MIT LINCOLN LABORATORY



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2019 COMMUNITY INVOLVEMENT REPORT

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2019 OUTREACH BY THE NUMBERS

MIT LINCOLN LABORATORY



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The 2019 group of LLRISE students gather outside the Laboratory with their mentors and Eric Evans (far right). For more information about the LLRISE Program, see page 7.

A Message From the Director

Lincoln Laboratory has built a strong program of educational outreach activities that encourage students to explore science, technology, engineering, and mathematics (STEM). These programs foster an interest in STEM and help young people gain confidence in their ability to tackle technical challenges. We see this outreach as vital to our nation's technological future.

Three of our most successful project-based summer programs—the Lincoln Laboratory Radar Introduction for Student Engineers (LLRISE), the Beaver Works Summer Institute (BWSI), and LLCipher—have together reached hundreds of high school students from across the country. Since 2012, the two-week LLRISE workshop has annually immersed up to 24 students in building and operating a small radar system. During its fourth year in 2019, the four-week BWSI program offered 275 students the chance to engage in one of 10 courses, ranging from sessions on programming robotic cars or autonomous quadrotors, to workshops on building small satellites. During an intensive week of classes, LLCipher introduces high school students to cryptography for secure computing. For summer 2020, when most of the nation was sheltering at home, these programs were redesigned as virtual workshops.

I encourage you to look through this booklet to learn more about the many programs we offer to students at every level of education and the various charitable projects we support. All these efforts are part of our commitment for service to the nation and our local communities.

Chin D. Curans

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





LINCOLN LABORATORY



K–12 Science, Technology, Engineering, and Mathematics (STEM) Outreach



Build-it-yourself lightsabers

Circuits are one of the most fundamental parts of engineering, and on Star Wars Day (May 4) they lit up-literally-in the form of lightsabers. A group of volunteers from the Lincoln Laboratory Hispanic Latino Network (LLHLN) spent their Saturday at the Latino STEM Alliance's family science festival in Roxbury, Massachusetts. They taught children of all ages to build a functioning miniature of the iconic movie weapon.

Each lightsaber was made from an LED light, an opaque plastic straw, some copper tape, batteries, and a popsicle stick in the same color as the child's lightsaber (generally green, blue, or purple). The LLHLN volunteers explained the basics of circuitry while helping students to build a basic circuit that would allow them to turn their lightsaber's LED on and

off. Eric Chaidez, the co-chair of LLHLN and a volunteer in attendance, estimated that around 60 students came by their Build Your Own Lightsaber booth, and that many came back a second time to build another lightsaber. "We wanted to provide STEM for students whose schools might not offer a strong curriculum in math and science."

Andres Sisneros, an LLHLN volunteer who spent the afternoon at the lightsaber booth, explained why he cares so much about youth outreach: "I'm from a very small town in New Mexico where events like this are pretty much nonexistent. This exposure-seeing people like you succeed, being told you can do this too, actually building, creating, and proving to yourself that you can-is huge." /



LLRISE participants show off their radars at MIT Museum to Louie Lopez. (left) Director of STEM in the Office of the Under Secretary of Defense, Research and Engineering. Lopez sponsors LLRISE, BWSI, and a variety of other Lincoln Laboratory outreach programs.

LLRISE

Twenty-four students from across the country completed the Lincoln Laboratory Radar Introduction for Student Engineers (LLRISE)—a two-week radar workshop. Now in its eighth year, the summer course challenges high school seniors to build their own small radar systems as they tackle collegelevel 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

We did so much in just two weeks and I learned a lot not only about radars, but about the college experience. I am much more prepared for what lies ahead in my education and career."

- LLRISE PARTICIPANT



Students practice soldering in preparation for assembling a radar.

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." /

Spotlight: High school senior builds radar from scratch

McKayla Leary is a recent graduate of Berwick Academy in Maine and attended the Lincoln Laboratory Radar Introduction for Student Engineers (LLRISE) in summer 2018. The two-week program gives rising high school seniors the opportunity to build and test a small radar unit. Leary enjoyed the program and decided that she still had more to learn about radar and did so with the help of Innovation Pursuit, an independent learning program at her school. The yearlong student-led program pairs students with mentors to explore an area of personal interest, culminating in a presentation to a panel of adjudicators. Leary's mentor was Eric Phelps, a Laboratory employee who regularly assists with the LLRISE program. "Having a mentor was so helpful. If I had tried to do this on my own, I would have been running around like a chicken with its head cut off," Leary said.

In the first few months, Leary focused on the mechanical aspects of the radar, while Phelps turned his energy toward the code to operate the radar. Leary's radar was completed and fine-tuned under Phelps' guidance, and was used for demonstrations during the celebration culminating the year's Innovation Pursuits program. Leary, who is now attending the University of Maine Orono, viewed the experience as successful and informative. She credits her time in LLRISE as the inspiration for pursuing a technical career. **/**



McKayla Leary, left, assembles a radar with classmates during the 2018 LLRISE program.

I'm looking forward to helping out with research when I get the opportunity to," she said. "This was my first glimpse into that." —MCKAYLA LEARY

LLRISE for Teachers

For the third year, the LLRISE program included a high school teacher. Wandesha Traylor, a chemistry and environmental science teacher at Wossman High School in Monroe, Louisiana, learned the principles of radar and built her own radar system. She plans to recreate the LLRISE program as an extracurricular activity at her own school, and is excited about integrating the radar lessons into labs and supplementing conceptual lectures with hands-on building activities. The goal of this program is to enrich STEM curriculum in underserved areas and help students realize the connection between different technologies and how they are applied. **/**



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In 2019, more than 50 volunteers* served as coaches and mentors for 12 Laboratory-sponsored teams totaling 130 students.

*Volunteers were both Laboratory staff and non-Laboratory mentors.

Visiting high school teacher Wandesha Traylor attended lectures on the basics of radar systems, assembled a radar system that could perform range-Doppler imaging, learned about computer-aided design and 3D printing, and toured Lincoln Laboratory facilities.

K–12 Science, Technology, Engineering, and Mathematics (STEM) Outreach



Lincoln Laboratory has a devoted group of volunteers who help at the FIRST Tech Challenge every year.

Massachusetts FTC Robotics

Massachusetts FIRST Tech Challenge (MASSFTC), created by Laboratory technical staff member Loretta Bessette, is dedicated to spreading STEM through the For Inspiration and Recognition of Science and Technology (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 Robotics Outreach at Lincoln Laboratory volunteers as referees, judges, and volunteers. /

ROLL is just one way that the Laboratory is helping shape the next generation of scientists. "Kids often have a lot of engineering knowledge. They just don't know that they know it."

- HEMONTH RAO, JR. FLL COACH



(Above) Students in the FIRST robotics program work in teams to explore real-world scientific challenges, develop a solution, and compete with LEGO-based robots of their own design. (Left) With the help of Robotics Outreach at Lincoln Laboratory, the Chain Reaction Robotics team in Plano, Texas, was able to add a smart camera called Limelight that will enable computer vision for their robot.

Robotics Outreach

Robotics Outreach at Lincoln Laboratory (ROLL) is designed to stimulate youth interest in robotics and engineering through hands-on activities. Laboratory staff members volunteer their time to serve as team coaches and provide students with important guidance while the students try to solve problems on their own. This year, students worked on space-themed challenges, including thinking about solutions involving space travel and living on the moon. Coaches meet with their teams once a week to teach them team building, problem solving, and technical basics.

While the overall goal of ROLL is to instill core values of professionalism and teamwork, there are also final competitions in which the teams compete. The Jr. FIRST (For Inspiration and Recognition of Science and Technology) LEGO League (Jr. FLL) students, in first to third grade, present their work at an expo in December, and FLL teams compete against other teams in their age group. FIRST Tech Challenge (FTC) teams consist

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of older high school students who use their more-advanced Android-based robots to compete against other teams from around the state in a qualifying round in March.

ROLL has dozens of volunteers each year, but the core volunteers in 2019 were Hemonth Rao, Richard Czerwinski, Jacob Huang, and Loretta Bessette. These staff give many hours each fall to help children learn how to program robots to compete in challenges specified by the FIRST organization.

Lincoln Laboratory Outreach supports several sister teams in the New England area and provides funds to robotics teams from as far away as Plano, Texas. ROLL has continuing collaborations with sister robotics teams throughout the New England area and at 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. /

K-12 Science, Technology, Engineering, and Mathematics (STEM) Outreach

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) 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. "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," said Grant Stokes, leader of the LINEAR program. /



As the 2nd place technology winner of the Broadcom MASTERS Science Fair, Rishab Jain, an eighth grade student from Portland, Oregon, was awarded with having a minor planet named after him. Rishab's winning invention is a novel biopsy tool that uses artificial intelligence to screen for genetic mutations of pancreatic cancer.



Capture the Flag

The national Capture the Flag outreach program is designed to stimulate youth interest in cybersecurity. High school students learn cybersecurity skills like cryptography, network forensics, critical infrastructure protection, and web exploitation. Then students put their new skills to the test, participating in a virtual competition of offensive and defensive challenges that mimic real-world cybersecurity scenarios. /

In our Capture the Flag outreach program, a Laboratory scientist helps students understand how key exchange works and why it is important. Capture the Flag promotes interest in cybersecurity and trains participants how to compete in challenges once they gain fundamental cyber skills.



LLCipher

LLCipher is a summer program for high school juniors and seniors that introduces cryptography and approaches to securing data. The 30 students from the region hear daily lectures at the Beaver Works Center in Cambridge, Massachusetts, and visit laboratories to gain insight on how different technologies use cryptography.

Sophia Yakoubov, Gene Itkis, Noah Luther, and David Wilson instructed the students in abstract algebra and number theory needed to apply the concepts used in blockchains and public key encryption. Emily Shen, Nabil Schear, and Uri Blumenthal offered support to the students and the teachers of this program. /

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(Left and below)

Students in the LLCipher summer program toured the Technology Office Innovation Laboratory to learn about using 3D printers for rapid prototyping and to see a range of items manufactured in the TOIL Laboratory.



K–12 Science, Technology, Engineering, and Mathematics (STEM) Outreach



Elisa Kirchheim teaches a middle school girl about circuits during the G.I.R.L. workshop.

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

In the second year of the Girls Innovation Research Lab (G.I.R.L.) program, Laboratory volunteer Yari Golden-Castano created a new workshop to introduce middle school girls to circuits and electronics. The overall goal is to offer hands-on activities in science and engineering to girls and show what careers can be considered in the scientific realm. In November, 40 participants in this debut event learned about various electronic components while building their own circuits using MIT's Scratch programming language and a Makey Makey board. The course organizers and

instructors-including seven Laboratory staff membershelped girls understand the basic programming needed to enable piano keys to change sound, color, and position while responding to different commands. The Laboratory team plans to develop the experience into a standalone workshop across the country to introduce more girls to programming and engineering. They also plan to offer a more advanced version of the program that will use Playground Circuit Board and Arduino.

AFCEA Internships

The Armed Forces Communications and Electronics Association (AFCEA) arranges summer internships for recent high school graduates interested in STEM careers. Each summer, one to two 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 2019, Derek Ng worked at the Laboratory, while another AFCEA intern, Robert Finnegan, worked at the Beaver Works Center in Cambridge, Massachusetts, 3D printing complicated parts. A third intern, Jared Boyer, assisted Kerri Cahoy in the research and design of a new form



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of laser communication technology at MIT. Ng worked in the Bioengineering Systems and Technology Group, where he was mentored by Darrell Ricke. During his internship, he picked up machine learning rapidly with minimal guidance and contributed to an advanced DNA forensics project, conducting scientific data quality assurance. Within hours of evaluating a high-performance programming language, he identified an implementation system flaw. Boyer said, "I enjoyed my time working for Lincoln Laboratory and developed a network of invaluable relationships within the MIT research community." /

> **I** found it amazing that I was able to work on important projects for the nation and learn important skills for my future career, all before starting college!"

> > — DEREK NG, 2019 AFCEA INTERN

Darrell Ricke (right) hosted an AFCEA intern over the summer He said "Even though Derek was coming directly out of high school, he performed during his internship at the level of a college graduate."

Technical School Internships

Every year, Lincoln Laboratory hires two to three rising seniors from local technical high schools as interns for the summer. John Boughner in the Advanced SATCOM Systems and Operations Group mentored Samuel Harris, an intern from Minuteman Career and Technical High School in Lexington, Massachusetts. Boughner guided Harris in hands-on testing to ensure high-power amplifiers were operational and in good working condition at both fixed and mobile antenna sites as part of the AEHF/ EPS programs. Boughner enjoyed the opportunity and said "being able to mentor a student from a Vocational-Technical high school and help teach about the high-tech environment we operate in with hands-on work is very gratifying for both the mentor and the student." /



Boughner (at right) observes as intern Samuel Harris connects a waveguide to a highpower amplifier to be able to perform bench testing.



Massapequa High School students conduct research at Lincoln Laboratory

From January 28 to February 1, five seniors from Massapequa High School in Long Island, New York, conducted research with Robert Haupt, a Lincoln Laboratory senior staff member in the Active Optical Systems Group. Three students worked with the non-contact laser ultrasound system, or N-CLUS, which uses laser pulses to excite ultrasound waves into tissue, allowing them to travel through the tissue interior and back to the surface where they can then be picked up by a vibrometer. Vibrations from the laser travel through different types of tissue at different speeds, and by measuring those discrepancies, the vibrometer can build a picture of the inside of the sample. The other two students studied how a configuration of boreholes might be able to mitigate the effects of an earthquake by seismically "cloaking" the area they enclose. Haupt has been working

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(Left) Robert Haupt (left) helps students collect data. (Above) A student adjusts transducers to measure how boreholes can mitigate earthquake vibrations.

on both projects for several years now, and hopes to use the data that the students collected to further his research.

This is the second year that Haupt and Lincoln Laboratory have hosted students from Massapequa High School. The program began when Robert Gariglio, a teacher at Massapequa, contacted him with an idea about how to bring laboratory research opportunities to students. Although Gariglio has since retired, he enjoyed taking part in the program last year so much that he travelled up independently to watch the students conduct this year's research. "I believe it's an experience you can't measure," he said. /

Job Shadowing

This was the third year that high school students in grades 10-12 could enroll in the Job Shadowing program during Daughters and Sons Days. The program catered to students interested in both technical and nontechnical fields to provide insight to what is involved in a specific job. The students chose to explore a field from among electrical engineering, mechanical engineering, physics, aerospace, biology, computer science, chemistry, meteorology, mathematics, and business. Each student spent the day with an employee to learn about a typical day in a particular field. Employees enjoyed being shadowed during the day, sharing their day, and hopefully inspiring a young person to choose a technical career. /





(Left and above) Students visiting Lincoln Laboratory for the Job Shadowing program experienced a typical day as a scientist while using some popular tools of the trade.

Thirty students participated and 25 staff members served as mentors over the two days of the Job Shadowing program.

Scouting

Girl Scouts

A Junior Girl Scout troop of 17 fourth graders from Burlington, Massachusetts, contacted Lincoln Laboratory for help in earning some of the brand-new STEM-based badges now offered by the Girl Scouts of USA. Edward Lyvers led technical staff in developing lectures and hands-on activities and demonstrations that would fulfill badge requirements while introducing the girls to engineering and digital arts. Four STEM workshops were held for the scouts throughout spring 2019:

• **Product Designer**, led by Yari Golden-Castano, taught girls about entrepreneurship, engineering skills, and real-life product designs.



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- Balloon-Powered Cars, led by Allison Norloff, focused on creative problem solving and mechanical engineering.
- Designing Robots, led by Kathleen Nahabedian, taught girls how to use basic engineering skills to build and program robots.
- **Digital Photography**, taught in two parts—photo taking and digital editing-by Lyvers satisfied part of the Girl Scouts Digital Arts category of the new STEM badge. /

Sara-anne Taylor helps a participant with the finer points of building a balloonpowered car in order to increase the car's speed and balance.

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G There is always confusion at the beginning of a task, but once a team starts working together, you begin to see the ideas form. The realization that they came up with a solution on their own makes it very rewarding."

K–12 Science, Technology, Engineering, and Mathematics (STEM) Outreach

Scouting (continued)

Explorer Post 1776

From October to May, 15 high school students explored engineering-related fields. Explorer Post is a program for girls and boys that aims to deliver character-building experiences for 14–20 year-olds. In 2015, the Laboratory organized a local branch called Explorer Post 1776.

The co-ed students met monthly for two-hour dives into technical and professional topics and engaged in team-building activities such as reverse engineering home electronics and creating a machine that propels a ping pong ball down a track. They have built prototypes by using creative problem-solving strategies and prepared demonstrations of their projects.



Students in Explorer Post 1776 visited Lincoln Laboratory in October to build and test water rockets.

An Explorer member inspects the Firepond Optical Facility telescope at the MIT Haystack Observatory in Westford, Massachusetts.



Explorer Post 1776 also teaches students about professional skills, including how to write resumes, apply for college, and develop presentations. The students appreciated the opportunity to visit and tour Laboratory facilities such as the MIT Haystack Observatory, the Firepond Optical Facility, the Microelectronics Laboratory, and the Rapid Prototyping Laboratory. "It is awesome to see the equipment and projects that people are working on at the Laboratory, and how things come to be," said Liliana Vornehm, daughter of staff member Joseph Vornehm. "I enjoy learning about the facilities and seeing what I might like to do as a potential career." /



K–12 Science, Technology, Engineering, and Mathematics (STEM) Outreach

Partnerships with MIT



Scouting (continued)

Scouting@Lincoln

Members of the Scouting@Lincoln group, Philip McKinley, Adam Margetts, and Bill Harmon, assisted at the Math Science Technology Expo at University of Massachusetts Lowell in March. Together, they organized the event and led activities to help scouts earn merit badges in robotics and space exploration. More than 200 scouts from the Middlesex County area attended this event to learn about STEM fields and careers. The keynote speaker for the Math Science Technology Expo was Lincoln Laboratory's Kristin Clark, who gave a presentation about satellite development. /



(Left) Venture Crew prepared for strenuous hiking in New Mexico by practicing on mountain ranges in the Northeast and in southern California. Mount Baldy, shown here, is at 10,046 feet elevation. (Top) At the Math Science Technology Expo, Kristin Clark shares a presentation about her work in developing the Transiting Exoplanet Survey Satellite for NASA's mission to explore earth-like planets nearest to Earth.

Venture Crew 1775

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 2019 included a tour of the MIT nuclear reactor. NovoBiotic Pharmaceuticals, and iRobot. This year, the Crew volunteered at Lexington Community Farm, at Cradles to Cravons, and served breakfast to the homeless at the Paulist Center in Boston. Venture Crew 1775's outdoor adventures have included a 12-day trip to Philmont Scout Ranch in New Mexico, which included backpacking and summiting mountains. The scouts also engaged in ice climbing, hiking to a hut on the Appalachian Trail, and team building. Their badge work engaged them in public speaking, wilderness survival, forestry, and space exploration.



MITES students practice taking measurements and finding means in a competitionbased approach to learning.



Andrew Fishberg speaks to MITES students on the benefits of choosing a technical career.

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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 provides a hands-on curriculum that strengthens foundational math, science, and communication skills in a challenging learning environment. Lincoln Laboratory plays a part in two OEOP programs: SEED and MITES. /

Saturday Engineering Enrichment and Discovery (SEED) Academy

The SEED Academy is a technical career exploration program for underserved middle and high school students from Boston, Lawrence, and Cambridge, Massachusetts. Students visit MIT for eight consecutive Saturdays and renew their commitment to study hard in the fall semester. They must maintain a strong academic standing in their school work in order to continue with the program each year. Lincoln Laboratory sponsored two students and an aeronautics and astrophysics course. /

Minority Introduction to Engineering and Science (MITES)

This year's MITES class included 80 promising high school seniors from 25 states and Puerto Rico, Ghana, and Nicaragua to take calculus, physics, mechanical engineering, and computer science courses at MIT. The free six-week experience offers a taste of life as an MIT student, including coursework, handson training, and the chance to create innovative solutions to real-world challenges. The program also stresses the value of pursuing advanced technical degrees and practicing presentation skills. 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 Andrew Fishberg, who explained his work on aerial drones and his career path. /

Partnerships with MIT

Spotlight: Beaver Works Summer Institute





Now in its fourth year, the Beaver Works Summer Institute (BWSI) offers hands-on STEM learning to rising high school seniors through project-based courses. This year, the program admitted more than 250 students from 27 states. This year's BWSI featured 10 courses — Autonomous RACECAR (Rapid Autonomous Complex Environment Competing Ackermann-steering Robots) Grand Prix, Autonomous Air Vehicle Racing, Autonomous Cognitive Assistant, Medlytics: Data Science for Health and Medicine, Build a CubeSat, Unmanned Air System–Synthetic Aperture Radar (UAS-SAR), Embedded Security and Hardware Hacking, Hacking a 3D Printer, Remote Sensing for Crisis Response, and Assistive Technology.

Students from the UAS-SAR course created an image of a covered space with a hidden pattern underneath by flying a small UAS around an enclosed room. The UAS was equipped with a radar that the students built and tested during the course.

A student in the Medlytics course explained his team's prototype, a web application to help physicians and patients identify disease from symptoms and then recommend treatment. "The best way to learn coding and statistics is to just do it," he said. The Medlytics

(Above) At the Beaver works Summer institute infail event, teams of students prepare to race autonomous racecars around an obstacle course in the MIT Johnson Ice Rink. (Right) A student in the UAS-SAR course flies a drone equipped with a radar to map a hidden area inside the MIT AeroAstro building. Students from the Hacking a 3D Printer course display their work to visitors in the MIT Stratton Student Center.

course allows students to apply advanced machine learning and data mining to real-world medical challenges.

One team of students from the Build a CubeSat course designed and built a prototype of a CubeSat that would inform people responding to oil spills about how to take action quickly and efficiently. The Autonomous Air Vehicle Racing class completed an obstacle course race made of bridges and rings hanging at different heights in the air. Each team developed algorithms that allowed an Intel drone to autonomously navigate the race course.

The final BWSI event was the RACECAR grand prix, which converted MIT's Johnson Ice Rink into an obstacle-filled racetrack. Students programmed RACECARs to navigate the track by using inertial sensors, lidar, and cameras.

This year's program included teams from Mexico and a team from Nauset High School on Cape Cod. In addition, the Ulsan National Institute of Science and Technology in South Korea provided teaching assistants to several BWSI courses and plans to adopt the BWSI curriculum next year. *I*

Race Car Course at BWSI

Technical staff member Andrew Fishberg developed an abbreviated RACECAR workshop for middle school students. Fishberg was worried that the BWSI program was reaching students too late in their educations to have maximum impact. "It only gets harder [to teach coding] the later you get to the students," he said. "This was an opportunity for middle school students to be exposed to the basics of programming, computational thinking, computer vision, and robotics." With the help of colleague Eyassu Shimelis and the Timothy Smith Network, Fishberg designed a four-week program to introduce middle schoolers to coding by programming racecars. Two dozen participants learned the basics of coding followed by actual work on a miniature autonomous racecar. "Basically everything they learn turns into the logic to drive the car," Fishberg said. "That application really drives home the learning objectives." /



Middle school students race their self-programmed RACECARs at the BWSI final event.

Black Girls Code

In October, Beaver Works representatives joined Bostonarea students, their parents, educators, and leading voices in STEM careers at the Black Girls Code networking event, an evening filled with conversation and connection. The mission of Black Girls Code is to offer opportunities across the country to foster an interest in programming, among a new generation of coders, particularly girls of color, between the ages of 7 and 17 at a time when children are naturally thinking about what they want to be when they grow up. /



Black Girls Code is a not-for-profit organization that provides technology education for African-American girls. Photo: BlackGirlsCode.com

At the end of the workshop, [the students] were more sure of themselves and more willing to explore their own ideas without fear."



All-Girls Race Car Course at BWSI

Boston-area girls discovered a passion for coding through eight Saturday robotics workshops designed to help middle and high school girls get a taste of computing. "My goal is to make computing 'normal' for girls," said Sabina Chen, who led a workshop that taught girls how to program a robotic car to autonomously follow colored cones. "The class is about exposure [to computing]," she explained.

While Chen was introducing the 20 middle school girls to coding and computer visualization software at the Beaver Works facility in MIT's Building 31, Eyassu Shimelis was conducting a similar series of classes for 21 high school girls in MIT's Building 33. Both workshops are based on a rigorous four-week course offered to high school seniors through the Beaver Works Summer Institute (BWSI). The summer course lets students explore technologies like coding and computer vision that can be used to enable a robotic vehicle to compete in autonomous navigation around a mini "Grand Prix" racetrack.

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The middle school and high school girls showcased the autonomous cars their teams programmed to navigate a circuitous course. Photo: Joel Grimm

Chen developed the curriculum for the middle school program that was offered this past summer in conjunction with the BWSI. "It is designed so students learn a specific concept, apply it, and see an immediate result," she said. The gratification of witnessing a hands-on application of a lesson is what keeps the students interested. Her curriculum will soon be online so that schools, robotics clubs, or even interested individuals can adapt it for themselves.

Shimelis taught a similar version of a racecar preliminary course for Boston-area high schoolers. "Many of the girls were faster at grasping the concepts than students in my summer course," Shimelis noted. The success of the workshops is captured in one student's comment about what she gained: "I see myself coding in the future!" /





(Left) At the Science on Saturday in December, Steve Villanueva of MIT's Kavli Institute showed children the part of the constellation that NASA's TESS satellite is currently watching in hopes of finding exoplanets. (Above) Children attending the Magic and Science of Optics took a great interest in how 3D glasses work.

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:

Science on Saturday 2019 began in March with **Teaching Computers to See, Play, and Think**. Scientists described how deep learning helps computers and robots know what's going on around them. Demonstrations showed examples of computer vision, augmented reality, and video games used in current machine learning. In May, the **Using Light for Science** demonstration explained how Laboratory scientists use light to create sound and vibration and how light can be used as a microphone to measure sound and light from far away.

Magic and Science of Optics in October explored the properties of light: how different colors of light combine, how a laser light can bend and bounce, and how a 3D image is made.

December's show, **Uncharted Space: Searching the Cosmos for Exoplanets**, featured a discussion of how scientists find exoplanets. Participants launched their own balloon rockets, practiced forming craters on different surfaces, and learned how gravitational fields work and how lasers communicate through space. *I*

Boston Citywide College and Career Fair

In October, representatives of two of our most popular outreach programs for high school students, LLRISE and BWSI, hosted information booths at the Boston Public Schools Citywide College & Career Fair at the Reggie Lewis Track and Athletic Center in Roxbury, Massachusetts. The fair was just one of approximately 500 events during the second annual Massachusetts STEM Week. Schools, non-profit organizations, colleges, museums, and business partners all participated in hosting and organizing STEM Week events for students ranging from preschool to college. /

Cambridge Science Festival

Each April, Lincoln Laboratory takes part in the Cambridge Science Festival, a week-long citywide event that offers hundreds of sciencebased 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-sponsored robotics team was on hand to let participants control miniature robotic cars built with LEGOs. /



(Above) At the Cambridge Science Festival, Joel Grimm educated parents, teachers, and students about the Beaver Works Summer Institute and other activities at Beaver Works. (Right) Laboratory volunteers at the Cambridge Science Festival helped participants learn how to maneuver robots to do tricks and navigate a path.

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John Yirrell (middle), a Laboratory intern and an LLRISE teaching assistant, demonstrated the ranging mode of the do-it-yourself radar built by students in the LLRISE program.



Community Recruiting Events

This fall, members of the Communications and Community Outreach Office (CCOO) and the MIT Lincoln Laboratory Beaver Works Center hosted several events to engage with middle and high school students across Boston including appearances at MIT Family Weekend and the NACA STEM College Fair hosted at Northeastern University.

"People talk about the need for diversity in STEM, and these fairs provide an onramp for students in urban schools," said Joel Grimm, Beaver Works Manager. "This is a great opportunity to meet students, talk to them about their future, and show them some of the opportunities that are available, as well as encourage them to do projects that aren't as intimidating as they imagine."

At these events, staff ran information booths, participated in panels, and conducted technical demonstrations to promote interest in STEM fields. They encouraged students to think about their futures and prepare for postsecondary pursuits.

The weekend STEM events allowed staff from the CCOO to showcase the LLRISE program's radar to hundreds of interested students, while Beaver Works personnel shared information about the Beaver Works Summer Institute and other activities at Beaver Works. /

STEM and recruiting events in underserved communities give us an opportunity to raise awareness about participating in our outreach programs, which allows for a more diverse talent pool to learn about STEM careers at the Laboratory."



Joel Grimm and Lisa Kelley represent Lincoln Laboratory while publicizing the Beaver Works Summer Institute outreach programs.

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 eight staff members assisted in judging science fair projects: Robert Moss (who also judged at the Massachusetts Middle School Science & Engineering Fair), Sean O'Melia, Jean Eugene Piou, Ken Kolodziej, Phillip Bailey, James Johnson, David Brown, and Jeffrey Psencik. /

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 Lincoln Laboratory. Their participation supports community outreach and STEM education on a local level.

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A Lincoln Laboratory volunteer judge, Shourov Chatteriji, asks a student to explain their science project during the Massachusetts State Science and Engineering Fair. Laboratory technical staff have volunteered as judges at the statewide science fair for the past 19 years.

Community Engagement

Kwajalein (Reagan Test Site) STEM Outreach

Laboratory staff members at the field site at Kwajalein Atoll, Marshall Islands, support the local schools to help 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. "Our STEM outreach is a great opportunity to show some of the things that we do and inspire a new generation of scientists and engineers." Kwajalein staff provided the following forms of STEM outreach in 2019: **Kwajalein STEM Expo:** Laboratory staff hosted five booths at the 2019 Kwajalein STEM Expo. Laboratory volunteers shared information about autonomous vehicles, image tracking algorithms, laser properties, and 3D printing. This Expo provided an opportunity to introduce the community to the Laboratory's new astronomy outreach program and see the telescope in person. The booth featured a cloud chamber particle detector and a recently acquired black hole event horizon image.

High School Lecture Series: While living on Kwajalein Atoll, some Laboratory staff give technical lectures at the high schools. Juan Montoya presented about lasers during spring 2019. The talk was entitled, "Laser Coherent Beam Combining and the Science of the Death Star," and described how the death star laser in Star Wars could have been constructed and the benefits of coherence.

Tom Sebastian explains the process and capabilities of 3D printing to a captivated audience of elementary school students in Kwajalein.

> It is my hope that [our outreach event] may inspire a student to embrace their curiosity and to develop a passion for science, engineering, and math."
> —JUAN MONTOYA, LABORATORY VOLUNTEER

Mars Project: Sarah Willis visited a 6th grade class on Kwajalein Atoll to describe some of the harsh conditions present on Mars. The students used the information to develop plans for space colonies on Mars as part of a capstone project for 6th grade.

Astronomy Research Project: Laboratory staff worked with students from grades 7–12 on an astronomy research project using the Laboratory's outreach telescope to get hands-on experience working as astronomers. The students took measurements on variable stars and will host a research symposium in spring 2020 to share their results with the community.

3D Printing Project: Tom Sebastian is working with 5th and 6th grade students on a material science project to develop a cheap method of turning raw coconut husks into a biocomposite material resembling particleboard. He will help the young scientists determine the properties and characteristics of coconut biocomposites, and then use the material to make a small model boat. He plans to adapt the process so that the material can be created using a 3D printer.





Astronomy Outreach: While working and living on Kwajalein, Jessica Brooks created the Astronomy Outreach program to introduce Kwajalein residents and guests from RMI to the wonders of astronomy and foster the relationship between Lincoln Laboratory and the local community. For this purpose, Lincoln Laboratory acquired an easy-to-use Celestron CGX 1100 Telescope with star-finder technology and a camera for astrophotography.

Astronomy nights are held once a month, with special events, such as scout nights, school events, and camping with the stars workshops. This outreach team has also hosted an astronomy information booth at local STEM fairs, allowing elementary students to learn how the telescope works and how to operate its motors. Sarah Willis indicates that plans are now underway to train volunteers to become telescope operators and to add a solar filter capability to the telescope so the community can also learn about the sun. *I*



During the first Astronomy night, volunteers assisted budding astronomers in locating a nebula and taking several photos like the one featured above.

2019 COMMUNITY INVOLVEMENT REPORT

Community Engagement



Brockton Public School students were treated to a tour of Laboratory facilities and a presentation about life as a scientist. Lincoln Laboratory staff assisting with Brockton Outreach included Yari Golden-Castano, Idahosa Osaretin, Donato Kava, and Chiamaka Agbasi-Porter.

Brockton Outreach

Ten Brockton High School and Ashfield Middle School students spent January 30 learning what weather would do to the roughly 50,000 flights that move through U.S. airspace every day. The group toured the Lincoln Laboratory Integrated Weather and Air Traffic Test Facility Airport Control Tower Flight Simulator and the Weather Systems Lab, as well as the Flight Test Facility and RF Systems Test Facility on Hanscom Air Force Base. The students were all members of the after-school financial literacy program Empower Yourself, run by Cedric Turner. He and principal James Cobbs, both of whom attended the tour, hoped that giving the students an opportunity to see work at a place like Lincoln Laboratory would help to pique their interest in STEM.

"Access is the name of the game," Turner said. "This could be a lifechanging experience."

The tour was organized by the Lincoln Employees' African American Network (LEAN). "Educational tours are very important, as they help provide inspiration for students. This is especially important for students from underrepresented communities, where such extracurricular activities are not common." said Idahosa Osaretin. the chair of LEAN. "We want our young people to dream and have ambitions of being great." Osaretin and Thomas Washington, of LEAN's outreach subcommittee, both attended the tour. /

Daughters and 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 Martine Kalke, James McIntire, Tina Shih, Will Moulder, and Bonita Burke. Following these presentations were tours of the Fabrication Engineering Laboratory, the Environmental Testing Laboratory, the Autonomous Systems Development Facility, the Defense Fabric Discovery Center, and the Technology Office Innovation Laboratory (TOIL). Staff hosted displays about laser communications, air traffic control, and 3D printers.

Children enjoyed seeing propellers in motion, watching thermal imaging in real time, and "listening" to light. Clever demonstrations taught new skills to participants, such as how to use GPS to triangulate a location, how to make a synthesizer, and how to use HTML to make a web page.

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.

Very popular and educational this year was a combat software game that children could play to gain an understanding of the challenges of RF-based communication in the presence of jamming. /

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Children visiting the Laboratory on Daughters and Sons Day had the chance to visually inspect charge-coupled devices through a microscope to see the intricate build and what it looks like up close.

Community Engagement



Students at East Lawrence High School practice using the robots brought in to the school by Lincoln Laboratory volunteers from the Huntsville Field Site for the onset of a new STEM outreach program.

> I can't believe I actually like building robots! It's fun! I can't wait to see our robot move."

> > SCHOOL IN TRINITY, ALABAMA.

Huntsville Field Site STEM Outreach

A teacher from East Lawrence High School in Alabama requested the assistance of the Lincoln Laboratory Field Site in Huntsville to set up a robotics program for students interested in programming and engineering. The goal is to boost math and science proficiency for this high school by way of offering coding in the classroom.

Keith Henderlong answered the call by kicking off a STEM outreach program in December that includes builderbot kits. Lincoln Laboratory staff helped students build a robot from a kit of parts and presented a challenge that should be accomplished by the robot once programmed correctly, such as autonomous maze navigation, unlocking a color sensor gate, grabbing an object, and carrying and dropping an object. Laboratory volunteers took the opportunity to increase awareness about STEM opportunities in northern Alabama, FIRST robotics, the Beaver Works Summer Institute, and the Laboratory's LLRISE program. Students responded with positive feedback, saying "There's a lot more opportunities in my community than I realized!" /



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 2019 tour groups included

U.S. Air Force cadets **ROTC students** U.S. Air Force Reserve Officer Training Corps **Research Science Institute Program** 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** World Bank Executives **Congressional Staff via MIT Security Studies Program**

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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







University Student Programs



University students from across the country conducted research under the guidance of Laboratory technical staff during the summer of 2019.



As a co-op in the Laboratory's Security Services Department, Northeastern University student Sarah Garrett experienced the challenges and unique learning opportunities of working in a government facility.

Worcester Polytechnic Institute Major **Qualifying Project Program**

From August 2019 to October 2019, eight 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. /



Rahul Tewari, who interned in Lincoln Laboratory's Cyber-Physical Systems Group, was one of over 250 students who visited the Laboratory for the 2019 Summer Research Program.

Summer Research Program

In 2019, 274 undergraduate and graduate students from 85 colleges and universities participated in Lincoln Laboratory's Summer Research Program, which offers students internships in technical groups. The students gained handson experience in a technical research environment while contributing to projects that complemented 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. /

Deportunities to creatively solve problems are more readily available here than elsewhere."

-RAHUL TEWARI, SUMMER INTERN IN THE CYBER-PHYSICAL SYSTEMS GROUP

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Working at the Lab has been such an enriching experience for me both personally and professionally. I met so many people in the security field who all taught me about what it's like working in a secure government facility.'

> ----SARAH GARRETT, NORTHEASTERN UNIVERSITY INTERN IN SECURITY SERVICES

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. 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. /

University Student Programs



Shreya Parjan, a member of the GarBots team, explains to a panel of Laboratory judges how her team's technology cleans pollution from rivers and oceans.

Intern Innovative Idea Challenge

Each year, the Intern Innovative Idea Challenge gives Laboratory interns the opportunity to form teams across groups and work on a project of their own design. It encourages creativity, but also teaches students how to refine a research concept, give a concise presentation, and pitch their idea with the hope of getting funding.

This year, more than 70 interns making up 24 teams participated in the program, which is now in its fourth year. Throughout the summer, the competition was whittled down to just six teams, each of which presented their projects to a panel of Laboratory judges in a Shark Tank-style showdown on July 28. The winning technologies of this year's Shark Tank included a system that allows American Sign Language users and English speakers to communicate in their preferred language in real time; a brace that prevents injury in wearers with the connective tissue disorder Ehlers-Danlos syndrome; and a device that cleans plastic pollution out of rivers.

The winning teams were awarded funding to continue developing their technologies and can return to the Laboratory next summer to begin prototyping their projects. The goal is to transition their projects into full-time Laboratory programs. /



The 2019 GEM fellows stand with Chief Diversity and Inclusion Officer Chevy Cleaves, far left.

National GEM Consortium

In the summer of 2019, the Laboratory hosted 18 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

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candidates that they may not find otherwise. GEM fellowships at the Laboratory offer the students numerous returns, from networking opportunities to high-level research experience.

"I had a great time working at the Lab, and this was an amazing opportunity to hone previous skills while learning new ones from some of the best and brightest in the field," said GEM fellow Matthew Perez. Perez spent his summer in the Bioengineering Systems and Technologies Group researching acoustic and speech-based biomarkers for identifying and analyzing different neurocognitive conditions, such as aphasia, depression, and concussions. /

University Student Programs

MIT Student Programs

Republic of the Marshall Islands Information Technology Internship Program

During 10 weeks at the Lincoln Laboratory Kwajalein Atoll field site, two citizens from the Republic of the Marshall Islands (RMI) completed a summer internship in information technology, for which Lincoln Laboratory staff served as instructors. The annual program includes exercises in troubleshooting and studying and building computers and networks that run on different operating systems. Interns participated in observations and field trips to departments around the U.S. Army Garrison at Kwajalein Atoll and received a weekly stipend in addition to an educational scholarship award. They honed their abilities in computer management, server administration, and computer networking and were awarded certificates recognizing their hard work. /





Instructor and Lincoln Laboratory technical assistant Ranny Ranis (left) and interns Naomi Mae Napa (center) and Abraham Mea (right) teamed up for the 2019 Republic of the Marshall Islands Information Technology Internship Program. Photo: Jessica Dambruch



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 solve 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 provide expertise and serve as advisors for these capstones.

Students in the MIT Department of Aeronautics and Astronautics capstone course began building a CubeSat, called BeaverCube, to study the ocean and cloud-top temperatures. BeaverCube is scheduled for launch in 2020 through NASA's CubeSat Launch Initiative. /

Cyber-Physical Systems Internship Program

With new projects continuously being added to the Laboratory's repertoire, college interns are often hired to help meet the increase in research demands. These interns gain invaluable experience in their field of study, and the Laboratory is able to scope out new talent and work with students that may transition to a full-time position in the future. The Laboratory's Cyber-Physical Systems Group has ongoing relationships with Tufts University and Morgan State University. Staff members recruit interns from these universities to develop stronger academic relationships with schools researching cybersecurity. /

Intern Shannon Robinson pursued a PhD degree in computer science from Tufts University while working in the Cyber-Physical Systems Group to develop algorithms and visualizations to aid anomaly detection.

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At the end of the fall semester, students in the MIT Department of Aeronautics and Astronautics capstone course presented a critical design review of the BeaverCube CubeSat.

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. /

MIT Student Programs



Students taking the RACECAR course through the Independent Activities Period stand with their autonomous robotic racecars.

MIT Independent Activities Period

Lincoln Laboratory technical staff lead activities offered during MIT's Independent Activities Period (IAP), a four-week period during MIT's January semester break. Under the IAP program, for-credit classes are available for registered MIT students, and non-credit activities, which may span the full four weeks or a limited number of days, are open to all members of the MIT community. IAP offerings range from academic classes to hands-on engineering projects to artistic pursuits. Lincoln Laboratory staff members instructed nine non-credit courses for the 2019 IAP:

Build a Small Radar System Build a Laser Communication Terminal Hands-on Holography Mathematics of Big Data and Machine Learning **RACECAR** (Rapid Autonomous Complex-Environment Competing Ackermann-drive Robotics) Build a Laser Radar **Practical High-Performance Computing** Software Radio Using Drones for Research: Data Processing and Legal Issues

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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 summer 2019, nine undergraduates were hired as UROP interns and six as UPOP interns.

"This is my second summer interning at Lincoln Laboratory, and I continue to be very impressed with its emphasis on continued education and development. I really appreciate how I have been able to pursue work in my academic field as well as explore very different areas," said Warner McGhee, an MIT UROP intern.

Courtney Byrne interned in the Laboratory's Active Optical Systems Group to explore her interests in military and space technology.



h The computational resources available through the Lab have allowed me to work on interesting and cutting-edge machine learning research related to action recognition. It allowed me to better understand technical problems related to national security, which will be valuable in my post-graduation career as an officer in the U.S. Air Force."

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 2018-2019, 11 6-A students participated in the program, gaining experience in design, development, research, and programming. /



Matthew Hutchinson worked in the Supercomputing Center researching ways for high-performance computing to improve machine learning.

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.

Spotlight: Students liked summer classes so much they came back to teach them

On July 8, 242 soon-to-be high school seniors and 25 middle school students arrived at MIT for the first day of classes in the Beaver Works Summer Institute (BWSI). Excited, nervous, and maybe a bit overwhelmed with the aura of MIT, the young people were greeted by the 40 college students who would be teaching assistants (TAs)—and, as is usually the case, friends and mentors—during the four-week program. Eighteen of these TAs knew exactly how the newly arrived BWSI participants felt because they had not long ago been in the participants' shoes.

"On the first day of class, I told my students I was in their position two years ago, that I understood how it felt to be away from home for the first time, to suffer from 'imposter syndrome,' and to be overwhelmed by the incoming college application process," said Kazi Alom, an MIT student who is a TA in the Embedded Security and Hardware Hacking course. This imposter syndrome—the feeling that one is really not the talented, excellent student that BWSI enrolls is a perception that the program aims to dispel, transforming insecure science and math students into confident future engineering undergraduates.

The BWSI is a rigorous science, technology, engineering, and mathematics (STEM) program that teaches STEM skills through project-based, workshop-style courses. These courses are guided by eminent faculty and practicing engineers from MIT, Lincoln Laboratory, and NASA's Jet Propulsion Lab. The program offers students a nontraditional learning experience in applying technology to solve real-world problems.

The BWSI began in 2016 with a single course that taught 46 students about programming small robotic cars to navigate a Grand Prix-style racecourse. Each year, the program has grown, and in 2019, 275 young people, some day students but the majority out-of-state residential students, have chosen to explore one of 10 hands-on classes. The 2019 offerings include the original racecar course and ones that let students program autonomous air vehicles and personal cognitive assistants, investigate data science for medical uses, build a small satellite, learn about creating images from radar data captured by a drone, tackle cybersecurity and hardware hacking, experiment with 3D printing, create assistive technology, and understand the uses of imaging systems in disaster responses. All courses challenge the kids to push themselves to confront difficult concepts and wrestle with high-level science and math.

The TAs who are helping with all these courses came as much to learn as to teach. "I decided to return to BWSI as a TA because it felt like the next step in my journey as a student. While I learned a lot during BWSI 2018, I certainly didn't master the course material, and coming back to help teach sounded like an excellent chance to continue learning," said Charlotte Fries, who has been accepted as a member of the class of 2023 at the University of St. Andrews in Scotland.



The instructors for the courses also benefit from having TAs who are BWSI alumni. "BWSI is an intense, rigorous challenge for students.... Alum TAs have been through that crucible themselves. They have an extra level of insight into the educational demands imposed by the theoretical concepts, by the practical aspects of engineering, and by the fast-paced design and iteration required from student teams. Our Alum TAs are expert guides for the students on how to successfully tackle the coursework and the final challenges," said Mark Mazumder, a member of the technical staff at Lincoln Laboratory and one of the lead instructors for Autonomous Air Vehicle Racing.

As the month-long program nears its end, what are the TAs taking away from the experience? They gained an appreciation

Eighteen former Beaver Works Summer Institute students returned to MIT this summer to serve as teaching assistants in the 2019 program. Photo: Glen Cooper

for teaching and felt they learned new skills. The BWSI program may have been as transformative for them as for the students.

"Being a TA has been a lot of fun—I almost feel like I get to do the program a second time. Everyone knows that you don't understand something fully until you can explain it to someone else, and I've really seen the proof of that so far in the program. I won't lie; there are still aspects of the curriculum that I don't understand well enough to explain to the students, but it's really satisfying to reinforce my learning from last year while teaching younger students. It also gives me a new appreciation for the instructors. The role of teacher's assistant or even instructor doesn't mean you actually know everything!" Fries said. /

MIT Assistive Technologies Hackathon

The Assistive Technologies Hackathon (ATHack) is an annual MIT–sponsored event that brings Cambridge- and Boston-area people living with disabilities—called co-designers—together with undergraduate, graduate, and PhD students from multiple disciplines to build prototypes of assistive devices. The sixth annual ATHack was held on March 2, 2019 at the MIT Lincoln Laboratory Beaver Works Center in Cambridge, Massachusetts. Laboratory staff members helped organize the event and volunteered at the event's machine shop. Devices developed at this year's ATHack included a portable bidet, a pneumatic neck support brace, a stable walker that improves upon commercially available ones, and a low-cost modular stander to aid people with limited lower body control. /



Alex Rosenberg (right), an ATHack co-designer, works with his team to create a technology that would allow him to play catch with his sons. Photo: MIT Assistive Technology Club.



MIT Academic Exposition

2019 marked Lincoln Laboratory's second year of participating in the academic exposition for MIT freshmen. The event is part of MIT's freshman orientation program and introduces the breadth of activities, clubs, resources, and educational opportunities available to MIT students. Representatives from Lincoln Laboratory's technical staff, Human Resources Department, Communications and Community Outreach Office, and Beaver Works talked to students about various programs through which they could work and collaborate with the Laboratory, including the Independent Activities Period program, the Undergraduate Research Opportunities Program, the Summer Research Program, and many more. Technology demonstrations prepared by the staff members allowed students to get a closer look at exciting projects underway at the Laboratory, such as virtual reality–assisted disaster recovery, satellites for severe weather monitoring, and laser communication for space applications. /

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Chris Gengler (left), a technical staff member in the Humanitarian Assistance and Disaster Relief Systems Group, looks on as an MIT freshman tries out a Lincoln Laboratory–developed system that uses lidar data and virtual reality to recreate disaster-affected environments.



Connor Paydos (right), representing Lincoln Laboratory's Human Resources Department, discusses the Laboratory's educational opportunities with an MIT freshman.

Military officers from various service branches engaged in research at the Laboratory for the 2019 Military Fellows Program.

U.S. Air Force Lieutenant Colonel John Bergmans researched how small unmanned aerial systems could be used to aid Air Force missions.

Military Fellows Program

Lincoln Laboratory's Military Fellows Program has been offering military officers unique technical work experiences for nine years. Since the program's start in 2010, a total of 290 military fellows have worked alongside Laboratory staff mentors on developing technologies and capabilities important to national security. Beginning in the summer of 2019, 55 military officers engaged in research at the Laboratory.

The fellowship program allows military officers to get hands-on experience with technologies that have applications to realworld problems. Lieutenant Colonel John Bergmans has been working in the Cyber System Assessments Group and the Artificial Intelligence Software Architecture and Algorithms Group on small unmanned aerial systems (sUAS) for the Air Force. His research focuses on teaming expendable sUAS, called hounds, with larger manned aircraft, called hunters, to search for mobile targets in highly contested environments.

"I have been able to research emerging technologies and potential solutions to a multitude of Air Force problem sets. It is incredible to have access to all of these researchers under one roof during my year as a fellow," Bergmans said.

Fellows find that their time at the Laboratory helps them expand their thinking outside of their traditional military training. "The Lab has a proven culture of innovation, and this program provides a mechanism to bring that spirit of innovation and best practices back to the Marine Corps," said Lieutenant Colonel Francisco Caceres, who worked in the Laboratory's Cyber-Physical Systems Group. "I think this experience will make me a better leader for our Marine Corps as we tackle the tough work of designing the future forces and their necessary capabilities." /

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I have gained a unique understanding of the inner workings of a federally funded research and development center and how to leverage the exquisite prototyping capability that the Laboratory brings to bear."

-LIEUTENANT COLONEL JOHN BERGMANS, U.S. AIR FORCE

Military Student Programs

Military Summer Intern 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 military summer interns in 2012 to give the interns exposure to technical programs on national security. In the summer of 2019, 61 military interns engaged in research across the Laboratory. /

Military interns arrive at Lincoln Laboratory for the 2019 research program.

2019 COMMUNITY INVOLVEMENT REPORT

COLLABORATIONS

Military Student Programs

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 the 2019 spring and fall semesters, the Technical Education Committee offered the following courses:

Amateur Radio Course Electromagnetics Estimation and Association Fundamentals of Flight Dynamics, Simulation, and Virtual Environments Laser Physics, Technology, and Applications Space Control Human Factors Engineering Introduction to Spacecraft Design Undersea Systems and Technology

IEEE Boston Reliability Chapter

The Laboratory encourages employees to participate in professional societies. The Boston Chapter of the IEEE Reliability Society holds events yearlong to let members discuss aspects of reliability engineering such as design, manufacturing, and testing. Every month during the academic year, the chapter coordinates a networking event with presentations about topics in reliability engineering, and once or twice a year, it holds a tour of a local company. Since 2012, the Laboratory has hosted most of the monthly meetings. /

As teachers and organizers, we got to share our passion for the space domain and highlight opportunities where the field is enabling military capabilities. We also got to hear perspectives and experiences from each of the services, which helps us as we continue to support their respective missions."

> —PETER NIEDFELDT, SPACE SYSTEMS ANALYSIS AND TEST GROUP TECHNICAL STAFF MEMBER

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 for 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. Building and maintaining connections with the cadets and officers helps the Laboratory better serve the U.S. military and helps 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 explores critical space technologies, capabilities, and policies that shape the use of space for military and government purposes. In 2019, the course was taught by Peter Niedfeldt and Mitchell Mailman, both members of the technical staff in the Space Systems Analysis and Test Group.

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 highlevel 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. /

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Dr. James Kuchar, instructor of the Fundamentals of Flight Dynamics, Simulation, and Virtual Environments course, uses a model aircraft to demonstrate how to mathematically represent an airplane's motion.

At the monthly meeting of the IEEE Boston Reliability Chapter, Daniel Weidman (second from the left), a staff member in the Laboratory's Mission Assurance Office, and members honored the past chairs of the chapter.

Technical Staff Programs

Kate Byrd, an associate staff member in the Advanced Sensors and Techniques Group, received an SM degree in engineering sciences from Harvard University in 2019 through the Lincoln Scholars program.

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. In 2018–2019, 20 staff members were 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. /

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 2018–2019, 27 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 2018–2019, six Laboratory employees participated in the MBA program. / Jason Yosinski, co-founder and research scientist of Uber Al Labs, gave a presentation at the Laboratory about how neural networks work and how they can be made better.

Technical Seminars

Technical talks motivate and inspire staff while facil relationships. The Technology Office Seminar Serie nationally known experts to the Laboratory. Each s designed to offer insights on specific technology, p to develop technology applications, and foster futu efforts. The Technology Office seminars offered in 2 variety of leading-edge topics in technology:

Recent Trends in Semiconductor Technology

First Flight of an Electroaerodynamically Prop What Comes Next

Architectured Metamaterials: Harvesting Ligh Sound Switches, and Beyond

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litating working	Innovations at Interfaces
es invites seminar is provide a forum	Looking for Planets Outside our Solar System with Super- conducting Photon Detectors
ure collaborative	Solar Geoengineering: Taking the Edge off Climate Change?
2019 covered a	Deep Learning on Mobile
	Tools for Analyzing and Controlling Complex Biological Systems
oelled Aircraft -	AI Neuroscience: Can We Understand the Neural Networks We Train?
nt, Tunable	Outcome-weighted Learning for Bayesian Regression and Low Probability Events

03 / COMMUNITY GIVING

Laboratory employees champion local and national causes each year, giving their time, talent, baked goods, and funds. The Laboratory community generously supports three main giving categories:

- Helping Those in Need
- Helping Those Who Help Others
- Supporting Local Communities

The Laboratory's Mechanix Cycling Team pedaled across Cape Cod this year, raising money to fight lung disease.

Autumn Escape Bike Trek

The Autumn Escape Bike Trek is a one-to-three-day tour across Cape Cod, Massachusetts. The money raised through the trek supports Americans suffering from lung diseases (like chronic obstructive pulmonary disease, asthma, and lung cancer) and funds life-saving research, education, and clean-air advocacy.

This year, the Laboratory's Mechanix Cycling Team celebrated its 5th year of trek participation. The team of six riders-including three Laboratory employees (Ned Rothstein, Jennifer Weis-Rothstein, and Christopher Smith)-raised \$7,046. The team tried a new fundraising method this year, also: they set up a mobile repair shop at the Natick Farmer's Market on two Saturdays, offering tune-ups and basic repairs in exchange for donations. Not only did this service raise money, but it also raised community awareness about the Bike Trek and brought the group a new team member. The group plans to expand this repair service next year. /

Spotlight: Huntsville Field Site

TeamWalk for CancerCare

Staff member Julie Arloro-Mehta, with a group of eight friends and family members, walked the streets of downtown Lowell, Massachusetts, this year, participating in the Team *Walk* for CancerCare. Together they raised \$4,925, supporting the patients at Lowell General Hospital's Cancer Center. Team Walk funds help patients pay for medications, nutritional supplements, prostheses, support groups, skilled nursing visits, transportation, and more. "TeamWalk is important to me because my father was one of the founding members of the Cancer Center at Lowell General Hospital. TeamWalk funds make a difference in the lives of today's cancer patients [and] enable Lowell General Hospital...to help people feel better, build confidence, and instill hope throughout their battle with cancer," said Arloro-Mehta. /

Residents of the Lowell, Massachusetts, area and their family and friends walk to raise money for those battling cancer.

The Laboratory's Huntsville Field Site in Alabama champions multiple community-giving efforts every year. Lately, staff have given their time and funds to support these local causes:

- Food Drive: The Huntsville Field Site collected nonperishable food for the Huntsville Food Bank. During the holiday season, the food is distributed to all the surrounding food pantries in northern Alabama.
- Computer Equipment Donations and Mentoring: Staff mentored the FIRST Robotics Team 7111, Rad Robotics, and donated computers and monitors to help the team

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(Left) Huntsville staff joined the fight to stop Alzheimer's this year, holding a bake sale and participating in the Walk to End Alzheimer's. (Top) The Huntsville Field Site sponsored a FIRST Robotics team of local high school students, providing equipment and expertise to help the students.

achieve their goals. The computer equipment enabled the students to collaboratively write code and program their robot. Staff members then attended the FIRST Robotics Huntsville Rocket City Regional Competition, cheering on the Rad Robotics Team, which placed 17th out of 55 teams!

 Alzheimer's Bake Sale and Walk for Alzheimer's: In September 2019, Huntsville raised funds for the Alzheimer's Association, which promotes education, support, advocacy, and legislation to end Alzheimer's and help those affected by this disease. Between the bake sale and the walk, the team raised \$1,400. /

Team Emily-a team made up of staff member Daniel Letourneau and his family and friends-joined the Walk for Kids again this year, working toward a better future for all children.

Boston Children's Hospital—Walk for Kids and Pancake Breakfast

When Daniel Letourneau's granddaughter, Emily, was born, the family knew they didn't have long with her. Emily was taken to Boston Children's Hospital, where the staff did everything they could for Emily and the family, treating Emily with the same care as if she was going to live forever. Letourneau (a Laboratory staff member) and his family joined the Eversource Walk for Kids in Emily's honor this June, raising \$655 toward the hospital's goal-"Until every child is well." The family also offered the Emily Letourneau Memorial Pancake Breakfast for the community in December-a breakfast which Santa himself attended. All-you-can-eat pancakes, sausages, and bacon were included in the price. One hundred people attended the breakfast, and the proceeds of \$1,888 were sent to the Boston Children's Hospital in Emily's name. "We knew Emily wasn't going to make it to her first birthday. She was such an inspiration. This is why we walk. All kids deserve a fighting chance," said Letourneau. /

Walk for Hunger

With the motto Make Hunger History, the Walk for Hunger is the oldest pledge walk in the country. Proceeds are used to ensure nutritious food is accessible to everyone in Massachusetts. Staff member Zachariah Trotz took on team organization this year, creating The Fellowship of the Bagel. The team raised \$725 to help end hunger in local Massachusetts communities. Four Laboratory staff members (Seth Trotz, Zachariah Trotz, Hannah Levin, and Kelsey Yee) joined the team, along with family member Gabe Trotz. "It is unconscionable to me that in a nation as prosperous as ours, that one in nine children is food insecure. We have the moral obligation to do better, and we all benefit as a society from doing so." said Seth Trotz, who has participated in the walk every year since 2007. /

Zachariah and Seth Trotz, son-and-father Laboratory employees, participate in the 20-mile walk through Boston to help put a stop to hunger.

Tour de Cure: New England Classic

"I have been doing the New England Classic for four years now. My office has a wall of bib numbers from all of the charity rides I've done...I have 13 of them, so I guess I've been at this a while!" shared Dana Boisvert, Laboratory staff member. Boisvert raised \$1,245 for the 2019 event, riding to raise funds that will help find a cure for diabetes. With 1.5 million Americans newly diagnosed with diabetes every year, this cause is urgent. The route begins in Bedford, Massachusetts, and passes very near to the Laboratory. Boisvert has found that having to live with diabetes himself has inspired him to be actively involved in supporting causes such as this. /

Kathleen McAleese walked to help others fight through to the light on the other side of their struggles.

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Dana Boisvert stands with his bicvcle. triumphant at the successful completion of the 150-mile Tour de Cure, which raises funds to finance research into diahetes

American Foundation for Suicide Prevention

Laboratory staff member Kathleen McAleese joined the Out of the Darkness Community Walk, offered by the American Foundation for Suicide Prevention (AFSP) this year. "I walked with the group The Best Way Out is Always Through, a team started by my dear friend Maddy Horowitz, who is a survivor of a suicide attempt and a fierce mental health advocate," McAleese states. The walk takes place in Rochester, New York, supporting the mission of AFSP: to increase funding and awareness for suicide prevention programs, drastically reducing the number of people lost to suicide each year.

McAleese raised \$565 for the cause, exceeding her goal of \$500. She summed up her experience: "...we can improve the lives of people around us by having honest and candid conversations...Not everyone has mental illness, but everyone has mental health and for that reason alone, we are doing ourselves a huge disservice by paying less attention to our mental and emotional well-being [than] we do to our physical well-being." /

Spotlight:

Alzheimer's Support Community and Kit Holland, Community Founder

Catherine Holland has led the Laboratory's Alzheimer's Support Community (ASC) for the past 11 years, inspiring and encouraging her teammates throughout the journey.

The Laboratory's Alzheimer's Support Community (ASC) is a pillar of encouragement for many in the Laboratory community. This group fights tirelessly to end Alzheimer's and help those affected by the disease.

This year, Laboratory employees Kit Holland, John Kaufmann, Sheila Chabot, Terri Welch, and Kathleen Cable led the charge, coordinating several activities that raised funds and awareness.

- The Greater Boston Walk to End Alzheimer's: 2019 marked the 11th year of participation for the Laboratory's Alzheimer's Walk Team. Twenty-three teammates raised \$33,455 this year.
- The Ride to End Alzheimer's: Ten riders from the Laboratory raised \$21,363-a new team record-and

earned the #2 fundraising ranking among the 20+ teams that participated in the ride. From 2012 to 2019, the team has raised \$112,519 to fight Alzheimer's.

- Information tables: Throughout the year, the team offered information sessions in the main Laboratory cafeteria during lunchtime. They provided educational materials and encouragement for those in the community whose lives are affected by Alzheimer's in a family member's life. The team also recruited new teammates for the walk and ride events at the information tables.
- Bake sales: The community held spring and fall bake sales, raising \$513 in the spring and \$525 in the fall.
- Purple for a Purpose: This event brings the community together for a picture in purple, and updates everyone on what the community has been up to.

From 2009 to the present, the Alzheimer's Support Community has raised an impressive total of \$436,764 to fight the disease. Their active participation has inspired another Lincoln community's action in this charity. "In September 2019, the Huntsville Field Site supported the Alzheimer's Association with a walk and bake sale. Our staff members' lives have been touched by Alzheimer's too. We saw what the Massachusetts Laboratory employees were doing, and we

Spotlight (continued)

wanted to mirror that in Huntsville," said Denise DeCoster of the Huntsville Field Site.

During her decades of Laboratory service, Catherine "Kit" Holland has helped with information design, event organization, and information management. "I love to organize things-that interest informs everything I do," she cheerfully reported.

Kit created the ASC in 2009, after her own mother died of Alzheimer's. "Caring for her was both shattering and deeply touching at the same time," Kit relates. She wanted to find a way to both express what had happened in her own family and support other families going through this heartbreaking experience. "I learned so much through this; I wanted to share what I knew to ease others' way," Kit said.

From the quiet beginnings of a wiki page sharing information, to today's thriving, multi-event-per-year group which has raised more than \$436,000, ASC blossomed under Kit's guidance. Kit stated, "Caring for others makes all the difference...bringing

people together to help each other: that's where the magic happens! The power of personal connection is in our stories—it inspires others to share their stories and to get involved."

After 11 years of leadership, Kit will be stepping down from guiding ASC, passing the torch to the capable hands of Laboratory employees Sheila Chabot, Kathleen Cable, and Terri Welch. Kit will be sorely missed, and the encouragement, empowerment, and love she has shared with her teammates and their families will leave a lasting, positive change in their lives.

"Kit's radiant personality, boundless energy, and passion for finding a cure for Alzheimer's has motivated the team every year to raise as much money as possible to find the cure. She inspires all of us to continue working to make the vision of the Alzheimer's Association a reality—the vision that we can all create a world without Alzheimer's," said Chabot. Kit's prime motivation in leading the ASC provides some insight to her positive mindset: "When inspired by a shared mission, people do great things together." /

> Members of the Laboratory Alzheimer's Support Community bicycle team each rode between 30 and 100 miles along the coast of Rye, New Hampshire, in the 2019 Ride to End Alzheimer's.

> > There is a wonderful feeling of camaraderie and encouragement among the riders, volunteers, and organizers."

- RICHARD TAYLOR, RETIRED LABORATORY STAFF MEMBER

2019 COMMUNITY INVOLVEMENT REPORT

The American Heart Association has saved so many lives with their research and development of new procedures. I want to see that continue."

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A team of six volunteers, including Laboratory staff members Susan Curry and Sandra McLellan, participated in the Boston Heart Walk, raising money and awareness for heart health.

American Heart Association

The Laboratory has a dedicated group of volunteers fighting for the health of American hearts through support of the American Heart Association. In 2019, the group participated in the Boston Heart Walk, held a bake sale, prize drawing, and wear-red-day photo shoot.

- Boston Heart Walk: Six Laboratory teammates joined the walk this year, raising \$5,211. They walked to raise funds for research that will save lives, and to increase further research that has, in the past, helped create things like the artificial heart valve.
- Wear Red Day Photo and Prize Drawing: The Laboratory's Heart Health Team held a photo shoot in February to support a national campaign to raise awareness about cardiovascular disease, helping to save lives through knowledge. They followed up the photo session with a drawing for prizes such as a reserved Laboratory parking spot, museum passes, and gift cards to local attractions.
- **Bake sale:** In September, the group held a bake sale in the Laboratory's main cafeteria. Nine hundred dollars in donations went to benefit the American Heart Association. /

Neonatal Intensive Care Unit at Beth Israel Deaconess Medical Center

Chelsea Curran, Laboratory staff member, ran the 2019 Boston Marathon as part of the Beth Israel Deaconess Medical Center team to support the center's Neonatal Intensive Care Unit. In the weeks before the race, Curran hosted a bake sale at the Laboratory to raise funds for the cause. "In addition to countless miles of training," Curran notes, "my marathon campaign also raised \$12,300, in no small part due to the generosity of the Laboratory community. The funds will go a long way toward providing care for premature infants as they make their journey home." /

This cause is near and dear to my heart because my son spent his first 47 days of life in the center's neonatal intensive care unit. The staff there took amazing care of him. It was an honor for me to give back to the hospital that gave our family so much."
— CHELSEA CURRAN, MARATHON RUNNER Staff smile while raising money for a local neonatal intensive care unit, holding a bake sale and even running in the Boston Marathon.

For Dana Boisvert, riding over 50 miles of hilly terrain was worth it to help advance autism research.

Eagles Autism Challenge

Dana Boisvert, Laboratory staff member, raised \$1,300 to advance autism research this year, riding 50 miles in the Eagles Autism Challenge. "Philadelphia is very hilly," Dana reports, "but I came because I'm an Eagles fan, and here was an opportunity to have a unique experience with the team while still really helping people. Several folks from the Laboratory donated to the cause—they provided more than one-half of what I raised. I'd like to thank the Laboratory community for their support!" said Boisvert. /

Staff member Kim Hebert smiles as she bikes to beat cancer. This was Kim's twelfth year in the Pan-Mass Challenge.

Pan-Mass Challenge

When cancer strikes, Massachusetts is lucky to have advanced cancer centers like the Dana-Farber Cancer Institute close at hand. Laboratory staff and their family members support Dana-Farber each year by participating in the Pan Mass Challenge—a bike-a-thon with the motto Closer by the Mile, featuring routes from 25 to 192 miles long.

Laboratory staff members Craig Perini, Kim Hebert, and Michael Connors rejoined the fight this year—Craig for his eleventh and Kim for her twelfth time! Staff members Ned Rothstein and Jennifer Weis-Rothstein provided bikemechanic expertise. Together, the team raised \$15,803, all of which goes to Dana-Farber to support cancer research.

Perini noted, "I ride in memory of and in honor of all those who are battling, have battled, or have been touched by this horrific disease." Hebert's aunts and mom supported her ride from their location in Kansas, making t-shirts and going to a local bike seller. Hebert shares, "There is positive news: my mom is cancer free! She fights on, as do others...I will fight with them."

Staff member Michael Connors joined the bike-a-thon this year. Connors said, "Over the years, cancer has touched both of our families, as well as several of our dear colleagues and friends. By riding in the PMC, we are hoping to help (Dana Farber's) charge to wipe out all forms of cancer." /

2019 was Michael Connors' first time riding in the Pan-Mass Challenge. Connors and his wife, Lawreen, are shown here during a brief break at Gillette Stadium during their 50-mile route.

Grab a CAB (Chemo Activity Bag)

Many people have experienced personally that chemotherapy treatments can be a long, tedious process. To alleviate this problem, Carrie Perry asked the Laboratory community to donate items meant to comfort, inspire, or help patients pass the time. During 2019, Laboratory staff donated puzzles, coloring books, hand warmers, sugar-free candies, crosswords, and books to be added to chemo activity bags (CABs). Perry assembles each bag to ensure a good assortment of items, and then delivers the bags to various hospitals and medical centers in the greater Boston area. The bags, designed to be fun and distracting, are welcomed by cancer patients looking for something to do during the chemotherapy process. /

For more than 80 years, the Lions Club has been collecting, sorting, cleaning, and distributing eyeglasses to citizens and seniors in need at home and abroad. Photo: Lion's Club

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

Massachusetts Lions Eyeglass Recycling Program

Led by Laboratory employee Santo Lucente, the Massachusetts Lexington and Lowell Lions Clubs created an eyeglass recycling program to help people around the world see more clearly. Through this program, the Lions have sent tens of thousands of eyeglasses to people in Bolivia, Peru, Colombia, Haiti, and a number of African countries, providing eye exams with the free eyeglasses. As an example, in Africa's Good Hope Clinic, the Lions served more than 2,300 people, including a 14-year-old girl named Kimberly. Kimberly's glasses had broken a few weeks before, but the clinic had the perfect pair for her, enabling her to continue her studies in law and support her community's justice system. "The Lowell Lions Club is great to work with, and they do important, helpful work." said Lucente. /

From across Massachusetts, more than 8,000 people gathered to walk all or part of the Boston Marathon route.

Cancer is a thief. It steals health and time and happiness. With your donation, we get closer to the real finish line: a world without cancer." -BENJAMIN SATTIN, WALK PARTICIPANT

Jimmy Fund

This September, staff member Benjamin Sattin laced up his sneakers to walk in the 2019 Boston Marathon Jimmy Fund Walk. Sattin helped to raise \$9,676 for critical cancer research and innovative pediatric and adult patient care at Dana-Farber Cancer Institute. The institute aims to improve the chances of survival for cancer patients around the world through their unique 50-50 balance between cutting-edge science and highly compassionate care. "This plan is designed to stop cancer in its tracks and prevent it from stealing more lives," Sattin reports. /

Coats for Kids Drive

This year, the Laboratory supported the 25th annual Coats for Kids Drive, helping keep local children warm during the cold winter months. Staff member Alicia LaDuke set up donation boxes in the Laboratory's main cafeterias, collecting new and gently used coats for those in need. Donated coats were cleaned free of charge by a local dry cleaning business and distributed through the Coats for Kids Distribution Partners network. This year, more than 270 coats were donated by the Laboratory community.

Helping Those Who Help Others

Santo Lucente and Marilyn Rosado happily donate boxes of new clothing for veterans to personnel from the Bedford Veterans Hospital

Lowell Humane Society

Sandra McLellan, Laboratory staff member, held a two-week collection drive for the Lowell Humane Society (LHS) at the Laboratory this year. All donated items went to help homeless pets in the local shelter. "My car was completely full when I took the donations to the shelter. The Laboratory community was as giving and generous as ever," shared McLellan. Laboratory staff members donated 16 rolls of paper towels, five garbage bags full of cloth towels, cat food and a litter box, dog and cat toys and treats, office supplies, funds, and much more. The LHS staff thanked Lincoln Laboratory for their support, and the LHS Executive Director added, "Because of supporters like you, homeless pets will find safe refuge in our shelter, and receive needed medical treatment, behavior training, spaying/neutering, and, of course, much love." /

Bedford Veterans Hospital Donations

Supporting the Veterans Hospital in Bedford, Massachusetts, Laboratory staff members Santo Lucente and Marilyn Rosado raised money and gathered clothes for needy veterans. Socks, t-shirts, undergarments, slippers, sneakers, and light sweatshirts were gathered throughout the year and donated on a regular basis to veterans residing at the hospital. Lucente and Rosado, with help from family members, also held a bake sale at the Laboratory, raising \$1,300 to purchase gift cards that will be used by the hospital to assist veterans. The Bedford VA Hospital responded with heartfelt thanks and sincere appreciation for the Laboratory's donation of 20 gift cards and an assortment of clothing received in July.

A wish list posted in the Laboratory cafeteria by staff member Sandra McLellan harvested a car full of care for local pets needing a home.

Helping Those Who Help Others

A group of runners takes off in the Race 2 the Summit—an event created by a Laboratory staff member to fight cancer and promote community involvement.

Race 2 the Summit

During New England's iconic autumn, 12 Laboratory employees participated in the annual Race 2 the Summit, running through Princeton and Westminster. Massachusetts. The event offers both half-marathon and 5k courses, both of which provide significant elevation changes and end at the summit of Wachusett Mountain.

Staff members Jesse Mills, Jeremy Coombs, and Jennifer Falciglia are on the board of the Marlene A. Mills Foundation, which organizes this event. Mills, Coombs, and Falciglia work extensively each year to organize the race. The involvement of Laboratory staff is also essential to success; several employees participated as race-day volunteers and runners this year.

The event raised \$5,000 that will be shared by the Dana-Farber Cancer Institute and the Marlene Mills Memorial Scholarship. This memorial scholarship is awarded to help local high school students who are involved in their communities go to college, continuing Marlene Mill's legacy of community improvement. /

Three of Jesse Mills' children celebrate their successful completion of the 5k course, supporting their grandmother's legacy, now the motto for the race, as displayed on their shirts.

The motto for the race is 'Never Give Up, Always Give Back.' That was the way my mom led her life, including her battle with cancer, right to the end. Doing this is a way to perpetuate her example and legacy of community service."

> —JESSE MILLS, MARLENE A. MILLS FOUNDATION BOARD MEMBER

LLOPEN 2019 Outreach

LLOPEN (Lincoln Laboratory Out Professional Employee Network) is dedicated to providing an environment where everyone can thrive and feel comfortable and providing opportunities to support charities of interest. This year, LLOPEN championed Harbor to the Bay—an annual charity bike ride with a course running from Boston to Provincetown, Massachusetts. All the riders' pledges are donated to four local charities that focus on the research and prevention of HIV/AIDS, and the care and support of those already afflicted. Two members of LLOPEN participated in the event: Peter LiBoissonnault rode, and Jennifer Swanson helped on the crew. LLOPEN was proud to back their efforts with the proceeds from other 2019 efforts, totaling \$1,160. LLOPEN held several other events throughout 2019:

• National Coming Out Day Bake Sale: This Pride Month bake sale raised \$940 for oSTEM (Out in Science, Technology, Engineering, and Mathematics)-a nonprofit, professional association for LGBTQ people in the STEM community.

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LLOPEN exists at the Laboratory as a support network and for anyone who has questions. Our OPEN Team also participates in Harbor to the Bay each year."

- MICHAEL KOTSON, LLOPEN COMMITTEE MEMBER

Peter LiBoissonnault, member of the Laboratory's LLOPEN employee resource group, rode in the Harbor to the Bay event this year, raising money to support those living with HIV/AIDS.

- Valentine's Day Cookie Grams: LLOPEN provided cookies, frosting, and a welcoming atmosphere for the Laboratory community to come together and be creative, making cookie grams for those they love.
- Ice Cream Social: In June, the group hosted an ice cream social for the entire Laboratory, so the community could stop by and learn more about LLOPEN and their upcoming activities.
- Conversations with LLOPEN: The group held this gathering monthly, with the goal of forming community, discussing LGBTQ issues in a casual and welcoming space, and encouraging people to network with one another and the LLOPEN committee. /

Helping Those Who Help Others

Staff member and Vietnam veteran Daniel Letourneau helps community members find their loved ones' names on the Wall That Heals during its sojourn in Bellingham, Massachusetts.

Wall That Heals

In August, veteran Daniel Letourneau supported the cause of the Wall That Heals: Honor. Preserve. Educate. This wall, a half-scale replica of the Vietnam Veterans Memorial in Washington, D.C., has toured the country since 1996. "I was fortunate to ride in a 2.5-ton Army vehicle with other Vietnam vets to escort the Wall That Heals to the 300th anniversary celebration of Bellingham, Massachusetts. The trip included state police vehicles, motorcycles, and a state police helicopter fly over," stated Letourneau. "Another 700 motorcycles, jeeps, trucks, and vintage cars joined in." For 24 hours a day until the wall moved to its next location, Letourneau and fellow veterans helped visitors locate a person's name out of the 58,276 names on the wall. /

Project Warm Blanket

Throughout December, Lincoln Laboratory staff helped Boy Scout Roy Benson, member of Troop 314 in Milford, earn an Eagle Scout award by gathering donations of new blankets, sheets, and towels for Veterans Inc., a 90-bed facility in Worcester, Massachusetts, that offers services to help veterans and works to end homelessness among veterans in our community. With the Laboratory's help, Benson donated \$4,000 worth of items that will help Veterans, Inc. supply residential quarters for homeless veterans. A total of 62 blankets, 62 sets of sheets, 67 bath towels, 77 facecloths, and 30 hand towels were donated by Laboratory staff as part of Benson's Eagle Scout project. /

Benson and co-scouts stand with a few of the Lincoln Laboratory donations collected for veterans.

Support the Troops®

Support Our Troops® Care Packages raise the morale of deployed U.S. troops worldwide, providing boxes full of items they might be missing. Laboratory employee and military veteran Kathleen Hart led the 2019 charge to bring the Laboratory's encouragement to these troops.

The Laboratory's group is made up of volunteers and runs off donations from employees. Staff member Molany Neak worked with an Orange Theory gym in Burlington, Massachusetts, to gather undistributed Halloween candy, resulting in nine large bags of candy for service members. The Laboratory community dropped off other requested items also. With these efforts combined, Hart was able to send 160 boxes of good cheer to deployed troops this year. Some of these found their way to the aircraft carrier USS Abraham

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Surrounded by boxes of candy and other goodies for deployed U.S. military, staff members Molany Neak, Kathleen Hart, and Jared Hart are happy to bring joy to the troops.

Lincoln. The Command Chaplain, LDCR Kevin Johnson, onboard the Abraham Lincoln sent a letter of thanks to Laboratory Troop Support, saying "We have quite a few sailors who are on their first deployment, and it's particularly important for them to know that their sacrifice is appreciated, and that they're remembered. It was particularly appreciated when our deployment was extended and we missed Christmas at home."

"Being a veteran myself, I remember how it felt to get a package from back home. Even if the package was not addressed to me, it gave me a good feeling that people were thinking of us while we were overseas. Being involved in this program allows me to help give that same feeling to someone else," said Kathleen Hart. /

One hundred four people, along with many dogs, enjoyed a summer day outdoors, running to raise money for wounded veterans and their service dogs.

Star Spangled 5k

On a beautiful, sunny day in June, more than 100 Laboratory and Hanscom Air Force Base participants ran through the local Minute Man National Park. Very appropriately, the group ran along the historic battle road, raising money for current-day wounded warriors and their "battle buddies."

Members of the Laboratory's Recent College Graduate employee resource group, Emily Joback, Christopher Flood, Mark Gymiski, and Mitesh Amin (former staff member), organized this Star Spangled 5k event.

They raised \$2,600, all of which went to the Troops First Foundation 24/7 Battle Buddies program. This program matches service dogs with veterans wounded in combat in Irag or Afghanistan. Each dog is chosen for a specific veteran and trained to make their daily lives easier. "We wanted to organize events for those interested in giving back to the community. An event that combined running, dogs, and benefits to those who've served our country seemed perfect," said Joback. /

Supporting Local Communities

Staff members Susan Curry, Guadalupe Cabrera, and Karen Grasso gather around a box full of toys, donated by the Laboratory community to brighten local children's holidays

Giving Trees

Ornamental trees, decorated with nametags, appear in the Laboratory around Thanksgiving each year. The nametags display the holiday-gift wishes of families and veterans in need, living in communities surrounding the Laboratory.

Giving trees allow the Laboratory community to offer some holiday cheer to people who otherwise might not get presents. Paula Mason, Laboratory staff member, organizes this effort every year through the Somebody Cares charity. This year, the Laboratory community gave 325 presents, brightening the holidays for many people in local Massachusetts communities.

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Toys for Tots

Toys for Tots was founded by the U.S. Marine Corps Reserve and delivers toys to children whose parents may not be able to buy them holiday gifts. Laboratory volunteers Susan Curry, Guadalupe Cabrera, Karen Grasso, and the Enterprise Applications Team gather donations of toys from the Laboratory community for these children. The team also held a bake sale, raising a further \$940 for the program. The team delivers the donated toys to a distribution center, from which local organizations take the toys where they're needed most. This year, staff donated nine enormous boxes of toys, several bags, and a few loose toys that were so big, they didn't fit in any container. "If we can do something for others, why not? The Lab community here is so giving-it's an encouragement to me," said Cabrera. /

For the 13th consecutive year, Paula Mason gathered gifts for local people in need.

Spotlight:

Marshallese Island Outreach

Helping to keep the oceans around the atoll clean, dozens of divers from the Kwajalein Scuba Club wait on the pier, ready to "splash" for the cause.

Amid the Pacific's sunny Marshall Islands, the Laboratory operates a field site on Kwajalein Atoll. Staff and their families, who spend two to three years at the field site, enjoy a friendly relationship with the local community. Laboratory employees support the local community with a variety of programs designed to enrich the lives of the residents and the environment of Kwajalein Atoll.

- Island Clean-Up Effort: As tropical storms roll across the atoll, they leave plastic pollution behind. Laboratory staff adopted Turtle Beach, and each year they collect five to six large garbage bags full of trash, all from oneeighth mile of shoreline.
- Kwajalein MIA Project (KMP) and Scuba Club: Phillip Davis, field site member and president of the Kwajalein Scuba Club, contributed to efforts locating the underwater crash sites of World War II aircraft through the Kwajalein MIA Project (KMP). These sites may be the sea graves of American servicemen listed as missing, and the KMP team is determined to bring them home. The team uses sonar to search the ocean floor for the sites. "There are nine suspected wrecks, of which four have been located by the KMP project over the years," reports Davis. "This September, a Defense POW/MIA Accounting Agency team came to Kwajalein to excavate one of the sites we found. They were able to confirm the identity of the wreckage. Analysis of the artifacts continues."

The Kwajalein Scuba Club (KSC), led by Davis and assisted by Juan Montoya, promotes dive safety, historical preservation, and maritime environmental awareness. All divers on the island are club members, including many of the site's Laboratory staff. The club runs fun events for the community, like a haunted wreck dive and Scuba Santa, and also holds an annual Harbor Cleanup. "We close Kwajalein harbor and send out dozens of divers to collect trash from the harbor bottom," reports Davis. Most of the dive community on Kwajalein join in this event, and MIT staff are among the dozens of volunteers.

- **Ri-Katak Lunch Program:** Staff help to provide a daily meal for K–12 students in need of food. This year, the program supported 44 students.
- Marshallese Interns: The field site sponsored two interns from the Marshall Islands, offering them a 10-week information technology course. Their final project involved deploying medical data backup equipment to the local island of Ebeye.

Staff participate in growing the educational opportunities of children, both at the field site and on neighboring islands. Here, staff demonstrate autonomous systems at a science fair

- Yokwe Yuk Women's Club: Each year, staff on Kwajalein enjoy a gala to fund the Yokwe Yuk Women's Club educational grants. Field site members Chameé Cross and Salma Taylor chaired the 2019 effort that included both a silent and live auction and raised a record amount of \$71,000. Cross and Taylor reached out to island businesses, previous Kwajalein residents, and returning travelers for auction items, which were packed into locally made baskets. The Yokwe Yuk Women's Club distributed the funds through a grant application-and-report process. "The Women's Club delivers the checks in person whenever possible; it's really wonderful," shares Cross.
- School Outreach: Laboratory staff also give their time and expertise to champion education at the schools on the islands of Ebeye and Kwajalein. Popular Ebeye programs include the robotics club and scientific seminars at the local high school. For children living on Kwajalein, staff offer technical outreach programs, which include 3D printing a canoe, astronomy nights, a STEM Fair, and oceanic engineering activities.

Back at the Laboratory's main complex in Massachusetts, Cheryl Nunes supports the Marshallese community by selling hand-woven baskets and wood carved sea creatures, created by Marshallese craftspeople, at the annual Community Outreach Fair. All profits from the sales go back to the Marshallese community. /

Supporting Local Communities

Gaining Ground Garden Volunteering

Laboratory volunteers enjoyed two Saturday mornings working together at the Gaining Ground Farm in Concord, Massachusetts. Gaining Ground is a nonprofit, volunteer-powered, organic farm that grows vegetables and fruit. They donate all of this fresh food to local hunger relief programs and food pantries.

This year, Laboratory employees and their family members and friends contributed 50 volunteer hours to the farm. The team helped harvest sugar snap peas, weed an onion patch, spread compost, and thin rows of carrot seedlings, assisting the farm in producing 120,000 pounds of fresh organic vegetables and fruit for donation. Joan Boegel, garden volunteer, said, "I'm passionate about supporting local agriculture and really enjoyed working alongside Lincoln Lab colleagues while learning about this highly productive small organic farm and its nonprofit mission from the friendly and expert farm manager and field crew."

at Gaining Ground Farm, where Laboratory volunteers Joan Boegel, Ellen Beachy, Roslyn Wesley, Allison MacDonald, Patricia Carey, Randal Guendel, Debra Hamilton, Daniel Calawa, William Gingrass, James Streitman, Katherine Barlett, Richard Marino, and Tso Yee Fan helped grow organic produce to give to people in need.

It was a great opportunity to be out in nature with my fellow colleagues to understand better how this farm works."

Secret Santa for Seniors

Helping to keep winter doldrums at bay, the Laboratory collaborates with MIT and the Cambridge Police Department each year, supporting the Secret Santa for Cambridge Seniors program. The program gathers gifts for local senior citizens, brightening their holiday season with friendly faces and presents. During the 2019 program, the Laboratory community helped contribute at least 90 gifts to cheer senior citizens in the local Cambridge, Massachusetts, area. /

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Buzzards Bay Coalition

Laura Bickmeier ran the seven-mile Falmouth Road Race this year, supporting the Buzzards Bay Coalition. The coalition is dedicated to the restoration, protection, sustainable use, and enjoyment of this local bay and its watershed. In order to participate in the race, Bickmeier raised \$1,300, partially through a bake sale held at the Laboratory. "The Falmouth Race is a wonderful, local, environmental nonprofit. I am a lifelong runner from one of the watershed communities, and I find it very gratifying to be able to support this local group," said Bickmeier. /

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

Supporting Local Communities

Field site staff members stand next to a small mountain of turkeys, which they helped to purchase. The turkeys were shared with community members for a Thanksgiving Day treat.

Colorado Field Site

The Colorado Springs Field Site continued their involvement in the local community this year, sponsoring families via Care and Share programs and helping feed those in need with the annual Thanksgiving Day Turkey Drive. Field site personnel generously donate their money and time to these field-site-organized efforts and also participated in other efforts through local churches, schools, etc.

Sponsored Family: The field site recently sponsored an airman from the Air Force Academy-an amazing worker and caring individual whose work ethic never falters despite hard times. Staff collected 60 presents, a large Christmas tree with decorations, stocking stuffers, food, and a large turkey for the airman and her family.

Thanksgiving Turkey Drive: Staff also participate each year in a Thanksgiving Day Turkey Drive, organized by Elder Construction. The drive helps get turkeys to community members who many not be able to afford a turkey dinner themselves. Staff recently collected five turkeys and \$500 cash to purchase frozen turkeys on the day of delivery. /

A full array of presents were collected by the Laboratory's Colorado Springs Field Site and delivered to a military family in need in time for the holidays.

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 past years, Lincoln Laboratory staff members have supported several charities or events on their own time:

American Red Cross Avon Walk for Breast Cancer AFCEA Golf Tournament Bedford Special Education Parents Advisory Council 5K Fun Run **Candy for the Troops Claddagh Fund Coat Drive for St. Francis House Shelter Cradles to Crayons Emily Letourneau Memorial Volleyball Tournament Epilepsy Foundation** 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 back 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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