

Lemelson–MIT Program

The Lemelson–MIT Program (LMIT) successfully executed plans to meet several strategic goals in FY2010. Among our many accomplishments, we increased:

- the number of competitive female applicants for the Lemelson–MIT Prize
- publicity and improved communications for the Lemelson–MIT Collegiate Student Prizes
- overall media coverage, with over 714 million impressions valued at approximately \$21 million
- representation of low-income schools in the InvenTeams initiative
- public engagement at EurekaFest.

Annual Innovation Awards

2010 Lemelson–MIT Prize

Presented to an outstanding living American inventor who has significantly benefited society, the \$500,000 Lemelson–MIT Prize is the program’s most prestigious vehicle for creating excitement about invention and innovation. This is the fourth year LMIT has awarded a mid-career individual.

Recognizing that the pool for the prize has not contained many competitive female candidates, LMIT targeted female members of the national academies this year. As a result, the number of competitive female candidates increased from one to three and we celebrated our first female winner.

The Lemelson–MIT Prize committee awarded the prize to Dr. Carolyn Bertozzi, the T. Z. and Irmgard Chu distinguished professor of chemistry and professor of molecular and cell biology at the University of California, Berkeley, and director of the Molecular Foundry at the Lawrence Berkeley National Laboratory. Bertozzi is LMIT’s first female winner of the prize, recognized for her inventions with a wide range of biopharmaceutical applications. While working to advance the diagnosis and treatment of diseases like cancer, arthritis, and tuberculosis, she also made significant advances manipulating the complicated process that takes place inside the living human cell. Bertozzi’s work in intercellular communication has led to the creation of the world’s first bioorthogonal chemical reactions, tools for labeling biomolecules in living cells, which she hopes will one day lead to a non-invasive method for early detection of diseased tissue in the body.

In 2008, Bertozzi and her former graduate student David Rabuka founded Redwood Biosciences. With a business model focused on in-house product development and close collaboration with other biotechnology and pharmaceutical companies, Redwood Biosciences has provided Bertozzi with a vehicle to translate discoveries in the lab to new medicines.

Bertozzi is dedicated to inspiring the next generation of scientists and has been actively involved in both high school outreach programs and the K–12 science community, which she believes yields as much of a learning experience for her as for the students. More information on Carolyn Bertozzi can be found at <http://web.mit.edu/invent/a-winners/a-bertozzi.html/>.

2010 Lemelson–MIT Award for Sustainability

Created to address the growing importance of sustainability—both for the developing world and industrialized nations—the \$100,000 Lemelson–MIT Award for Sustainability recognizes and supports inventors who are working to safeguard the well-being of our communities and planet.

The fourth annual \$100,000 Lemelson–MIT Award for Sustainability was presented to Dr. BP Agrawal, founder of Sustainable Innovations (SI), a rural India-focused non-profit organization. SI is dedicated to building self-sustainable enterprises, especially among young entrepreneurs.

Agrawal and SI’s initial projects in India have been in clean water (Aakash Ganga–River from Sky) and healthcare (Arogya Ghar–Clinics for Mass Care), both of which were awarded World Bank development marketplace awards.

Given the often complex and non-consensus definitions of “sustainability,” LMIT will continue to refine the sustainability award and its focus. More information about BP Agrawal can be found at <http://web.mit.edu/invent/a-winners/a-agrawal.html>.

2010 Lemelson–MIT Student Prize

Awarded annually since LMIT’s inception to a MIT senior or graduate student who has created or improved a product or process, applied a technology in a new way, redesigned a system, or demonstrated remarkable inventiveness in other ways, the \$30,000 Lemelson–MIT Student Prize continues to serve as a highlight of our recognition activities.

Dorothy Lemelson announced Erez Lieberman-Aiden, a PhD candidate in the Harvard–MIT Division of Health Sciences and Technology, as winner of the \$30,000 Lemelson–MIT Student Prize at a celebration on March 3, 2010, for his breadth of inventiveness, spanning linguistics, mathematics, engineering, and molecular biology. Lieberman-Aiden’s most recent invention, dubbed Hi-C, has been hailed as a revolutionary technology—warranting the cover of *Science* magazine—that will enable an entirely new understanding of cell state, genetic regulation, and disease. Developed together with postdoctoral associate Nynke van Berkum of the University of Massachusetts Medical School, and advisors Eric Lander and Job Dekker, Hi-C makes it possible to create global, three-dimensional portraits of whole genomes as they fold. It is the first and only technique to do so. Lieberman-Aiden’s other remarkable inventions include the iShoe, a sensor-laden shoe insole that enables early diagnosis and rehabilitation of deteriorating balance for the elderly; evolutionary dynamics of language theory; and evolutionary graph theory, a novel approach to studying how topology affects evolution of a population.

Lieberman-Aiden has leveraged the credibility of winning the student prize to connect with more people at MIT and Harvard who otherwise might have been difficult to access. As a result, more people are willing to take a risk with him, and he is able to target increasingly ambitious projects.

The Lemelson–MIT Student Prize received extensive local and national press coverage this year, totaling more than 123 million impressions in 10 national top-tier media outlets including: *USAToday*, *Scientific American*, the Huffington Post, and CNN/HLN. More information about Erez Lieberman-Aiden can be found at <http://mit.edu/invent/a-winners/a-lieberman-aiden.html/>.

2010 Lemelson–MIT Collegiate Student Prizes

2010 was the fourth year of the Lemelson–MIT Collegiate Student Prize program—the fourth year with Rensselaer Polytechnic Institute and the University of Illinois at Urbana-Champaign, and the second with the California Institute of Technology.

\$30,000 Lemelson–Rensselaer Student Prize

Kayvan J. Rafiee developed a new method for manufacturing and using graphene, an atom-thick sheet of carbon atoms arranged like a nanoscale chain-link fence, to store hydrogen; potential applications include hydrogen-powered cars and trucks.

\$30,000 Lemelson–Illinois Student Prize

The first undergraduate recipient of the Lemelson–MIT Collegiate Student Prize, Jonathan Naber, with the help of his partners on the Illini Prosthetics Team, developed an affordable prosthetic arm from recycled materials that is extremely functional, durable, and easily manufactured for people in developing countries.

\$30,000 Lemelson–Caltech Student Prize

Heather D. Agnew helped develop an innovative technique to create inexpensive, yet highly reliable and stable biochemical compounds that have the potential to replace antibodies used in many standard medical diagnostic tests.

Media results at LMIT's partner schools in FY2009—a main goal for the Lemelson–MIT Collegiate Student Prizes—did not meet expectations. LMIT learned through this experience that providing a prize alone is insufficient in ensuring the desired outcomes at other schools, where many interests compete for limited resources. As a result, instead of expanding to a fifth school in FY2010, we opted to focus on the existing four schools by strengthening the branding around a national initiative—which included a live, networked announcement event—and dedicating resources to provide each school with communications support.

Media coverage overwhelmingly positioned the news as a national prize, often including references to all four winners. LMIT will continue to leverage current resources to meet the objectives of the Lemelson–MIT Collegiate Student Prizes at the current schools in favor of expansion.

Invention Education

InvenTeams

InvenTeams™, LMIT's grants initiative supporting high school invention teams, continued as a national program in FY2010, with 15 new grants and six continuing grants awarded in October 2009. The new grantees were a diverse group from 13 states. They developed prototypes of one consumer product, three assistive devices, eight health/safety or environmental inventions, and three affordable technology devices for developing country applications.

Approximately 233 students and more than 58 teachers and mentors were involved in these projects (this is a decrease from FY2009 as a result of one fewer InvenTeam and fewer continuing grants). Females made up approximately 30% of all participating InvenTeams students—30% of students on new InvenTeams and 33% on continuing teams. When given the opportunity to self-identify their ethnicity (multiple selections possible), students predominately selected Caucasian (48%), Asian American (22%), Mexican American (15%), African American (10%), other Hispanic groups (6%), and other/no response (4%). We infer this to mean that of the 233 students at least 30% were from underrepresented ethnic groups.

InvenTeams received significant media coverage again this year, with more than 68 million impressions received through top-tier outlets such as Newsday.com and *Popular Science*. More information about InvenTeams can be found at <http://web.mit.edu/inventeams/>.

Invention Education Outreach

FY2010 was spent actively pursuing and developing partnership opportunities and content with organizations that possess significant youth channels. These interactions are seen as providing significant leverage to InvenTeams' reach of several hundred students.

Organizations such as the Boy Scouts of America, Girl Scouts of the USA, WGBH, and 4-H—and the youth channels that they own—are important partners to LMIT, reaching more youth through indirect resource means.

LMIT worked with WGBH in FY2009 to develop the *Invent It, Build It* activity book and advise on the Mentors for Young Inventors program. This year, LMIT helped WGBH update the mentors program and partnered with Howtoons to create a guide to encourage youth to illustrate their invention ideas. Howtoons' *A Guide to Visual Communication* is the second in a series of three books LMIT has planned, with the first book, *How to Come Up with Ideas*, and the third, *How to Build Your Ideas*, scheduled for completion in FY2011 and FY2012, respectively.

LMIT has continued to be a leader in MIT K-12 outreach activities, including running sessions on invention and ice cream through the Edgerton Center's annual summer camp for Gloucester middle school students.

LMIT introduced the Inventing merit badge this year, in partnership with the Boy Scouts of America, which has nearly one million active scouts in the United States. This partnership has the potential to reach many youth for the foreseeable future. LMIT staff developed the merit badge booklet, using many examples and images from award winners and InvenTeams.

More than 600 scouts have earned or started the process of earning the badge, through workshops at MIT and activities at scouting's 100th anniversary jamboree.

LMIT is currently working with 4-H and the Girl Scouts to identify and develop similar opportunities to the Inventing merit badge. These initiatives are expected to be as interesting to the media as the Inventing merit badge, which received more than 74 million impressions and over 110 placements in media outlets including the *Boston Globe*, *FastCompany.com*, *Scouting Magazine* online, and *TIME.com*'s Techland blog.

LMIT plans to begin to conduct a grassroots communications campaign in FY2011 among decision makers in InvenTeams' communities. The intent of this targeted communication is to encourage future investment in hands-on science, technology, engineering, and mathematics (STEM) learning opportunities, and especially invention-related experiences. LMIT will, for example, organize meetings with community leaders and civic groups (including MIT clubs) to discuss invention education and invite local youth groups (e.g., Boy Scouts, Girl Scouts, 4-H, and Boys & Girls Clubs) to see their local InvenTeam's project.

Lemelson–MIT Program Support of MIT Programs and Classes

The Lemelson–MIT Program aims to cultivate a larger community of student inventors at MIT through sponsorship opportunities. By supporting organizations that promote projects at different stages, stories/resources are generated and can be leveraged as inspirational and informative content for youth.

MIT IDEAS Competition

LMIT sponsored the ninth annual MIT Innovation, Development, Enterprise, Action, and Service (IDEAS) Competition, choosing to focus its \$10,000 of support on technological innovations for the developing world. This year's winner of the LMIT-sponsored \$5,000 IDEAS Award for International Technology, PerfectSight, developed an innovative mobile system for diagnosing refractive eye conditions for under a dollar using cell phones. PerfectSight participated LMIT's EurekaFest 2010 (see below), showcasing its project during the awards reception. For more information, see <http://web.mit.edu/ideas/www/index.html/>.

Product Engineering Processes

In the senior-level mechanical engineering class 2.009 Product Engineering Processes, teams of 14 to 16 individuals design and build working alpha prototypes of new products while developing skills in product design, creativity, innovation, group dynamics, team management, consensus building, and communication. Working within a budget, they engage in a unifying engineering experience.

This year’s theme was “emergency.” Guided by professor David Wallace, students designed and built prototypes for a variety of projects, including an adjustable buoyancy backboard, a walker that helps a fallen person to stand, and a back-up self-contained underwater breathing apparatus. Final projects were presented in early December 2009 in what was a highly educational, thought-provoking, and entertaining evening event for the MIT community and the class sponsors.

LMIT funds are used primarily for team project budgets, but they also provide resources for the students to participate in a number of engaging, creativity-enhancing, and hands-on learning experiences. Funding for 2.009 in FY2011 will decrease to \$15,000 to allow LMIT to standardize the maximum on-campus sponsorship amount. For more information, see <http://web.mit.edu/2.009/www/>.

\$100K MIT Entrepreneurship Competition (Development Track)

LMIT continued its sponsorship of the \$100K’s Development Track in FY2010. The mission of the development track is to jump-start transformative businesses that serve emerging and frontier markets. It is the most tangible of all tracks, with finalists typically producing physical prototypes early and having strong ties to the MIT IDEAS Competition.

The 2010 winner of the \$100K’s Development Track was SolSource 3-in-1, which engineered “a novel device that harnesses solar energy for portable cooking, heating, and electricity generation” using only sustainable and locally available materials. As evidence of the strengthening of the student inventive community and pathways to implementation, the SolSource team has several members from HeatSource Textiles, last year’s winner of the LMIT-sponsored \$7,500 IDEAS Award for International Technology.

All of the finalists from the \$100K’s Development Track created videos for LMIT’s use on topics ranging from the science behind their projects to teambuilding. More information can be found at <http://www.mit100k.org>.

MIT Global Startup Workshop

In FY2010, LMIT helped sponsor the Global Startup Workshop (GSW) with \$2,500 in prize money for an elevator pitch contest. The LMIT executive director moderated two conference panels, “Young Entrepreneurs” and “Women and Entrepreneurship.” For the sponsorship, the GSW team created a video on the importance and how-to’s of the elevator pitch. More information can be found at: <http://www.mitgsw.org>.

Thought Leadership

Invention Index

The 2010 Lemelson–MIT Invention Index focused on youth’s perceptions of STEM education, the STEM fields, and invention. Media coverage was strong with 113 million impressions from top national outlets including MSNBC.com, *MAKE*, and *Science Daily*. The media coverage certainly helped position LMIT as an invention and STEM resource.

The survey found that while in the classroom, educators play a powerful role in exciting teens about STEM. More than half of teens (55%) would be more interested in STEM simply by having teachers who enjoy the subjects they teach.

An overwhelming number of respondents wished that they knew more about STEM in order to create or invent something (85%), but a majority reported being discouraged from pursuing STEM professions due to a lack of understanding of the subjects, of what people in these fields do, and of not knowing anyone who works in these fields (51%).

Less than one-fifth of respondents believed that scientists contribute most to society's well-being, and even fewer selected engineers (5%). Many teens may lack a full understanding of the societal impact of STEM professionals, further highlighting the need for teachers, mentors, and opportunities in these areas. More information about the Invention Index can be found at <http://web.mit.edu/invent/n-pressreleases/n-press-10index.html>.

Other Thought Leadership

Other examples of thought leadership include invitations to LMIT staff to speak at conferences and events on invention, innovation, and education, and the facilitation of subsequent recognition of LMIT award winners in articles or at conferences.

EurekaFest 2010

LMIT held its fourth annual EurekaFest™ event June 16–19, 2010. EurekaFest is a multi-day celebration designed to empower a legacy of inventors through activities that inspire youth, honor role models, and encourage creativity and problem solving.

EurekaFest comprises three major components: a series of events held at MIT across three weekdays that serves as a capstone for InvenTeams students; a celebration of this year's award winners; and an all-day design challenge and public engagement event at Boston's Museum of Science over the weekend.

EurekaFest at MIT: Wednesday, June 16–Friday, June 18

LMIT was able to highlight the pipeline of inventive careers and provide opportunities for youth and accomplished inventors to interact and become inspired by one another. Mentoring and inspiration were significant themes. Award winners were asked to invite to the event the person who has most inspired them, Lemelson-MIT Collegiate Student Prize winners and finalists were presenters and mentors, and InvenTeams students underwent a specially designed Advanced Invention-to-Venture (AI2V) training for high school students with the National Collegiate Inventors and Innovators Alliance E-Teams as mentors. Excite Award Teachers (finalists for InvenTeams grants) participated in active learning workshops on tools, electronics, and the invention process. They were also able to learn first-hand about the InvenTeams' experience from teachers and students. It was an ambitious program. Several educators from China were invited through the MIT Alumni Club of China and Microsoft China and observed training sessions.

BP Agrawal drew a significant crowd the evening of Thursday, June 17, inspiring youth attendees with his life story and approach to solving the problems of India's rural poor. Stephen Cass, editor of *MIT Technology Review*, moderated this year's Breakfast of Champions—an opportunity for the award winners to informally connect. Cass led their annual study on emerging technologies. The discussion was broad ranging, covering topics such as where innovation happens and where innovators can be found, what and how to inspire youth to pursue STEM studies and careers, and what to do about the BP oil accident.

MIT Institute Professor and Nobel Laureate Phillip Sharp and LMIT faculty director Michael Cima presided over the 16th annual awards ceremony on Friday, June 18. Dean of engineering Subra Suresh and Dorothy Lemelson presented the \$500,000 Lemelson–MIT Prize and the \$100,000 Lemelson–MIT Award for Sustainability. Unable to attend EurekaFest this year, MIT president Susan Hockfield recorded a video greeting that kicked off the ceremony.

Dr. Carolyn Bertozzi's presentation highlighted the impact of mentors and colleagues in her life, her passion for science, and her love of music. It was not a surprise to see her at the keyboard during the reception.

This year saw the introduction of two new EurekaFest elements: master classes for both the Lemelson–MIT Prize and Award for Sustainability winners, and the announcement of a significant invention education initiative.

Carolyn Bertozzi and BP Agrawal each gave a master class during EurekaFest. These lectures are intended to provide each award winner with the opportunity to have a scientific exchange with the MIT community and help them focus their evening talks on their inspirations rather than technical details. The presentations were attended by approximately 50 people. Youth interested in health sciences from Sociedad Latina, a local non-profit, participated in Bertozzi's class.

The Inventing merit badge, which LMIT developed in collaboration with the Boy Scouts of America during FY2010, was unveiled at EurekaFest. Boy scouts from the Boston area, including more than 30 of the first scouts to earn the new merit badge, scout volunteers and leadership from the Boy Scouts of America national organization, distinguished Eagle Scouts who included MIT professors and alumni, and parents joined us for the announcement.

EurekaFest attracted approximately 150 guests (not including the 200 InvenTeams students, teachers, educators, and mentors) at events such as Friday's awards ceremony and Thursday afternoon's InvenTeams and Lemelson–MIT Collegiate Student Prize presentations.

EurekaFest at the Museum of Science: Saturday, June 19

This year's day at Boston's Museum of Science again featured a large-scale design challenge for InvenTeams students and local youth, and expanded hands-on invention activities for museum guests.

Continuum (<http://dcontinuum.com>), an international design consultancy, was brought on board to help streamline and improve the design challenge and expose youth to design as a field of study and possible career path. Continuum’s vice president of product innovation, Tom Merle, was the kick-off speaker for the AI2V training, and spoke about the field of design as a career and some of the projects and companies with which he has been involved. At Saturday’s design challenge at the Museum of Science, Daniel Braunstein, an MIT alumnus and principal mechanical engineer for Continuum, talked with students about the design process and its many pitfalls and enjoyable learning moments.

Hands-on activities for the general public were organized this year to coincide with the design challenge. LMIT invited Howtoons creator Nick Dragotta, toy designer Ingrid Dragotta, and MIT student group Design-o-mite to showcase their work. Each use illustration and “making” to engage youth in the design process. The Museum of Science hosted activities in their discovery space and computer clubhouse.

Traditionally, the Lemelson Center at the Smithsonian hosts a table during EurekaFest at the Museum of Science. However, to prepare for a larger collaboration at EurekaFest 2011—slated to include Spark!Lab—LMIT and the Lemelson Center took a sabbatical from this regular engagement.

LMIT aggressively marketed EurekaFest—and especially EurekaFest at the Museum of Science—to the public, with radio spots on WBUR, announcements in local events calendars, and on-campus promotions for the broader MIT community. EurekaFest garnered more than 37 million impressions, including coverage in the *Boston Globe*, Discovery.com, *Education Week*, MassHighTech.com, and Time.com.

EurekaFest 2011 will include stronger public components at the Museum of Science, such as the possibility of pre- and post- activities for guests, Spark!Lab, and other engagements around invention. LMIT’s Museum of Science activity is also the basis of a scaling experiment—can LMIT leverage the experience to do similar, one-day events at venues across the country to engage more of the public in a cost-effective manner?

Work is under way to develop another major invention education initiative that can be announced at MIT, similar to this year’s unveiling of the Inventing merit badge.

Personnel Changes

In FY2010, Maura Hume joined LMIT as awards program assistant, and Ilana Schoenfeld, development and external relations officer, left to pursue other opportunities and was replaced by Stephanie Martinovich. All other personnel remained the same.

Joshua Schuler
Executive Director

More information about the Lemelson–MIT Program can be found at <http://web.mit.edu/invent/>.