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The MIT Energy Initiative is an Institute-wide endeavor designed to help transform the global energy system to meet the needs of the future and to help build a bridge to that future by improving today’s energy systems. The MITEI program is structured to include research, education, campus energy management and outreach activities.

The initiative will channel the talents of MIT students and faculty to help meet the global energy challenge by enhancing energy research opportunities and outcomes, supporting the educational needs of MIT students, promoting sustainable energy values and technologies on the MIT campus and establishing a major campus dialogue on energy and associated environmental challenges.

The initiative will support these objectives by pursuing substantial new funding. “We have been able to utilize initial funding from diverse sources—from the Institute, from industry and from private donors—to seed early-stage activities for each of the initiative’s focus areas,” Moniz said.

The initiative has funded innovative energy research projects involving four MIT schools. It has supported several graduate fellowships in various energy-related disciplines, supported development of a new energy-focused undergraduate course, established a student fund for campus energy management and outreach activities. Above, left, Roger Moore, MIT superintendent of utilities, decodes the MIT cogeneration plant for students. The plant has reduced its own greenhouse gas emissions by 30 percent since 1995. At center, geothermal facilities in Iceland are mining the heat that resides as stored thermal energy in the Earth’s hard rock crust, the subject of a recent MIT-led study. Right, solar panels like those on the roof of MIT’s Hayden Library harness the renewable, carbon-neutral energy that strikes the surface of the Earth.

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Central Square Theater breaks ground for new hall

From left to right: Catherine Carr Kelly, campaign manager, Central Square Theater; Debra Wise, artistic director, Underground Railway Theater; Mimi Huntington, artistic director, The Nora Theatre Company; Carl Barron, president, Central Square Business Association; Steve Marsh, managing director, real estate, MIT Investment Management Company; Jarrett Barrios, state senator; Marty Walz, state representative; and Ken Reeves, mayor of Cambridge. Behind the groundbreakers are various members of the state legislature, Cambridge City Council, and Cambridge School Committee.
Michelle D. Christy is named director, Office of Sponsored Programs

Michelle D. Christy, current director of the Office of Research and Project Administration at Princeton University, has been appointed director of MIT’s Office of Sponsored Programs (OSP), effective July 16.

Claude R. Canizares, vice-president for research, said the announcement was made in an e-mail to the Institute community this morning.

Canizares will “continue a strong tradition of leadership in the Office of Sponsored Programs,” Canizares wrote.

She brings to her new role “extraordinary energy, experience, knowledge and skill across a broad spectrum of research administration activities. She has enormous energy and enthusiasm for the job, as well as an ability to balance the needs of faculty and other principal investigators with the legal and fiduciary requirements with which we must cope,” Canizares wrote.

As director of OSP, Christy will have responsibility for “all aspects of pre- and post-award administration, compliance, indirect cost analysis and sub-award administration, and will head the dedicated and capable OSP staff. A nationally respected leader in the field, her appointment will ensure that MIT continues to play its long-standing role as a leader in research policy,” Canizares wrote.

Christy began her career in research administration at Tulane and Rutgers universities. She was named associate director in the Office of Research and Project Administration at Princeton University in 1995 and held that position until 2003, when she was appointed director of the office. She holds a B.A. in English literature and an M.B.A. with a concentration in finance from Rutgers University.

In his letter, Canizares expressed his gratitude for the “excellent work of the search committee,” which was co-chaired by Executive Vice President and Treasurer Theresia S. Douglas, and a committee of faculty, Professors Rohan Abeyaratne, Martin A. Schmidt and Timothy M. Swager and, from the staff, Robin C. Elices, Deborah L. Fisher, Ronald E. Haselton, James L. Morgan, Doreen Morris, William Peters, Charlene Placido, Anthony P. Sharon and Cecilia Wardle.

Canizares wrote that he was also “profoundly grateful to Julie T. Norris for her willingness to return to OSP to serve as its interim director, and to OSP’s leadership and staff for the tremendous effort they have expended to assure smooth continuity of operations. OSP has continued to move forward under Julie’s leadership, including adapting to the challenges of the new grants.gov electronic submission system, and everyone in the office deserves our thanks.”

Task force forges energy curriculum

A primary focus for the Education Task Force, which held its first meeting April 26, is to develop and coordinate a robust energy curriculum for undergraduate and graduate students that integrates expertise and perspectives from all five schools at MIT. “The task force will seek to ensure that outreach to prospective students effectively informs them about opportunities to study and work on energy issues at MIT,” said task force cochair Angela Belcher, the George M. Wesner Professor of Materials Science and Engineering and Biological Engineering. “Education task force objectives are strongly aligned with environmental concerns as well as burgeoning ‘walk the talk’ activities on campus,” she said.

The members of the Education Task Force, co-chaired by Belcher and Jesseon Tester, the H.P. Meinzer Professor of Chemical Engineering, are: Donald R. Allred, associate professor of building technology in the Department of Architecture; Ahmed F. Ghoniem, professor of mechanical engineering; Michael W. Golay, professor of nuclear science and engineering; Steven B. Leeb, professor of electrical engineering and computer science and mechanical engineering; Donald R. Lesourd, Epoch Foundation Professor of International Management in the Sloan School; F. Dale Morgan, professor of geophysics in the Department of Earth, Atmospheric and Planetary Sciences; Dava Newman, professor of aeronautics and astronautics; Donald R. Sadofsky, John F. Elliott Professor of Materials Chemistry; Susan S. Silby, professor of anthropology; Jeffrey A. Steinfield, professor of chemistry, Washington Taylor, professor of physics.
Energy initiative web site launches

The MIT Energy Initiative (MITEI) today launches a new web site (web.mit.edu/mitei) that will enable users inside and outside the institute to learn about the full range of MIT’s energy research, education and campus activities. Features include a database of energy-related classes that current and prospective students can browse and a comprehensive overview of energy research at MIT and the past and future of the MIT Energy Program, launched by the education and campus energy task force in 2005.

The site includes information on all MIT laboratories, centers, programs and departments with a focus on energy and links to student groups around campus. To keep things fresh, the MITEI site has frequent updates.

The MIT Energy Initiative (MITEI) focuses on: innovations, transformations, global systems and tools. Within these categories are more specific topics such as nuclear energy, wind, carbon management, energy research.

Richard Anthony
MIT Spectrum

Gang Chen's research with nano-scale materials gave him a head start in the field of nanotechnology when it was still brand new. Today, nano-materials, in which dimensions are measured in billions of a meter, are the foundation for a fast-growing approach to energy saving.

That approach involves thermoelectricity, which is based on a long-standing finding that some metals and, especially, semiconductors (the best known of which is the silicon used in computer chips) can generate a voltage when heated. The system also works in reverse: One common use of thermoelectricity relies on heat or its opposite, meanwhile, they’re like heat pumps and air conditioners, respectively.

In design terms, thermoelectric devices have key pluses. For one, they’re solid-state: no liquid fuels, no moving parts. They’re also easily scalable up or down.

This last feature explains many of thermoelectricity’s current uses. "If you need a small-scale device," says Chen, "you don’t really have any other choices." That’s why many deep-space probes use thermoelectricity to power engines.

There have been efforts to make the technology more mainstream. "In the '40s, the U.S. government has predicted thermoelectric generators could replace conventional engines in some cars before mid-century," Gang Chen is striving to further such advances.

Using a solar-activated battery, researchers are developing a gasoline engine that performs like its full-sized counterpart but no more than current batteries, Epstein said. According to a September 2006 BBC News story, Epstein, “who has lived and breathed his project for the last 10 years” with a team of some 30 staff students, expects that the device could be available commercially within three to five years.

“A laptop that will run for three hours on battery charge will run 15 to 20 hours using the microengine and it should end up costing no more than current batteries,” Epstein said. Another MIT team is developing a half-sized gasoline engine that performs like its full-sized counterpart but no more than current batteries, Epstein said. According to a September 2006 BBC News story, Epstein, “who has lived and breathed his project for the last 10 years” with a team of some 30 staff students, expects that the device could be available commercially within three to five years.

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In projects win media notice...turbine but offers fuel efficiency approaching that of today's hybrid engine system—at a lower cost. The key? Carefully controlled injection of ethanol into an increasingly common fuel, directly into the engine's cylinders. There's a hill to be climbed or a car to be red.

These small engines could be on the market in five years, according to Daniel R. Cohn, a nuclear research scientist in the Plasma Science and Fusion Center (PSFC) and the Laboratory for Energy and the Environment. John B. wood, the Sun Jae Professor of Mechanical Engineering and director of the Sloan Automotive Laboratory, and Leslie Bromberg, a principal researcher at the PSFC, announced in April 1997 the launch of a new energy conference, the Boston Globe Sunday Magazine, and other publications. In the piece, David \[...\]

\[...\]treated, difference than some guy coming in off the west and saying he had a dream during the day about some new technology.

\[...\]nerted biofuels

Ethanol is often touted as a potential solution to the growing oil-driven energy crisis. There are significant obstacles to producing ethanol. One is that high ethanol levels are toxic to human beings. Others are the surge in corn and other crop material into ethanol.

\[...\] MIT researchers made headlines when they engineered a new strain of yeast that can tolerate elevated levels of both ethanol and glucose, while producing ethanol faster than un-engineered yeast.

\[...\]he MIT Jeffrey W. Tester, the H.P. Mein-\[...\]energy conferences, including the World Energy Experts Conference. Moniz said that the report found "a lack of urgency in many directions on U.S. policy related to coal, including implementing a program to capture emissions and store them underground.

**Envisioning and engineering our global energy future**

Multidisciplinary work engages individuals, industry

From science and technology to systems analysis and economics, management and social science, MIT pursues the energy-environment agenda in more than 40 laboratories, programs, departments and centers.

"What the MIT Energy Initiative is really about is multidisciplinary, multifaceted, university sustained research efforts," said Robert Arm-

strong, deputy director of MITEI. The initiative creates new opportunities to leverage MIT's multiple strengths in ways that make it value-added to corpo-

tion and donors and also allow MIT to have a major impact in the market-

place and in government policy," Armstrong said. "It is important for a place like MIT to develop 'gee whiz' technology, and it's also important to place it in a context so it gets deployed by industry. That's what a lot of people are looking for.

Armstrong highlighted the initiative's scope, flexibility and range. "We're going to have a mix of technology thrusts, from interesting smaller-scale applications to systems at very large scale," he said. "We're also unusual because we can cover the spectrum as wide as possible in a wide range of areas, such as efficiency in heat management, buildings and trans-

dport.

A newly identified MITEI research thrust is enabling science or "tools" that, instead of looking at a particular energy system or technology, explore basic science through fields such as catalysis, multielectron transfer chemistry important for solar and fuel cells, and methane chemistry.

\[...\]university-industry consortia and part-

nerships will be established around flag-

ship projects of mutual interest. We're engaged in a broad range of energy companies, from oil companies to utility companies to greenfield projects around the world to secure support from sources ranging from giant industries to entrepreneurial startups and individuals who are passionate about solving global energy problems.

Armstrong said he and Moniz have been heartened to find that there is "an extraordinary amount of interest" in what MIT has to offer. Faculty research teams have been involved by pre-

senting overviews of their work to companies and by identifying mul-

disciplinary research challenges that can have considerable conse-

quences in the supply, delivery and use of energy and in mitigating environmental consequences.

In an interview with the Boston Globe, Moniz said that the report found "a lack of urgency in many directions on U.S. policy related to coal, including implementing a program to capture emissions and store them underground.

**Student proposals sought**

A new initiative provides mini-grant fund-

ing for student energy and environment proj-

ects. The Campus Energy Task Force of the MIT Energy Initiative is calling for proposal submissions from students working on projects related to MIT's campus energy and environment footprint. This call is for activities for summer and fall 2007. For more information, see sustainability.mit.edu/CampusEnergy/TaskForceRFP.

"Why the MIT Energy Initiative (MITEI) have geared up for the next phase of the initiative. George F. Schultz, MIT alumus and former faculty member, secretary of state for Energy and Admin-

istration and now professor emeritus at Stanford's Graduate School of Business, has agreed to serve as chair of MITEI's External Advisory Board. The high-level business leaders will consist of as many as 25 people; it will provide high-level strategic direction for the initia-

tive and review MIT's progress in energy fields.

\[...\]kian Kenderdine joined MITEI in March 2007 as associate director for stra-

tegic planning. Previously a vice president at the Gas Technology Institute, she was involved in initiatives to increase natural gas supply and to enhance energy efficiency and security. Earlier, she was a senior U.S. Department of Energy official, serv-

ing as director of the Office of Policy and as senior policy advisor to the secretary of energy on oil, gas, coal and nuclear issues.

She is a frequent speaker at international energy conferences, including the World Petroleum Congress and the Internation-


Robin Elkins, director of the Admin-

istrative Services Organization for the Departments of Chemical Engineering and Mat-

erials Science and Engineering and the Center for Bioengineering, will join MITEI later this month as executive director. Elkins will work with the director, deputy director and associ-

deate director in managing and coordinat-

ing MITEI activities. "I'm looking for-

ward to working with this broad-based initiative, which encompasses important interdisciplinary research and education-

al programs involving all five schools, and improved campus energy management," said Elkins. Elkins, who has 28 years of manage-

ment experience in higher education, 19 of those at MIT.\[...\]
Institute serves as honest broker of energy reports

Deborah Halber

News Office Correspondent

MIT energy reports are making a difference in policy debates. In January, an 18-member panel led by Peter L. Cooper released an in-depth study titled, "The Future of Geothermal Energy in the Commonwealth." The study was commissioned by the Massachusetts Institute of Technology (MIT) and was released last month. It is the first comprehensive study of the state's geothermal potential that better understands the risks and rewards of adopting geothermal energy as an alternative to fossil fuels.

The report states that geothermal energy has the potential to provide a significant portion of the state's energy needs, but that it requires significant investment in research and development. The report also highlights the benefits of geothermal energy, such as its reliability, cost-effectiveness, and emissions-free nature.

In its report, the panel issued a recommendation that the state should develop a comprehensive geothermal energy strategy that includes both research and development and the deployment of geothermal energy technologies.

The report also highlights the benefits of transitioning to geothermal energy, such as reducing emissions and improving energy security. It is hoped that the recommendations made in the report will be adopted by state policymakers and provide a roadmap for the future of geothermal energy in Massachusetts.

In addition to the research and development component, the report also includes a comprehensive economic analysis of geothermal energy projects, which will help policymakers determine the costs and benefits of investing in geothermal energy technologies. The report also includes a section on the environmental impacts of geothermal energy, which will help policymakers determine the potential risks and benefits of adopting geothermal energy as an alternative to fossil fuels.

The report concludes that geothermal energy has the potential to make a significant contribution to the state's energy portfolio, and that it is important to develop a comprehensive strategy to ensure the successful deployment of geothermal energy technologies in Massachusetts.

The report was compiled by a coalition of experts, including geoscientists, economists, and engineers, and was released in coordination with the Massachusetts Institute of Technology (MIT). The report was commissioned by the Massachusetts Department of Public Utilities and the Massachusetts Executive Office of Energy and Environmental Affairs.

The report is available for download online at the Massachusetts Department of Public Utilities website.
DAYLIGHT

Continued from Page 4

e emerging light at every point, all at the same time—and then easily change the incident angle and repeat the process.

Key to their system is an ellipsoidal acrylic dome coated with a mirror on the inside. Placed on a flat surface, the dome (like all ellipses) has two focal points. A light ray shining upward from one focal point will bounce off the mirrored inside of the dome and arrive at the other focal point, regardless of the angle at which the ray leaves the first focal point.

To test a sample of, say, cooled glass, they place it at one of the focal points. At the other focal point, a fish-eye lens pro-

trudes from the flat surface. A beam of light (including the full solar spectrum) shines through the piece of coated glass from below, and rays emerge at various angles. The researchers then captured images of the dome and its fish-eye lens, and the intensity indicates how much light came via that pathway.

"So we get complete information in one shot, while making thousands of point measurements," said Andersen. "It's continuous information, and it's obviously much more time-efficient."

Changing the incident angle of the light is as easy as turning the MIT Space on a specially designed computer-controlled 5-foot-diameter platform that can tilt at various angles to the light source. (The platform is also proving ideal for seeing—for a given latitude and season—how sunlight illuminates a building and penetrates a scale model placed at its center.)

The researchers' next task is to calibrate the system. They need to establish the relationship between pixel location and light angle and between intensity and light quantity. They are also developing analytical methods to determine the pathways taken by light of specific wavelengths—a prerequisite to controlling the heat component.

"Calibrating the device is very complicated, but we only have to do it once," Andersen said. "After that, using the device to test something will be very fast." The data generated will help manufactur-

ers improve their products and will enable Andersen and others to incorporate state-of-the-art window systems into building-simulation tools used by architects. The result will be better products used to their best advantage.

This research was supported by the National Science Foundation.

AAAS

Continued from Page 1

in October at its Cambridge, Mass., head- quarters.

FELLOWSHIP

Continued from Page 1

students with an American perspective on issues of politics, race and class. Also, "it will serve as an excellent opportunity to learn about their history—the way they perceive the United States," he said.

Eton, situated across the Thames River from Windsor Castle, was established in 1440 by King Henry VI; its graduates have included royalty and prominent leaders in politics, medicine and law. Prince William, the son of Prince Charles and Princess Diana, attended Eton.

Butler, an African-American who comes from the small town of Pritchard, Ala., is the first person in his immediate family to attend college. He believes his unique cultural background will help him be an effective "ambassador" of both the United States and MIT.

"I plan on devoting a good deal of time to discussing issues of race and class—these are very important things, which affect everyone's circumstances," he said. "It's colored my experience throughout my life.

Also, Butler said, the college's science department was eager to work with him as a science teacher. Butler worked in the MIT LunarDREEM Project. He also won first place in a NASA in-situ resource utili-

zation competition. Currently, he has been working as an archivist in the Industrial Liaison Program in the MIT Office of Corporate Relations.

As an Annenberg fellow, Butler will also be required to coach one or more sports. Butler, who has a second-degree black belt in tae kwon do, said he would either coach a martial arts class or saber fencing.

By turns soft-spoken and passionate, Butler thinks his keen interest in world events helped win him the fellowship. In his interview with an Eton official, "we spent quite a bit of time talking about politics. Specifically he mentioned how he numbers of graduates from Eton planned to take up some role in the British military as officers. Something that was at the fore-

front of the mind of many students was the Iraq war. I'm very much against the war, we talked about where the students stand and the British government's role."

Butler's selection represents the first asso-

ciation between MIT and Eton.

"It is a great honor," Orent said. "We're hoping it is the beginning of a longer relation-

THEATER

Continued from Page 2

for the buildings' recovery and reuse. It was then that the two theater companies approached the Institute about the possi-

bility of locating a new black box theater on the site.

Working closely with the Cambridge Historical Commission and its executive director, Charles Sullivan, MIT set out to restore and rehabilitate historically significant aspects of the buildings in its effort to design the new theater. Unfortu-

nately, the delicate condition of the struc-

ture combined with the contaminated state of the urban soil could not allow for the restoration of the buildings. Instead, MIT is developing a replica of the origi-

nal building as part of a larger develop-

ment that will include the theater and retail and office space. The designer of the project is Pfeiffer/Richardson Archi-

tects PC.

At the groundbreaking ceremony, Steve Marsh, managing director for real estate in the MIT Investment Management Compa-

ny, observed that the development "will be a vibrant tribute to former historic struc-

tures" and thanked staff member Michael Ouw for his dedicated work in bringing the project to fruition.

Marsh was joined in the program by Cambridge Mayor Ken Reeves, state Sen. Jarrett Barrios, state Rep. Marty Walsh, Central Square Business Associa-

tion President Carl Barron and the Cen-

tral Square Theater's Steering Committee chair, Marty Blatt. Reeves acknowledged MIT's role in the project as critical and thanked the Institute for its support of the community.

After the speaking program, attendees joined in a parade with puppets, stream-

ers and costume-clad revelers, led by the Second Line Social Aid and Pleasure Soci-

ety Brass Band, to a community reception including theatrical performances at the Cambridge YMCA.

Construction of the Central Square Theater is now under way, with the first pro-

duction planned for winter 2008.
Gerardo Jose la O’ left his hometown of Bacolod City in the Philippines almost 10 years ago to attend Berkeley and then graduate school at MIT. Visits home consisted of eating fresh seafood and sweet pastries called boat tarts and lounging on the white sand beaches where he swam, snorkeled and scuba dived as a youth.

Even before he left for college, la O’ (known as G.J. to his friends) noticed something about the coral reefs that were as familiar to him as his own room: They were getting harder to find. You had to swim farther out, braving strong currents, to find the reefs and their 1,000plus species of spectacularly colored fish.

La O’ wasn’t the only one who had noticed a change. In Sagay City, a major fishing area bounded by the Visayan Sea, three decades of dynamite fishing had decimated coral formations. The habitat for one of the highest concentrations of biodiversity in the world was being destroyed. Fish were becoming scarce.

When la O’ steps off a plane in Manila these days, it’s not just an escape from New England weather. He’s on a mission to save the coral.

With fellowships from MIT’s Graduate Student Council and the MIT Public Service Center, la O’ and MIT students Emzo de los Santos, a sophomore studying bioengineering; Martin M. Lorilla, a Sloan management student; and former MIT Department of Urban Studies and Planning Fellow Illac Diaz launched First-Step Coral. The students coupled their science and engineering skills with a new technology to promote a low-cost, environmentally friendly way to regrow the Philippine coral reefs.

First-Step Coral recently won a $7,500 award in the MIT IDEAS competition and is one of eight semifinalists in the 2007 MIT $100K Entrepreneurship Competition “development track” for advancing low-income communities in developing countries. Winners will be announced May 16 at an awards ceremony at 7 p.m. in Kresge Auditorium.

“I’ve seen the natural ecosystem get worse and worse. It’s overused, overexploited,” la O’ said. “The fishermen throw sticks of dynamite into the water and the sonic waves cause the fish to die and make them easier to catch. It also shatters the coral and causes it to slowly die off. It’s akin to carving a hole in the center of the Amazon and denuding it, but the coral reefs are less visible because they’re underwater.”

The coral reefs help provide more than 60 percent of the animal protein consumed by the Philippines’ population of 80 million. The declining fishing industry then puts more pressures on the land, which must support more agriculture as people move inland in search of a new food supply.

While at MIT, la O’ heard about an MIT alumna, Thomas J. Goreau, who had invented a way to help renew coral reefs.

“Goreau’s invention, called Biorock, uses an electrochemical process to deposit calcium carbonate, also known as white limestone, onto a common iron building material called rebar. Rebars are used for construction supports and can be fashioned into any shape. The students make it into curved structures that resemble small Quonset huts. After the calcium is deposited on the black iron it turns white and clumps of living coral that the volunteers tie to the metal begin to grow and attach themselves to the framework. In trials in the Pacific Islands, the Indian Ocean and the Caribbean, corals attached to Biorock grow three to five times faster than native coral and have an increased survival rate.

The MIT students’ innovation is to power the electrochemical process with wind turbines, tidal power and solar panels. During a trip to the Philippines in January, the First-Step Coral team installed 500-watt solar panels donated by Shell and Sunpower to power Biorock in the Carbin and Momohec islands in the Sagay Marine Reserve. The team plans to study the effect of the cyclical nature of the renewable sources on the growth and development of the coral.

In addition, the students presented information on the project to local schools and centers—reaching more than 500 schoolchildren and community leaders—and created a partnership with a new marine museum to get schools involved in monitoring the progress of the reefs. They also hope to stop children from breaking off bits of living coral to sell to tourists. “You really need a strong community partner for the long-term success of a project like this,” la O’ said.

La O’ two-week stints at home are much busier these days. “I used to go home almost as a tourist. This time, I’m much more fulfilled, more in touch with the community. Every time I go home now, I have something to check into,” he said. He hopes that the reef will make such a dramatic turnaround that it will become a destination for divers and snorkelers, and out-of-work fishermen can drive water taxis to bring eco-tourists to the best sites.

La O’, who is studying materials science, plans to pursue a career in high-temperature fuel cells and electrochemical energy systems that could one day be used in cars and stationary power systems, but that’s in the future. Now we’ve got a more pressing need—the marine ecosystem. It’s great to apply my knowledge to something with a positive impact. And who else gets to do a project where you must spend time on beaches in nice coral reef areas?”

Wind, sun and tides power Biorock, MIT rehab for recovering coral reefs

Deborah Halber
News Office Correspondent

The MIT team grafts corals onto Biorock in the Visayan Sea.