid, U.S. policies overseas, cuts in student aid and sexual harassment on campus.

"My intention was always to make the MIT community aware of our being part of a larger global society, and we as leaders had a duty to fight for those who had less," he said.

After graduating from MIT in 1986 with a degree in electrical engineering and computer science, he was one of the early developers of a graphic software program that was eventually sold to Lotus. He had always been interested in art and design, so after selling his company he went to the MIT Media Lab and got a master's degree in animation, focusing on how to present scientific data visually. He also holds a master's degree in mechanical engineering from MIT.

His next venture was a software program called EchoMail, which companies can use to automatically sort and respond to customer e-mails. EchoMail has been used by major companies including Nike, Citibank, IBM and Proctor & Gamble.

In 2004, Ayyadurai returned to MIT, this time to work on a Ph.D. in systems biology, a relatively new field that integrates biology, engineering and computer science. The goal of systems biology is to figure out how the layers of a biological system, from genes to cells to organs to the whole body, are linked.

Systems biologists start by figuring out how individual cellular pathways work, but deciphering just one pathway can take years. To speed up that process, Ayyadurai developed a computer model that can integrate the activities of all the different pathways in a cell—work that formed the basis of his doctoral thesis.

Professor Dewey Forbes, Ayyadurai's thesis advisor, said the project was conceived as a tool that would help the biological community address the large-scale problem of modeling the complexity of a complete cell.

"In the end, Shiva not only provided the basic system called Cytosolve, but he used it to create a new composite model of the upregulation of interferon following viral infection," said Forbes. "There is a lot of excitement about the several aspects of the thesis, and much of it should be in public journals in the near future."

To Ayyadurai, who defended his thesis last month, the appeal of systems biology is its combination of a range of fields, especially computing and medicine.

"For me, this goes back to everything I wanted to do," he said.

AWARDS AND HONORS

Lorlene Hoyt, assistant professor of urban studies and planning, is the winner of this year's Ernest A. Lynton Award for the Scholarship of Engagement given by the New England Resource Center for Higher Education.

Lorlene Hoyt

Hoyt studies and teaches on urban revitalization strategies, business improvement districts, and planning education. She is the project director of MIT@Lawrence, a university-community partnership focused on affordable housing, community asset-building and youth pathways to education and careers.

The single Lynton Award recipient from a pool of 72 nominations from across the country, Hoyt has been invited to present her work at the annual conference of the Coalition of Urban and Metropolitan Universities to be held Oct. 21 in Baltimore.

Assistant Professor **Tanja Bosak** is the recipient of the 2007 Geological Society of America Subaru Outstanding Woman in Science Award, to be presented Oct. 27 in Denver. Bosak, new to MIT this fall, uses laboratory models to examine microbial biosignatures in carbonate rocks. Her approach to interpreting signs of life in ancient rocks includes developing a laboratory system that mimics the chemistry of the Precambrian ocean.

MIT economist **Daron Acemoglu** and graduate student **Vanda Felbab-Brown** recently received awards from the American Political Science Association. Acemoglu was honored for his co-authorship of the book "Economic Origins of Democracy and Dictatorship" and as co-author of the article "Economic Backwardness in Political Perspective." Felbab-Brown's "Shooting Up: The Impact of Illicit Economies on Military Conflict" won best doctoral dissertation in the field of policy studies.

The Multimedia Educational Resource for Learning and Online Teaching has presented its 2007 Editors' Choice award in physics to Professor **John Belcher** for Physics 8.02: Faraday's Law. The freshman course subject is taught collaboratively and interactively, including use of 3-D animations and visualizations, employing MIT's Technology Enabled Active Learning (TEAL) teaching format. TEAL personnel involved include Andrew McKinney, Philip Bailey, Pierre Poignant, Ying Cao, Ralph Rabat, Michael Danziger, Mark Bessette, Andreas Sundquist and Mesrob Ohannessian.

Stars locked in bizarre death-dance

Elizabeth Thomson
News Office

MIT astronomers played a key role in discovering what NASA calls one of the most bizarre objects in space: a star "skeleton" of very low mass that is orbiting and being slowly consumed by a second massive star known as a pulsar, that is itself spinning faster than a kitchen blender.

A NASA team, led by Hans Krimm and Craig Markwardt at Goddard Space Flight Center and an MIT team led by Deepto Chakrabarty, an associate professor of physics in MIT's Kavli Institute for Astrophysics and Space Research, described the overall system (known by its abbreviation SWIFT J1756.9) in an article accepted for publication in the Astrophysical Journal Letters.

"While we already know of several cases of pulsars that have consumed or vaporized most of the mass in their companion star, SWIFT J1756.9 is possibly the most extreme example," said Chakrabarty.

Systems like SWIFT J1756.9 provide a rare opportunity for astronomers to examine how "millisecond pulsars" are spun up to incredibly rapid speeds, and to determine their eventual fate, he added.

SWIFT J1756.9 was discovered earlier this year using NASA's Swift and Rossi X-Ray Timing Explorer (RXTE) satellites. The RXTE observations indicate that the pulsar, a type of neutron star, is spinning 182.07 times per second, even though it contains at least 1.4 times the mass of the sun but is only about 10 miles across. "This means that the surface of the star is moving at about 7,000 miles per second, or roughly 4 percent the speed of light," Chakrabarty said.

The companion object was found to orbit the pulsar every 54.7 minutes at an average distance of about 230,000 miles (slightly less than the distance from Earth to the moon). It has what astronomers consider a very low mass: about seven times that of Jupiter. For comparison, the sun is more than 1,000 times more massive than Jupiter.

"This object is merely the skeleton of a star," says Markwardt. "The pulsar has eaten away the star's outer envelope, and all that remains is its helium-rich core."

The system is only the eighth millisecond pulsar observed to be pulling mass from a companion, and only one other such system has a companion with such a low mass. The companion in that system also has a minimum mass of about seven Jupiters.

The system probably formed several billion years ago, when it consisted of a very massive star and a smaller star. The more massive star evolved quickly and exploded as a supernova, leaving behind a pulsar. The smaller star eventually started to puff up as it aged, and the two objects became embedded in the extended stellar envelope. This drained orbital energy, causing the two stars to draw ever nearer.

Today, the two objects are so close to each other that the pulsar's powerful gravity produces a tidal bulge on its companion, siphoning gas into a disk that surrounds the pulsar. The flow eventually becomes unstable and dumps large quantities of gas onto the pulsar, causing an outburst like the one observed in June.

With an estimated distance of roughly 25,000 light-years from Earth, the system is normally too faint to be detected and is only visible during an outburst. SWIFT J1756.9 had never been seen to erupt until this June, so as Markwardt points out, "We don't know how long it will slumber before it wakes up again."

In addition to Chakrabarty, the MIT team includes Jacob Hartman, a graduate student in physics who defended his Ph.D. thesis on Aug. 2.

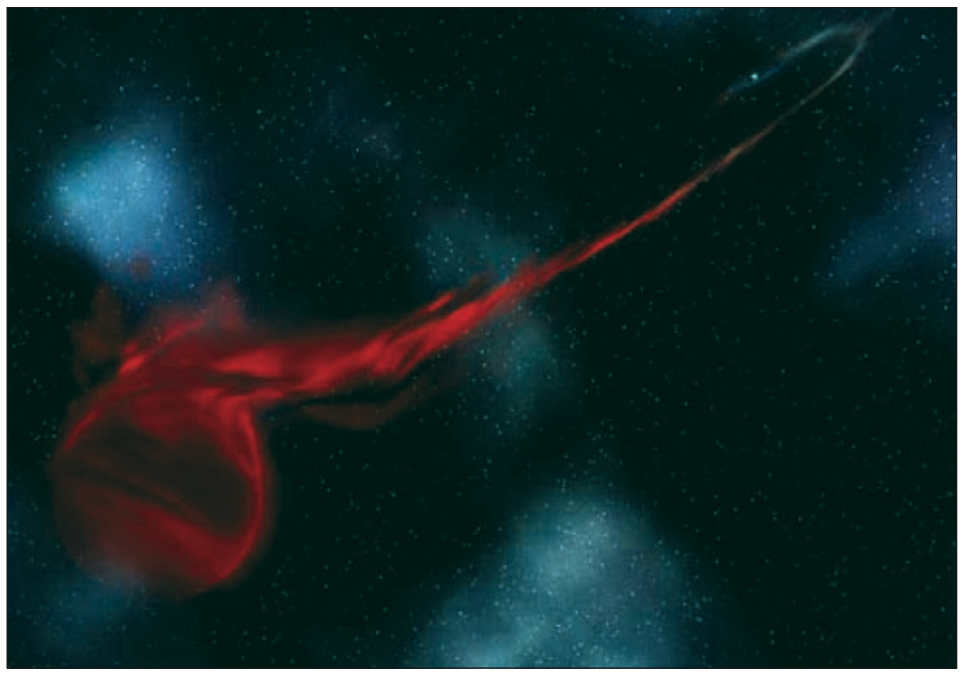


IMAGE / **AURORE SIMONNET/SONOMA STATE UNIVERSITY**

In this artist depiction of the SWIFT J1756.9 system, the massive gravitational pull of a pulsar, shown at upper right, distorts its companion star, left, into a teardrop-shaped object, ripping gas from it. This material flows in a stream toward the pulsar and forms a disk around it. Eventually, enough gas builds up in the disk to produce an outburst bright enough to make the system visible from Earth.

BRAIN

Continued from Page 1

gers, or neurotransmitters, during synaptic cell-to-cell signaling.

To figure out exactly how complexins work, Littleton created the first genetically engineered mutant—in this case, a fruit fly—that produces no complexins at all.

There are two sides to synaptic transmission: presynaptic and postsynaptic. When an electrical nerve impulse zaps the presynaptic side, it triggers lightning-fast events that release neurotransmitters. This activates the postsynaptic cell. Mission accomplished: The foundation of a memory is formed.

The neurotransmitters are like racehorses. They champ at the bit until they get the signal to dash toward the finish line. On the presynaptic side, small compartments, or vesicles, containing neurotransmitters are the starting block and complexins are the gatekeepers that prevent the neurotransmitters from releasing prematurely.

After a big burst of electrical activity sends out a flood of neurotransmitters, a few vesicles still produce some neurotransmitter. The MIT work explains the molecular machinery behind these "minis," which can occur for a few minutes after the big event. Without complexin as a gatekeeper, minis occur unchecked, leading to massive rewiring and synaptic growth.

"This spontaneous release in the brain is not only important for signaling, it can trigger synaptic growth," Littleton said. "What's really exciting is that complexin's activity may be regulated. If we can regulate this machinery, we may be able to promote synaptic growth and potentially allow targeted rewiring in areas of the brain affected in various neurological diseases."

Littleton also holds an appointment in MIT's Department of Brain and Cognitive Sciences.

Biology graduate student Sarah N. Huntwork co-authored the Nature Neuroscience paper.

This work was supported by the National Institutes of Health and the Packard Foundation for Science and Engineering.

PHOTO / **DONNA COVENEY**

J. Troy Littleton, a professor in the Picower Institute for Learning and Memory at MIT, joins biology graduate student Sarah N. Huntwork in the lab where she works with drosophila, or fruit flies. They have created the first genetically engineered mutant that produces no complexins (proteins that play a role in the release of neurotransmitters) during cell-to-cell signaling.

MIT IDs binocular vision gene

Research could lead to treatments for some visual disorders

Deborah Halber
News Office Correspondent

In work that could lead to new treatments for sensory disorders in which people experience the strange phenomena of seeing better with one eye covered, MIT researchers have identified the gene responsible for binocular vision.

Unlike horses and eagles, whose eyes on the sides of their heads provide two different scenes, humans see a single, in-depth view. Now researchers from the Picower Institute for Learning and Memory have identified the gene responsible for melding images from two eyes into one useful picture in the brain.

The work, which appeared in the Sept. 4 issue of the Public Library of Science (PLoS) Biology and in the journal Cerebral Cortex, shows that a novel gene is necessary for binocular vision.

"There are other instances in the brain where two different inputs have to be properly aligned and matched–such as auditory and visual projections to the midbrain that enable us to orient to sound," said lead author Mriganka Sur, Sherman Fairchild Professor of Neuroscience at the Picower Institute and head of the Department of Brain and Cognitive Sciences at MIT. "This is the first study to pinpoint a gene with this kind of job."

Two points of view

Binocular vision allows us to perceive depth and carry out detailed visual processing. The images projected by each eye are aligned and matched up in brain regions called the visual thalamus and cortex.

The MIT researchers discovered that the genes Ten_m3 and Bcl6 have a key role in the early development of brain pathways for vision and touch. Ten_m3 appears to be critical for the brain to make sense of the two disparate images from each eye.

In mice that had the Ten_m3 gene knocked out, projections from their two eyes were mismatched in their brains. Because each eye's projection suppresses the other, the mice were blind, even though their eyes worked normally.

Remarkably, the researchers found that when the output of one eye was blocked at a molecular level, the knockout mice could see again. With one eye's conflicting input shut down, the other eye was able to function, though only with monocular vision.

PHOTO / **DONNA COVENEY**

Mriganka Sur

"This is an amazing instance of 'gain of function' that proves immediately that the gene is directly responsible for creating matched projections from the two eyes," Sur said.

Human disorders in which the Ten_m family of genes is affected are often accompanied by visual deficits. "There are reports of human visual conditions in which simply closing one eye allows a person to see much better," Sur said. "We believe that genes such as Ten_m3 are at the heart of these disorders."

Co-authors include Catherine A. Leamey, former MIT postdoctoral associate now at the University of Sydney; Atomu Sawatari, Kelly A. Glendining, Sam Merlin, Paul Lattouf and Natasha Demel of the University of Sydney; MIT affiliates Gabriel Kreiman, Kuan H. Wang and Ning-Dong Kang; Reinhard Fassler and Xiaohong Zhou of the Max Planck Institute for Biochemistry in Germany; and Susumu Tonegawa, Picower Professor of Biology and Neuroscience at MIT.

This work was supported by the National Institutes of Health, the Simons Foundation and Australia's National Health and Medical Research Council.

Research Digest

New tool to study genes' history

The wheels of evolution turn on genetic innovation—new genes with new functions appear, allowing organisms to grow and adapt in new ways. But deciphering the history of how and when various genes appeared, for any organism, has been a difficult and largely intractable task.

Now a team led by scientists at the Broad Institute of MIT and Harvard has broken new ground by developing a method, described in the Sept. 6 advance online edition of Nature, that can reveal the ancestry of all genes across many different genomes. First applied to 17 species of fungi, the approach has unearthed some surprising clues about why new genes pop up in the first place and the biological nips and tucks that bolster their survival.

"Having the ability to trace the history of genes on a genomic scale opens the doors to a vast array of interesting and largely unexplored scientific questions," said senior author Aviv Regev, an assistant professor of biology at MIT and a core member of the Broad Institute. Although the principles laid out in the study pertain to fungi, they could have relevance to a variety of other species as well.

Driven by the recent explosion of whole genome sequence data, the authors of the new study were able to assemble a natural history of more than 100,000 genes belonging to a group of fungi known as the Ascomycota. From this, the researchers gained a detailed view of gene duplication across the genomes of 17 different species of fungi, including the laboratory model Saccharomyces cerevisiae, commonly known as baker's yeast.

–Nicole Davis, the Broad Institute

Pinpointing a genetic link to height

It became clear nearly a century ago that a person's height is determined by a number of genetic factors. Little progress, however, has been made in determining the specific genes involved. An international research team has brought light to this question by pinpointing a genetic variant associated with human height—the first consistent genetic link to be reported.

The findings, published in the Sept. 2 advance online edition of Nature Genetics, stem from a large-scale effort led by scientists at the Broad Institute of MIT and Harvard, Children's Hospital Boston, the University of Oxford and Peninsula Medical School, Exeter.

In addition to being a textbook example of a complex trait, height is a common reason that children are referred to medical specialists. Although short stature by itself typically does not signal cause for concern, delayed growth can sometimes reflect a serious underlying health condition.

Using a new "genome-wide association" method, the research team searched the human genome for single-letter differences in the genetic code that appear more often in tall individuals compared to shorter individuals. By analyzing DNA from nearly 35,000 people, the researchers zeroed in on a difference in the HMGA2 gene – a "C" written in the DNA code instead of a "T". Inheriting the "C"-containing copy of the gene often results in more height: one copy can add about a half centimeter in height while two copies can add almost a full centimeter.

–Nicole Davis, the Broad Institute

Professors disagree with article

The Sept. 12 Tech Talk article "Not so super-cool after all" did not accurately convey the conclusions reached by the lead researchers, Jacopo Buongiorno, assistant professor of nuclear science and engineering, and Lin-Wen Hu, associate director of the Nuclear Reactor Laboratory.

The article, which was approved by one member of the research team, discussed a recent paper published in Physics Review Letter (PRL), "Mean-Field Versus Micro-Convection Effects in Nanofluid Thermal Conduction."

Buongiorno and Hu submitted the following statement to Tech Talk: "As co-authors of the PRL paper and principal investigators of the nanofluid research program at MIT, we would like to clarify that we were not consulted during the preparation of this article and disagree with its conclusion. The objective of our PRL paper was to test the validity of a physical mechanism (micro-convection) that has been proposed as an explanation for thermal conductivity enhancement. Our objective was not to deduce a general conclusion about nanofluids; in fact experimental data from other laboratories [that] exist in the literature have shown abnormal enhancement, which require further study. Therefore, the statement 'the early promise of nanofluids as an advanced nanoengineered coolant remains largely unfulfilled' is unwarranted and inconsistent with the PRL paper contents. Finally, regardless of the controversy about thermal conductivity, the experiments on boiling of nanofluids at MIT are yielding positive results. The addition of small amounts of nanoparticles has significantly increased the critical heat flux, a limiting measure of heat a material can withstand with a boiling coolant. Many systems based on boiling (for example, nuclear reactors, coal-fired boilers, heat exchangers) could greatly benefit from such critical heat flux increase. This aspect was omitted from the article, further contributing to its negative tone."

Tracking the 'jihad effect'

Sarah H. Wright
News Office

An MIT graduate student has received a fellowship from a U.S. Department of Homeland Security-funded research center to study the "jihad effect"—that is, how wars impact the trajectory of terrorist movements.

Stephanie Kaplan, a Ph.D. candidate in political science, plans to use the funds she receives from the National Consortium for the Study of Terrorism and Responses to Terrorism (START) to support her work on the relationship between armed conflicts and terrorism.

Kaplan is particularly interested in the way the Iraq War has shaped and will shape the future of al Qaeda. Ultimately, she hopes to contribute to improving the formulation and practice of U.S. counterterrorism policy.

"Regardless of how the war ends, whether the United States leaves Iraq now or stays in the months and years ahead, we must understand how the conflict has mobilized new assets on behalf of our enemies—skilled people, weapons, money, social bonds and legitimacy—and to what end those assets will be deployed in the future," Kaplan says.

"It is far better to begin this conversation now than years from now, when the jihad effect will be felt in full force," she adds.

Based at the University of Maryland, College Park, START is a Department of Homeland Security "Center of Excellence" charged with researching how terrorist groups form and behave and on how societies may best respond to terrorist threats.

PHOTO / **DONNA COVENEY**

Stephanie Kaplan, a Ph.D. candidate in political science at MIT, studies the relationship between armed conflicts and terrorism.

For Kaplan, MIT provides an ideal venue to develop new concepts for understanding terrorism within the field of political science.

"When it comes to counterterrorism, all too often the focus remains at the operational level—catching the next operative and foiling the next attack. This is a matter of mindset, but it is also a matter of time—in Washington, very few people have the luxury to step back and process the information coming at them in a long-term, strategic manner. I came to MIT so that I could figure out what that big picture is and do so in a rigorous way. And the political science department and Security Studies Program here at MIT are perfect homes in which to do that," she says.

This year, Kaplan will work as a teaching assistant in a political science course, American Public Policy for Washington Interns, designed for MIT students in the Institute's summer Washington internship program.

Before coming to MIT, Kaplan worked in several policy capacities in Washington, D.C., including as a staff member on the National Commission on Terrorist Attacks upon the United States, known as the 9/11 Commission.

Kaplan, who was managing editor of the commission's final report, treasures one memory of her experience above all others—a late-night walk around Ground Zero after a marathon session with the staff investigating New York City's emergency response.

"The gravity of 9/11 combined with the responsibility of carrying out the investigation really hit home," she says.

A native of Arlington Heights, Ill., Kaplan received a B.S. in foreign service from Georgetown University in 2000; she came to MIT in 2004.

Leveraging learning for artificial respiration

Research could lead to better, more cost-efficient ventilators; the ability to adapt may help improve the use of mechanical ventilators in clinical settings

Elizabeth Dougherty
Harvard-MIT Health Sciences and Technology

The same kind of learning that allows humans to get used to a subtle touch or persistent odor may also help human vital signs adapt to medical interventions such as mechanical ventilation.

New research from the Harvard-MIT Division of Health Sciences and Technology, led by research scientist Chi-Sang Poon, Ph.D., suggests that this innate ability to adapt, called nonassociative learning, which exists even in reflexive actions such as breathing, could be leveraged to design more-effective and less costly artificial respiration.

In work described in the Sept. 12 issue of Public Library of Science ONE, Poon examined rats under mechanical ventilation to see how they applied different forms of nonassociative learning to adapt to the rhythm imposed by the respirator.

The MIT research suggests, however, that if a doctor takes the patient's natural breathing rhythm into account and sets the ventilator's rhythm in that same range, the patient will adapt and synchronize with the ventilator. This new approach could minimize the need for induced sedation or paralysis.

"We have intrinsic nonassociative learning capabilities, called habituation and desensitization, that [can] make up for changes in the spontaneous rhythm due to artificial lung inflation," says Poon.

In tests of rats under artificial respiration, Poon found that, if using a suitable rhythm, rats adapted to the mechanical ventilation. He also found that this learning capability enabled mice to adapt to an artificial rhythm even when the mechanical respirators applied constant air pressure. The rats effectively "tuned out" this extra pressure, filtering it out as background noise. When Poon disabled the neural pathways involved in nonassociative learning, the rats' ability to adapt was either eliminated or compromised.

Though nonassociative learning is a familiar notion to researchers, commonly applied to smelling roses and adjusting to sunlight after emerging from a dark movie theater, it is not usually applied in a clinical environment. Because of their focus on stabilizing patients, clinicians often discount the power of learning. "Many ventilators are designed as if the patient were never in the equation," says Poon. "But it turns out our vital functions can learn to adapt in order to survive."

Poon's coauthors of the PLoS ONE paper are Shawna M. MacDonald of MIT's Department of Mechanical Engineering and Gang Song, an HST research scientist.

This work was supported by the National Heart, Lung and Blood Institute of the National Institutes of Health.

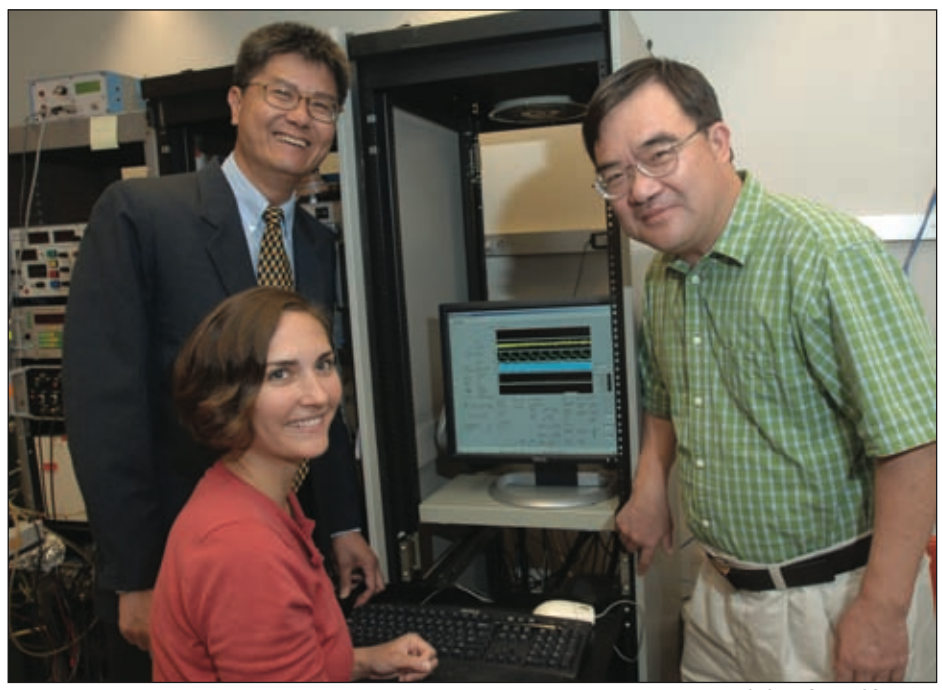


PHOTO / **DONNA COVENEY**

Principal research scientist Chi-Sang Poon, left, co-authored the PLoS ONE paper with Shawna MacDonald of MIT's department of mechanical engineering and Gang Song, an HST research scientist.

MIT team cooks up simple fuel recipe

Anne Trafton
News Office

MIT senior Jules Walter has seen firsthand the impact of deforestation in his native Haiti: Nearly 98 percent of the island's forests are gone, and more trees are being cut down every year.

Deforestation is not only an environmental problem in that country, but it also makes life difficult for Haitians who rely on wood to cook their food.

A team of MIT students including Walter is working to bring affordable, environmentally friendly cooking fuel to developing countries like Haiti. The technique, which grew out of an MIT class, offers a simple way to produce charcoal briquettes from organic material such as sugarcane waste.

The students have formed a company to produce and distribute the charcoal to Haitian villagers. Their firm, which includes Walter, MIT graduate students Amy Banzaert and Kendra Leith, and Haitian community organizer Gerthy Lahens, recently won $30,000 in seed money from the MIT $100K Entrepreneurship Competition.

Walter, a computer science major, traveled to Haiti in August to conduct a market study and meet with potential investors. He hopes the business idea appeals to those who want to invest in something that is both profitable and socially responsible.

"Traditionally people think you can either make money or help people," said Walter. "But this is a project where we really think we can do both, and do both well."

Students in MIT lecturer Amy Smith's course, D-Lab: Introduction to Development, first started working to develop low-cost cooking fuels after a trip to Haiti in 2003. The D-Lab course gives students the chance to explore technological solutions to real-life problems.

"The charcoal project was one of the very first D-Lab projects, and over the years, dozens of students have worked to help create the solution," said Smith, who received a master's in engineering from MIT in 1995 and won a MacArthur Fellowship, nicknamed the "genius grant," in 2004.

Walter and his teammates named their company Bagazo after the energy source for the charcoal: bagasse, or sugarcane waste. Sugarcane is widely available in Haiti, and corncobs and possibly other plant wastes, including banana leaves, can also be used to make the charcoal.

Several families in Haiti have tested the briquettes and liked them better than wood charcoal, Walter said. The briquettes are good for cooking because they burn longer than wood and are easier to light. They also create less smoke than wood and dung fires.

PHOTO / **AMY SMITH, MIT**

MIT senior Jules Walter, in Ghana, is holding a sample of charcoal made from corncobs.

"Both of those emit a lot of smoke, especially when people cook inside their homes, and it gives them problems with their lungs," Walter said.

The production process has three steps. First, organic waste is carbonized in a drum in a low-oxygen environment, which prevents it from turning to ash. The resulting powder is mixed with a binder to help hold it together. Then it is pressed into briquettes with a simple machine press and allowed to dry.

The entire process takes two and a half to three hours, but the Bagazo team wants to speed up and automate the process. Their plan is to develop a small- to medium-scale manufacturing business to distribute the fuel to people.

Although the team is focusing on Haiti, the briquettes could be beneficial in other places where trees are scarce, such as Africa and India. Students in Smith's class have visited Ghana and Pakistan to see if the briquettes could be successful there, and interested parties in Namibia have also contacted Walter.

For more information about the project, please contact Walter at jdwalter@mit.edu.

LEGATUM

Continued from Page 1

drawing upon the expertise of all of MIT's programs and laboratories.

"MIT believes that an innovative entrepreneurial approach, practically implemented from the bottom up, provides an effective route to the creation of businesses and jobs and to meeting essential human needs. MIT has always been committed to making a difference in the world and we believe this new center continues to help us fulfill that mission," said Phillip L. Clay, chancellor of MIT.

PHOTO / **L. BARRY HETHERINGTON**

Iqbal Quadir, left, and Alex "Sandy" Pentland will serve as executive director and faculty director, respectively, of the Legatum Center for Development and Entrepreneurship at MIT.

"We are excited at the opportunity to work with such a successful emerging markets investor as Legatum, which shares a similar dedication to excellence and a belief in the practical application of knowledge as a means of creating opportunity and prosperity in developing nations," continued Clay.

Professor Alex "Sandy" Pentland, director of the Human Dynamics Group at the MIT Media Lab and a pioneer in mobile information systems, health systems, smart environments and technology for developing countries, will act as the faculty director of the center.

Iqbal Quadir will serve as the executive director of the center. He founded GrameenPhone, a profitable venture that provides universal telecommunications access in Bangladesh. Before joining MIT, Quadir taught at Harvard University.

"We seek a balance in the debate on what constitutes effective development, which has traditionally been overwhelmingly out of balance in favor of top-down thinking. By focusing on emerging entrepreneurs and leveraging technological innovation, the Legatum Center at MIT will spawn a plethora of new business ventures in the developing world," said Quadir. "Our ambition is to advance the principle that it is entrepreneurs who most effectively drive organic economic growth."

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.

VEHICLES

1992 Chryster LeBaron convertible. White w/ new black roof, navy blue interior. New CD player, speakers, 10" subwoofer. 94,500 miles. New muffler, windshield & tires. $2,000/BO. Call Christina at x3-6967.

FOR SALE

Lowrey Spinet Piano (Approx 10yrs old). Blond mahogany wood, good condition $500. Call Ken at 978-250-1387.

SixFlags Tickets: two tickets to SixFlags New England, good for any day 2007, sale at half price, $20 each . Call x8-8314.

HOUSING

Arlington: Lge 3BR apt. for rent. Off-street parking (1 vehicle), front & back porches, yard, laundry, storage. Easy access to T (Alewife), bus, restaurants, shops. Avail. Oct. 1. $1650/month + util. Contact 617-750-0106 or ells.ells@verizon.net.

VACATION

Aruba: Oct. 20-27: Occidental Allegro Grand (Palm Beachfront), large 1-BR suite w/ LR; 2 balconies; 2 TVs; 2 full baths; full kitchen w/ dining area; inc. daily maid service. $1,200/week. Call Maria at x3-8012 or 781-248-3662.

For sale: Deeded early May time-share week, 5-star Westgate Resort, Kissimmee, Fla. All amenities, ground floor, screened porch, sleeps 6. Adjacent to large pool, hot tub, health club. All offers considered. Call 617-436-5663.

DIGITALK: Where IT's at

Update on Vista at MIT

IS&T now offers full support for Business-class editions (Business, Enterprise and Ultimate) of Windows Vista on new systems purchased with the Vista operating system. If you decide to buy a Windows Vista machine, IS&T recommends that you select a system bundled with the Vista Business edition. This version provides more functionality than the Home edition, and it is easy to upgrade from the Business to the Enterprise edition. Note that you can't upgrade from the Home edition to Enterprise, and that the Home edition can't be a member of the Windows domain.

IS&T will continue to support Windows XP and does not recommend that you upgrade your existing system to Windows Vista at this time. Migrating to Vista is a very involved process that requires a lot of preparation and preplanning. Detailed migration guidelines for DLCs and individual users will be provided by the Vista Release Team, vista-release@mit.edu, later this fall.

For full details on Vista support at MIT, go to itinfo.mit.edu/article.php?id=8544.

ACCORD: Teaching with technology

ACCORD is MIT's new Academic Computing Coordination group. It brings together the many educational technology service providers that support teaching and learning on campus. Participants include ACCORD's core group–the Libraries, the Office of Educational Innovation and Technology (OEIT), and Information Services and Technology—as well as OpenCourseWare and academic departments.

ACCORD recently revamped the Teaching with Technology web site at web.mit.edu/teachtech for easier discovery of services and additional resources for faculty and instructors. Services range from class management tools, to multimedia and digital documents, to learning spaces. To find out more, visit the Teaching with Technology web site or request a brochure by sending e-mail to accord@mit.edu.

Network upgrades

Through two recent upgrades, the capacity of MIT's connection to Internet2 has increased by a factor of four. IS&T boosted MIT's connection to the Northern Crossroads regional network from one gigabyte per second to 10. In turn, Northern Crossroads upgraded New England's aggregate connection to the Internet2 network from 2.5 GB/s to 10 GB/s. These network upgrades help facilitate MIT's global leadership in advancing knowledge and education in science and technology.

Collaboration has been key to these network improvements. MIT is an active member of both Northern Crossroads (www.nox.org) and Internet 2 (www.internet2.edu). Northern Crossroads is an informal affiliation of about two dozen New England institutions with a shared interest in advanced networking. Internet2 provides high-speed connectivity to research and education institutions throughout the U.S.

New Java User Group

MIT's Java User Group promotes the sharing of ideas and mutual support for Java developers and others who are interested in Java and related technologies. The group has monthly meetings featuring practical demonstrations of Java and Java-related tools. All members of the MIT community are welcome.

Upcoming meetings focus on the popular integrated development environments, Eclipse and NetBeans, and checking code with compiler plug-ins from CSAIL. To find out more or to join the Java User Group mailing list, go to web.mit.edu/jslate/www/javausers. For a list of all user groups at MIT, visit web.mit.edu/ist/usergroups.

Digitalk is compiled by Information Services and Technology.

MIT Museum show celebrates ocean engineer Jerry Milgram

Deborah Halber
News Office Correspondent

MIT ocean engineer Jerry Milgram, William I. Koch Professor of Marine Technology, designed the last U.S. winner of the America's Cup, pioneered oil spill cleanup and investigated dozens of notorious marine disasters. Now, as the legendary professor and "sea-going Sherlock Holmes" prepares to retire after more than four decades on the MIT faculty, his career is the focus of a new exhibition in the MIT Museum's Compton Gallery.

The multimedia show, "Jerry Milgram: an exceptional ocean engineer," is a celebration of the long and storied career of the MIT alumnus. It includes models of world-famous raching yachts, a replica of the America's Cup trophy, hundreds of stunning images and interviews with Milgram and colleagues presented in interactive video displays.

For more than a century, MIT has been a key player in ocean engineering. MIT research has advanced U.S. naval technology, created submersible vehicles capable of withstanding the harsh deep-ocean environment and innovated offshore energy production. MIT graduates' impact spans ship design and building, ocean transport, security, energy, safety, salvage, marine science and archaeology.

"The hydrodyanamics of what happens at or near the surface of the sea is one of my main categories of expertise," Milgram said. This applies to many aspects of his wide-ranging career as naval architect, computer-aided sail designer, entrepreneur and educator of more than a generation of naval officers and ocean engineers. Among the first to apply advanced scientific technology to yacht design, he is probably best known for his work on sail and hull design for every America's Cup boat since 1968.

As an ocean accident expert, Milgram investigated, among other disasters, the 1982 sinking off Newfoundland of the mobile offshore drilling rig Ocean Ranger, which killed its entire crew. He testified before Congress on how to reduce the impact of oil spills such as that of the Exxon Valdez.

Milgram's life work is closely entwined with that of fellow MIT 1962 alumnus Bill Koch. Koch, a contributor to the Milgram museum exhibition, was skipper and syndicate manager for America3, the last winning U.S. entry in the America's Cup competition.

The America's Cup, the oldest sporting trophy in the world, represents the pinnacle of yacht design. When Koch, a businessman and scientist, became involved with yacht racing in the early 1980s, he teamed up with Milgram to build the world's fastest boat.

"When I was introduced to Jerry Milgram, I knew I had finally found someone who understood how to apply the scientific method to sailing," Koch said.

The Milgram exhibition opened Aug. 31 and will run in MIT's Compton Gallery, Building 10-150, 77 Massachusetts Ave., Cambridge, Mass., through Feb. 3, 2008. For information, see http://web.mit.edu/museum/exhibitions/compton.html.

PHOTO / **DONNA COVENEY**

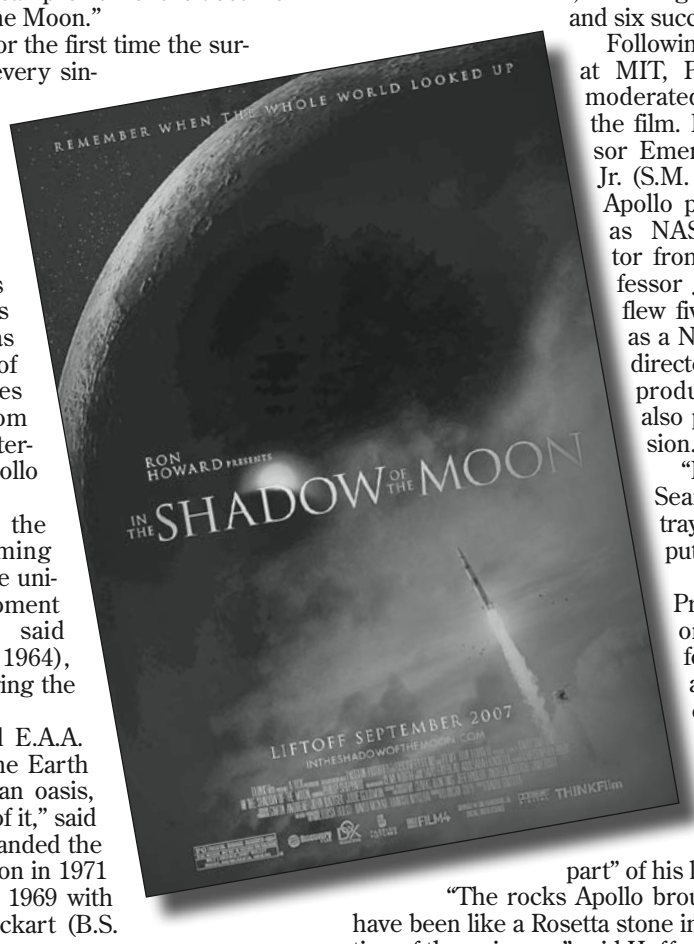
MIT retiring professor Jerry Milgram (left) with MIT alum Bill Koch at the opening of an exhibit that honors Milgram's many contributions to Ocean Engineering, at the Compton Gallery at MIT.

In the shadow of the moon

John Tylko
News Office Correspondent

Many of the engineers who developed the Apollo guidance system at MIT in the 1960s and 1970s were among the standing-room-only crowd that gathered Sept. 10 on campus for a special sneak preview of the documentary film, "In the Shadow of the Moon."

The film brings together for the first time the surviving crew members from every single Apollo mission that flew to the moon, and allows them to tell their story in their own words.



Four of the 12 astronauts who walked on the moon during the Apollo program received degrees from MIT's Department of Aeronautics and Astronautics. Each was interviewed in the making of the film, which intersperses high-resolution footage from the Apollo missions with interviews of 10 of the original Apollo astronauts.

"The biggest joy was on the way home…an overwhelming sense of connectedness to the universe accompanied by a moment of ecstasy…an epiphany," said Edgar D. Mitchell (Sc.D. 1964), who walked on the moon during the Apollo 14 mission in 1971.

David R. Scott (S.M. and E.A.A. 1962) reflected on viewing the Earth from the moon. "It truly is an oasis, and we don't take good care of it," said Scott in the film. Scott commanded the Apollo 15 lunar landing mission in 1971 and also flew on Apollo 9 in 1969 with MIT alum Russell L. Schweickart (B.S. and M.S. 1963).

MIT's Instrumentation Lab (now Draper Laboratory) developed the onboard guidance, navigation and control systems for the Apollo command and lunar modules. During the first lunar landing, the guidance computer displayed program alarms when simultaneous procession of the landing solution and the abort rendezvous solution led to an overload condition. "That combination wasn't anticipated by the guys at MIT," said Buzz Aldrin (Sc.D. 1963), who was the lunar module pilot of the Apollo 11 mission that accomplished the first lunar landing in July 1969.

The Apollo guidance computer experienced no hardware errors during 15 flights of the Apollo spacecraft with astronauts on board, including nine flights to the moon and six successful lunar landings.

Following the Sept. 10 screening at MIT, Professor David Mindell moderated a panel discussion on the film. Panelists included Professor Emeritus Robert C. Seamans Jr. (S.M. 1942, Sc.D.), who led the Apollo program while he served as NASA's deputy administrator from 1960 to 1968, and Professor Jeffrey A. Hoffman, who flew five space shuttle missions as a NASA astronaut. The film's director, David Sington, and co-producer, Christopher Riley, also participated in the discussion.

"It was a great film," said Seamans. "It not only portrayed an epic period, but it put heart and soul into it."

Seamans, who briefed President John F. Kennedy on NASA's early planning for a lunar landing in 1961 and helped shape the goal of landing a man on the moon before the end of the decade, said the eight years he spent at the U.S. space agency represent "the most important part" of his life.

"The rocks Apollo brought back from the moon have been like a Rosetta stone in understanding the evolution of the universe," said Hoffman. "The value that we got scientifically from Apollo should not be underestimated."

"I think the film is an optimistic film because it represents what we can do, what we can achieve," said Sington. "If this film ends up sending a few more people to MIT, then it will have been a success."

University of Cambridge students stage Shakespeare at MIT

The Cambridge American Stage Tour brings its Alice-in-Wonderland version of "The Winter's Tale," one of Shakespeare's most enchanting and moving plays, to MIT this week.

The play, directed and produced by students from the University of Cambridge, features eight undergraduates playing 20 characters, aided and abetted by a selection of rag dolls.

Illuminated with subtle reference to Lewis Carroll's "Alice's Adventures in Wonderland," Shakespeare's text is configured to stress the fantastical world of Bohemia by using familiar childhood motifs. For example, the old shepherd becomes the Mad Hatter with his son, the March Hare.

PHOTO COURTESY / **CAST**

Members of the the Cambridge American Stage Tour perform William Shakespeare's "The Winter's Tale" at MIT this week.

CAST, which is sponsored by MIT's Dramashop, has toured America since 1999. Its roots are in the ADC (Amateur Dramatic Club) Theatre, the oldest student theater in Britain, which has nurtured talents such as Sam Mendes, John Cleese and Sir Ian McKellen.

Performances of "The Winter's Tale" will take place Sept. 19 and 20 at 8 p.m. in Kresge Little Theater. Tickets cost $8, $6 for students. For reservations, see web.mit.edu/dramashop. For more information, contact Hayden Taylor at hkt@mit.edu or call (857) 928-6316.

Brown, 3 other MIT faculty win NIH awards

Elizabeth Thomson
News Office

Four MIT faculty have been honored by the National Institutes of Health for their "exceptionally innovative" research.

Professor Emery Brown is among 12 scientists nationwide to receive 2007 Pioneer Awards, while three other faculty are among 29 winners of New Innovator Awards. Pioneer Awards support scientists at any career stage, while New Innovator Awards are reserved for new investigators.

Brown will receive $2.5 million over five years. Professors Ed Boyden, Alan Jasanoff, and Mehmet Fatih Yanik will each receive $1.5 million over five years for winning New Innovator Awards.

PHOTO / **DONNA COVENEY**

Emery Brown

Ed Boyden

Alan Jasanoff

Mehmet Fatih Yanik

"MIT is extremely proud to have Professors Brown, Boyden, Jasanoff, and Yanik honored in this way by the NIH. These awards reflect their strong records of innovation and creativity and confirm, once again, that our faculty are truly among the best," said Provost Rafael Reif.

"Novel ideas and new investigators are essential ingredients for scientific progress, and the creative scientists we recognize with NIH Director's Pioneer Awards and NIH Director's New Innovator Awards are well positioned to make significant—and potentially transformative—discoveries in a variety of areas," said NIH Director Elias A. Zerhouni.

"The conceptual and technological breakthroughs that are likely to emerge from their highly innovative approaches to major research challenges could speed progress toward important medical advances," he added.

Brown, a professor in the Harvard-MIT Division of Health Sciences and Technology and in the Department of Brain and Cognitive Sciences, is the third member of the MIT faculty to win a Pioneer Award.

According to the NIH, Brown "will develop a systems neuroscience approach to study how anesthetic drugs act in the brain to create the state of general anesthesia."

Boyden, the Benesse Career Development Professor in the Department of Biological Engineering and in the Media Lab, will "invent and study new methods of controlling the neural circuits that malfunction in neurological and psychiatric disorders." Boyden also has an appointment in the McGovern Institute for Brain Research.

Jasanoff, N.C. Rasmussen Assistant Professor of Nuclear Science and Engineering, will "devise genetically controlled, noninvasive methods for measuring brain activity in animals." Jasanoff also has appointments in the Department of Biological Engineering, the Department of Brain and Cognitive Sciences, and the McGovern Institute for Brain Research.

Yanik, assistant professor in the Department of Electrical Engineering and Computer Science, will "develop microchip technologies to perform extremely fast studies of gene function in small animals to rapidly identify genetic targets for new drugs." Yanik also has an appointment in the Research Laboratory of Electronics.

This is the first group of New Innovator Awards and the fourth group of Pioneer Awards. Both programs are part of an NIH Roadmap for Medical Research initiative that tests new approaches to supporting research.

Unique Middle East program rooted at MIT bears fruit

Palestinian becomes first MEET student to enroll at MIT

Greg Frost
News Office

Three years ago, Wissam Jarjoui faced an uncertain future in an unstable place. The Palestinian student from East Jerusalem had never met an Israeli, and he hadn't even heard of the Massachusetts Institute of Technology.

Today, 17-year-old Jarjoui finds himself part of MIT's Class of 2011. He radiates confidence as he speaks about the virtues of teamwork. And he considers several Israelis among his best friends.

Jarjoui has come a long way in those three years, thanks in part to a unique program born at MIT that was designed to bring Israeli and Palestinian youths together in an educational environment. The program, Middle East Education through Technology (MEET), was founded by Anat Binur, a graduate student in political science at MIT, her brother, Yaron Binur (S.B. 2006), and a friend, Assaf Harlap. Jarjoui was one of MEET's original participants; today he is the first MEET student to have enrolled at MIT.

"MEET literally changed my life," he says.

Jarjoui chuckles as he recalls the MEET recruiters who came to his high school in early 2004 looking for participants in what would be the program's first class.

"They told us that MIT was supporting MEET and that MIT was the top technology school in the world," he says. "At first I didn't believe it."

It was only later when he asked his brother that he realized the recruiters weren't kidding; moreover, he could see that MEET was an opportunity not to be missed.

The program certainly had its attractions, not least of which was the fact that it was free. But there were other enticements: the chance to learn computer science, teamwork and leadership skills—and, through it all, the prospect of transcending political and cultural boundaries.

Co-founder Anat Binur explains the program was not designed to create a platform for direct dialogue about the conflict in the Middle East but, rather, to empower each side through education, and to use technology as a way for students to connect though joint interests and to learn about each other.

"They come from diverse backgrounds and sit together and find a common language," she says. "In order to connect or communicate, initially it doesn't matter what language you speak or where you are from; what matters is how well you can program."

Jarjoui, who prior to starting MEET had never met someone from the other side of the Middle East conflict, says the first few days were "a little tense" but that the Palestinian and Israeli students soon found common ground.

"After those first few days we understood that we shared interests, and that made us think about one another in a different way," he says.

The MEET curriculum is based on methodology developed by faculty from the MIT Computer Science and Artificial Intelligence Laboratory and MIT Sloan School of Management. MEET is further supported by business and academic leaders from the Middle East, the United States and Europe.

MEET's ranks have grown from that first summer, when only 15 Israeli and 15 Palestinian students participated. This past summer, more than 80 students were enrolled.

Jarjoui, who hopes to study computer science, electrical engineering and management at MIT, says it is because the language of MEET is technology and not politics that it has been a success.

"From one individual's point of view, it is possible to reach a solution [to the conflict in the Middle East], but it's hard to reconcile two nations to the same solutions when they have fundamental differences," Jarjoui says.

"I believe the way to do it is to make those two groups of people interact with each other and realize that the only difference they have is what they choose. That's what MEET showed me. It gave us all a chance to explore one another without looking at the political side," he says.

And that may well be the most powerful lesson of MEET. Jarjoui notes that the program provided a platform for him and other students to cross the political divide and forge what he hopes will be lifelong friendships.

"The people I met through MEET are my best friends," he says. "MEET is a family—not just for me, but for all the MEET students."

Theodore Golfinopoulos, a second-year MIT graduate student in electrical engineering and an MIT instructor at MEET, got to know Jarjoui last summer and says the program opened the Palestinian youth's eyes to the world at large and taught him to dream big.

"Of course, most people who know about MEET's mission are more interested in its political aspects," Golfinopoulos says. "All I can say about this is that Wissam has told me that it would have been unlikely for him to make any Israeli friends were it not for MEET. I think that's a pretty powerful statement, politically, culturally or otherwise."

–Additional reporting by Karla Mansur in CSAIL

PHOTO / **JASON DORFMAN**

Wissam Jarjoui, 17, has become the first participant in MEET, a program that brings together Israeli and Palestinian youths, to enroll at MIT.