LINCOLN LABORATORY
COMMUNITY OUTREACH

MIT LINCOLN LABORATORY

2018 COMMUNITY INVOLVEMENT REPORT

Contents

GEM students and Eric Evans join MIT's mascot, Tim the Beaver, to cheer about the benefits of being a GEM Fellow.

A Message

From the Director

Community outreach and education programs are an important component of the Laboratory's mission. From the beginning, our outreach initiatives have been inspired by employee desires to help people in need and to motivate student interest and participation in engineering and science.

The Laboratory's educational outreach provides in-classroom presentations and Science on Saturday demonstrations to regional K–12 schools. We sponsor FIRST robotics programs and offer mentor-based internships for college and graduate students preparing for science and technology careers. There are also opportunities to be a part of the Laboratory's volunteer base by serving as judges and advisors for local and regional science fairs and science-based activities.

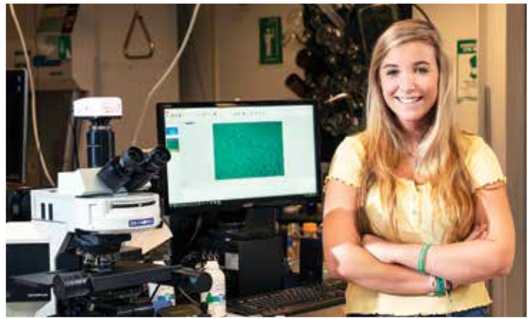
The Laboratory is committed to giving back to the community by sponsoring fundraising and community service events in support of the Alzheimer's Association, American Heart Association, Wounded Warriors, and other charitable organizations. The involvement of the entire Lincoln Laboratory community is encouraged, and suggestions on how we might improve our outreach activities are welcome.

Eric D. Evans
Director

01 / EDUCATIONAL OUTREACH

Lincoln Laboratory takes pride in promoting science and engineering education for all grade levels in three main areas:

- K–12 STEM Outreach
- Partnerships with MIT
- Community Engagement



> “I got to help the LLRISE students with soldering, which gave me insight to some common problems that I could address in the board design.”
>
> —JONATHAN DUFFY, LLRISE INTERN

Jonathan Duffy (far left), an LLRISE participant in 2014, interned at Lincoln Laboratory this summer. He researched different ways to lower the cost of a radar kit from $400 to $130 in an effort to offer an online LLRISE class for schools across the country. At left, an LLRISE student solders wires to 3D-printed components for her range radar system.

Lincoln Laboratory Radar Introduction for Student Engineers (LLRISE)

Nineteen students from across the country completed the Lincoln Laboratory Radar Introduction for Student Engineers (LLRISE) two-week radar workshop. Now in its seventh year, the summer course challenges high school seniors to build their own small radar systems as they tackle college-level courses, tour Laboratory facilities, and sample college life while staying in MIT dormitories.

The students learn about physics, electromagnetics, Doppler radar, pulse compression, signal processing, circuitry, and antennas. Then they apply knowledge from the lectures as they build their own radar. In addition, they learn how to use a 3D printer and soldering iron. After the radars are completed, the students stage experiments and present a technology demonstration.

“LLRISE incorporates project-based, hands-on learning opportunities,” said Kelli Thornhill, an intern in the Communications and Community Outreach Office who helped with LLRISE. “The students accepted into this program gain an understanding of radar technology, but more importantly, they gain an understanding of what the emerging STEM fields look like in both a professional and a college environment.” /

Two secondary education teachers, Abdon Ascalera Rosario (left) and Ashley Puopolo (above), practiced building radars in LLRISE in hopes of offering the program at their respective schools.

LLRISE for TEACHERS

For the second year, the LLRISE program included two secondary education teachers who learned the principles of radar and built their own radar systems. They plan to recreate the LLRISE program at their own schools in Stoneham, Massachusetts, and Puerto Rico.

Ashley Puopolo was one of two secondary education teachers who attended LLRISE this year. As a STEM specialist for the Stoneham Public School District, Puopolo appreciated the opportunity to attend LLRISE and learn course content with the students. “The workshop exceeded my expectations,” she said. “LLRISE has so many different components that opened my eyes as an educator to different models of teaching.”

Puopolo shared that one of the highlights of the workshop was touring Laboratory facilities, such as the Microelectronics Laboratory and Rapid Prototyping Lab. “These tours helped me realize the connection between different technologies and how they are applied,” said Puopolo.

Abdon Ascalera Rosario, an instructor at the Boys and Girls Club of Puerto Rico, also attended LLRISE this year. He shared his hope that kids in Puerto Rico will be able to enjoy the same STEM experience as the students who attended LLRISE: “We have a STEM program [in Puerto Rico], but we don’t have a curriculum that covers radar. Now we can incorporate the lessons learned in LLRISE to introduce these concepts to our students.” /

Spotlight:

Girls Who Build: Music Technology

On February 3, 40 high school girls and 30 Laboratory volunteers spent their Saturday at Beaver Works in Cambridge, Massachusetts, exploring the relationship between engineering and music. The workshop was the latest in the annual Girls Who Build series that is designed to help increase the number of girls entering STEM fields by demonstrating how engineering can be applied to any passion.

"We break down stereotypes of what an engineer does and what one looks like," said Kristen Railey, founder and co-leader of the program. Railey is a mechanical engineering doctoral candidate in the MIT and Woods Hole Oceanographic Institution Joint Program and a joint Draper Laboratory and Defense Science and Engineering fellow. She founded the workshop series in 2014 while a Laboratory staff member in the Advanced Undersea Systems and Technology Group. "Each of the workshops is hands on, creative, and applied to a theme that girls can relate to, such as music. Another important element to the workshops is incorporating female guest speakers from industry so the girls can see themselves as engineers."

"We strive to teach the participants hands-on skills they will need to have a successful career in engineering," said Kate Byrd, a member of the technical staff in the Advanced Sensors and Techniques Group and co-leader of the program.

The workshop included two activities, lectures by female engineers from the Laboratory, and a keynote speaker, Angela Roderick of Bose Corporation. Roderick described the path that led her to become an acoustical engineer and stressed the importance of deciding one's own career.

During the first activity, Build a Speaker, the girls worked in teams of three to make their own speakers. They collaborated for two hours to solder a printed circuit board and build a case to enclose the electronics. "As the participants were working, the volunteers explained printed circuit boards and the components needed," Byrd said.

For the second activity, Build a Guitar Synthesizer, the participants learned to code and then used their code to manipulate music and create original chords. "This was a great way to relate seemingly abstract engineering concepts like Fourier transforms to something that makes sense, like filtering bass or treble from a song," Byrd said. "It also gave the girls an opportunity to tap into their musical creativity as they composed their own song."

This year, Laboratory volunteers came from every technical division, the Information Services Department, and the Safety and Mission Assurance Office. "I was blown away by the support we received from the Laboratory," Byrd said. /

> "We fail every day, but we help each other find answers to problems. That's what engineering is all about."
>
> — ANGELA RODERICK OF BOSE CORPORATION, *KEYNOTE SPEAKER FOR GIRLS WHO BUILD: MUSIC TECHNOLOGY*

Participants work together to assemble the pieces of the speaker in the Girls Who Build: Music Technology workshop.

LLRISE in Rhode Island

Beginning in January, Laboratory staff visited the Metropolitan Regional Career and Technical Center (MET) in Providence, Rhode Island, and helped five students build radars. Eric Phelps, George Pantazis, and Chiamaka Agbasi-Porter supplemented the history curriculum of a class learning about how radar was used in the Battle of Britain. They prepared an online version of the LLRISE course, visited the school for the initial radar building phase, and hosted hands-on building and testing radars here at the Laboratory. While here, the students were given tours of a variety of Laboratory facilities. /

(Left) MET students listen to George Pantazis (right) for instructions on assembling a radar. **(Below)** A student practices soldering for their radar.

(Above) FIRST LEGO League teams show off their robots and programming abilities at a scrimmage. **(Right)** A FIRST LEGO League team strives to complete their space mission during the scrimmage using the LEGO robots they built over the fall season.

Robotics Outreach

Robotics Outreach at Lincoln Laboratory (ROLL) is designed to stimulate youth interest in robotics and engineering through hands-on activities. Each year, ROLL provides demonstrations at several events, including the Cambridge Science Festival, a robotics-themed Science on Saturday show, and a variety of community STEM programs in the area. Members of ROLL mentor robotics teams participating in regional and national competitions. ROLL has dozens of volunteers each year, but the core volunteers in 2018 were Hemonth Rao, Richard Czerwinski, Jacob Huang, and Loretta Bessette. These volunteers help children learn how to program robots to compete in challenges specified by the FIRST (For Inspiration and Recognition of Science and Technology) organization.

The FIRST robotics competitions are divided into age groups. The younger students research engineering challenges, learn teamwork, and become familiar with motorized LEGO elements. Teams of middle and high school students are challenged to design, build, and program a robot to play a floor game and complete an obstacle course of the students' choosing. High school–aged teams compete head to head on a special playing field with robots they have designed, built, and programmed.

In 2018, 50 volunteers served as coaches and mentors for 17 Laboratory-sponsored teams totaling 134 students. ROLL has continuing collaborations with sister robotics teams in many nearby towns and Hanscom Air Force Base. ROLL ensures these teams have adequate supplies to build their robots. Sister teams stage scrimmages and share design concepts to ensure that each team is ready for competition. /

FTC Team 7297, named LiMITless, won the Motivate Award for their team building, enthusiasm, and effort to share the culture of FIRST with their community. Team 7297 is mentored by Joshua Sanz, Ekaterina Kononov, and Carol Chiang.

(Above) High school students compete with regional teams and test the design and programming of their robots.

Massachusetts FTC Robotics

Massachusetts FIRST Tech Challenge (MASSFTC) is an organization created by Loretta Bessette, a technical staff member at Lincoln Laboratory. MASSFTC is dedicated to spreading STEM through the FIRST program to students in Massachusetts. All high school–level robotics teams in the state belong to MASSFTC, which holds workshops and scrimmages to promote team cooperation prior to competitions. MASSFTC hosts a regional qualifier tournament, using ROLL volunteers as referees, judges, and volunteers. /

Middle school students interact with smart fabrics at the Defense Fabric Discovery Center.

Defense Fabric Discovery Center Tour

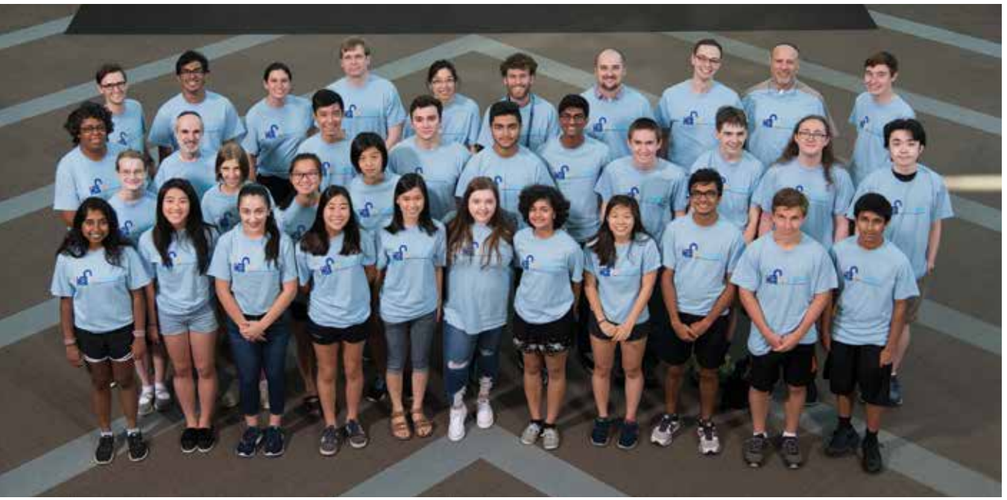
On February 26, middle school students from the Tremont School in Lexington, Massachusetts, visited the Microelectronics Laboratory and the Defense Fabric Discovery Center (DFDC). The students had been learning about fibers in class, and the school contacted the Laboratory to see how advances in research and development are leading to a transformation of textiles.

"Since the heart of the DFDC is the incorporation of semiconductor device functionality into fibers, we included a tour of the Microelectronics Lab," said Alexander Stolyarov of the Chemical, Microsystem, and Nanoscale Technologies Group. "The students got to see how traditional semiconductors are fabricated and how those same semiconductors can be integrated into textile fibers."

Stolyarov continued, "The students got to see all parts of the process—from the making of the preforms, to the fiber drawing, to the fabrics containing the device fibers. The students were just as amazed as the teachers. They were literally looking at and touching the world's first fabric optical communication system."

This field trip was the first public outreach activity the DFDC has held, but staff are looking forward to hosting more in the future.

"The students loved it," said Irene Jackson, a humanities teacher at the Tremont School. "One student said she felt she was seeing the future and that it was awesome." /



The 25 participants in LLCipher stand at the ready for a tour of Laboratory facilities. The LLCipher mentors are pictured in the back row.

LLCipher

Now in its fourth year, the LLCipher program, an introduction to cryptography and securing data, accepted high school juniors and seniors from the region to the Beaver Works Center in Cambridge, Massachusetts, from August 6 through 10.

The LLCipher program began when Bradley Orchard observed a lack of opportunity for advanced students who had completed calculus before their senior year of high school. Orchard recognized a significant need for additional learning experiences and more advanced topics than those currently offered in most high schools. “I have seen the beneficial effect of introducing advanced high school students to higher levels of mathematics, such as topics from set theory, abstract algebra, or real analysis,” he explained. Alexander Ledger, Gene Itkis, Noah Luther, and Ben Kaiser instructed the students in abstract algebra and number theory needed to apply the concepts used in blockchains and public key encryption. Martine Kalke explained the types of work that Lincoln Laboratory performs, while others, including Emily Shen, Nabil Schear, David Wilson, and Uri Blumenthal offered support to the students and the teachers of this program. /

> “Cryptography combines beautiful mathematics with powerful, useful, and fun techniques. Most importantly, there are aspects of cryptography that are very accessible to these advanced students.”
>
> — BRADLEY ORCHARD, CO-CREATOR OF LLCIPHER

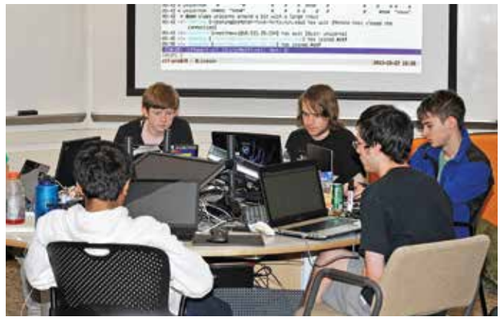
CyberPatriot and Capture the Flag

The Laboratory offers a joint program that introduces students to the challenges faced by cybersecurity specialists. Both CyberPatriot and Capture the Flag competitions engage students in races to find and fix bugs in computer systems.

Laboratory staff mentor and coach the students participating in the CyberPatriot and Capture the Flag competitions, teaching them the basics of cybersecurity. The goal of both programs is to encourage students to enter the computer science field. CyberPatriot is a nationwide Air Force program and competition that teaches high school students defensive computer security. In CyberPatriot, students delve into various exercises to learn how to identify malware, “clean” a computer system, and establish a secure network in a simulated corporate network setting. The Capture the Flag competition covers a wide variety of real-world cybersecurity skills, ranging from identifying flaws in cryptographic algorithms, to recovering forensic artifacts of a damaged hard drive, to exploiting a remote server to steal sensitive information. /

> During the CyberPatriot Finals Competition, we watch in amazement each year as our student competitors get more proficient at the rigorous tests we put them through,”
>
> — BERNIE SKOCH, CYBERPATRIOT NATIONAL COMMISSIONER

(Left) A team of 12 students competed in digital forensics and networking challenges under the guidance of Andrew Fasano, Christine Fossaceca, and Robert Elkind. **(Below)** A Capture the Flag team tests its cybersecurity skills while defending its network.



CERES Connection

In an effort to promote science education, the Laboratory collaborates with the Society for Science and the Public (which hosts three national science competitions, including the Regeneron Science Talent Search) and the International Astronomical Union in an initiative called the Ceres Connection. The Ceres Connection names minor planets in honor of the finalists of each science competition, as well as the finalists' teachers. All of the minor planets from the Ceres Connection were discovered by the Lincoln Near-Earth Asteroid Research (LINEAR) program.

"When we started getting asteroid naming rights in the late 1990s, we wanted to make sure that we used that unique opportunity to promote excellence in science education," said Grant Stokes, leader of the LINEAR program. "I can't think of a better way to inspire a generation of students and teachers than officially naming a part of the solar system in honor of them and their achievements."

Alumni of the Regeneron competition have made notable contributions to science and have earned some of the world's most distinguished science and math honors, including eight Nobel Prizes, five National Medals of Science, and two Fields Medals. This year, the finalists' research includes an algorithm for alleviating vehicular traffic delays, artificial intelligence to identify biased language in social media, and a three-year investigation into the effects of an insecticide on a bee population. /

Grant Stokes, seated center, joined the 40 finalists of the Regeneron Science Talent Search at the award ceremony in Washington, D.C., on March 13.

Students inspect CubeSat models while listening to a guest speaker from the STAR Lab (Space Telecommunications, Astronomy, and Radiation Laboratory), part of the Department of Aeronautics and Astronautics at MIT. Photo credit: Avery Normandin

Team America Rocketry Challenge

In 2018, Paul Devlin and Curtis Heisey helped a team of five students, grades 8 to 11, build a rocket to specifications and use it to compete in the Team America Rocketry Challenge (TARC). Devlin and Heisey helped the students build a rocket that would launch an egg 800 feet into the air and recover it safely, but the TARC-imposed restrictions on the shape of the rocket forced the students to face a number of flight stability issues in their rocket design. The students learned about version control while rapidly re-engineering a completely new rocket within two weeks. The fact that the team was able to conduct qualifying flights prior to the end of the competition period was an accomplishment in itself. /

Climate CubeSat Co-building Program (C^3)

To fulfill NASA's vision of 50 CubeSats from 50 States in 5 Years, the MIT Media Lab and Lincoln Laboratory collaborated to teach 20 Boston-area high school students about the full life cycle of spacecraft development. Beginning in March, students from the John D. O'Bryant School and the Clay Center Amateur Radio Club of Dexter Southfield School, both in Boston, Massachusetts, attended college-level lectures as part of a multiterm endeavor. As they learned about satellite systems, orbits, propulsion, climate science, electronics, coding, and hardware relevant to building a CubeSat (a miniaturized satellite), they took notes in preparation for build and test sessions in fall 2018. Kerri Cahoy, the MIT organizer for this program, provided a broad overview of small satellites and their utility. She and Ariel Ekblaw, the MIT Media Lab organizer, have had discussions with NASA and the U.S. Department of Education to scale the program nationally. Cahoy and Ekblaw aim to launch the CubeSats with a climate science–related payload sometime in 2019. /

The TARC team perform field tests of their rocket design to assess the need for any refinements before competition.

(Left) Julia Maybury extracts DNA from rainbow trout fish cells to capture luminescence that could be used in environmental screening. **(Below)** Elena Parsons peforms particle counter calibration.

AFCEA Internships

The Armed Forces Communications and Electronics Association (AFCEA) arranges summer internships for recent high school graduates interested in STEM careers. Each summer, two to four students are offered Laboratory internships, and at least 40 AFCEA students from schools in the local area tour the Laboratory facilities to learn about the latest research and career options in math and science. In 2018, three AFCEA interns worked at the Laboratory.

Julia Maybury worked with Scott Wick in the Bioengineering Systems and Technologies Group to establish luminescence in rainbow trout fish cells that can be used to enhance results from an environmental screening device. “The benefit of working at Lincoln Laboratory is that you are able to work on complex and groundbreaking research. The world-class facilities, deep expertise of the staff, and focus on scientific progress make for an exciting work environment,” Maybury said.

Kelli Therrien, who was mentored by John Boughner in the Advanced SATCOM Systems and Operations Group, worked on fiber-optic drawers, installing high-power amplifiers in Lincoln Laboratory’s experimental terminal and performing two feed swaps in the new multiband test terminal antenna.

While in the Chemical and Biological Defense Systems Group, Elena Parsons worked with John Williams analyzing microscopic chemical release and testing chemical sensors for potential airborne threats. Parsons was surprised to play an important role in a real program. She said, “I can’t believe that an 18-year-old intern is able to work on projects that actually impact the world. It was truly an invaluable experience.” /

(Right) participants of the Job Shadowing program on Daughters Day pose for a group photo with their mentors. **(Below right)** students in the Job Shadowing program practice some rudimentary 3D printing.

> “The Job Shadowing program enables students to be in a place where they can ask themselves, ‘Can I see myself here? Could I do this for a living?’ and come up with an honest answer.
>
> — VICTORIA LOEHLE, JOB SHADOW MENTOR

Job Shadowing

This was the second year that Daughters and Sons Days included the Job Shadowing program for high school students in grades 10–12. Thirty students and 27 mentors participated.

“My mentee and I took apart a rack of high-frequency digital receivers,” said Victoria Loehle of the Advanced Sensor Systems and Test Beds Group. “The best way to figure out whether you want to do something is to actually do it.” Loehle’s mentee asked how he could practice this work at home, and she suggested working on a software-defined radio. “My impression was that he’ll actually get the hardware, download the software, and play around with it.”

The Job Shadowing program also catered to students interested in careers outside of STEM fields. Jacki Smith—a high school sophomore and daughter of Gary Smith of the Laser Technology and Applications Group—is interested in a career in graphic design and shadowed Susan Hersey of the Technical Communications Group. “Every person I talked to gave advice that resonated with me and provided a glimpse into what life could be like as a graphic designer,” Jacki said. /

Girls Innovation Research Lab (G.I.R.L.)

Forty middle school girls gathered at Beaver Works in Cambridge, Massachusetts, on December 8 to discover electronics and programming through a new effort in Lincoln Laboratory outreach called Girls Innovation Research Lab (G.I.R.L.). Yari Golden-Castano taught the students about electronic components and different types of conducive and non-conducive materials. A second activity introduced the participants to block programming using Scratch. The instructors explained basic programming by having the students build piano keys and program them to change sound, color, or position. Later, the girls each built a circuit using a Makey-Makey board to respond to the keys as programmed. Both Scratch and Makey-Makey are tools that allow continued building on your own.

Golden-Castano, the organizer of G.I.R.L., said the goal of the program was to show middle school girls that engineering can be fun. She said, "We specifically chose tasks that are applicable to the students' everyday lives. Doing hands-on activities helps girls realize that becoming an engineer or computer scientist is an attainable goal." She added, "Participants were excited to show their parents what they had built and how the Makey Makey board could be used to control the keys."

Thanks to the help of Lincoln Laboratory staff Elisa Kirchheim, Jamal Grant, and Kathleen Nahabedian, the program was a success in that girls were excited to learn and inspired by what they accomplished. Plans are underway to make this a standalone workshop that can be taken to different cities to continue to introduce girls to programming and engineering. A more advanced version of this program using Playground Circuit Board and Arduino is currently being developed. /

(Left) Participants of the first G.I.R.L. program learn how to construct a closed circuit. **(Above)** Yari Golden-Castano teaches middle school girls the principles of electricity before helping them design a circuit.

Boy and Girl Scouts of America

Lincoln Laboratory support of scouting is separated into four programs. Each group has plans to develop exciting outreach efforts, find new ways to connect with the community, and increase program participation in the coming years.

Girl Scouts

With the growth of Lincoln Laboratory outreach to the Boy Scouts, a small group of volunteers wanted to include outreach to girls. Edward Lyvers coordinates monthly STEM workshops for a Girl Scout troop in Burlington, Massachusetts. The workshops are part of a national push by the Girl Scouts to include more STEM-based badge work for girls. Laboratory staff members and Girl Scout almunae Allison Norloff, Kathleen Nahabedian, and Yari Golden-Castano give demonstrations on a variety of STEM principles. Plans are underway for STEM workshops in 2019 on the topics of digital photography, balloon-powered cars, product design, and programming. /

Explorer Post 1776

Curtis Heisey and John Kuconis teamed up for a third year with Komba Lamina of the Boy Scouts of America Explorers program to sponsor an Explorers group at Lincoln Laboratory. Explorer Post 1776 focuses on letting kids discover engineering skills through hands-on design projects. Students gain experience building engineering prototypes and performing engineering challenges, like building bottle rockets, making a mini car from a kit of parts, and taking apart electronics to practice reverse engineering. Skill development in job searching, resume writing, and applying to colleges also plays a vital role in Explorer Post meetings. Post 1776 meets monthly from October through May at Lincoln Laboratory with students from Madison Park Technical Vocational High School in Roxbury, Massachusetts. /

Explorer Post students practice reverse engineering in order to study the design process and assess the mechanisms that make devices work. Students dissected an electronic pencil sharpener, a hand-held mixer, and a zip drive.

Scouting (continued)

Scouting@Lincoln

The Scouting@Lincoln group demonstrated a suite of STEM activities at MassJam 2018, a regional jamboree that gathers 5,300 Scouts and happens only every five years. MassJam 2018 took place over Columbus Day weekend at the Cape Cod Fairgrounds in East Falmouth, Massachusetts. Curtis Heisey led the planning effort and organized a number of demonstrations. /

Jonathan Duffy shows MassJam attendees how a radar works.

Venture Crew 1775

Boy Scout Venture Crew 1775 is a co-ed group of scouts, aged 14 to 20, that focuses on adventure, STEM, and service. Venture Crew's STEM field trips in 2018 included a tour of Tufts University's biomechanical research lab and active radio observations of the moon at MIT Haystack Observatory. This year, the Crew served breakfast to those in need at Boston Common and shoveled snow for the elderly. Venture Crew 1775's outdoor adventures have spanned kayaking, sailing, mountain boarding, and ice climbing. They also plan long-term adventure trips to Boy Scout Camps, such as Florida Sea Base and Kandersteg International Scout Centre in Switzerland. /

(Right) Venture Crew prepares for an 8-day whitewater canoeing excursion in Maine.
(Below) Crew members verify navigation on a break during the 70-mile trip.

> “At the end of the program, you feel empowered to try your hand at even more ambitious things, to see how far you truly can go.”
>
> —BWSI PARTICIPANT

(Left) This year’s BWSI program attracted 198 students from across the country, doubling the number accepted in previous years. **(Above)** Students in the Unmanned Air System Course test their drones for speed and accuracy. **(Below)** Students from the RACECAR course practice maneuvering their self-built, self-programmed mini cars.

Beaver Works Summer Institute

The Beaver Works Summer Institute (BWSI), a four-week STEM program held at the MIT campus, exposes bright high school students to world-class lectures and hands-on STEM challenges. In 2016, its first year, the program had a single class of 46 students. This year, BWSI expanded to eight courses and 198 students from 105 schools across the country and Kwajalein Atoll, India, and Puerto Rico, and students participating remotely from Mexico and Canada.

Among the courses offered this year, five are new to BWSI: Medlytics: Data Science for Health Medicine, Hack a 3D Printer, Embedded Security and Hardware Hacking, Build a CubeSat, and Unmanned Air System–Synthetic Aperture Radar. The 2017 classes—Autonomous RACECAR Grand Prix, Autonomous Cognitive Assistant, and Autonomous Air Vehicle Racing—were offered again this year.

In the CubeSat class, students learned hardware testing, assembly, and environmental screening to develop miniature satellites that are suitable for launch into space. Students in the Medlytics course built a mobile health application and presented it to Boston-area physicians.

A primary goal at BWSI is to expose students to the real-world challenges and technologies they might come across if they later work in STEM fields. The courses were supplemented with seminars presented by Lincoln Laboratory staff, MIT faculty, and local industry leaders. These speakers covered topics such as artificial intelligence, innovation in industry, self-driving cars, and technologies for disaster response. /

(Left) BSWI students work as a team to choose mini car improvements. **(Below)** Andrew Fishberg (right) teaches high school students about autonomous vehicles to prepare them for the Beaver Works Summer Institute.

BWSI Preparatory Course

Laboratory staff member Andrew Fishberg launched a new pre-BWSI course aimed at underrepresented students from the Boston area. For six weeks, he prepared the students for the BWSI RACECAR course by teaching the basics of programming and stressing teamwork—an essential skill for any real-world, open-ended engineering problem. Fishberg noted that the most productive and successful teams will be those that best leverage each other's personal strengths. "One of the core components of teamwork is that not everybody needs to be good at every part of the puzzle," he explained. In the future, Fishberg plans to expand the preparatory program to include more students, thus increasing the diversity and accessibility of BWSI. /

> "Teaching robots tasks that come easily to humans was the most challenging part of the program."
>
> —BWSI PARTICIPANT

Spotlight:

High School Students Visit Beaver Works in Preparation for State Science Competition

Seven top-performing students from New York's Massapequa High School visited the Beaver Works facility in February 2018 to conduct research experiments with the help of Justin Chen of the Advanced Capabilities and Technologies Group and Robert Haupt of the Active Optical Systems Group.

Haupt guided two seniors as they worked with a Noncontact Laser Ultrasound (N-CLUS) that can be used for medical imaging. "The students performed measurement experiments using the N-CLUS system to examine the capabilities of imaging through soft tissue to detect and image stress fractures in bone," Haupt said.

Using beef short rib samples, the students detected a simulated stress fracture by analyzing before and after images of the ribs. "We acquired a very important data set for the noncontact laser program with the assistance of the students," Haupt said. "They observed some important new phenomena that have not been documented before."

A second group of students demonstrated electrokinetics in bone repair. The three high school seniors applied a direct-current electric field to bone to promote enhanced movement of calcium, which resulted in more rapid healing and repair of stress fractures in the bone.

Chen worked with two students on critical infrastructure assessment. Using an iPhone camera, the students applied Chen's motion magnification algorithm to measure and detect vibrational changes in buildings. The students took measurements of MIT's Cecil and Ida Green Building, which, because of structural difficulties, acts as a wind tunnel and results in many vibrational change measurements.

"If there is one thing that I have learned from the students' visit, it's that 'smart is smart' and does not depend on age. I was curious how high school students would perform in the lab without the rigorous technical background I am used to," Haupt said. "It turns out surprisingly well." /

Robert Haupt, seated, works with high school seniors at Beaver Works in preparation for a state science competition.

MITES students toured Haystack Observatory in Westford, MA. They learned about the complex upgrades needed to modernize the radar to produce high-resolution images of satellites.

MIT OEOP Programs

The MIT Office of Engineering Outreach Programs (OEOP) in the School of Engineering offers rigorous academic experiences that encourage the pursuit of careers in technical fields and provide a hands-on curriculum that strengthens foundational math, science, and communication skills in a challenging learning environment. Lincoln Laboratory plays a part in three OEOP programs: MITES, SEED, and STEM. /

Minority Introduction to Engineering and Science (MITES)

In June, promising high school seniors from across the country arrived at MIT to participate in MITES for six weeks. Students were immersed in college-level courses in math, physics, life sciences, engineering, and humanities. The program stresses the value of pursuing advanced technical degrees and helps students develop skills to achieve success in science and engineering. Lincoln Laboratory sponsors two students in this program and hosts a guided tour of the Haystack Observatory. MITES students listened to presentations by Laboratory staff member Malik Oliver, who explained how he chose his career path and why jobs in technical fields are important. /

Saturday Engineering Enrichment and Discovery (SEED) Academy

The SEED Academy is a seven-semester technical career exploration program for underserved high school students in Boston, Lawrence, and Cambridge, Massachusetts. Lincoln Laboratory sponsored two students and an aeronautics and astrophysics course. Laboratory staff member Jamal Grant presented a talk on what he does at work and how he has benefited from a technical career. /

(Top) At the SEED Spring Final Symposium, Jamal Grant spoke about his path to a career at Lincoln Laboratory. He aimed to empower students to advocate for themselves in pursuit of educational and enrichment opportunities. **(Bottom)** MITES students tour MIT Haystack Observatory.

Science, Technology, Engineering, and Mathematics (STEM)

STEM is a year-round academic enrichment program for talented local middle school students who want to get ahead in math and science. The courses use lectures, projects, and experiments to help participants develop mathematical thinking and problem-solving abilities. Lincoln Laboratory sponsored a short robotics course for the students. /

Attendees of the Sight and Color Science on Saturday demonstration used red, blue, green, and yellow cellophane sheets and a flashlight to practice mixing colors.

Science on Saturday

Science on Saturday events are fun, free science demonstrations at Lincoln Laboratory and are given several times each school year by scientists and engineers. Since 2005, local community children ages 5 to 17, their parents, and their teachers have been welcome to attend these events. This year, four science demonstrations were featured:

- **The Science of Sight and Color** explored how color is perceived by humans and by animals.
- **The Rise and Fall of Pluto: How Science Progresses** explained how Pluto was discovered and why its status as a planet changed in 2006.
- **Real-World Robotics** discussed what technologies are used to build robots and showed what robots can do.
- **The Science of Art** displayed how different art forms use elements of science. /

(Left) Jason Huang (right) helps a Cambridge Science Festival participant understand how to control a robot to pick up blocks. **(Below)** Siva Yegnanarayanan (right) asks a student questions about her science project. Lincoln Laboratory staff have volunteered as judges for this statewide science fair for the past 18 years.

Cambridge Science Festival

Each April, Lincoln Laboratory takes part in the Cambridge Science Festival, a week-long citywide event that offers hundreds of science-based demonstrations and activities to the Greater Boston area. This year, Laboratory volunteers invited participants to measure the changing speed of objects by using radars built by high school students in the Lincoln Laboratory Radar Introduction for Student Engineers (LLRISE) program. A Lincoln Laboratory robotics team was on hand to let participants control miniature robotic cars built with LEGOs. /

Local School Science Fairs

Technical staff members from Lincoln Laboratory support Lexington High School by volunteering as judges for the school's Science and Engineering Fair. Many other schools are supported by Laboratory employees contributing to their children's school science fairs or career days without deliberately representing the Laboratory. Their participation supports community outreach and STEM education on a local level. /

Massachusetts State Science and Engineering Fair

Lincoln Laboratory has supported the Massachusetts State Science and Engineering Fair (MSSEF) by serving as a bronze donor to the event and awarding scholarships from the John Welch Memorial Fund to the second-place winners in the physics and engineering competitions. This fund, among others, is part of the MIT Lincoln Laboratory Giving Program. Since 2000, Lincoln Laboratory technical staff have been volunteering as judges for the MSSEF, held on MIT campus in the Johnson Athletic Center. This year, these nine staff members assisted in judging science fair projects: Kenneth Kolodziej, Phillip Bailey, Robert Moss, Joshua Dettman, Sean O'Melia, Christopher Lloyd, David Brown, Siva Yegnanarayanan, and Jean Eugene Piou. /

Kwajalein STEM Fair

On March 15, six Laboratory staff members at the field site at Kwajalein Atoll, Marshall Islands, were invited to help support a science festival and guide students in an exploration of science, technology, engineering, and math.

"Given Kwajalein's purpose as a test range, the children on the island are surrounded by advanced technology, scientists, and engineers, but they do not often get an up-close view of the equipment and work in action," said Justin Stambaugh, manager at the field site. "The STEM fair was a great opportunity to show some of the things that we do and inspire a new generation of scientists and engineers."

Jessica Brooks taught the students about astronomy, telescopes, and constellations. Brooks showed a video of the moon that was taken with a new Laboratory community telescope. The students were intrigued to learn more about the craters on the moon and the mechanics of a telescope.

Alexander Divinsky explained 3D printers and drones. "My aim was to share the basics of drones, robots, and automation with the kids," he said. "I showed the students a swimming robot and explored some of the things a robot can do — such as help with surgery, fly through a cloud, swim, and collect trash in the ocean."

To show how science is used in daily lives, Spencer Johnson connected a microphone to an oscilloscope and had the students play various instruments, such as the xylophone, cymbals, or drums. He explained how higher-pitched notes have higher frequencies and how modern equipment can transform sound into electrons and signals to record and play back later. "What is truly exceptional about some of the STEM outreach activities is that you get an opportunity to witness the first time a person experiences something," Johnson said. "Being able to facilitate that moment is incredibly gratifying."

(Left) Spencer Johnson, left, and Alexander Divinsky, right, demonstrate STEM principles of automation and sound for children. **(Below)** Jessica Brooks guides young girls as they learn about constellations and then draw their own.

In a collaboration with Stoneham Public Schools, Lincoln Laboratory staff members volunteer their time to present STEM demonstrations on a variety of topics to all ages.

Stoneham STEM Fair

Lincoln Laboratory staff members visited Stoneham Middle School to host activity stations at the school's STEM fair. Students visited each activity station to learn about infrared imaging, the principles of radar, and the outreach programs offered at the Beaver Works Center. David Maurer spoke to the students about the importance of careers in science, technology, and engineering.

RMI summer interns Dickson Batlok (left) and Jakio Lamwe (right) pause with Instructor Ranny Ranis (center) as they prepare for their final presentations about their internship experience with Lincoln Laboratory.

RMI Summer Internship

During 10 weeks with Lincoln Laboratory staff at the Kwajalein Field Site, two citizens from the Republic of Marshall Islands, Dickson Batlok and Jakio Lamwe, completed a summer internship in information technology. The interns honed their abilities in computer management, server administration, and computer networking, and were awarded certificates recognizing their hard work in the program. Working with program instructor Ranny Ranis and technical advisors John O'Rourke and Jessica Holland, Batlok and Lamwe learned how to troubleshoot hardware, program different operating systems, and build networks. The interns plan to use their training to benefit their communities. Lamwe, a teacher from the island of Ebeye, will pursue opportunities to share his information technology training with students. Batlok, an Ebeye Schools IT employee, hopes to more fully support school networks. He has already created an early design for a network to assist communities on Ebeye and Guegeegue.

Holland, who has assisted with the program for three years, says the experience is beneficial to both the Lincoln Laboratory staff and the interns. "They learn a lot," Holland said. "The goal is that they continue to receive more education and skills they can bring to their home islands and atolls, which is important to bringing a higher level of technology to the Republic of the Marshall Islands."

Shakti Davis (right) tells a visitor about real-time electrophysiological signals at the Laboratory's PRESAGED display at Military Invention Day.

> "Military Invention Day showcased the hard work of our team, our Laboratory's contributions to national security, and the exciting possibilities new technologies hold for improving human health."
>
> —ALBERT SWISTON, PRESAGED TEAM LEAD

Military Invention Day

On May 19, Mark Hernandez, Shakti Davis, and Albert Swiston, all of the Bioengineering Systems and Technologies Group, participated in Military Invention Day hosted at the Smithsonian National Museum of American History in Washington, D.C. At this event, scientists and engineers present interactive displays to introduce the general public to military-related research going on around the country.

The Laboratory's research team educated people about PRESAGED, or Presymptomatic Agent Exposure Detection, which is an algorithm they developed to use real-time physiological data to provide early warnings of disease. The PRESAGED team's display consisted of a demonstration of the real-time electrophysiological signal of visitors' hearts while they held onto a set of copper electrodes. Nearby, a movie showed models of the impact PRESAGED could have on a disease outbreak.

"We got to interact with a huge cross section of the public," Swiston said, "from high school students, to grandparents, to doctors, to the former director of the Transportation Security Administration. It was a unique and rewarding opportunity." /

Puerto Rican Outreach

In February, Mabel Ramirez, Advanced Concepts and Technologies Group, and Erik Limpaecher, Energy Systems Group, traveled to Puerto Rico to install a solar-powered water filtration system on Boys and Girls Clubs in Residencial Las Margaritas as they did in Loíza in 2017 after Hurricane Maria. During this trip, they also visited three other Boys and Girls Clubs, including Residencial Ramos Antonini to speak to students about Lincoln Laboratory technologies and the benefits of a technical career. Between 18 and 25 students ranging from grades 3 to 12 attended each session. Ramirez said, "Some of the students had great questions about artificial intelligence, lasers, and inserting chips in clothing." /

> "It was very rewarding to see kids get excited about science and the pictures of gadgets that engineers build."
>
> —MABEL RAMIREZ, VOLUNTEER SPEAKER

Mabel Ramirez visited high school students from Residencial Ramos Antonini in San Juan, Puerto Rico, to talk about science and engineering projects and careers as a scientist or engineer.

While touring the Technology Office Innovation Laboratory during Daughters and Sons Days, Jeffrey Roth helps his children understand how a 3D printer works.

Daughters & Sons Days

On April 18 and 19, the Laboratory opened its doors to the children and grandchildren of employees for the 26th annual Lincoln Laboratory Daughters and Sons Days. The event gave children ages 7 to 19 an opportunity to engage in STEM through demonstrations, talks, and tours.

Both days started with discussions of the work of individual staff members, including Laura Kennedy, Mabel Ramirez, Heather Zwahlen, Jamal Grant, and Alexia Schulz. Following these presentations were tours of the Fabrication Engineering Laboratory, the Autonomous Systems Development Facility, the Defense Fabric Discovery Center, and the Technology Office Innovation Laboratory (TOIL). Staff spent the day running demonstrations, such as a laser communications display, an air traffic control tower simulator, and an underwater remotely operated vehicle obstacle course.

At the event "Secret Codes: The Hunt for Candy," staff taught children how to use ancient cryptographic techniques to solve puzzles and unlock a treasure box that contained candy. The 3D printing events at the Fabrication Engineering Laboratory and TOIL were very popular this year with all ages. /

Raoul Ouedraogo demonstrates a small radar for attendees of Daughters and Sons Days. He showed how disaster survivors could be located by using the radar to detect breathing through piles of rubble.

Joseph Venuti and second graders discuss the different ways the weather develops.

3,600

school students tour Lincoln Laboratory facilities each year

Other School Outreach

- Michelle Clark led an egg drop experiment for the kindergarten class at Merrimack Valley Montessori School in Salem, New Hampshire.
- A collaboration is developing between Lincoln Laboratory Outreach and Stoneham Public Schools. Laboratory staff set up STEM demonstrations throughout the year focusing on radar, data conversion, and music-sampling theory. Stoneham Public High School is being considered as a test bed for our online LLRISE program.
- Mark Donahue and Dinara Doyle visited four elementary schools to teach children about robots. They demonstrated a robot that follows a person, and they showed children how a robot "sees" a person.
- Eric Phelps, George Pantazis, and Chiamaka Agbasi-Porter attended the Science Education Expo at Boston University in Boston, Massachusetts, in June to demonstrate LLRISE radar systems and show real-world applications of the self-built LLRISE radars.
- Joseph Venuti, Dinara Doyle, and Mark Donahue visited second graders in Littleton, Massachusetts, and showed how hurricanes, lightning, and tornadoes form.
- At the Georgia Institute of Technology, Lincoln Laboratory staff mentored a student team from the Electrical and Computer Engineering Department in preparation for the Georgia Tech Expo. The team created a cheaper alternative to a drone in the form of a weather balloon for disaster relief.
- Jamal Grant explained how to build satellites to the Pioneer Charter School of Science II in Saugus, Massachusetts, for STEM Day in April.
- Melissa Smith spoke to the students in the iTrek (I Turn Research in Empowerment and Knowledge) Program in August to interest students in STEM-related fields of study. /

Tours and Visitors

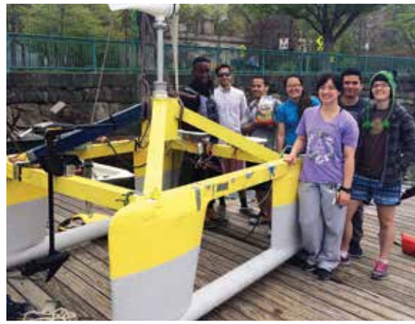
As part of the Lincoln Laboratory Community Outreach initiative, tours of Laboratory facilities, such as the Microelectronics Laboratory, the Air Traffic Management Laboratory, the Rapid Hardware Integration Facility, the RF System Test Facility, and the Flight Test Facility, are given annually to a number of groups. Our 2018 tour groups included

AFCEA Diversity Career Day at Hanscom Air Force Base
UMass–Lowell U.S. Air Force Reserve Officer Training Corps
National Reconnaissance Office fellows
Research Science Institute Program
U.S. Air Force cadets
U.S. Army Test and Evaluation Command
U.S. Army Soldier Systems Center
U.S. Military Academy at West Point
Electronic Systems Center at Hanscom Air Force Base
Tutoring Plus of Cambridge
ROTC students

02 / EDUCATIONAL COLLABORATIONS

Inspired by employee desires to connect with the community and to motivate student interest in science, technology, engineering, and mathematics, our outreach initiatives include

- University Student Programs
- MIT Student Programs
- Military Student Programs
- Technical Staff Programs

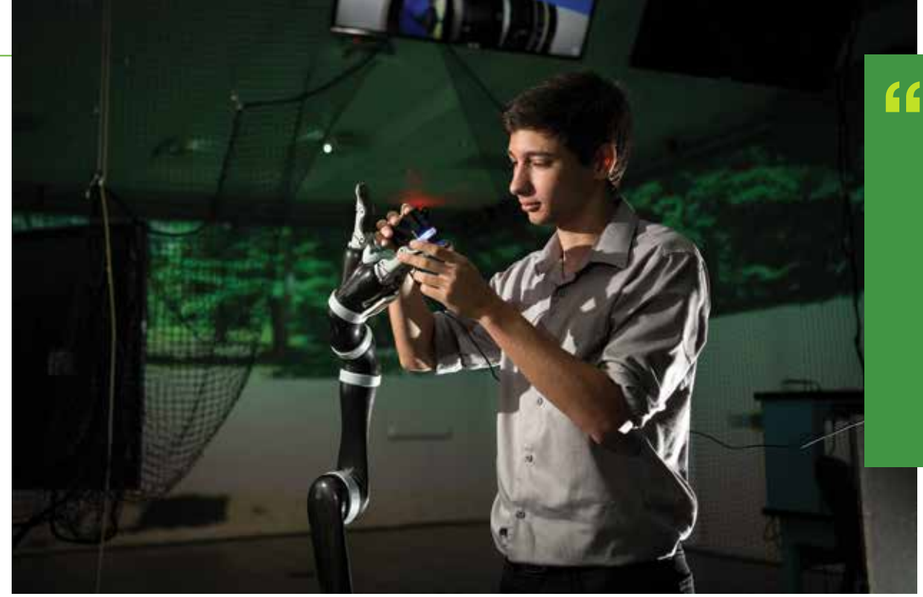


Students from across the country converge at Lincoln Laboratory for internships offered through the 2018 Summer Research Program.

Summer Research Program

In 2018, 246 undergraduate and graduate students from 93 colleges and universities participated in Lincoln Laboratory's Summer Research Program, which offers students internships in technical groups. The students gained hands-on experience in a technical research environment while contributing to projects that complement their courses of study. Each summer, cadets from the military academies accept internship positions at the Laboratory to acquire engineering experience and insight into the ways advanced technology can solve problems faced by the military. /

> "During my internship at Lincoln Laboratory, I was given the support to learn new things, challenged to gain a strong understanding of various projects, and offered a broad experience of what it means to be an engineer."
>
> —ALLEGRA FARRAR, SUMMER INTERN IN THE SYSTEMS ENGINEERING GROUP



> "As an intern at the Laboratory, I was able to conduct a research project that spanned from the design phases of a device to its fabrication and all the way to performance testing. This type of work is an invaluable experience to me as an undergraduate student exploring graduate school and career paths."
>
> —ERIN MORISSETTE, WPI INTERN IN QUANTUM INFORMATION AND INTEGRATED NANOSYSTEMS GROUP

Worcester Polytechnic Institute senior Toby Macaluso worked with robots as an intern in the Control and Autonomous Systems Engineering Group.

Worcester Polytechnic Institute Major Qualifying Project Program

From August 2017 to October 2018, 10 students worked as Laboratory interns under Worcester Polytechnic Institute's Major Qualifying Project Program, which requires students to complete an undergraduate project equivalent to a senior thesis. Under this program, students participate in Laboratory work that is applicable to their senior projects, learning to apply their skills and knowledge to problems typical of those encountered in industry. /

Northeastern Co-op Program

For the past 30 years, Lincoln Laboratory has had a partnership with Northeastern University, hiring more than two dozen students as interns during the summer and the school year. Students from the College of Computer and Information Science and from the College of Engineering gain valuable skills as they work with hardware, learn software, develop prototypes, and practice teamwork and communication while working on engineering projects and the administration of computer systems. Eric Evans, Lincoln Laboratory Director, said, "We see it as a 6- to 18-month interview, in a sense. We get a good feel for how they think and how they work on teams, and then we try to hire the best." /

Team Colibri, one of the Intern Innovative Idea Challenge's winning teams, demonstrates their unmanned aerial vehicle in front of the live audience.

University Cooperative Education Program

Technical groups at Lincoln Laboratory employ students from area colleges under cooperative education arrangements. The students work full time with mentors during the summer or work/study semesters and part time during academic terms. Highly qualified cooperative education students are significant contributors to technical project teams. In 2018, 95 co-ops worked in divisions and departments at the Laboratory. College and universities that regularly partner with Lincoln Laboratory in this program are Wentworth Institute of Technology, University of Massachusetts–Boston, and Rochester Institute of Technology. /

Intern Innovative Idea Challenge (I³C)

To provide summer interns an opportunity to flex their technical skills beyond assigned work, Lincoln Laboratory initiated a program in 2016 that encourages interns to envision a new technique or device to solve a current problem. This year's I³C was divided into three rounds: a proposal round, a poster round, and a final Shark Tank round. In the final challenge, interns were given five minutes to pitch their technology to a panel of senior Laboratory staff to convince them that their technology was worth one of the monetary prizes and possible further development at the Laboratory. Interns devoted out-of-work hours to work on their projects, which included a variety of ideas such as a dynamic camouflage system to better disguise soldiers, a bicycle brake system to reduce lost energy during braking, and an unmanned aerial vehicle (UAV) optimized for search-and-rescue missions.

First place was awarded to Team ALMA (Automatic Linguistic Meeting Analyzer), who pitched a conversation analysis system that provides objective data on potential workplace bias. Second place went to Team Colibri for developing a prototype of a lightweight UAV with extended flight time. In third place was Team MAP (Mental Health Awareness and Preservation), who envisioned biosensor patches that can track biological triggers associated with traumatic brain injuries and then send this information to a mobile application for a physician to analyze.

"I³C was a great opportunity not only to take an idea from concept to fully thought-out project with a prototype, but also to meet and work with an incredible team of people along the way," said Tzofi Klinghoffer, the team leader of MAP and an intern in the Summer Research Program. /

The 2018 GEM fellows commemorate their internships in a photo with the MIT mascot, Tim the Beaver, and Lincoln Laboratory Director Eric Evans, far right.

National GEM Consortium

In the summer of 2018, the Laboratory hosted 19 students affiliated with the National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM). GEM is a network of leading corporations, laboratories, and research institutions that enables qualified students from underrepresented communities to pursue graduate education in science and engineering.

GEM fellows work as summer interns while completing their studies and receive financial support that is often the deciding factor in their pursuing graduate education. The internship process also allows companies to access and recruit talented candidates that they may not find otherwise. "By reaching out to underrepresented research students, we are creating an environment where underrepresented students will see a path for success at Lincoln Laboratory," said William Kindred, Diversity and Inclusion Program Manager.

GEM fellowships at the Laboratory offer the students numerous returns, from networking opportunities to high-level research experience. /

Alexa Aguilar, an MIT graduate student, worked as a research assistant in the Laboratory's Advanced Sensors and Techniques Group.

MIT Research Assistantships

Lincoln Laboratory employs research assistants from MIT. Working with engineers and scientists, MIT graduate students contribute to sponsored programs while investigating the questions that evolve into their doctoral theses. The facilities, the research thrusts, and the reputation of staff members are prime inducements behind the students' decision to spend three to five years as research assistants in a technical group at the Laboratory. /

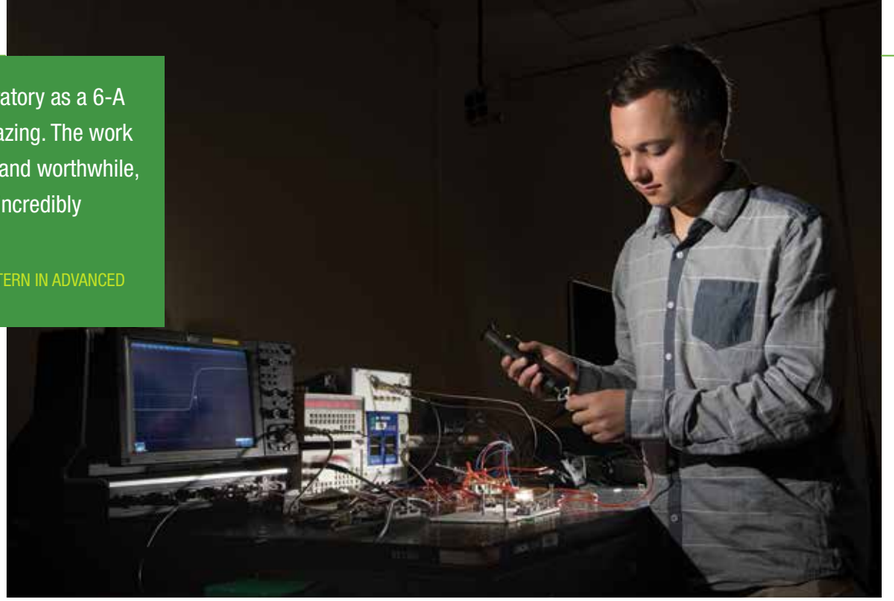
MIT Independent Activities Period

During MIT's Independent Activities Period (IAP), a four-week period in January between semesters, Lincoln Laboratory technical staff lead activities ranging from academic seminars, to hands-on engineering projects, to externships involving MIT students in the Laboratory's research. This year's IAP included a tour of the Laboratory's air traffic control and satellite fabrication laboratories and a workshop on how to use drones for research. Lincoln Laboratory staff members organized the following classes for the 2018 IAP:

- Build a Small Radar System
- Free-Space Laser Communication
- Hands-on Holography
- Introduction to Autosec
- Software Radio
- Mathematics of Big Data
- RACECAR: Rapid Autonomous Complex-Environment
- Competing Ackermann-steering Robot

MIT students Francis McCann (left), Marwa Abdulhai (center), and Suzanne O'Meara (right) participated in externships at the Laboratory during the MIT Independent Activities Period.

> "Working at Lincoln Laboratory as a 6-A participant has been amazing. The work I am doing is interesting and worthwhile, and the people here are incredibly intelligent and helpful."
>
> —LORENZO VIGANO, MIT 6-A INTERN IN ADVANCED IMAGER TECHNOLOGY GROUP



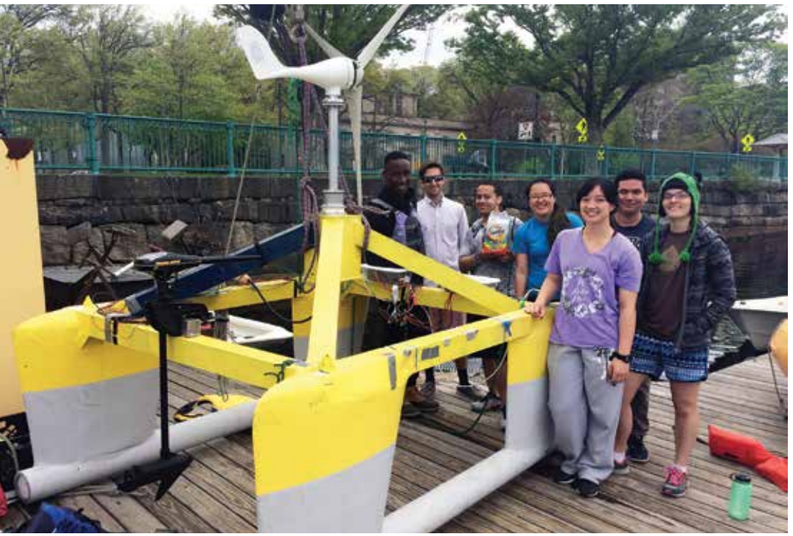
As a research assistant at the Laboratory, MIT student Lorenzo Vigano worked with near infrared imaging in the Advanced Imager Technology Group.

MIT Undergraduate Research Opportunities and Practice Opportunities Programs

Lincoln Laboratory is one of the research sites that partners with MIT's Undergraduate Research Opportunities Program (UROP) and Undergraduate Practice Opportunities Program (UPOP). Students undertaking a UROP or UPOP assignment may choose to do a research project for course credit or accept a paid internship. Most participants at the Laboratory are interns working under the direct supervision of technical staff members. The students engage in every aspect of onsite research – developing research proposals, performing experiments, analyzing data, and presenting research results. In the summer of 2018, 20 undergraduates were hired as UROP interns and six as UPOP interns. /

MIT 6-A Master of Engineering Thesis Program

Students in MIT's 6-A Master of Engineering Thesis Program spend two summers as paid interns at Lincoln Laboratory, contributing to projects related to their studies. Mentors are matched with students in order to relate the scientific and engineering principles from the classroom to engineering problems in industry. While working as research assistants, the students develop their Master of Engineering theses under the supervision of both Laboratory engineers and MIT faculty. In 2017–2018, nine 6-A students participated in the program, gaining experience in design, development, research, and programming. /



Students taking the Beaver Works capstone course stand with their project, an autonomous floating station.

MIT Lincoln Laboratory Beaver Works

Beaver Works, an initiative between Lincoln Laboratory and the MIT School of Engineering, provides students with space, mentors, and tools for project-based learning. MIT faculty and Lincoln Laboratory staff work together at Beaver Works to strengthen research and educational partnerships.

The main Beaver Works collaboration is the capstone course, an MIT engineering class in which students develop technology that solves a real-world problem. During two or three semesters, the students design a system that addresses a need and then fabricate a working prototype. Lincoln Laboratory researchers serve as advisors for these capstones and provide expertise in engineering design and fabrication of proof-of-concept models built by the students. /

MIT Professional Education

Lincoln Laboratory collaborates with MIT faculty to offer courses through MIT's Professional Education Short Programs. These professional education courses attract participants from industry and business to the campus for topics designed to expand familiarity with emerging technologies, like biotechnology, cybersecurity, data modeling and analysis, machine learning, big data, robotics, mechanical design, radar, and systems engineering. Lincoln Laboratory staff have led a variety of such courses since 2012, including Build a Small Radar System, and Design and Analysis of Experiments, which are offered every year. /

> "I enjoyed my first Professional Education course so much and there were so many interesting topics available that I went back for more!"
>
> —TINA CHEN, LINCOLN LABORATORY STAFF MEMBER

Spotlight:

Springfield Technical Community College Student Participates in Internship at Lincoln Laboratory

Springfield Technical Community College / Published June 12, 2018

SPRINGFIELD, Mass. – Growing up in southern Texas, Gerald Gagnon never dreamed he'd be working in a premier research laboratory affiliated with the Massachusetts Institute of Technology.

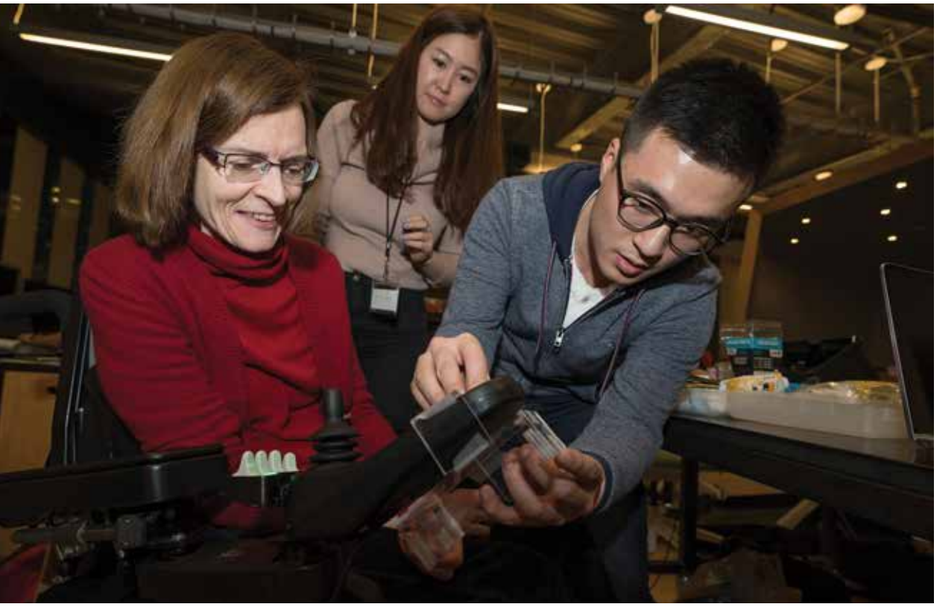
But this summer, a week after receiving his certificate in Optics and Photonics Technology from Springfield Technical Community College (STCC), Gagnon started working as an intern at MIT Lincoln Laboratory, a Department of Defense research and development laboratory in Lexington, Massachusetts.

"I come from a humble background. I'm the oldest and the first to go to college in my immediate family," said Gagnon, 32. "Now, I'm this guy from south Texas who's right here on the East Coast, going to MIT. I say that to my family, and they can't believe it. These types of accomplishments were not in the cards for a lot of people I know."

Gagnon moved from Texas to Western Massachusetts and enrolled at STCC where he received his associate degree in liberal arts. A professor mentioned the one-year Optics and Photonics Technology certificate program, which piqued his interest. Dr. Nicholas Massa, department chair for Optics and Photonics Technology at STCC, encouraged Gagnon to apply for the summer photonics internship at Lincoln Laboratory. Gagnon interned in the Laboratory's Laser Technology and Applications Group working as a technician in the Integrated Photonics Lab.

MIT Assistive Technologies Hackathon

The Assistive Technologies Hackathon (ATHack) is an annual MIT-sponsored event that brings people living with disabilities – called co-designers – together with undergraduate, graduate, and PhD students from multiple disciplines to build prototypes of assistive devices. The 2018 ATHack was held in March at the MIT Lincoln Laboratory Beaver Works Center in Cambridge, Massachusetts. Seventy students and 13 co-designers worked in 16 teams to solve accessibility issues that the co-designers faced. Laboratory volunteers included Fabrication Engineering Group's Kurt Krueger and Richard Landry, who staffed the event's machine shop, and Ryan McKindles from the Bioengineering Systems and Technologies Group, who served as a mentor and judge. /



Graduate students from Northeastern University and Harvard University build a camera system that will allow a co-designer to see behind her wheelchair.

(Left) Shourov Chatterji, right, discusses the Laboratory's work with MIT students at the Academic Exposition. **(Below)** An MIT student holds a model of the Laboratory–developed Perdix system that was on display at the Academic Exposition.

MIT Academic Exposition

In 2018, Lincoln Laboratory participated in the MIT Academic Exposition for the first time. The exposition, held on August 28 at the Johnson Ice Rink, was part of the MIT freshman orientation program. Incoming freshmen had talked to Laboratory staff members to learn about the educational opportunities available to them at the Laboratory, including internship programs such as the Undergraduate Research Opportunities Program.

Laboratory staff members volunteering at the exposition greeted students and discussed some of their projects and research. Laboratory-designated booths displayed posters, videos, and even prototypes of technologies developed at the Laboratory. Projects represented at the exposition included disaster recovery technology, lunar and undersea laser communications systems, and autonomous vehicles.

"The ideas they have at the Lab are way out there. I think what they do is really incredible," said Devansh Agrawal, a junior exchange student from Imperial College London, who attended the exposition and learned about the Laboratory's work in undersea communications.

Additionally, the Beaver Works Centers were open to freshmen on August 29. Students toured the facilities and learned about resources offered by the centers, including test beds for autonomous vehicles and unmanned aerial vehicles, and courses on various topics in technology and engineering. /

Forty two military officers engaged in research at the Laboratory in 2018 as part of the Military Fellows Program.

Military Fellows Program

From 2017 to 2018, 42 military officers from the U.S. Army, Air Force, Navy, Marine Corps, and the Massachusetts Air National Guard engaged in research at the Laboratory through the Military Fellows Program. The program officially started in 2010 with the goal of directly involving military officers in the development of technologies that impact national security. Fellows who participate in the program gain hands-on experience developing defense technologies and learn about Lincoln Laboratory's role in supporting the military. In turn, Laboratory staff benefit by being exposed to the officers' unique insights and learning about the military's needs.

To support the educational pursuits and career development of the military officers, the Military Fellows Program pairs each fellow with a research program at the Laboratory that complements the fellow's academic background.

"I have been able to directly apply the methods and tools from my academic courses at MIT to my work at the Lab," said U.S. Army Captain Raymond Vetter, who worked in the Surveillance Systems Group to conduct research on the integration of small unmanned aerial systems into the National Airspace System, particularly over urban areas. Vetter is pursuing a master's degree in engineering and management from MIT, and his program emphasizes developing the architecture for complex systems and integrating the systems into their desired environments.

While working at the Laboratory familiarizes the fellows with military technologies, it can also help the fellows see these technologies from a different perspective. "The chance to expand my understanding of technologies beyond Army-centric systems was unique and very appealing, and researching small unmanned aerial systems has certainly met that goal," Vetter said.

Vetter said the skills he acquired at the Laboratory will have a lasting positive impact on not only himself but also on the next generation of U.S. military officers. His next assignment in the Army will be to serve as an instructor in the Department of Systems Engineering at the U.S. Military Academy in West Point, New York. "The lessons I have learned to approach complex problems, both at Lincoln Laboratory and at MIT, will better enable me to teach and mentor the future leaders of the nation's military," Vetter said. /

(Left) U.S. Navy Lieutenant Commander Cheryl Griswold assisted with data collection in the Computer Assisted Rehabilitation Environment, a fully immersive virtual environment system with the Laboratory's Sensorimotor Technology Realization in Immersive Virtual Environments (STRIVE) Center. **(Below)** U.S. Army Captain Raymond Vetter worked with unmanned aerial vehicles during his time as a military fellow.

Service Academy Research Program

Military interns spend three to five weeks of their summer working at Lincoln Laboratory under the Service Academy Research Program. The interns represent the service academies and the U.S. Army Reserve Officers' Training Corps (ROTC) program. The Laboratory started hosting Service Academy interns in 2012 to give Laboratory staff a clear view of the warfighter's perspective and needs while on the battlefield. John Kuconis, Executive Officer in the Director's Office, stated, "Educating the next generation of military officers about Lincoln Laboratory and its capabilities can have mutual benefits in the future." /

Military interns arrive at Lincoln Laboratory for the 2018 summer research program.

Cadets from West Point visit the Laboratory to learn about its role in developing technology for national defense.

West Point Collaboration

Lincoln Laboratory partners with the U.S. Military Academy at West Point to offer real-world experience to cadets via internships and technology demonstrations. Internships to West Point cadets are included in the Laboratory's Military Fellows Program and the Summer Research Program. Each year, West Point cadets visit the Laboratory and the Flight Test Facility on Hanscom Air Force Base for demonstrations of cutting-edge technology and presentations on research areas currently investigated by Lincoln Laboratory scientists and engineers. John Kuconis, who organizes the cadets' visit to the Laboratory, explained why the collaboration is important: "Building and maintaining connections with the cadets and officers will help us better serve the U.S. military in the future and will help the cadets understand the work performed at the Laboratory." /

Military Courses

Laboratory staff teach elective courses to the officers attending the Naval War College in Newport, Rhode Island. The Space Technology and Policy course, taught by Jonathan Kadish, Peter Niedfeldt, and Robert Guerriero, explores critical space technologies, capabilities, and policies that shape the use of space for military and government purposes. The course organizers are collaborating with the National Intelligence University to develop a space-focused master's degree program in science and technology intelligence. The new course will be offered at the National Intelligence University campus in Bethesda, Maryland in 2019, and Laboratory staff will help provide course content and lectures.

The Cybersecurity course taught by James Landry and Amy Hughes describes cyber operations, cyber threats, and cyber defense. This course inspired a similar course for the Air Force's Life Cycle Management Center at Hanscom Air Force Base in Bedford, Massachusetts.

A group of staff members from the Air, Missile, and Maritime Defense Technology Division provides a high-level introductory course on ballistic missile defense (BMD) issues. The course explores the critical technologies, capabilities, operational concepts, and policies that influence how BMD affects the military capabilities of the United States. /

(Left) Jon Schoenberg (at right), one of the course organizers, speaks to course attendees about data modulation while using an amateur radio transceiver and vertical antenna. **(Below)** In-house experts and outside instructors offer a range of technical, programming, and software application courses onsite at Lincoln Laboratory.

Technical Education Program Onsite Courses

Lincoln Laboratory offers technical education programs designed to help employees expand their knowledge and versatility in unique areas across the Laboratory. Certification courses for operating systems, network devices, and programming languages are offered regularly.

In Fall 2018, the Technical Education Committee offered Build a Radar, Optical Engineering, Light Detection and Imaging, Electromagnetics and Antenna Technology Expanded, Applied Statistical Signal Analysis, and Amateur Radio Courses. /

Boris Tolpin, an employee in the Laboratory's Program Support Office, is completing a master's degree in business administration at the Wharton School's Philadelphia campus.

Lincoln Scholars Program

The Lincoln Scholars Program supports Laboratory staff graduate education in areas of strategic importance to the Laboratory. The program promotes the recruitment and retention of talented technical staff, enhances the technical capabilities of Laboratory staff, and improves relationships with local university research faculty in fields relevant to the Laboratory. The students work at the Laboratory in between semesters and make substantial technical contributions to the Laboratory. Each scholar is paired with a mentor throughout the program. Scholars work full time at the Laboratory for two years after ending their studies. Currently, 20 staff members are enrolled in the program. Almost 200 staff members have pursued full-time technical graduate work through the Lincoln Scholars Program. /

Boston University Program

Core and elective courses from Boston University's master's program in computer science are offered onsite at Hanscom Air Force Base. These courses include computer networks, cryptography, and software engineering, and can be taken independently, as part of a certificate program, or as a master's degree program through Boston University. Since the program started in 2012, more than 160 staff members have enrolled in the program; this year, 16 staff members participated. /

Part-Time Graduate Studies Program

The Part-Time Graduate Studies (PGS) Program enables motivated and talented staff members to pursue a master's degree part time via distance learning or at local universities, in areas of importance to the Laboratory, while continuing to work at the Laboratory full time. The program objective is to provide developmental opportunities to highly motivated employees to the joint benefit of the Laboratory, its sponsors, and the employee. In 2018, 35 employees participated in the program. /

Part-Time Master in Business Administration Program

The Part-Time Master in Business Administration (MBA) Program was established by a team of Laboratory senior business leaders in 2017. The creation of the program was prompted by the need to develop stronger business leaders who can bring insight to the Laboratory in the areas of finance, program planning and analysis, financial reporting, and management. Participants continue to work at the Laboratory while pursuing their MBAs in a shortened time frame and with financial support. In the first year, three employees in the Laboratory's Program Support Office were accepted into the MBA program. /

Technical Seminars

Technical talks motivate and inspire staff while facilitating working relationships. The Technology Office Seminar Series invites nationally known experts to the Laboratory. Each seminar is designed to offer insights on specific technology, provide a forum to develop technology applications, and foster future collaborative efforts. The Technology Office seminars offered in 2017–2018 covered a variety of leading-edge topics in technology:

Enabling the First Interstellar Missions

Reinvention of Education

Enhancing Human Capability with Intelligent Machine Teammates

Pluto Revealed! Latest Results from NASA's New Horizons Mission

Essential Concepts of Causal Inference – a Remarkable History

The Power of Miniaturization in Medicine

Remote Sensing in Maya Archaeology: Failures, Progress, and the Lidar Revolution

03 / COMMUNITY GIVING

Laboratory employees walk, run, bike, bake, and give to support local and national causes throughout the year. The Laboratory community is happy to engage in

- Helping Those in Need
- Helping Those Who Help Others
- Nourishing Mind, Soul, and Character

Seven team members biked 160 miles to raise funds that will be used by the American Lung Association to combat lung diseases.

Autumn Escape Bike Trek

Laboratory community members Ned Rothstein, Jennifer Weis-Rothstein, and Christopher Smith and their friends made up the Mechanix Cycling Team in the Autumn Escape Bike Trek this year. In this three-day, 160-mile ride, participants "escaped to the Cape" to support the American Lung Association. Riders were required to raise a minimum of $500 each to participate, but the team of seven riders raised much more—$5,410 in total. The money is used to research ways to combat lung diseases, such as lung cancer, chronic obstructive pulmonary disease, and asthma. /

TeamWalk for CancerCare

This June, Laboratory staff walked to help those with cancer. The three- to six-mile walk takes place in downtown Lowell, Massachusetts, with food, music, and children's activities along the route. This year the Laboratory team raised $4,000, which brings the cumulative total to $32,000 in the last eight years. The funds will provide services and support for local cancer patients and their families. /

> "My father was treated for cancer. While he could afford treatment and had a lot of support from family and friends, we saw so many who did not. TeamWalk provides grants, assistance with wigs, transportation, and payments that are not covered under insurance for a community that has many individuals in need."
>
> —JULIE ARLORO-MEHTA, TEAMWALK PARTICIPANT SINCE 2010

In the fight against cancer, Laboratory staff walked through Lowell, Massachusetts, raising money to support those currently battling the disease.

American Heart Association

Those at the Laboratory who are passionate about heart health participated in three events in 2018, helping bring attention to this important issue and raising funds for the American Heart Association. Laboratory staff celebrated Wear Red Day with photo sessions and prize drawings. Items such as Bruins hockey pucks, a reserved spot in the parking garage, cafeteria gift cards, and tickets to local attractions were included in the drawings. The effort raised $486. A bake sale raised a further $883. Finally, a team of six Laboratory staff members walked in the Boston Heart Walk, raising roughly $6,000. /

Laboratory staff gathered to celebrate Wear Red Day, raising awareness about heart disease and strokes.

Staff at the Laboratory's Huntsville location took on the entire Christmas lists of two local children in need.

Presents for Local Children in Need—Huntsville Field Site

The Huntsville Field Site in Alabama provided for two local foster children during the holidays—Cody, age 4, and Courtney, age 10. Laboratory staff donated all the items on the children's wish lists, including practical items such as clothes and blankets, as well as things like iPods and toys. Through the program Kids to Love, staff were able to give these children a merry holiday. /

Spotlight:

Alzheimer's Support Community

A team of 18 Laboratory cyclists put their "mettle to the pedal" in the 2018 Ride to End Alzheimer's along the seacoast of Rye, New Hampshire.

The Laboratory Alzheimer's Support Community supports the goal of ending Alzheimer's disease by raising funds for the Alzheimer's Association. The Laboratory's biking and walking teams have raised $380,586 toward the cause since 2009, and 2018 marked the 10th year of participation for the Laboratory's Alzheimer's Walk Team.

The funds provide resources for research, plus care and support for Alzheimer's patients and their loved ones. Several different activities contributed to the fundraising and to raising awareness about the disease:

- **The Greater Boston Walk to End Alzheimer's**—the 31 people in the Laboratory's Alzheimer's Walk Team raised more than $35,000 in honor of their loved ones and Paul Gray, the 14th president of MIT, who died of Alzheimer's in 2017. The team was a top fundraiser, ranking 2nd out of 500 plus teams that participated in the Greater Boston Walk.

- **Ride to End Alzheimer's**—18 Laboratory cyclists participated in the 62-mile long ride this year. The team raised $20,683 in donations, smashing the previous team record and resulting in a #2 ranking among more than 60 event teams.

Spotlight (continued)

- **Information table and bake sales**—the Alzheimer's Support Community hosted these events to increase awareness and support for 2018's Walk to End Alzheimer's, and raised $2,797.

- **Purple for a Purpose**—in August, members of Alzheimer's Support Community and the Laboratory community joined for a group photo in the Laboratory's front lobby, wearing purple to raise awareness of Alzheimer's and honor people affected by the disease.

First-time participant in the Ride to End Alzheimer's Victoria Loehle shared, "A good friend of mine recently lost her grandmother who had been suffering from Alzheimer's…I thought about them when the hills were toughest, realizing how much it would hurt to lose someone you love that way. It was a very emotional 62 miles, but everything about that day was so perfect that you just felt everyone would be alright in the end." /

Alzheimer's Support Community members host a table at the yearly Community Outreach Fair and are eager to help people understand the issues surrounding Alzheimer's Disease.

Laboratory staff gathered in the main lobby to raise awareness and support for the Alzheimer's Association.

Daniel Letourneau (back, center) and his family joined the Boston Children's Hospital Walk for Kids in June 2018.

Boston Children's Hospital—Walk for Kids

Each year, Daniel Letourneau and his family participate in the Boston Children's Hospital Walk for Kids, participating as "Team Emily." The funds they raise help to fuel care and research for children around the world, with the goal of changing the future of health for every child. /

Grab a CAB (Chemo Activity Bag)

Since 2016, Carrie Perry, Contracting Services Department, has been collecting donations for Chemo Activity Bags (CABs). Perry said, "I create these bags for cancer patients receiving chemotherapy. It gives them something to do during the sometimes long and boring process. In the bags are…assorted goodies to keep people occupied and hopefully put a smile on their faces." Perry continued, "The people at the Laboratory have been so kind and generous in the giving process."

Perry collects the items, puts the bags together, and holds a bake sale to raise money for additional items. She also participates in the Relay for Life in Gardner, Massachusetts, by setting up a table for participants to make bags to give to friends and family members going through the chemo process. /

Carrie Perry creates bags full of fun activities and creature comforts to cheer cancer patients while they undergo chemotherapy.

In the fight to cure cancer, Laboratory staff members participated in the 2018 Pan-Mass Challenge, both by riding and by assisting those who rode.

Pan-Mass Challenge

Laboratory staff participate in this annual bike-a-thon that raises more money for charity than any other single event in the country. The Laboratory team raised $16,598 this year, which was donated to the Dana-Farber Cancer Institute to aid the fight against cancer.

The weather during the challenge this year was stormy, with rain and wind in abundance, but staff members made the best of it. Three members (Craig Perini, Janine Block, and Kim Hebert) rode their bikes. Two more staff members supported the ride as a mechanical crew leader (Ned Rothstein) and a mechanic (Jennifer Weis-Rothstein). Block related, "I participated because cancer affects everyone. That makes the challenge a pretty moving experience." /

The Laboratory's Out Professional Employee Network (OPEN) hosted a bake sale to raise funds for The Trevor Project to help young people in crisis.

The Trevor Project

LLOPEN, the Laboratory's Out Professional Employee Network, offered their first-ever National Coming Out Day bake sale. The $594 of donations were given to The Trevor Project.

The Trevor Project provides crisis intervention and suicide prevention services for lesbian, gay, bisexual, transgender, queer, and questioning (LGBTQ) youth. These accredited, life-saving, life-affirming services create safe, accepting, and inclusive environments through the phone, online, or through text.

Michael Kotson, bake sale organizer, said, "The generosity of everyone who visited our table was heartening. These valuable dollars will go a long way towards helping LGBTQ+ youth get the love and support they need at the times when they need it most." /

Walking to end hunger is a family affair for Laboratory staff member Seth Trotz, who has participated in this event with his sons, pictured above, for many years.

> "I was floored to learn that food insecurity, even in Massachusetts, is around 10%. And much of this problem falls on kids, preventing them from really having the opportunity to thrive."
>
> — SETH TROTZ, WALK FOR HUNGER PARTICIPANT

Walk for Hunger

Laboratory staff member Seth Trotz and his family joined in the Walk for Hunger this May. They completed a 20-mile route and raised $356, beating their goal of $250. With the motto Make Hunger History, this event began in 1969 (the oldest pledge walk in the country) and has paid for more than 1 billion meals in Massachusetts so far.

Trotz has joined the Walk for Hunger almost every year since 2007, usually in company with one or more of his sons. "At the end of each 20-mile event," Trotz noted, "it definitely feels like an accomplishment."

He continued, "A significant part of the inspiration for the walk came when my youngest son, Caleb, had a class field trip to the food pantry in our town. I learned that there were many, many families that depended on the food pantry on a regular basis. And if it was this common in Acton, (Massachusetts), what about less obviously well-to-do communities elsewhere?"

Organized by Project Bread, the walk raises money to support various programs that help end hunger in local communities. They work to ensure that nutritious food is accessible to the people who need it most, to strengthen local food systems, and to help people break the cycle of hunger and food insecurity for good. /

The Laboratory's sponsor dog calmly observes the crowd of staff around him during a 2018 visit to the Laboratory.

Operation Delta Dog

Lincoln Employees with Disabilities (LED) raised $10,000 in 2018 to sponsor a shelter dog through Operation Delta Dog. The organization believes in improving lives—both those of abandoned dogs and those of wounded warriors. The rescued dog will be trained to be a service animal for a veteran suffering from traumatic brain injury or post-traumatic stress disorder. LED formed Team Lincoln Labradors and joined the Walk and Wag for Veterans event (a silent auction, raffle, and walk-a-thon rolled into one). LED also raised funds through a pizza party fundraiser, a bake sale, and an annual luncheon. /

Above: Lincoln Employees with Disabilities (LED) raised funds to sponsor a rescued service dog for a veteran, improving two lives. Left: Laboratory staff pose with their sponsor dog.

At the peak of Mount Wachusett, staff celebrated their successful run while helping those who support their local communities.

> "I am trying to follow in my mom's (Marlene A. Mills) footsteps. She organized parents in our neighborhood to report crime…and transformed our whole neighborhood. She taught me that if you see something wrong, you should work to fix it!"
>
> — JESSE MILLS, RACE 2 THE SUMMIT ORGANIZER

Race 2 the Summit

Three Laboratory employees serve on the board of the Marlene A. Mills Foundation, founded to perpetuate a sense of community and volunteerism and promote running as part of a healthy lifestyle. The foundation organizes the Race 2 the Summit each year. Jesse Mills, Jen Falciglia, and Jeremy Coombs, along with other Laboratory employees, run this race yearly.

With a motto of "Never Give Up, Always Give Back!", the event offers both half-marathon and 5K courses. Both courses provide significant elevation changes, and take place along the quintessentially scenic New England roads of Princeton and Westminster, Massachusetts. The race ends at the summit of Wachusett Mountain, where runners can enjoy Wachusett Mountain's Annual BBQFest.

The race sends 100 percent of profits to the Dana-Farber Cancer Institute and the Marlene Mills Memorial Scholarship. This college scholarship is awarded to help local high school students who are involved in their communities, continuing Marlene Mills' legacy of community improvement. In 2018, the race raised roughly $3,000, and 12 Laboratory staff members participated. /

Laboratory volunteers enlisted the help of local Bedford High School students for a packing party, and filled boxes with donations for deployed U.S. troops.

Support Our Troops®

Support Our Troops® Care Packages raise the morale and well-being of deployed troops worldwide, providing boxes full of items they specifically request. This year, Annie Anderson (daughter of Scott Anderson, Director's Office) helped Support the Troops as her Senior Community Project.

Throughout the year, Laboratory staff members Debbie Shaw and Michelle Colburn meet to organize materials like clothes, candy, and other nonperishable items donated by Laboratory staff. Then, they pick up mailing boxes and customs forms and hold a packing party.

This year's main packing party, held in the Laboratory cafeteria, was supported by high school students from the town of Bedford (four miles from the Laboratory). They combined donations from Laboratory employees with donations they brought themselves, and filled 80 care packages for troops far from home. /

School Supply Drive—Huntsville Field Site

In Huntsville, Alabama, Laboratory field site staff organized a school supply drive for two local teachers who had recently transferred to lower-income schools. The schools did not have the funding to provide basic supplies for their students and teachers, so Laboratory staff gathered a variety of school supplies themselves and donated the much-needed items to the school. /

> "Each year, we try to find new ways to give back to our community. While we are a small group, we know there is so much we can do."
>
> —REBECCA HARRIS, ALABAMA FIELD SITE STAFF MEMBER

Staff at the Laboratory's Huntsville, Alabama, field site gather around donations they collected for local students.

The MIT Federal Credit Union branch in Lincoln Laboratory has managed a Toys for Tots drive annually for the past 20 years.

> “Toys for Tots has been a tradition at the Laboratory for many years. I took up this cause to keep that tradition alive, so these children can have toys for the holidays. Something has to be there under the tree. The Laboratory community can be proud of making all those kids happy!”
>
> —SUSAN CURRY, TOYS FOR TOTS ORGANIZER

Toys for Tots

Toys for Tots, founded in 1947 and run by the U.S. Marine Corps Reserve, delivers toys to children whose parents may not be able to buy them gifts for Christmas. According to the Marine Corps, “local Toys for Tots campaigns are the heart and soul of the Marines’ Toys for Tots Program.”

Volunteers work together to wrap brown cardboard boxes with cheerful holiday paper and large bows. The boxes are then placed strategically throughout the Laboratory, kicking off the giving opportunities.

Susan Curry, Guadalupe Cabrera, Karen Grasso, and the Enterprise Applications Team gather donations of toys from the Laboratory community and take them to distribution centers located in Middlesex and Essex Counties. There, local organizations pick up the toys and take them where they are needed most. Most of the children who receive presents through Toys for Tots would not receive presents otherwise. /

For the 12th consecutive year, Paula Mason gathered gifts for local people in need.

Giving Tree

Every Thanksgiving, ornamental giving trees decorated with nametags appear in the Laboratory’s atrium and cafeteria areas. Through the Somebody Cares charity, Laboratory staff member Paula Mason gathers names of local families and veterans in need, and lists their names and wishes on the giving trees’ tags.

The giving trees offer the Laboratory community an opportunity to bless people with the gifts they need for the holiday season. Each year the Laboratory community gives two giving trees’ worth of gifts to people in the Billerica and Lowell, Massachusetts, communities. /

Santa for Seniors

Community Giving at MIT partnered with the Cambridge Police Department (CPD) to brighten the holiday season for Cambridge senior citizens engaged with city services. More than 20 departments across campus and Lincoln Laboratory participated in this wonderful holiday tradition and donated an abundance of tasty treats, blankets, sweaters, coats, hats, gloves, socks, and books for our Cambridge neighbors. On Christmas Eve morning, the Cambridge Police, along with volunteers, delivered 460 gift bags filled with love to seniors living in 12 buildings and 50 residences. Many gifts were personally matched with the seniors to ensure that they would receive items they most needed. Cambridge Police Sgt. Susan Kale thanked MIT donors for their tremendous kindness, “Without your generous support, we would not have been able to run this program to accommodate all the requests we received.” In a note expressing his gratitude, a senior wrote, “Thank you all so very, very much for that huge bag full of goodies! I love best the elegant and warm scarf, the socks, and the hot chocolate mix with marshmallows. I feel happy and lucky to be a senior citizen in Cambridge.” /

The Santa for Seniors program in Cambridge, Massachusetts, ensures that the senior citizens in the community are not forgotten during the holidays.

Spotlight:

Marshallese Island Outreach

During the annual Community Outreach Fair, visitors could choose from a beautiful selection of items created by people from the Marshall Islands.

The Laboratory operates a field site on Kwajalein Atoll in the Marshall Islands, where 13 staff members serve two- to three-year assignments. The amicable relationship enjoyed by the Laboratory staff and the local community prompted the initiation of an outreach program to enrich the educational experiences of Marshallese students.

At the Laboratory's main complex in Massachusetts, the outreach group sells Marshallese ornaments, woven baskets, necklaces, wall hangings, and intricately carved wooden turtles to support Marshallese artisans and Micronesian schools.

Laboratory staff stationed at the Kwajalein Atoll Field Site donate their time and money throughout the year to both the local Kwajalein community and the larger Marshallese community. Staff participated in the following activities throughout the year:

- Mentoring Boy Scouts, Girl Scouts, and robotics clubs locally
- Helping provide school lunches for students in need
- Joining in Earth Day island clean-up efforts
- Donating items to Marshallese schools and education, such as two fishing/exploration charters, electronic equipment, and school supplies.

Members of the Kwajalein Atoll Field Site worked together to keep the atolls beautiful, and gathered up trash that would have otherwise polluted local islands and reefs.

> "We sponsor a family for Christmas each year. Sometimes, a few of us sponsor additional families as well."
>
> —JO WILSON, COLORADO FIELD SITE STAFF MEMBER

Veteran Family Sponsorships—Colorado Field Site

The Colorado Field Site continued their annual tradition of sponsoring one or more families who are experiencing financial setbacks. The site helped two families recently.

A service veteran (single mother) and five children requested holiday help. The staff's generous response included collecting clothes and shoes for all the children, along with toys, games, books, a bike, dolls, candy, stocking stuffers, and a tree complete with decorations. Staff also provided food for the family's Christmas dinner, a grocery card, and several boxes of used clothing.

Another family that requested assistance was spending their last Christmas together, due to a terminal cancer diagnosis. The Colorado Field Site staff donated $550 to give the family more control over how they spent this precious time together. /

Staff at the Colorado Field Site gathered money and presents—fun toys and essential items—for local veteran families in need.

Children from the Mercy Home came out to cheer on Alec Dean, summer intern at the Laboratory, as he ran in the Chicago Marathon to support the home.

Mercy Home for Boys and Girls

The Mercy Home for Boys and Girls in Chicago provides a home away from home for children and saves lives by giving them the opportunity to break cycles of poverty.

Alec Dean, who spent his summer as an intern at the Laboratory, is passionate about supporting this goal. During his internship, he recognized that the Laboratory invests in local causes and pursued ways to raise funds for the home. While at the Laboratory, Dean conducted a bake sale raising $375.

Dean also ran in the Chicago Marathon for the cause. The marathon winds through some 27 neighborhoods of Chicago and passes directly in front of the Mercy Home itself (an area of the race called the "Mercy Mile"). The children were present, despite the rain, to encourage their supporting runners with a wave and a smile as they passed the home. /

> "I ran in the Chicago Marathon…because the Mercy Home offers a safe home to children who grew up in an abusive environment. I aim to ensure that they have the resources they need to give these children a future."
>
> — ALEC DEAN, LABORATORY INTERN

Youth Action Organization

The Youth Action Organization mentors and trains underprivileged teens to become socially responsible leaders within their communities. Laboratory staff member Shelly Hazard participated as part of a larger team effort to make a lasting contribution to this organization. Hazard held a bake sale in September, raising $530 for the organization.

Youth Action combats the cycle of poverty in the Philadelphia, Pennsylvania, area—the poorest major city in the country, with a large portion of its population living at or below the poverty level. Youth Action provides an important service to their community, giving teens a new option for growth, development, and leadership. /

> "Thank you for the generosity of Laboratory personnel in helping at risk teens gain a brighter future and make an impact in their communities."
>
> —SHELLY HAZARD, LABORATORY STAFF MEMBER

Shelly Hazard organized a bake sale to help Philadelphia youth.

Mount Washington Road Race

The Mount Washington Road Race is a historic, all-uphill run. The race draws thousands of runners each year from across the United States, Canada, and the rest of the world, who attempt to summit the highest peak in the Northeast—Mount Washington.

This year, the 17 team members of Team MIT Lincoln Laboratory, including Laboratory Director Eric Evans, attempted the grueling trek, and every member made it to the summit. /

> "(The race) definitely builds unity. For some, it's the ultimate challenge. Others are trying to set a personal record. For me, I love getting a group of folks together and raising them all up to meet whatever goal they set."
>
> — GLEN COOPER, MT. WASHINGTON ROAD RACE PARTICIPANT

Team MIT Lincoln Laboratory completed the 7.6-mile uphill climb to the summit of Mount Washington, and helped each other to achieve their goals.

Other Community Outreach Events

The Laboratory encourages its staff to support a variety of causes on their own and to join colleagues in charitable efforts. In the past year, Lincoln Laboratory staff members have supported several charities or events on their own time including

American Diabetes Association's Tour de Cure
American Red Cross
Avon Walk for Breast Cancer
AFCEA Golf Tournament
Bedford Special Education Parents Advisory Council 5K Fun Run
Claddagh Fund
Candy for the Troops
Coats for Kids
Cradles to Crayons
Emily Letourneau Memorial Volleyball Tournament
Epilepsy Foundation
Jimmy Fund
St. Baldrick's Foundation

About Our Volunteers

The Laboratory thanks those who have offered their time, talents, and support this past year. We are proud to say that volunteerism among Laboratory employees grows each year. The Lincoln Laboratory Community Outreach Committee will continue to offer many opportunities for employees to participate in educational outreach and community giving events. The involvement of the entire Lincoln Laboratory community is encouraged.

If you engage in outreach or are interested in starting a new outreach program, please contact the Communications and Community Outreach Office.

About Our Programs

MIT Lincoln Laboratory Giving supports activities directed by the Laboratory's Communications and Community Outreach Office, funding for special STEM events and workshops offered at the Laboratory, and grants to participants in programs run by MIT.

If you would like to support STEM outreach, visit the Laboratory's external homepage, choose the Outreach section, and then click Community Giving. You can contribute to any of the following funds:

Roger W. Sudbury Memorial Fund for community outreach

John Welch Memorial Fund for educational outreach

The Barbara P. James Fund for general support

The Lincoln Laboratory Director's Fund for STEM education

The Carl E. Nielsen Jr. Family Fund for MIT graduate students in electrical engineering and computer science

These endowed and expendable funds enable the Laboratory to support programs that complement its mission of developing technology in support of national security by helping ensure that the U.S. workforce remains preeminent in technology. Contributions in any form sustain efforts to motivate and prepare students to become the next generation of scientists and engineers.

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AIR FORCE STEM

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