

## Lemelson-MIT Program

The [Lemelson-MIT Program](#) (LMIT) continued its mission in academic year 2017 of celebrating outstanding inventors and inspiring youth through its awards program, invention education activities, and communication activities, including EurekaFest. A new executive director, who joined the program in July 2016, will inform a new strategic plan and four-year grant period with the Lemelson Foundation beginning in January 2018. Discussions of the strategic plan and four-year grant proposal are currently in process; a final proposal is due to the Lemelson Foundation in October.

Noteworthy outcomes for AY2017 included:

- MIT inventor of femto-photography awarded the [\\$500,000 Lemelson-MIT Prize](#);
- Continued partnership with *MIT Technology Review* to celebrate the Lemelson-MIT Prize winner;
- More diverse winners in the national student prize competition for graduate and undergraduate students;
- New executive director;
- Completion of eight online JV InvenTeam activity guides and infrastructure needed to make complete kits of materials and tools online available for purchase;
- Expansion of the JV InvenTeams to 42 teams;
- New marketing and communication efforts for invention education;
- New partnerships; and
- Continued recognition for InvenTeams from elected officials through community engagement efforts.

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 Student Prize Competition](#).

LMIT strives to increase the number and diversity of high-quality nominations for the \$500,000 Lemelson-MIT Prize each year. The goals for the prize in AY2017 included having 10 new nominations and two women nominees. The nomination pool resulted in a total of 24 nominations, with 21 from academia and three from the private sector. Fourteen out of the 24 nominations were new nominees and four female nominees placed in the top 11.

The screening committee—comprising MIT alumni and faculty, and members of the no-longer-awarded Lemelson-MIT Award for Global Innovation—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 2016 \$500,000 Lemelson-MIT Prize in mid-May. The winner, [MIT Professor Ramesh Raskar](#), inventor of femto-photography, was announced in early September before EmTech 2016, where he was celebrated. The announcement exceeded 48.3 million impressions, largely generated by social media (47.9 million). Total impressions attributed solely to traditional media (online, print, and broadcast) amounted to 382,150 impressions. The media data represents a significant shift over the past three years from print and online placements to social media.

### **Lemelson-MIT Student Prize Competition**

The national Lemelson-MIT Student Prize competition is open to graduate students and teams of undergraduate students that are selected on the basis of their inventive work and its significance to the US economy. The nonmonetary student prize incentives include prestige, communication and media training, networking opportunities with other inventive students, judges, past winners, and the Lemelson network, and a push for significant media coverage. The prize categories remained the same for 2017 as in 2016: "Cure It!" (healthcare), "Use It!" (consumer devices), "Eat It!" (food and agriculture), and "Drive It!" (transportation).

The Lemelson-MIT Student Prize recruiting efforts reached 140 applications, a drop from last year's 193 applications and short of the goal of 200 applicants per year. LMIT fell under the category goal of 36 "Eat It!" graduate and undergraduate applications (there were 18) and the category goal of 44 "Drive It!" graduate and undergraduate applications (there were 10). This decline is attributable to the lack of an executive director for six months and the need to control the award officer workload associated with both the Lemelson-MIT Student Prize and the Lemelson-MIT Prize. However, there was a 50% increase in the representation of female graduate students who applied (33% compared with 21% in prior year).

Screening committees were formed to select graduate student and undergraduate student team finalists in the competition's four categories. These committees included experienced screeners from the Lemelson-MIT Student Prize competition and experts in health technology, consumer products, transportation, and food and agriculture. Finalists submitted videos of their inventive work and 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 \$15,000 graduate prizes and \$10,000 undergraduate team prizes. Nine prizes were awarded in 2017, with the most women among the winners of the national student prize to date. The national jury chose two graduate women winners in the "Cure It!" category who were both doing exceptional inventive work that had potential effects on society. Five of the nine winners the jury selected were from MIT. The nine [winners of the 2017 Lemelson-MIT Student Prize are:](#)

[Lisa Tostanoski](#), "Cure It!" graduate winner from University of Maryland, developed an innovative idea to deposit microparticles in lymph nodes—the tissues that orchestrate immune responses to control the local release of regulatory immune signals and program cells not to attack "self" tissues. Her studies in a mouse model of multiple sclerosis demonstrated that a single intra-lymph- node dose permanently reverses disease-induced paralysis.

[Katy Olesnavage, “Cure It!”](#) graduate winner from MIT, invented a process to create high-performance, mass-producible, low-cost prosthetic feet.

[Maria Filsinger Interrante, Zachary Rosenthal, and Christian Zoe, “Cure It!”](#) undergraduate team winner from Stanford University, developed novel protein drugs to kill multi-drug-resistant gram-negative bacteria. These molecules can get in through the first cell wall and trigger lysis of the bacteria from within, offering a new strategy to combat an urgent global problem.

[Tony Tao, “Drive It!”](#) graduate winner from MIT, invented a small (6” long) electric unmanned aerial vehicle (UAV) that could be jettisoned from a mothership at high speeds and altitudes. The UAV (and its canister) is designed to stabilize, unfold in free fall, and fly autonomously in a swarm to take data and radio it back to the mothership or to personnel on the ground.

[Tomas Vega and Corten Singer, “Drive It!”](#) undergraduate team winners from the University of California, Berkeley, developed an open-source, modular, adaptable, smart wheelchair that provides spatial awareness for visually impaired users to prevent obstacles and ease their navigation.

[Natasha Wright, “Eat It!”](#) graduate winner from MIT, developed a photovoltaic (solar) powered desalination system for off-grid water production in communities in India and Gaza. The system uses a technology called electro dialysis reversal.

[Matthew Rooda and Abraham Espinoza, “Eat It!”](#) undergraduate team winners from the University of Iowa, developed the SmartGuard device to reduce the incidence of piglet mortality caused by accidental crushing by the mother pig.

[Apoorva Murarka, “Use It!”](#) graduate winner from MIT, invented an electrostatic transducer that uses a 125-nanometer-thick metallic film—approximately one thousandth of the width of a human hair—to produce high-fidelity sound more efficiently.

[Chandani Doshi, Grace Li, Jessica \(Jialin\) Shi, Chen \(Bonnie\) Wang, Charlene Xia, and Tania Yu, “Use It!”](#) undergraduate team winners from MIT, invented Tactile, a portable, real-time text-to-braille converter. The device allows people who are visually impaired to take a picture of printed text that will be transcribed to braille on a refreshable display.

Winners were announced through a national press release and in coordination with their schools on April 19, 2017. The Lemelson-MIT Student Prize continued to serve as a highlight of LMIT’s recognition activities, with more than 97.64 million total media impressions.

LMIT celebrated the winners at EurekaFest, June 16–17, 2017, 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. New partnerships and opportunities for invention education are described below.

## InvenTeams

[InvenTeams](#), LMIT's premier hands-on invention experience for teams of high-school students, educators, and mentors, continued as a national program. LMIT announced the selection of 15 2016–2017 InvenTeams, representing 13 US states, on October 25, 2016. InvenTeams' projects were under way in November, with teams completing research and outreach to beneficiaries customers. Prototypes were built and iterated in December through late April, when teams begin to think about EurekaFest.

LMIT continued programmatic improvements. These included:

- Conducting all 15 InvenTeams site visits before the end of 2016. Site visits early in the grant cycle offer guidance to teams for successful start-up of the invention process;
- Exhibiting and presenting at all three National Science Teachers Association regional conferences in the fall of 2016 to raise educators' awareness of LMIT's invention education programmatic offerings—JV InvenTeams, InvenTeams, and invention education in general;
- Holding trainings in communications and public relations and “finance 101” using Adobe Connect and videoconferencing with the teams;
- Supporting InvenTeam master teachers to attend site visits and mid-grant technical reviews for InvenTeams; and
- Requiring teams to hold mid-grant technical progress reviews open to their respective communities.

Media coverage of the 2016 announcement amounted to more than 2.2 million impressions, including online articles, social media, and regional broadcasts. National media placements appeared on FoxNews.com, STEMDaily.com, WomenYouShouldKnow.com and TheJournal.com.

## Junior Varsity InvenTeams

The majority of effort on the Junior Varsity (JV) InvenTeam initiative during July and August 2016 focused on the completion of four additional invention activity guides, involving three outside contractors. The goal was to have eight JV InvenTeams activity guides available for download on the Lemelson-MIT website by September 1 to provide additional invention educational resources, not just for JV InvenTeam grantees, but for the general public for free.

LMIT continued to work with the kit vendor, AquaPhoenix Scientific, to set up online ordering of invention kits for grantees and the general public from the Lemelson-MIT website. Invention kits contain most materials and tools needed to create the invention activity aligned with each JV InvenTeam activity guide. Kits are designed for 20 students and cost no more than \$500. Currently, four invention kits are available for purchase on the website. LMIT will be working closely with AquaPhoenix to make the additional four JV activity guide invention kits available on the LMIT website for September 2017.

Lemelson-MIT announced the award of [42 JV InvenTeam grants](#) to 39 schools in California, Massachusetts, Oregon, and Texas in a press release during National Engineering Week in February. The announcement also publicized the availability of JV InvenTeam activity guides for any educator to download free from the Lemelson-MIT website and the program's new offering of professional development workshops for a fee that will take place in July 2017. JV InvenTeams in each geographic location were offered a field trip to visit a college campus or science museum. Massachusetts teams had the opportunity to visit MIT and attend the Cambridge Science Festival; California JV InvenTeams visited Antelope Valley College; Oregon JV InvenTeams visited the Oregon Museum of Science; and Industry and Texas JV InvenTeams visited Rice University. All schools and organizations that receive JV InvenTeam grants serve student populations with high proportions of students who are eligible for free or reduced-price lunches.

### **Community Engagement**

Lemelson-MIT started a community engagement campaign in 2011 to create awareness among political and community leaders about the InvenTeams projects happening in their community and the support needed from the community to sustain the projects throughout the school year and beyond. The success of this campaign depends on consistent, continuing outreach. At the start of the InvenTeam grant period, LMIT sends a letter to political leaders in communities where one or more schools has a team; in response to LMIT's letter, the school or schools receive a certificate of appreciation from political leaders. This recognition helps to excite and encourage InvenTeams. A list of local officials and supporting mentors and local organizations are included in the final grant application for InvenTeams.

Community engagement efforts for AY2017 focused on letter and email campaigns for InvenTeams. The letter and email campaign for InvenTeams was executed in late January, in anticipation of the letters arriving on the desks of elected officials on or near the date of National Inventors Day in February. Elected and school officials in each InvenTeam community received a letter from LMIT that encouraged recognition of the InvenTeam. Emails were sent to school administrators and additional supporting local companies that were listed in the InvenTeam grantee's application. LMIT sent 208 letters and 234 emails to elected officials, school administrators, and community members in InvenTeams communities. A second letter and email campaign was executed in mid-May to invite special community members, partners, and elected officials to EurekaFest. These members of the community either participated at their school events or gave recognition or donations to the teams. The highlights from the InvenTeams community engagement campaign this year included:

- The DIY Girls InvenTeam of San Fernando, California, a city in Los Angeles County, created a prototype of a solar-powered tent geared toward providing the homeless with a safe and efficient temporary shelter. DIY Girls is an established nonprofit that provides science, technology, engineering, and mathematics (STEM) education to Latina or Hispanic girls in the Los Angeles region. Prior to having an InvenTeam, the nonprofit had gained some local recognition, but with the help of the InvenTeam grant and the Lemelson-MIT Program, DIY Girls received national attention from political figures such as California Secretary of State Alex Padilla, Congressman Tony Cardenas, and Chelsea Clinton. The team's news coverage appeared in sources such as Mashable, [National Public Radio](#), and an on-air radio interview with radio personality and former "American Idol" host Ryan Seacrest. Additionally, DIY Girls has strong ties to MIT; the school's lead educator, Evelyn Gomez, graduated from MIT in 2010; DIY Girls Executive Director Luz Rivas graduated from MIT in 1995; and California Secretary of State Alex Padilla graduated in 1994 and served on the MIT Corporation for five years.
- Another success story came out of the Charles R. Drew Charter Senior Academy InvenTeam in Atlanta, Georgia. The team worked on a prototype to monitor the back seat of a car for the presence of a child or a pet; in hot weather, a child or pet forgotten in a back seat may die. The local news stations in Atlanta picked up the story (Fox 5 News and [11 Alive, NBC](#)), which led to an invitation from Dr. Phil to be a part of the audience during a show. They raised more than \$23,000 on their [GoFundMe page](#).
- Greenbrier East High School's InvenTeam in Lewisburg, West Virginia, created a system to transform waste cardboard into a building product, specifically, a brick. The team planned on continuing this project and their invention of the "Greenbrick" after EurekaFest to help Lewisburg, which was recently flooded, leaving people homeless and without a way to rebuild their homes efficiently. The team received citations from the outgoing West Virginia governor. The incoming governor, Jim Justice, attended and spoke at their team's mid-grant technical review. The team also received news coverage from the local [NBC affiliate](#).

## EurekaFest 2017

LMIT held its eleventh annual [EurekaFest](#) event on June 16–17, 2017. EurekaFest was focused on InvenTeams and the Lemelson-MIT Student Prize winners.

EurekaFest is a multiday celebration designed to establish a tradition of invention through activities that inspire youth, honor role models, and encourage creativity and problem solving. It comprises a series of events held at MIT over two days that serves as a capstone for InvenTeams students, as training for prospective InvenTeams educators, and as a celebration of the Lemelson-MIT Student Prize winners. New this year was a series of workshops that LMIT held for student prize winners, such as financing an invention or business and how to market a venture. The two days included an all-day design challenge and public engagement event. Faculty Director Professor Michael Cima and Executive Director Stephanie Couch presided over the awards ceremony on Friday, June 16. David Coronado, program officer at 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 finale 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 Student Prize winners were presenters and critiqued InvenTeams' presentations. Excite Award recipients (finalists for InvenTeams grants) participated in active learning workshops. 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 marketed EurekaFest in local events calendars, with letters to local businesses, with on-campus promotions intended to reach the broader MIT community, and with large Metropolitan Boston Transit Authority bus-stop posters around MIT and Kendall Square that featured MIT winners of the Lemelson-MIT Student Prize.

## Partnerships and New Activities

### MIT EmTech

LMIT established a partnership with *MIT Technology Review* in 2013 to provide an annual celebration of the Lemelson-MIT Prize winner at a peer-level event. Ramesh Raskar was congratulated on the first night of [EmTech 2016](#), which included a presentation and fireside chat with Jason Pontin, *Technology Review's* editor in chief; remarks from Carol Dahl, executive director of the Lemelson Foundation; and a celebratory 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.

The 2017 winner, who was selected in early June, will be announced in mid-September 2017 and celebrated in early November at EmTech 2017. The celebration will again include a brief presentation, fireside chat with the editor, presentation of the prize, and a reception.

### Dewey Square Group

To support a reexamination of LMIT's communications efforts, LMIT issued a request for proposals and communications plans from top public relations firms. As a result, LMIT determined that the program will be best served by a change from Cone Communications to Dewey Square Group. The change is effective on January 1, 2017. The request for proposals limited the new communications firm's role to the Lemelson-MIT Prize and Lemelson-MIT Student Prize. The prize efforts are national in scope and the target audiences can be engaged through strategies typically employed in the mass communications arena. More direct communications and marketing strategies will be implemented for the invention education part of the program.

## **Innoskate 2016**

Lemelson-MIT partnered with the Lemelson Center for the Study of Invention and Innovation to bring [Innoskate](#) to the Lynch Family Skatepark in Cambridge, Massachusetts, on October 29, 2016. LMIT co-hosted a master class at MIT the night before to explore the deeply rooted connections between behaviors and strategies that promote creative and innovative thinking and action. Two MIT professors, Allan Adams and Peko Hosoi, joined skateboarder Rodney Mullen, multimedia artist Steven Sebring, and Secretary General of the International Skateboarding Federation Josh Friedberg. Approximately 250 people from the skateboarding, MIT, and Cambridge communities attended the master class. The Innoskate festival at the Lynch Family Skatepark had approximately 3,000 in attendance. The public festival was full of skating activities, hands-on design activities, high-speed photography demonstrations, and panel discussions. Panel discussions included topics on the history of skateboard innovation with MIT lecturer Christina Chase, and on innovation, collaboration, community, and the skateboarder's brain with MIT graduate student Chris Leppla. Local students, including JV InvenTeam students, assisted with hands-on activities and greeting the public.

## **The Engine**

The Lemelson-MIT Program was asked this fall to assist MIT with the development of a school outreach program that could be affiliated with the “Engine” — a new space in Central Square that is bringing support to early-stage companies that require expensive equipment. Conversations with the mayor, city staff, the Cambridge Community Foundation, and many others have resulted in a concept paper that proposes the development of a “pathway to invention” for young people that includes elementary school students. Contributions to local schools that other Lemelson Foundation grantees can make will be included as part of the pathway offerings. The pathway initiative is being talked about as the “fuel” that is needed to complement the “Engine.” Although it was developed for youth in MIT's backyard, this approach can be researched and can serve as a model for advancing an array of invention education programs in other communities across the US.

## **Administration**

The close of 2017 marks the end point in the Lemelson-MIT Program's current grant from the Lemelson Foundation. LMIT included in that grant an objective to change from a July 1 to June 30 fiscal year to a January 1 to December 31 year—thus, proposing an interim grant period of 18 months to be followed by a conventional four-year grant period starting January 1, 2018. LMIT will continue to celebrate, inspire, and educate its target audiences and is excited to undertake a new four-year grant proposal starting January 1, 2018.

## **Finances and Funding**

LMIT adjusted its fiscal year from July 1 to June 30 to January 1 to December 31 for the upcoming grant period. A six-month extension (July 1, 2016, to December 31, 2016) at the beginning of the four-year grant period made the fiscal year synchronous with the calendar year and allowed the new executive director enough time to inform a new strategic plan for the new grant proposal.

LMIT requested a total budget of \$4,621,757 from the Lemelson Foundation to fund activities from July 1, 2016, to December 31, 2017.

## Personnel Changes

LMIT undertook significant personnel changes in AY2017. [Stephanie Couch](#) started as the new executive director on July 11, 2016. Gayle Golding and Kayley Bolstad joined the Lemelson-MIT Program in August as financial and administrative assistant II and program assistant, respectively. Gayle provides general operations assistance and Kayley provides programmatic assistance with the prize programs, InvenTeam finances, and community engagement efforts. Marlena Love, the program's award officer, resigned on January 18, 2017. Recruitment efforts to find a replacement began in mid-December so that Love could be involved in the interview process. Janell Ciemicki joined the program in February 2017 as Love's replacement.

Couch and Boyle worked with the Human Resources staff in the Office of the Dean in the School of Engineering to write updated job descriptions and a new approach for conducting annual employee evaluations. This work raised the need to revise job titles for several employees so that they aligned with standard practices at MIT. The new titles and incumbents are Stephanie Martinovich, communications manager; Connie Wang, communications coordinator; Liza Goldstein, invention education coordinator; and Tony Perry, invention education coordinator.

## Future Plans

The Lemelson-MIT Program plans to:

- Continue to undertake finalizing a new grant proposal to the Lemelson Foundation for the grant period starting January 1, 2018;
- Increase diversity in recruitment efforts for the prize program;
- Cultivate additional sources of funding to grow the program's annual revenue;
- Continue marketing efforts surrounding the availability of JV InvenTeam activity guides and kits;
- Offer ongoing professional development webinars and workshops for middle and high school educators;
- Finalize a strategic plan for invention education and LMIT's work over the next three to five years; and
- Work with the mayor and city of Cambridge, Cambridge Public Schools, the Cambridge Community Foundation and MIT's "Engine" to develop a "pathway to invention" for young people in Cambridge that can "fuel" the Engine.

**Stephanie Couch**  
Executive Director