Researchers harness bacteria to produce energy, clean up environment

Anne Trafton
News Office

In the search for answers to the planet’s biggest challenges, some MIT researchers are turning to its tiniest organisms: bacteria. The idea of exploiting microbial products is not new: Humans have long enlisted bacteria and yeast to make bread, wine and cheese, and more recently discovered antibiotics that help fight disease. Now, researchers in the growing field of metabolic engineering are trying to manipulate bacteria’s unique abilities in order to help generate energy and clean up Earth’s atmosphere.

Catherine Drennan

Gregory Stephanopoulos

Kristal Jones Prather

By Catherine Drennan and Gregory Stephanopoulos

Once it is completed in 2010, the new MIT Sloan building (E62, pictured in this artist rendering) should be the greenest building on campus. The six-story structure will incorporate a number of environmentally friendly features including daylighting, chilled beams and radiant ceiling panels.

Alternative-energy enthusiast wins Gates scholarship

Alternative-energy enthusiast Orian Welling, a senior in mechanical engineering, has been awarded a full scholarship for graduate study at the University of Cambridge, England, by the Gates Cambridge Trust.

The 24-year-old Wisconsin native heard about the scholarship through his mechanical engineering professor, Prof. Scott Crandall, and decided to apply. The university is known for its strong sustainability programs, and Welling hopes it will serve as an example for other students.

Welling was selected for the scholarship because of his commitment to alternative energy and his work on developing sustainable technologies. He is currently riding his bicycle from South Africa to England, and plans to complete his journey in September. "I’m currently riding my bicycle through southern Africa, and I’m planning to return to MIT next September," he says.

The Gates Cambridge Trust was founded in 1996 by Bill and Melinda Gates to support graduate students in fields such as public health, education, and the environment. The scholarship covers tuition, fees, and living expenses for two years.

Welling’s passion for alternative energy was kindled at a young age: His parents long ago founded the Midwest Renewable Energy Fair, and his father managed the event for many years. "As a child, I learned about the importance of renewable energy through my family’s involvement in the fair," Welling says.

In high school, Welling was inspired by the work of Dr. Amory Lovins, co-founder of the Rocky Mountain Institute, who has pioneered the use of sustainable technologies in the building industry. "I was intrigued by the idea of using science and engineering to solve global problems," Welling says.

Welling is currently working on a project to develop a portable solar cooker intended to withstand the high winds on the plateau of western China. "The cooker is designed to be lightweight and portable, and it can be easily transported to remote areas," he says.

Welling plans to continue his research on sustainable technologies after he completes his studies in England. "I hope to use the knowledge and skills I gain at Cambridge to help address some of the world’s most pressing problems," he says.

Welling is grateful for the opportunity to study at the University of Cambridge, one of the world’s leading institutions for research and education. "I’m excited to be able to work with some of the best minds in the world on cutting-edge research," he says. "I hope to contribute to the flow of ideas and knowledge that will help shape the future of sustainable energy.

Welling is grateful to his family and friends for their support and encouragement. "I couldn’t have done this without their help," he says. "I’m looking forward to the opportunities that will come my way as a result of this scholarship."
Six junior faculty named Sloan Research Fellows

Six junior MIT faculty, including three from the Department of Physics, have won 2009 Alfred P. Sloan Foundation Sloan Research Fellowships, intended to enhance the careers of the very best young faculty members in specified fields of science.

MIT faculty this year’s Sloan Research Fellows are Scott Aaronson of the Department of Electrical Engineering and Computer Science, Pablo Jarillo-Herrero of the Department of Physics, Guido Gerosa of the Department of Economics, John McGreer of the Department of Physics, Ramesh Raskar of the MIT Media Lab, and Robert Simcoe of the Department of Physics.

The fellowships were established in 1955 to provide support and recognition to early career scientists and scholars, often in their first appointments to university faculties, who were endeavoring to set up laboratories and establish their independent research projects with little or no outside support. Financial assistance at this crucial point, even in modest amounts, often pays handsome dividends later to society.

“The Sloan Research Fellowships support the work of exceptional young researchers early in their academic careers, and often at pivotal stages in their work,” said Paul L. Joskow, president of the Alfred P. Sloan Foundation and the Elizabeth and James Killian (1926) Professor of Economics and Management at MIT. “I am proud of the Foundation’s rich history in providing the resources and flexibility necessary for young researchers to enhance their scholarship, and I look forward to the future achievements of the 2009 Sloan Research Fellows.”

MIT tied with Harvard for second place in the list of institutions whose faculty received the most fellowships this year. The University of California at Berkeley had seven fellows.

Distinguished words

Irwin Jacobs ’52, ScD ’89, co-founder and chairman of Qualcomm Incorporated, delivers the inaugural lecture of the School of Engineering Distinguished Lecture Series, which will be a regular opportunity for members of the engineering community at MIT to hear from leaders and pioneers in the engineering disciplines.

News in brief

Kauffman study finds MIT alumni companies generate billions for regional economies

A Kauffman Foundation study released recently demonstrates the critical role universities play not only in fostering innovation and entrepreneurial growth, but in stimulating the much-needed recovery in regional and global economies.

According to the study, “Entrepreneurial Impact: The Role of MIT,” which analyses the economic effect of MIT alumni-founded companies and their entrepreneurial ecosystem, the active companies founded by MIT graduates formed an independent nation, their revenues would make that nation at least the 17th-largest economy in the world. Within the U.S., these companies currently generate hundreds of billions of dollars and hundreds of thousands of jobs to regional economies, particularly those in Massachusetts and California. Globally, a less conservative estimate of their annual world sales would equal $2 trillion, producing the equivalent of the 11th-largest economy in the world.

“MIT’s significant economic impact is of particular interest because it provides an important model for universities interested in helping their students become more effective entrepreneurs,” said Lesa Mitchell, a vice president of the Kauffman Foundation.

For more information on this study, see www.kauffman.org/mit.

New faculty task force to examine tenure

A new MIT faculty task force has been formed to examine the process of promotion and tenure at the Institute. Co-chaired by Chemistry Professor Robert Silbey, former dean of the School of Science, and Thomas Kochan, the George Maverick Bunker Professor of Management at the MIT Sloan School of Management and the incoming chair of the faculty, the new ad hoc committee will review existing policies, procedures, norms and practices that guide promotion and tenure decisions, including the process of considering complaints and grievances.

“MIT is firmly committed to rigorous, comprehensive and fair review for promotion and granting of tenure to faculty,” Silbey and Kochan said in a statement. “As an integral part of fair practices in conducting such reviews, the Institute needs to consider seriously any complaints about procedures involved in promotion and tenure and to do so in a manner outlined in MIT’s Policies and Procedures.”

The task force, created by the Faculty in consultation with Provost L. Rafael Reif, will review promotion practices among the Institute’s five schools and consider such issues as mentoring, feedback, fairness and impartiality.

For more information on the faculty task force, see web.mit.edu/newsoffice/2009/faculty-taskforce-0218.html.
Margaret (Peg) Warner, special assistant to the EVP and treasurer, 67

Margaret (Peg) Warner, special assistant to the executive vice president and treasurer, passed away on Saturday, Feb. 7, at her Lexington home after a courageous battle with cancer. She was 67.

Peg began her career at MIT in 1998 as assistant director of the Office of Technology and Financial Planning, responsible for international financial development, submission and reporting. Appointed as special assistant to the EVP and treasurer in 2003 for her deep knowledge of MIT, particularly of campus/ capital-planning activities, to provide invaluable and outstanding service.

She began her financial career 39 years ago at the Harvard University Southcottian Astro-Physical Observatory, where she was director and curator for the Radio and Geoastronomy Division. In 1984, she joined Raytheon Company, where she served as business and program manager for several profit centers and later as marketing manager and director of competitive intelligence for Raytheon Service Company. When Raytheon acquired Calspan, an aeronautical and field personnel in the United States and Egypt, Peg also established a computer system to manage finances and logistics for critical air shipment of parts and assemblies to Calspan. A native of California, Peg graduated from Stanford University with a BA in French Literature and from Harvard University with an MA in Romance Languages and Literature; she was fluent in French, Italian and Spanish.

She received an MBA from Boston University in 1984. A tireless volunteer for the causes in which she believed, Peg served on numerous nonprofit arts, civic and cultural boards in the Boston area, including the Museum of Science (where she served on the Finance Committee), the Massachusetts Cultural Council, the MIT Museum Advisory Board, the Friends of the Boston Public Garden, Light Boston (an organization dedicated to illuminating Boston's historic buildings), Arts in Education “The Tank”, the Harvard University Credit Union and the Five Fields Neighborhood Association in Lexington. She was active in several animal welfare groups around the country, including the Charles River Animals Foundation and the Somerville Alley Cats. Friends fondly remember Peg’s whimsical, off-beat sense of humor; her love of all things edible, especially sweets; her interesting tales of MIT, Harvard and California; and, of course, her delightful stories about love and for her three cats, Thomas, Lucy and Ida. Peg enjoyed gardening, hiking, horseback riding, traveling and spending time in her log cabin in the White Mountains. She loved to attend theater, dance, and music concerts and especially enjoyed having lunch with friends and colleagues around the Institute. Peg was a very special person and friend, said Vice President for Finance Israel Ruiz. “Everyone in the Institute community that got to meet Peg knows that, beyond her passion for baking and watching MIT’s financial ‘bottom line,’ she had a myriad of wonderful interests and talents.”

“Personally, I always looked forward to having an enriching end-of-the-day conversation with her. She embraced me and counseled me since my first day at MIT and always made sure to keep me from ‘getting too far away from MIT’,” Ruiz added. “Despite my great sorrow at her passing away, I do take comfort in remembering our shared moments and great memories of our many years together working with shared passion for MIT.”

She will be fondly remembered for her delightful spirit, her sincerity and her loyalty to her many friends at MIT. She will be tremendously missed by all.

A memorial service celebrating Peg’s life will be held at 1:30 p.m. on Tuesday, March 24, in the MIT Chapel, followed by a reception.

Alan Jay Simmons, former Lincoln Laboratory group leader, 84

Alan Jay Simmons SM ’48, who worked at MIT’s Lincoln Laboratory for more than 11 years, died peacefully on Monday, Feb. 9, of complications from Parkinson’s disease. He was 84.

Simmons began his connection with MIT in the late 1940s, when he received his SM in electrical engineering and computer science. In 1971, Simmons began work at MIT’s Lincoln Laboratory, eventually becoming one of the lab’s group leaders.

Besides working as a manager and administrator, he continued his work solving engineering problems related to satellite antenna systems for defense and communication.

In 1976, two satellites that Simmons worked on at Lincoln Lab, LES 8 and 9, were launched into geosynchronous orbit where they remain today still functioning.

In 1987, Simmons retired from full-time work at Lincoln Lab and began consulting. In 1991, he named a life fellow of the Consulting Engineers and Scientists Members of Engineers (IEEE). Throughout his career, he also published more than a dozen scientific papers and was a frequent speaker at professional meetings here and abroad.

A memorial was held on Saturday, Feb. 14, in Sandwich, Mass.

Margaret (Peg) Warner

The Most Excellent Order of the British Empire was founded in 1917 to recognize contributions and service performed for public or other distinctions. It is widely used by the queen to honor northerners who have given outstanding service to the United Kingdom.

DeLong wins ASM award

The 2009 American Society for Microbiology (ASM) D.C. White Research and Mentoring Award has been awarded to Edward F. DeLong, professor in the Department of Civil and Environmental Engineering and Department of Biological Engineering. DeLong was cited as one of the first marine microbiologists to apply novel molecular genetic methods to address fundamental ecological questions. The award will be presented in May during the 109th General Meeting of the ASM in Philadelphia.

Kettele wins award for lifetime achievements

Wolfgang Kettele, a professor in the Department of Chemical Engineering, has been awarded the Humboldt Research Award for having been nominated by the German scientist Wolfgang Th. Hanusch. The award is conferred in recognition of lifetime achievements in research. In addition, the awardee is invited to carry out research in their own choice in cooperation with specialist colleagues in Germany.

Buchanan wins Benjamin Siegel prize

The 2008/2009 Benjamin Siegel prize — offered to the MIT student submitting the best written work on issues in science, technology and society — has been awarded to graduate student Nicholas Buchanan, in the Program in Science, Technology, and Society, for her paper “Narrating Nature: Scientific Legality, Indigenity, and Environmental Authority.”

MIT has set tuition and fees for 2009-2010 and has budgeted an additional $7.6 million for financial aid enhancements, including an expansion in aid to midnight and middle-income families, in an effort to make more students have access to an affordable education. While tuition and fees will increase 1.8 percent to $37,782, the smallest increase in eight years, the total undergraduate financial aid rise will be more than 10 percent to $81.6 million. That marks the fourth year in which MIT’s financial aid enhancements have outpaced rising tuition. This year, understanding that colleges can also present challenges for middle-income families, MIT’s financial aid budget includes an additional $1.4 million to help families earn more than $75,000 a year.

The latest initiatives build on MIT’s long tradition of ensuring that it remains affordable to talented students from a full range of economic backgrounds. The Institute’s student population is already among the most economically diverse of America’s top-ranked universities, partly as a result of MIT’s commitment to “need-blind” admissions and to meeting the full need of all undergraduates it admits. Moreover, MIT doubled its undergraduate financial aid in 2006 and 2007.

“With the increased financial aid available in 2008, MIT recognizes that students and their families need our help more than ever. That’s why we are privileged to be able to continue our commitment to need-based aid but to be able to allot more funds to financial aid and support student efforts,” said Dean for Undergraduate Education Daniel Hastings.

“We want all students to be able to afford to attend and not worry about finances.” Hastings said. “Helping students can get the maximum educational benefit from their time at MIT.”

DeLong wins ASM award

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Community Giving at MIT: now more than ever

Local nonprofits that we care about need financial help now more than ever. Please join generous MIT employees and retirees in supporting Community Giving at MIT, the easiest and most effective way to make your charitable contribution.

Donate to the MIT Community Service Fund, the United Way of Massachusetts Bay & Merrimack Valley, or your favorite local charity through payroll deduction, check, credit card or securities by Feb. 27, the official close of the campaign.

Every gift, modest or large, counts and is appreciated. Donate online at web.mit.edu/community-giving or receive a donation packet from the Community Services Office (617-253-7914 or community-service@mit.edu).

WIN AN IPHONE!

Don’t forget, the first-ever Sustain- ability at MIT Photo Contest is ongoing through February. Take that still image to submit your photos. Show us what you see and what your aspirations are as MIT launches a new Strategic Plan to help the Institute walk the talk on energy and the environment.

The grand-prize winner will receive an iPhone and have his or her winning entry published in the MIT magazine and in MIT’s official newspaper, Tech. Talk. Prizes will also be awarded to the first- and second-place finishers.

For complete rules, including how to enter, please visit web.mit.edu/resou- rces/2009/photo_contest.html.
Putting heads (and computers) together to solve global problems

Anne Trafton
News Office

I magine if the planet’s collective brainpower and computing power could be brought together to tackle some of the world’s toughest problems, including global climate change and cancer.

It may sound like science fiction, but researchers at MIT’s Center for Collective Intelligence (CCI) are trying to make it reality.

Popular applications such as Wikipedia, Linux and YouTube already take advantage of collective intelligence — the harnessing of human knowledge and intelligence that allows groups of people to act together in ways that seem to be intelligent. But those applications only scratch the surface of what is possible with collective intelligence, says Thomas Malone, director of the CCI and professor at the MIT Sloan School of Management.

He envisions that pooled brainpower, enabled by computing advances, could allow doctors to make better cancer diagnoses and help experts and others brainstorm solutions to climate change.

“If ever a problem required the best intelligence from our whole species and all of our computer power, many people would say this is it,” says Malone. “That’s a kind of intelligence that’s never existed on the planet before.”

Beyond YouTube

One ambitious CCI project aims to tackle one of the most pressing and complicated issues now facing the world: global climate change.

“Every problem requires the best intelligence from our whole species and all of our computer power,” says Malone. “Certainly people are working on the problem in various ways, but so far the results leave a lot to be desired.”

Global climate change involves so many variables — pollution, transportation, economics, etc. — that it’s impossible for any one expert to have all of the solutions, or even all of the solutions for all the countries.

In one part of the Climate Collaboratorium project, led by Mark Klein, CCI principal research associate, the center is developing an online deliberation tool that allows experts in a wide range of fields to get together to share ideas.

Unlike existing online discussion forums, the Climate Collaboratorium requires users to catalog their contributions and connect them to points that have already been made.

Such “argument maps” help eliminate the repetitive, unhelpful comments and tangents that render most online discussion forums unhelpful.

Klein, who initially developed online deliberation tools to help engineers share ideas about projects they’re working on, believes such tools could one day prove useful in tackling other large, complex problems, such as poverty or terrorism.

“Because these are such big problems, it’s essentially impossible for any one person or small group to be cognizant of all of the issues, ideas and trends,” Klein says.

The CCI has also proposed a project to consolidate patient data, clinical practices and medical research into a worldwide network. The network could use that information to precisely pinpoint the type of cancer and predict the treatment best suited to individual patients based on their demographic characteristics.

Wisdom of the crowds

CCI researchers are also exploring collective prediction, building on the success of popular Internet sites where people can buy and sell predictions about the outcome of elections, sporting events, etc.

Such sites, based on the collective wisdom of its users, have proven remarkably accurate, says Malone.

The MIT team plans to expand on that concept by bringing computers into the mix and programming them to make predictions, along with humans.

This maximizes collective intelligence by taking advantage of the strengths of each group: Computers are good at predicting things based on historical data, and people are good at predicting how an unexpected event will play out.

In an early version of this system, the CCI is developing a model to predict what plays are most likely to be called next in a football game, depending on the game situation and the team’s historical tendencies. The same approach may someday be useful for predicting the actions of a business competitor or a military enemy.

While developing these projects, the CCI is also taking a scientific look at ways to measure collective intelligence, similar to the way a psychologist measures an individual person’s IQ. This research could allow them to figure out ways to improve intelligence, possibly by adding or subtracting members of the group, or using different processes.

“This early examples we’re seeing around us today are not the end of the story,” says Malone. “They’re just the beginning.”

Chronic infection may add to developing-world deaths

MIT study points to hidden threat stalking many diarrhea patients

David Chandler
News Office

Worldwide, nearly 2 million people per year die from diarrhea, the vast majority of them in poor countries in Africa and Asia. The disease accounts for 18 percent of all deaths among children — and yet is almost always preventable with proper treatment. Now, new research from MIT indicates that underlying, low-level undiagnosed infection may greatly add to the severity of a number of these cases. This realization could lead to changes in health-care strategies to address the problem.

The findings, reported by MIT Professor of Biological Engineering and Comparative Medicine David Schauer, show that these undiagnosed gastrointestinal infections increase the severity of and delay recovery from acute diarrhea and that the analysis provides a model that could allow public health officials to evaluate new preventive strategies or therapeutic treatments.

The work grew out of the increasing recognition of the relationship between persistent, chronic infections many people carry and the outcomes of later infection.

“It seemed likely that persistent enteric infection with bacterial agents would also elicit immune responses that could have similar effects,” says Schauer. “This had not been previously studied,” Schauer says. “We wanted to provide proof of principle and begin to define the mechanism for such an interaction.”

To study the possible effects of these chronic infections, Schauer and his team used laboratory mice infected first with a strain of bacteria that causes a chronic condition but produces no symptoms, and then with a second infectious agent that causes acute diarrhea.

They found that even though the underlying chronic infection did not cause disease on its own, it did make the acute infection much worse than in a control group that was only exposed to the second agent.

Schauer and his team say as far as they know this is the first time, for any kind of disease, that an underlying “subclinical” infection has been shown to make a later bacterial infection more severe. And in the case of diarrhea, this may play a significant role, since about 50 percent of the world population carries a chronic infection with Helicobacter pylori, which causes stomach inflammation but usually no clinical symptoms, and which is closely related to the initial infectious agent used in the mouse experiments.

“It may be that an individual’s infection status with these or other agents is important in determining outcomes of infection, immune-mediated disease or even immunization,” Schauer says.

The work may also be significant in terms of understanding the results of much clinical research with rodent models. Infections similar to the chronic H. pylori “are now known to be widespread in many rodent facilities and, when introduced to these Helicobacter species does not cause clinical disease, except in certain genetically engineered lines of mice,” Schauer says, “so it is important to be aware of infection status with these agents when conducting research with laboratory rodents.”

A report on the research was published in November in the journal Infection and Immunity, and was highlighted in December in Microbe magazine, both from the American Society for Microbiology. The work was carried out by Schauer and his students Megan E. McBee and Patricia Z. Zhang in the Department of Biological Engineering, and Arin B. Rogers and James G. Fox in the Division of Comparative Medicine, all at MIT. The work was supported by a U.S. Public Health Service grant.
**MICROBES: Using bacteria for energy**

**Continued from Page 1**

help soak up pollutants such as carbon monoxide and carbon dioxide from the Earth's atmosphere.

*Chemical factories*

Found in nearly every habitat on Earth, bacteria are chemical powerhouses. Some synthesize compounds useful to humans, such as biofuels, plastics and drugs, while others break down atmospheric pollutants. Most rely on carbon compounds as an energy source, but species differ widely in their exact metabolic processes. Metabolic engineers are learning to take advantage of these differences, and one area of intense focus is biofuel production. At MIT, Prather is developing bacteria that can manufacture fuels such as biodiesel and ethanol from agricultural byproducts, and Stephanopoulos is trying to make better microbial producers of biofuels by improving their tolerance to the toxicity of the feedstocks they ferment and products they make.

The recent spike in oil prices has pushed to find better pathways to produce biofuels and other chemicals such as bioplastics. "You see a visible boost when you have a crisis linked to energy problems," says Stephanopoulos. Manufacturing plastics and textiles using bacteria can be far less energy intensive than traditional industrial processes, because most industrial chemical reactions require high temperatures and pressures (which require a great deal of energy to create). Bacteria, on the other hand, naturally thrive at around 30 degrees Celsius and at atmospheric pressure. Metabolic engineering involves not only creating new products but also developing more-efficient ways of making existing compounds. Recently, Prather's laboratory reported a new way to synthesize gluconic acid, a compound with multiple uses, ranging from the synthesis of nylon to water treatment, by combining genes from plants, yeast and bacteria. Prather is also working on bacteria that transform glucose and other simple starting materials into compounds that can be used to make biodiesel and other pharmaceutical compounds. The two labs are investigating methods to make different compounds with higher activity as well as improved pathways.

Both labs collaborate in a project to engineer the isoprenoid pathway in yeast and bacteria, which is responsible for the biosynthesis of many important pharmaceuticals and textiles. The two labs are investigating methods to make different compounds with higher activity as well as improved pathways.

Microbes express a huge range of metabolic pathways and offer exciting opportunities but also challenges. "Biology has a lot of diversity that's untapped and undiscovered, but the flip side is that it's very hard to engineer in precise ways," says Prather. "Nature has evolved to do what it does, and to get it to do something different is a nontrivial task."

**Bacterial clean-up crew**

Drennan is also looking to bacteria, but with a different goal in mind. Instead of using bacteria to build things, she's studying how they break things down — specifically, carbon dioxide, carbon monoxide and other atmospheric pollutants. Her microbes, found in a range of habitats including freshwater hot springs, absorb carbon dioxide and/or carbon monoxide and use them to produce energy. Such microbes remove an estimated one billion tons of carbon dioxide from the environment each year. "These bacteria are responsible for removing a lot of CO and CO2 from the environment," says Drennan, who is a Howard Hughes Medical Institute investigator. "Can we use this chemistry to do the same thing?"

To answer that question, Drennan and her students developed a computer program to decipher the structures of the metal-protein enzymes involved in the reactions, which they believe will allow them to figure out how the enzymes work. That understanding could lead to development of catalysts to lower carbon monoxide levels.

"That's not the only way to go from nature, the first step is to understand how nature works," she says.

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**MIT Tech Talk**

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Cooking up a new approach to chemistry

Anne Trafton
News Office

It’s Tuesday afternoon, and the smell of chocolate wafts from a lounge kitchen through the hallways of MIT’s Building 24. Inside the sixth-floor kitchen, students are busy measuring flour, melting chocolate, and beating eggs. But they’re not just trying to satisfy a sweet tooth — they’re doing science.

This is “Kitchen Chemistry,” a course in which students learn principles of food chemistry through experiments involving chocolate chip cookies, hot sauce, chili, coffee and ice cream, among other tasty treats.

Patricia Christie, a lecturer in MIT’s Experimental Study Group, has been teaching “Kitchen Chemistry” every spring since 2008.

“I’m a chemist who likes to cook,” she says. “In this class, we apply chemical principles to food to get students to think about food in a different way.”

Students learn why certain recipes call for baking soda and others require baking powder, and why chopping an onion makes you cry. And this is undoubtedly the only chemistry class at MIT in which the students get to eat their experiments.

“That’s the biggest perk,” says junior Jenna Houston, a chemical engineering major.

“My roommate has already put in a request for some of the ‘Death by Chocolate’ cookies the class whipped up during a recent session, said Houston’s baking partner, Sarah Cooper-Davis, a senior mechanical engineering major.

The course is limited to 18 students, and is so popular that it fills up within minutes of the opening of class registration. Another 10 students were waitlisted this year.

The class is part of the Experimental Study Group, an alternative academic program at MIT that offers small, hands-on seminars for all undergraduates, as well as a small group-learning program in the freshman core subjects.

In the case of the Kitchen Chemistry class, the hands-on approach gives students a chance to figure out culinary mysteries such as why you need to add vinegar to milk when baking scones (the batter needs an acid to combine with baking soda, a base, to produce carbon dioxide that causes the dough to rise).

“The fun thing is they don’t even realize they’re learning about chemistry,” says Christie, “but they’re learning a lot.”


Big ideas

In unusual coincidence, MIT philosophers release eight books

Stephanie Schorow
News Office

It’s unusual for philosophers to publish many books these days, which is why the publication of eight books by eight of the 12 MIT philosophy faculty in the span of a year marks a noteworthy chapter for the Institute’s philosophy section.

“Philosophers, especially analytic philosophers, tend to publish articles rather than books,” says Richard Holton, professor and head of the philosophy section in the Department of Linguistics and Philosophy. “So, he says, it is unusual to have so many philosophy books — both published and upcoming — from MIT at one time.

The themes of the eight books differ widely — ranging from the philosophy of Fellini to free will to the epistemology of pornography — but “they are all careful, analytic works,” says Holton. “In that sense they are all very much MIT products, and they have all benefited from much discussion in the department here. They show how very diverse topics can benefit from what is recognizably the same approach. It is a feature of philosophy that, unlike most disciplines nowadays, we remain generalists.”


Holton cautions against reading too much into the timing: “I wish there were some intriguing explanation, but I think it’s basically coincidence.”

Library book sale Feb. 26

MIT Libraries’ book sale will be held from 10 a.m. – 3 p.m. on Feb. 26 in the Bush Room, 10-105.

The sale offers a selection of material including architecture, art, chemistry, children’s books, engineering, fiction, history, linguistics, math, movies, music and physics. Proceeds will benefit the Libraries’ Preservation Fund.

The sale is open to the MIT community only; dealers and their representatives by appointment only. For more information, contact the MIT Libraries’ Gifts Office at 617-253-5693 or gifts-lib@mit.edu.

‘Mind-Body Month’ offers self-care, stress relief tips

With economic issues constantly in the news and other seasonal stresses taking their toll, MIT’s “Mind-Body Month” — being held now through March — aims to enhance community members’ well being, health and relaxation.

“Stressful times require deliberate measures, and we’ll present some of the most effective stress-reduction skills,” said Susanna Barry, a program manager in MIT’s Medicals Center for Health Promotion and Wellness.

“Participants will come away with concrete tools to manage their stress and tap into their natural relaxation response.”

Some of the events currently scheduled as part of Mind-Body Month include meditation classes, sleep and mindfulness workshops, chair massages, yoga and more.

Most workshops are free of charge, but some (including the chair massage) do require a fee. Workshops can be scheduled to be held in your area, at lunchtime or otherwise.

For more information on Mind-Body Month, visit http://web.mit.edu/about/news/article/mind-body-090210.html, or contact Susanna Barry at 617-253-1166 or barryj@mit.edu.

The program is co-sponsored by MIT Medical, the Department of Physical Education, Athletics and Recreation (DAPER), the Board of Chaplains, Student Life Programs, the Student Activities Office and lgbt@mit.edu.
A project to develop a networked underwater energy-harvesting robot and a study of stem cell-based engineered tissues are among the international faculty research projects that will receive nearly half a million dollars in funding as part of a new program by the MIT International Science and Technology Initiative (MISTI).

Of the 104 proposals received for the inaugural 2008-2009 MISTI Global Seed Funds, 27 were awarded funding. Faculty and research scientists from 26 departments across the Institute submitted proposals for projects in 42 countries. MISTI includes undergraduate, graduate or postdoctoral student participants.

Teams will collectively use the $457,400 in grant money to jump-start international research by beginning collaborations with faculty and student counterparts abroad. Funds will be used to cover travel costs to introduce and workshop costs to facilitate the projects. MISTI will provide cultural preparation for participating students before their departure. The MISTI Global Seed Funds program was initiated through funding from the Office of the Provost to enhance the internationalization of MIT research and education.

**WELLING:** Alternative-energy enthusiasm wins Gates scholarship

Continued from Page 1

will now pursue a doctoral in mechanical engineering at Cambridge as one of 100 Gates Cambridge Scholarship recipients (out of more than 700 applicants).

In addition to her research and work on alternative energy, Welling is a teacher. She has participated in MIT's CETI (China Educational Technology Initiative), teaching mechanical engineering in English through the hands-on bicycle design workshop. As a lab assistant for the Department of Mechanical Engineering, Welling has taught students about the hands-on design techniques as well as Matlab and SolidWorks.

MIT students have won 15 of the prestigious scholarships, which are awarded to the top engineering students from anywhere in the world, since the program was established in 2000 by the Bill & Melinda Gates Foundation. The scholar-

**South African activist photographer visiting MIT through March 10**

Zannele Muholi, an award-winning South African photographer and video artist, will be on the MIT campus through March 10 as the 2009 Ida Ely Rubin Artist-in-Residence.

Muholi, who is known for her evocative portraits of black lesbians and transgender people in South Africa, will present a public program today, teach a hands-on photography workshop, and meet with students and faculty.

Muholi will present a program titled “Izikathu” (which roughly translates from the Zulu as “period in time” or “time of the month”) at 7 p.m. today, in the Broad Institute auditorium. It is free and open to the public.

Wells will explore the idea of creating community through visual imagery in a photography workshop that runs from consecutive Fridays, March 2 and 26, from 6:10 to 9 p.m. Cost is $20 for students, $40 for MIT affiliates. Register through the Student Activity Web site at at ara.mit.edu/clases.

**Economist Robert C. Merton to receive Muh Award**

Robert C. Merton, a Nobel Prize-winning economist whose work revolutionalized financial mathematics and helped launch the growth of the risk-management industry, will receive the 2009 Robert A. Muhammit Award presented by the School of Humanities, Arts, and Social Sciences (SHASS) as free and open to the public.

In addition to his studies and work on securities markets, Merton has applied his theoretical insights to a variety of practical settings. He is the founder of the academic field of behavioral finance and is a leader in the field of financial economics. Merton is an early adopter of a green building policy and goals — and reducing greenhouse-gas emissions. “MIT was an early adopter of a green building policy and goals, and our expertise has evolved and strengthened over time,” says Steven A. Lasnay, deputy director for environmental sustainability and a member of the Campus Energy Task Force. “Our newest buildings — the MIT Sloan School of Management, NW35 [the new Ashdown House] — and the David H. Koch Institute for Integrative Cancer Research were expected to be LEED Gold.”

For the new Koch building, Walter E. Henry, director of Facilities’ Systems Engineering Group, and others modeled and tested airflow in laboratory fume hoods, which suck out noxious chemical fumes, to determine whether a drop in the velocity of the air entering the hoods would maintain their effectiveness. They found that a 20 percent reduction would keep the fume hoods safe and make them less expensive.

Another significant marker of change is MIT’s commitment to hold new construction and renovation up to scrutiny by the USGBC’s Leadership in Energy and Environmental Design (LEED®) Green Building Rating System. LEED certification is free and open to the public.

Among the features of NW35, the new graduate student housing at Pacific and Albany streets, are a storm-water management system, use of renewable materials, a reflective roof with provisions for future solar panels, and low-VOC paints and adhesives. MIT Sloan, the Koch Institute, and the Graduate Student Association have all developed or adopted green LEED designations. “An institute built around innovation,” says Lasnay, “MIT has an obligation to demand and uphold the highest standards in environmental friendly infrastructure.”

**MISTI selects first winners of Global Seed Funds**

**GREEN: MIT buildings utilizing green technology**

Members of the MIT community may submit one ad each issue. Ads should be 30 words maximum; they will be submitted by e-mail to ttads@mit.edu or mail to Classifieds, Room 1-400, Deadline Monday the week before publication.

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**WANTED**

A small team of entrepreneurs is seeking a capable and enthusiastic programmer with experience (e.g. Perl) to join an existing healthcare venture. If interested, please email info@weightreduction.com.

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**Mitosis selects first winners of Global Seed Funds**

**Economist Robert C. Merton to receive Muh Award**

Robert C. Merton, a Nobel Prize-winning economist whose work revolutionalized financial mathematics and helped launch the growth of the risk-management industry, will receive the 2009 Robert A. Muh Alumni Award presented by the School of Humanities, Arts, and Social Sciences (SHASS) as free and open to the public.

The award, given every two years, honors an MIT graduate for noteworthy achievements in the humanities, arts or social sciences. The ceremony includes a public lecture and reception.

“The Muh Award is a singular opportunity for us to recognize MIT graduates who have made significant contributions, and whose life work calls on deep knowledge in the disciplines of our school,” said Deborh Fitzgerald, the R. E. Davis Dean of the School of Humanities, Arts, and Social Sciences. “We are delighted to present Bob Merton with the Muh Award.”

Currently the John and Natty McAr-

**Robert C. Merton**

Merton has applied his theoretical insights about securities markets in practical settings. He was a founding principal of Long Term Capital Management, and is currently the developer of Smartasset, a pension management system that addresses deficiencies associated with traditional defined-benefit and defined-contribution plans.

Merton will present the 2009 Muh Award lecture titled “Observations on the Science of Finance in the Practice of Finance” on March 5 in the Wong Auditorium, Building E51-113, 2 Amherst St. The event is free and open to the public.

The Robert A. Muh Alumni Award was first announced in October 2000 at the 50th anniversary celebration of the School of Humanities, Arts, and Social Sciences (SHASS).

Muh ’59, a life member of the MIT Corporation and past chair of the Humanities Visiting Committee, endowed the award to honor an MIT graduate who has made significant contributions to education, scholar-

Merton was an interviewee in a 2008 article published in Technology Review in April 2008. 2008-technologyreview.com/business/200101/.
SPIN CYCLE
a new kind of washer

In many developing countries, electricity is unreliable or unavailable and water must be carried by hand, so conventional modern washing machines are not an option. Washing clothes can take up a significant amount of time, and doing laundry in open streams or lakes can add to water pollution, so the availability of a human-powered washing machine could make a big difference to the quality of life.

A pedal-powered washing machine that MIT students and staff built mostly from bicycle parts and empty barrels could solve many of these problems, and at the same time could be built locally and thereby create jobs.

Under development for almost four years, the new machine — dubbed “bicilavadora,” combining the Spanish words for bicycle and washing machine — got its most rigorous workout last month when a team of MIT students took the latest prototype to an orphanage in the slums of Ventanilla, Peru. With 670 resident children, the home generates its most rigorous workout last month when a team of MIT students took the latest prototype to an orphanage in the slums of Ventanilla outside Lima, Peru. With 670 resident children, the home generates

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

See video of the bicilavadora in action in Peru at:
web.mit.edu/newsoffice