Lemelson-MIT Program

Goals, Objectives, Priorities, and Accomplishments

The Lemelson-MIT Program (LMIT) undertook significant programmatic changes in fiscal year 2015 and successfully implemented plans to meet several strategic goals. It executed strategic plans for the awards program, K–12 Invention Education initiatives, JV InvenTeams, and InvenTeams. The core activities of LMIT in FY2015 were:

1. Recognizing outstanding inventors—through the award of the $500,000 Lemelson-MIT Prize, which was celebrated in partnership with MIT Technology Review, and the addition of two new prize categories for the national collegiate invention competition for graduate and undergraduate students;
2. Inspiring youth—through Invention Education (focused collaborations with national youth organizations around invention education content), InvenTeams, JV InvenTeams, Community Engagement, and EurekaFest (a multi-day event to celebrate and catalyze InvenTeams, JV InvenTeams, and the Lemelson-MIT National Collegiate Student Prize winners); and
3. Communications—LMIT's efforts to recognize outstanding inventors and inspire youth are leveraged through media coverage.

Further details and LMIT's goals and accomplishments are described below.

Recognizing Outstanding Inventors

LMIT's activities to recognize outstanding inventors and inspire youth to lead creative lives through invention include two annual awards: the $500,000 Lemelson-MIT Prize and the Lemelson-MIT National Collegiate Student Prize Competition.

LMIT strives to increase the number and diversity of high-quality nominations for the $500,000 Lemelson-MIT Prize each year. Fiscal year 2015's goals for the prize included having 15 new nominations and two new competitive nominees from groups that are underrepresented in the science, technology, engineering, and mathematics (STEM) fields. The revised nomination process that LMIT introduced in FY2014, featuring fewer requirements and a revised timeline, was well received by nominators. The revised procedure resulted in 12 new nominations, eight comprehensive updates, and three female nominees who placed in the top 10.

The screening committee—comprising MIT alumni and faculty, and including members of the no-longer-awarded Lemelson-MIT Award for Global Innovation (to provide global perspective)—reviewed the 24 nominations received and identified four finalists who advanced to the national jury. LMIT's national awards jury of influence makers from the scientific, entrepreneurial/venture capital, and media industries met and selected the winner of the 2014 $500,000 Lemelson-MIT Prize in mid-May. The winner, Dr. Sangeeta Bhatia, was announced in early September, before EmTech 2014, where she was celebrated.

Lemelson-MIT National Collegiate Student Prize Competition

The launch of a national collegiate competition in FY14 focused LMIT's efforts on raising awareness of the program and generating applications. Two new prize categories (themes) were introduced in the second year, "Drive It!" and "Eat It!" to the initial prize categories, "Cure It!" and "Use It!" The goal of 150 applications for each of the four themes at the graduate individual and team undergraduate levels was set for recruitment efforts. Recruitment efforts included having the awards program officer execute a nationwide roadshow to promote the competition and having LMIT contact MIT alumni who are employed by or attending top engineering schools as part of a multi-phase, targeted email campaign. The majority of applicants reported that they had heard of the competition in "an email from a faculty member," which will help LMIT make the most efficient use of marketing resources. LMIT also created a promotional "sizzle reel" video for the announcement of the winners, and two educational and two profile videos of the NCSPC winners with an intended use of increasing awareness and recruiting applicants. The production of the videos was labor intensive and took longer than estimated, prohibiting LMIT from fully leveraging the videos' engagement and recruiting potential.

Fifty graduate students and undergraduate student teams from 28 colleges and universities representing 18 states used an online application platform to submit their applications. There were 18 eligible applicants for the graduate student "Cure It!" category, 13 for the undergraduate "Cure It!" category, three each for the graduate student and undergraduate "Drive It!" and "Eat It!" categories, four for the graduate student "Use It!" category, and three for the undergraduate "Use It!" category. The University of Illinois at Urbana–Champaign and Rensselaer Polytechnic Institute, former partners with the Lemelson-MIT Collegiate Student Prize, remain closely affiliated; three applications came from the from University of Illinois at Urbana–Champaign and one from Rensselaer Polytechnic Institute. Rice University and Penn State University were strong contributors, with four and three applications, respectively. Ten of the applicants were from MIT, a decrease from the 21 MIT submissions of the previous year. No applications were received from universities in the Pacific Northwest, a common occurrence in many national programs. LMIT will continue to build awareness of the competition in that geographic area.

Screening committees were formed to select up to 11 graduate student and undergraduate student team finalists in the competition's four categories. These committees included experienced screeners from the Lemelson-MIT Collegiate Student Prize Competition and experts in health technology, consumer products, transportation, and food and agriculture. Finalists submitted videos of their inventive work and additional letters of support. The same national jury that selected the winner of the $500,000 Lemelson-MIT Prize then reviewed and selected the winners of the three $15,000 graduate prizes and two $10,000 undergraduate student team prizes. The jury decided not to award a "Use It!" graduate prize or an undergraduate "Eat It!" or "Drive It!" prize to maintain the level of excellence. Two of the five winners the jury selected were from MIT.

The five winners of the 2015 Lemelson-MIT National Collegiate Student Prize Competition—Carl Schoellhammer (MIT, graduate team, "Cure It!"), Western Michigan University's NeoVent (undergraduate team, "Cure It!"), Josh Siegel (MIT, graduate team, "Drive It!), Alexander Richter (North Carolina State University graduate team, "Eat It!"), and Penn State University's Mobium Solutions (undergraduate student team, "Use It!")—were announced through a national press release and in coordination with their schools on May 19. LMIT had held an event on April 16, during MIT's Campus Preview Weekend, to showcase New England–area applicants to the Lemelson-MIT National Collegiate Student Prize. Approximately 500 people attended. The announcement resulted in 27.8 million media impressions, including social media impressions. LMIT celebrated the winners of the 2015 National Collegiate Student Prize Competition at the now college- and youth-centric EurekaFest, June 19–20, at MIT.

Inspiring Youth

LMIT's activities to inspire youth to lead creative lives through invention include Invention Education, InvenTeams, JV InvenTeams, Community Engagement, and EurekaFest.

Invention Education

LMIT's Invention Education activity mostly consists of collaborations with national youth development organizations, including the Boy Scouts of America, the Girl Scouts of America, and 4-H, to promote inventive thinking and doing. This is also the arena in which LMIT pursues new ideas and opportunities, and engages with the MIT K–12 STEM community.

Accomplishments for Invention Education included a fifth invitation to the White House Science Fair for InvenTeams, encouraging 100 Boy Scouts to earn the Inventing merit badge that LMIT introduced, holding workshops on invention through other organizations, and developing new, inspiring invention-education content. LMIT brought two InvenTeams to the White House Science Fair in addition to the team from Massachusetts: the SOAR (Students on the Academic Rise) High School InvenTeam in Lancaster, California, and the Wallenpaupack Area High School InvenTeam in Hawley, Pennsylvania. Media coverage was significant at more than 20.6 million impressions via print, online, broadcast and social media.

InvenTeams

On October 15, LMIT announced the selection of 15 2014–2015 InvenTeams from 10 US states. InvenTeams' projects get under way in November with teams completing research and outreach to their intended beneficiaries or customers. Prototypes are built and iterated in December through late April, when teams begin to think about EurekaFest. InvenTeam rosters from 2014–2015 show that 201 young people, 19 educators, and 20 mentors were actively participating on the 15 teams—approximately a 5:1 student-to-educator/mentor ratio. LMIT enlisted the support of master teachers to conduct site visits; feedback was positive, so LMIT will consider repeating this tactic in the future. Some site visits coincided with the public, mid-grant technical reviews in the InvenTeam communities.

Recruitment for 2015–2016 InvenTeams resulted in at least three InvenTeam finalists [also called Excite Award Recipients (EARs)] from each of four "hot spot" regions—Massachusetts, Texas, Oregon, and California. The hotspots accounted for 18 of the 35 total EARs. Three JV InvenTeam educators from the Houston area and California's 2015 STEM Teacher of the Year—a previous EAR with a newly built IDEAlab for invention and innovation—from the Archer School for Girls in Los Angeles are among the many highly qualified EARs.

LMIT's survey of alumni InvenTeams students has been developed and will be sent out in the summer of 2015.

Junior Varsity InvenTeams

JV InvenTeams expanded in Massachusetts and Texas in FY15, aiming to have 10 teams in each geographic location while expanding into Oregon. The goal was to have a total of 25 teams of not more than 20 students each. LMIT staff worked with 26 teams totaling 405 students and 55 educators. Some sites had more than one team. KIPP Sunnyside (Houston, Texas), Oregon City Service Learning Academy (Oregon City, Oregon), and Lowell High School (Lowell, Massachusetts) had multiple teams. KIPP Sunnyside and Oregon City Service Learning Academy are utilizing JV InvenTeams as part of their regular schoolday STEM enrichment. In-person professional development training on invention and the JV InvenTeam activities for educators and administrators from the selected sites took place in November at Oregon's 21st Century Community Learning Center Conference, in January at MIT, and in February at KIPP Sunnyside High School. Two JV InvenTeam campus visits took place. 140 JV InvenTeam students and educators visited MIT on April 9, which provided an opportunity for MIT's evaluator to interact with students and educators. On April 14, 170 JV InvenTeam students and educators visited the University of Houston. The JV InvenTeams from Oregon convened at the Oregon Museum of Science and Industry in mid-May as part of a larger event that included inventors from Columbia Sportswear Co., Stanley Black & Decker's hydraulics group, and Oregon Mathematics, Engineering, Science Achievement (MESA) students, showcasing their work alongside the JV InvenTeams' work. There were also design challenges for the public, Boy Scouts who were working on the Inventing and Sustainability merit badges, and Girl Scouts who were participating in an invention meeting. Stanley Black & Decker, Inc., once again supplied each team with hand and power tools.

Work commenced with WGBH (Boston's PBS station) to develop four additional activity units. The topics of these four units are controls (automatic door project), heat transfer (evaporative cooling project), optics (camera exploration), and human power (project idea under development). These four units will join the library of existing units to provide additional options for JV InvenTeams in FY2016 and will be available as free downloads from LMIT's website.

LMIT begun planning for the expansion of JV InvenTeams into California and the increase in sites in Oregon to 10 for a total of 35 teams in FY2016, with an eventual increase to 40 overall the following year. The 21st Century Community Learning Center networks will again figure into the California effort. Managing the consumable and

printed materials shipments for JV InvenTeams required significant personnel effort this year and will increase as the effort is scaled up. LMIT is in the process of identifying kitting vendors with experience in hands-on science experiments to provide services to help LMIT manage this effort.

Communications

LMIT continued to focus on the communications goal of increasing overall media coverage. This year, LMIT had 652 million impressions (there were 607 million in FY2014). Media coverage of each of LMIT's initiatives is discussed below.

Administration

The close of fiscal year 2015 marks the end of the Lemelson-MIT Program's current grant award from the Lemelson Foundation. LMIT will begin to develop its proposal for beyond FY2016 during FY2015.

Recognizing Outstanding Inventors: Specific Initiatives

Lemelson-MIT Prizes

Presented to an outstanding mid-career American inventor who is dedicated to improving the world through technological invention, the $500,000 Lemelson-MIT Prize is the Lemelson-MIT Program's most prestigious vehicle for creating excitement about invention.

LMIT established a three-year partnership with *MIT Technology Review* to implement the decision to make the annual celebration of the Lemelson-MIT Prize winner a peer-level event that is distinct from the EurekaFest activity. Dr. Sangeeta Bhatia was lauded on the first night of EmTech 2014, which included a fireside chat with Jason Pontin, *Technology Review*'s editor in chief; remarks from Carol Dahl, the Lemelson Foundation's executive director; and a reception. The partnership and event were deemed successful, with more than 800 people in attendance. Some 61% of MIT's C-level staff, directors, and vice presidents attended, as did 64 media outlets; many more watched online.

Recruiting for the 2015 Lemelson-MIT Prize began with the announcement that Sangeeta Bhatia had won the 2014 prize. It included several underwriting slots on National Public Radio shows in major markets, online advertisements with Fastcompany.com and *MIT Technology Review* (950,000 impressions and 469 clicks), and outreach and email campaigns to LMIT's network. LMIT has also encouraged the nomination of mid-career inventors working in global markets—not only those focused on developed world markets—to advance the "mainstreaming" of invention for the developing world and to highlight that modern invention-based ventures must be global. Twelve new and eight updated nominations were received.

The winner, who was selected in late May, will be announced in mid-September 2015 and celebrated in early November at EmTech 2015. The celebration will again include a fireside chat with Jason Pontin, the presentation of the prize, and a reception.

Lemelson-MIT National Collegiate Student Prize Competition

The 2015 fiscal year was the second year of the Lemelson-MIT National Collegiate Student Prize Competition, a nationwide search for the most inventive undergraduate and graduate students that was informed by a FY2013 strategic evaluation. The national prize builds on the legacy of the Lemelson-MIT Collegiate Student Prize, which has served as a springboard for collegiate inventors for nearly 20 years. The Lemelson-MIT Program had awarded a student prize at MIT since 1994, and had also awarded additional prizes in collaboration with Rensselaer Polytechnic Institute and the University of Illinois at Urbana–Champaign since 2007 and with the California Institute of Technology from 2009 to 2011.

The new competition launched in fall 2013 with two categories: health care ("Cure It!")—to recognize students' work in technology-based inventions to improve health care—and consumer products ("Use It!")—to recognize students' work in technology-based inventions to improve consumer devices and tools. LMIT added two new categories in FY15, "Eat It!" for food and agriculture and "Drive It!" The applicants' showcase in April during MIT Campus Preview provided exposure for regional applicants, increased awareness of their work and of the competition, and provided an opportunity for applicants to network with one another. The 2015 Lemelson-MIT National Collegiate Student Prize winners are noted below.

Carl Schoellhammer, the "Cure It!" graduate winner from MIT, develops novel devices and treatment modalities to enable the transdermal and oral delivery of biologics; his inventions aim to ease discomfort for millions of patients. Joseph Barnett and Stephen John, a team from Western Michigan University, won the "Cure It!" undergraduate prize. The team is developing NeoVent, a low-cost respiratory solution for premature infants around the world.

Josh Siegel, the "Drive It!" graduate winner from MIT, invented a cloud-based platform that uses automotive data to optimize vehicle efficiency, performance, and reliability.

Alexander Richter, the "Eat It!" graduate winner from North Carolina State University, invented a technological solution to address the urgent global food scarcity challenge.

Justin Keenan and Kevin Paroda, a team from Penn State University that is creating the next dimension of three-dimensional (3-D) printing, won the "Use It!" undergraduate prize. The team's invention, commercialized by their company, Mobium Solutions, embodies the maker spirit and focuses on making 3-D printers more accessible by creating 3-D add-on products.

The Lemelson-MIT National Collegiate Student Prize Competition continued to serve as a highlight of LMIT's recognition activities, with more than 27 million media impressions in outlets such as *Forbes* and *Discovery*. Other highlights this year include:

- NVBots, the 2014 "Use It!" undergraduate team winner, closed a more than $2 million seed round to finance their production of the NVPro device and research and development. The company now has 12 full-time employees and is partnering with Staples.

- Nate Ball, the 2007 $30,000 Lemelson-MIT Student Prize winner, celebrated the 10-year anniversary of his company, Atlas Devices.
- Miles Barr, the 2012 $30,000 Lemelson-MIT Student Prize winner, was selected as a MIT Technology Review 35 Innovator Under 35 in 2014. His company, Ubiquitous Energy, was highlighted in Bloomberg News.

Inspiring Youth: Specific Initiatives

Invention Education

LMIT's Invention Education activities contracted during this reporting period because of personnel limitations. Efforts were focused in support of the Inventing and Sustainability merit badges of the Boy Scouts of America. Dr. Eric Evans, director of MIT's Lincoln Laboratory, invited the invention education officer to be a focus group member to help determine the laboratory's future support to Boston Minuteman Council STEM expansion. The program supported two Boy Scouts STEM camps with guidance and personnel to lead youth in achieving the Inventing and Sustainability merit badges. Nationally, the Inventing merit badge with the Boy Scouts of America was awarded to 2,902 Boy Scouts in 2014. Collaborations with the Girl Scouts of Oregon and Southwest Washington began. LMIT's collaboration with GiantOtter to use artificial intelligence to model personality, social interaction, and communication for an interactive game to develop inventive youth is still in progress. Invention Education, through White House Science Fair coverage, received 20.6 million impressions via print, online, broadcast, and social media.

LMIT continued to be a leader in MIT's K–12 outreach activities in fiscal year 2015, including active engagement and collaboration with the Edgerton Center and the MIT Museum, as well as through MIT alumni interest groups.

InvenTeams

InvenTeams, LMIT's premier hands-on invention experience for teams of high-school students, educators, and mentors, continued as a national program in FY2015, with 15 new grants.

LMIT continued several programmatic improvements to InvenTeams this year. These included:

- Conducting all InvenTeams site visits earlier than in previous years (and before the end of the calendar year);
- Holding trainings in communications and public relations and "Finance 101" using Adobe Connect;
- Video conferencing with the teams;
- Support of Invention Education master teachers to attend site visits and mid-grant technical reviews for InvenTeams;
- Requiring teams to hold mid-grant technical progress reviews that were open to their communities; and

- Establishing a team blog as the monthly report medium (the blogs feed into LMIT's website).

Media coverage of the FY2015 announcement amounted to more than 2 million impressions, including online articles, social media, and regional broadcasts.

Junior Varsity InvenTeams

JV InvenTeams, LMIT's hands-on/minds-on invention experience for ninth- and 10th-grade students and their educators at low-resourced schools, continued to expand during its second year with the addition of schools in Oregon. The Massachusetts sites were Bartlett Junior Senior High School (Webster), Chelsea High School (Chelsea), Holyoke Public Schools (Holyoke), Lowell High School (Lowell), Putman Vocational Technical School (Springfield), Sociedad Latina (Boston), Wareham Public Schools (Wareham), and Triton Regional School District (Byfield). The Texas sites were Cypress Springs High School (Cypress), Energy Institute High School (Houston), Galena Park High School (Galena), KIPP Houston High School (Houston), KIPP Sunnyside High School (Houston), Sharpstown International School (Houston), Waller High School (Waller) and Yes Prep West (Houston). The Oregon sites were Siuslaw High School (Florence), Oregon City Learning Academy (Oregon City), Milwaukie High School (Milwaukie), and Klamath Union High School (Klamath Falls).

There was no press announcement for the JV InvenTeam initiative in FY2015. Lemelson-MIT instead focused media outreach efforts on EurekaFest at the Oregon Museum of Science, where corporate sponsors Stanley Black & Decker and the Columbia Sportswear Co. were referred to in full-length stories. More than 1 million impressions were garnered from media outreach.

Community Engagement

FY2015 community engagement efforts, typically comprising a letter-writing and email awareness campaign and engagement events, focused on writing letters for InvenTeams and was executed in the spring instead of immediately after the fall 2014 InvenTeam announcement. The delay was caused by November elections and personnel resource constraints that slowed the researching of contact information. Elected and school officials in each InvenTeam community received a letter from LMIT that encouraged recognition of the InvenTeam. The Lemelson-MIT InvenTeam in Virginia received congratulatory letters from their US senator, governor, and lieutenant governor, and the InvenTeam in Texas received a letter from their lieutenant governor. This effort exceeded its goal of a 10% response rate target.

LMIT did not have the resources to support and attend community engagement events as it had in previous years; these community events often help schools gain community support for ongoing projects. LMIT still suggested that InvenTeams hold mid-grant technical review events on their own, which several did. The site visit/mid-grant technical review with the Concord High School InvenTeam (Wilmington, Delaware) included a visit from Delaware Governor Jack Markell, who offered a strong message in support of STEM education. Several teams have garnered financial support as a result of these events. Davenport West High School InvenTeam (Davenport, Iowa), for example,

received a donation of $10,000 from a local philanthropist who attended the team's mid-grant technical review. The InvenTeam secured an additional $5,000 from a competition. Community engagement efforts in FY2016 will be expanded to provide more support for InvenTeams community engagement events and include JV InvenTeams outreach.

EurekaFest 2015

LMIT held its ninth annual EurekaFest event June 19 and 20. EurekaFest was focused on InvenTeams and the Lemelson-MIT National Collegiate Student Prize winners.

EurekaFest is a multi-day celebration designed to establish a tradition of invention through activities that inspire youth, honor role models, and encourage creativity and problem solving. It comprises two major components: a series of events, held at MIT over two days, that serves as a capstone for InvenTeams students and as training for prospective InvenTeams educators; and a celebration of the Lemelson-MIT National Collegiate Student Prize winners. The two days include an all-day design challenge and public engagement event. Professor Michael Cima, who is LMIT's faculty director, and Vice President for Open Learning Sanjay Sarma presided over the awards ceremony on Friday, June 19. Dorothy Lemelson, co-chair, and Carol Dahl, executive director of the Lemelson Foundation, attended EurekaFest and spoke on behalf of the foundation.

LMIT continued its partnership with the Museum of Science, Boston, on an iteration of last year's "Duck 'n Hover" design challenge, in which high-school students from across the country designed and built a wind-powered device that could hover three stories in the air while carrying rubber ducks as payload. The devices were built in the morning on the MIT campus and displayed in the afternoon at the Museum of Science. Students from the Science Club for Girls and the Museum of Science participated in EurekaFest along with InvenTeam students.

Lemelson-MIT Collegiate Student Prize winners were presenters and critiqued the InvenTeams' presentations. Excite Award recipients (finalists for InvenTeams grants) participated in active learning workshops on tools, electronics, and the invention process. They were also able to learn about the InvenTeams experience from teachers and students. Surveys were conducted at the end of the event to collect information on InvenTeam students' and educators' experiences, but the responses have not yet been analyzed.

LMIT aggressively marketed EurekaFest, and especially EurekaFest at the Museum of Science, with expanded radio spots on WBUR, announcements in local events calendars, on-campus promotions intended to reach the broader MIT community, and large MBTA bus-stop posters around Kendall Square that featured Lemelson-MIT National Collegiate Student Prize winners. EurekaFest garnered more than 3 million media impressions and many prominent listings of its events, including in the *Boston Globe* and *Boston Common Magazine*.

Finances and Funding

Fiscal year 2015 was the third year of LMIT's current four-year funding cycle with the Lemelson Foundation. The FY2015 grant was approximately $3 million. The Lemelson

Foundation allowed LMIT to retain $465,732.84 in unspent funds from FY2014 and to add the FY2014 interest of $23,442.98 to FY2015's budget, bringing that budget to $3,489,175.82. The unspent money and interest will be used to invest in the future of JV InvenTeams by improving the current and developing new JV InvenTeams content offerings, to undertake Phase 2 of LMIT's website redesign, and to develop a small custom publication and web presence around LMIT's 20th anniversary.

Future Plans

The Lemelson-MIT Program plans to:

- Continue to execute the revised proposal to the Lemelson Foundation for fiscal years 2015 and 2016;
- Continue to increase female representation in InvenTeams, both through outreach to more girls' schools and in invention education outreach overall, through renewed efforts to engage with the Girl Scouts of America;
- Identify partners for the expansion of JV InvenTeams;
- Further refine the annual awards program, including continuing emphasis on obtaining nominations of women and other groups whose members are underrepresented in STEM fields, for the Lemelson-MIT Prize and the Lemelson-MIT National Collegiate Student Prize Competition;
- Celebrate the 20th anniversary of LMIT; and
- Cultivate additional sources of funding.

Personnel Changes

LMIT undertook a rigorous process to find the best candidates for two open positions: invention education associate (InvenTeams) and finance and program assistant. The processes took significantly longer than anticipated, directly affecting financial results (salaries and benefits for six months for the invention education associate and for 10 months for the finance and program assistant). The delay meant that LMIT had to reset priorities and to scale back some efforts such as community engagement (as noted earlier) that affected operations spending in activities. LMIT is confident that the new team members will help LMIT continue to exceed expectations.

Anthony (Tony) Perry joined LMIT in February 2015 as the invention education associate. It was a challenging fall and winter; the position had been empty since August 2014 and Liza Goldstein—LMIT's other invention education associate (JV InvenTeams) was on leave until December 2014. LMIT leaned more heavily on master teachers and secured contract and student workers to provide support to Leigh Estabrooks, our invention education officer, during this time.

Steven Rinaldi joined LMIT in early May as the finance and program assistant. LMIT has leveraged student workers to support Kerri Mills in the meantime.

Joshua Schuler
Executive Director