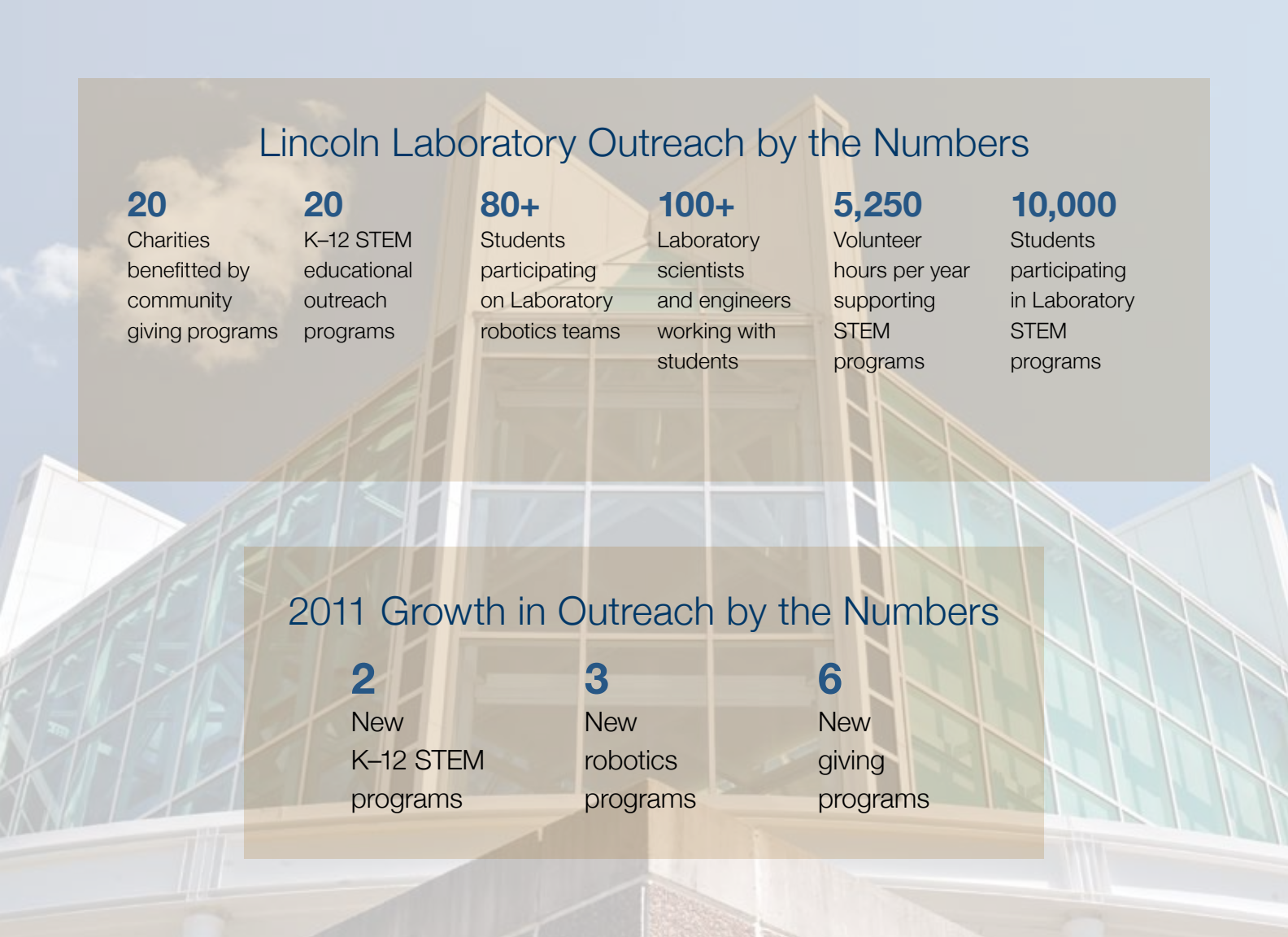
LINCOLN LABORATORY COMMUNITY OUTREACH

MIT LINCOLN LABORATORY

COMMUNITY INVOLVEMENT **2011**



Lincoln Laboratory Outreach by the Numbers

20
Charities benefitted by community giving programs

20
K–12 STEM educational outreach programs

80+
Students participating on Laboratory robotics teams

100+
Laboratory scientists and engineers working with students

5,250
Volunteer hours per year supporting STEM programs

10,000
Students participating in Laboratory STEM programs

2011 Growth in Outreach by the Numbers

2
New K–12 STEM programs

3
New robotics programs

6
New giving programs

A Message from the Director

Eric Evans, the Director of Lincoln Laboratory, meets students from Boston, Cambridge, and Lawrence middle schools. These students visited the Laboratory as part of the Science, Technology, Engineering, and Math (STEM) Program offered by MIT's Office of Engineering Outreach Program.

Community outreach and education programs are an important component of the Laboratory's mission. From the beginning, our outreach initiatives have been inspired by employee desires to help people in need and to motivate student interest and participation in engineering and science. There are many opportunities to participate. The Laboratory's educational outreach initiatives offer the opportunity to provide in-classroom and Science on Saturday presentations to regional K–12 schools, to sponsor U.S. FIRST robotics programs, and to participate in mentor-based internships for college and graduate students preparing for science and technology careers. There are also opportunities to be a part of the Laboratory's volunteer base to serve as judges and advisors for local and regional science fairs and science-based activities. The Laboratory is committed to giving back to the community by sponsoring fund-raising and community service events in support of the United Way, the National Multiple Sclerosis Society, the Salvation Army, and other charitable organizations. The involvement of the entire Lincoln Laboratory community is encouraged and suggestions on how we might improve our outreach activities are welcomed.

Eric D. Evans

LLCO is an initiative to promote K–12 STEM educational outreach and ***community involvement and giving*** *in partnership with MIT's Office of Engineering Outreach Programs and the MIT Public Service Center.*

Lincoln Laboratory takes pride in promoting science and engineering education for all grade levels, and supporting the community through giving programs. Outreach programs capitalize on the strengths of the Lincoln Laboratory scientific community and strive to integrate service with education and research. Lincoln Laboratory has a history of supporting educational outreach through three primary programs: Massachusetts Institute of Technology's (MIT) VI-A Master of Engineering program, Worcester Polytechnic Institute's (WPI) Major Qualifying Project, and the university cooperatives and summer intern program. However, since 2006, the Laboratory has increased its focus on educational outreach initiatives, spawning the Lincoln Laboratory Community Outreach committee, and cultivating the Laboratory's position to motivate interest and participation in science, technology, engineering, and math programs for K–12 students, develop a program to introduce minorities to engineering careers, and offer classroom presentations and science seminars targeted to specific ages.

MIT Lincoln Laboratory is a member of the National Defense Education Program (NDEP) which invests in science, engineering, and math education in K–12 programs and is supported by the Department of Defense Research & Engineering. NDEP's mission is to support a new generation of scientists and engineers who will apply their talents in the nation's defense laboratories.

In 2011, the Communications and Community Outreach Office was pleased to add to their staff Chiamaka Porter as the Science, Technology, Engineering, and Math (STEM) Outreach Coordinator. Her background in chemistry and her strong ties with MIT, the Boston community, and the Edgerton Center have benefitted Lincoln Laboratory as the number of outreach events supported by Lincoln Laboratory increases.

TABLE OF **CONTENTS**

EDUCATIONAL **OUTREACH**

Most classroom presentations can be adapted to different lengths and ***different grade levels.***

Classroom Presentations

In this program, Lincoln Laboratory technical staff members give free science presentations and lead hands-on activities in local K–12 classrooms. Over 40 presentations are available in fields including biology, chemistry, physics, earth science, engineering, archaeology, and math. Since the program's inception in 2005, our volunteers have visited schools from Rockport, Maine, to Fitchburg, Massachusetts, and from Nashua, New Hampshire, to Dover, Delaware. Each year our volunteers give classroom presentations to approximately 7000 students. Our volunteers also judge local science fairs and give teacher workshops. Laboratory employees interested in volunteering or schools interested in hosting a presentation should email Todd Rider at *thor@ll.mit.edu*.

Jeff Gottschalk teaches students how to make a circuit at the McCarthy-Towne Elementary School in Acton, Massachusetts.

Science on Saturday

This program features free science demonstrations by Lincoln Laboratory technical staff in our Auditorium. More than 3500 local K–12 students, their parents, and teachers attend Science on Saturday events over the course of each school year. Since the program's origin in 2006, attendees have enjoyed watching and volunteering to assist with demonstrations on rockets, chemistry, robotics, asteroids, archaeology, lasers, and many other topics. The 2011–2012 school year will feature Open House presentations on cryogenics, weather, and computers; special presentations at the MIT Museum on thermodynamics and robotics; hands-on science activities hosted by the Lincoln Laboratory Technical Women's Network; spy science; radar; and a special guest presentation on radio astronomy by researchers from MIT's Haystack Observatory.

Science on Saturday events involve a high level of interaction with audience members. Children discover the power of centrifugal force by dropping paint onto a spinning disk (top). The audience experiences the sound qualities of "the wave" during a demonstration about acoustics (bottom).

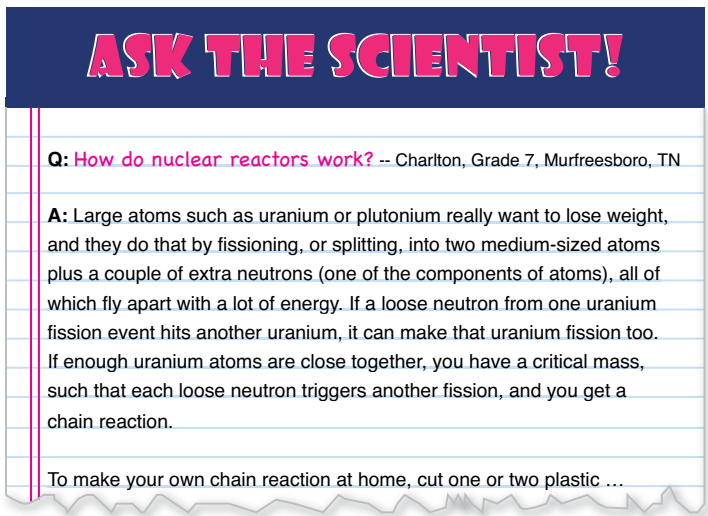
*Are you a **K–12 student with** **a question** about a science, technology, engineering, or math topic?*

Ask the Scientist!

In February 2011, Lincoln Laboratory's external website featured a new page where K–12 children can submit science-related questions. Each month, a Laboratory scientist selects one question from the mailbox and posts an answer on the web page. Among the first questions asked were

- How does the power company make the power that comes to our house?
- Why does static electricity make my hair stand up?
- How many planets are in the solar system?

This website is expected to gain popularity through classroom visits and science demonstrations, and will hopefully soon generate enough questions so that answers can be posted on a weekly basis.



Science Kits

Approximately 2500 science kits were made and distributed for free to children at the 2011 Lincoln Laboratory Open House events and also in schools. Each kit includes instructions and numerous components in a quart-sized plastic bag. The kits contain materials for 64 different experiments in aerospace engineering, archaeology, astronomy, biology, chemistry, electrical engineering, forensic science, geology, mathematics, mechanical engineering, meteorology, nuclear engineering, optics, paleontology, physics, and waves and acoustics. Many Laboratory volunteers manned an assembly line to stuff components into bags to produce the 2500 kits.

The Robotics Outreach is designed to help students experience how ***interesting and rewarding*** *the life of engineers and researchers can be.*

ROBOTICS OUTREACH AT MIT LINCOLN LABORATORY

Robotics Outreach

In addition to hosting hands-on workshops to introduce students to robotics programming, Robotics Outreach at Lincoln Laboratory (ROLL) sponsors several teams at the For Inspiration and Recognition of Science and Technology (FIRST) Robotics regional and national competitions. Staff volunteers mentor students at weekly sessions throughout the fall and winter. Children learn to program robots to complete challenges specified by FIRST, working on a research topic, building teamwork, and developing gracious professionalism throughout the season.

FIRST Teams

FIRST competitors of high-school age join FIRST Technical Challenge (FTC) teams, while students in middle school and below join FIRST Lego League (FLL or FLL Jr.) teams. More than 20 staff members volunteer as coaches and mentors, some in their local schools.

The teams participating in the 2010–2011 FIRST competition were

FLL Jr. (competing in the junior "Body Forward" challenge)

Brainstormin' Fire Beavers

FLL (competing in the "Body Forward" challenge)

Bot Boys
Robovers (NDEP sponsored)
Brickinators
Negative J (NDEP sponsored)
Super Silly Scientific Solvers
Insane Robot Posse
Purple Popcorn Eaters
Terminators
LLAMAs

FTC (competing in the "Get Over It" challenge)

MITiBots
E-Lemon-Ators
Spy Ponders (NDEP sponsored)
Robots and Brain Bots, Inc. (RABBI) (sister team from Gann Academy in Waltham, Massachusetts)
Battery-Powered Pickle Jar Heads (sister team from Lexington, Massachusetts)

World Champs

The MITiBot and Robots and Brain Bots, Inc. (or R.A.B.B.I.) teams earned an invitation to compete in the World Championship in St. Louis, Missouri, in late April. More than 600 teams from 29 countries competed in three different age-group competitions.

Lincoln Laboratory's MITiBot team won the 2011 FIRST World Championship with their two alliances.

MITiBot, mentored by John Peabody of Lincoln Laboratory's Aerospace Sensor Technology Group, competed twice before in the World Championship match, but the third time was the charm. This year, they won the World Championship as members of the winning alliance—an award which represents the alliance in the final match of the competition, consisting of three teams. This selection was a tribute to the creative marketing and scouting techniques used by the MITiBots. Of the MITiBot team, Peabody said, "The students this season worked extremely hard at perfecting the design they created. Rather than redesigning the robot numerous times, the students continued to improve on what they thought was the most efficient design for this season's game. It was rewarding to see them trust in their design and improve upon it with an engineering process."

*"The students this season worked extremely hard at **perfecting the design they created.**"*
– Mentor, John Peabody

Gann Academy's R.A.B.B.I. team turned their debut at the 2011 World Championships into an award-winning season. This team was sponsored by NDEP through ROLL.

Team R.A.B.B.I., from Gann Academy in Waltham, Massachusetts, mentored by Jerry Jaeger of the Airborne Networks Group at Lincoln Laboratory and coached by Tal Achituv, husband of Rachel Achituv of the Laboratory's Chemical and Biological Defense Systems Group, won the Inspire Award at the World Championship—an impressive feat for a rookie team. This most prestigious award is given to the team that embodies the challenge of the FTC program and best represents a role model as an FTC team. This team won based on their "unique robotics design, team spirit, high motivation, and detailed engineering notebook," paired with "skillful and diligent efforts to overcome a myriad of technical and logistical challenges, and outreach efforts promoting FIRST," according to the judges.

This season's successes for these two teams are testament to the long hours spent every weekend from September through May building and programming a robot designed for the specified challenge, as well as to good advice from technical mentors and applying lessons learned in past competitions.

Sister Robotics Teams

ROLL has a continuing collaboration with the John D. O'Bryant School in Roxbury, Massachusetts, mentoring two teams for the FIRST robotics competition. ROLL ensures that these teams have adequate supplies, funds, and mentorship to design, build, and program their robot for competition, and the Laboratory robotic teams assist their sister teams by staging scrimmages and sharing design concepts as well as computer programming tips. Teams in Waltham and Lexington receive funding from ROLL, and mentors are always available to any sister team.

The Laboratory's outreach coordinator, Chiamaka Porter (left), assisted with mentorship of the J.D. O'Bryant robotics high-school team as they prepared for competition.

RoboWorkshop — NASCAR Student Racing Challenge

ROLL's new workshop explored the physics of NASCAR motorsports using 1:10-scale radio-controlled (RC) cars. Middle- and high-school students learned to optimize performance of their RC cars, paralleling the activity in NASCAR garages across the country. Follow-on workshops are planned in which kids will learn to program general-purpose processors to control sensors for an autonomous robotic NASCAR.

*ROLL offered **two new programs** in 2011, RoboWorkshop and the SeaPerch Derby.*

SeaPerch Derby

Late in 2010, Lincoln Laboratory sent six students and two mentors to the SeaPerch Derby, a competition sponsored by the Office of Naval Research that teaches how to build a remotely operated underwater vehicle. Students learn basic skills in submarine design and explore marine engineering concepts. Teams test their vehicles, deploy them on missions, and compete in events of general design and craftsmanship, maneuvering, and a simulated sea rescue. The challenge fosters an end goal, promotes presentation skills, and rewards sportsmanship and mastery of concepts.

Jonathan Williams, back right, formerly of the Advanced Capabilities and Systems Group and Jennifer Eisenman, front right, of the Air Defense Techniques Group volunteered to mentor the two student teams participating in the SeaPerch Derby at New Bedford High School. The teams are pictured here with RADM Phil Wisecup, back left, current Naval Inspector General and former president of the U.S. Naval War College, the sponsor of the derby.

MIT Office of Engineering Outreach Programs (OEOP)

MIT's Department of Engineering's OEOP offers deserving students rigorous academic experiences that provide an understanding of how technical concepts relate to their everyday lives. Not only do OEOP programs encourage the pursuit of careers in technical careers, they also provide a hands-on curriculum that strengthens foundational math, science, and communication skills in a challenging learning environment with high expectations. Lincoln Laboratory plays a part in four OEOP programs: MITES, SEED, MSBP, and STEM.

Minority Introduction to Engineering and Science (MITES) Program

This six-week residential summer program for top high-school students in the nation stresses the value and reward of pursuing advanced technical degrees and careers while developing the skills necessary to achieve success in science and engineering. This year, Lincoln Laboratory sponsored two students in the six-week summer program at MIT, and hosted 75 students enrolled in the MITES program for facility tours and career presentations by Michelle Clark of the Chemical, Biological, and Nanoscale Technologies Group, and David Freeman of the Optical Systems Engineering Group.

Saturday Engineering and Enrichment Discovery (SEED) Academy

The SEED Academy is a seven-semester technical career-exploration program for promising but traditionally underserved high-school students in Boston, Lawrence, and Cambridge, Massachusetts. In 2011, Lincoln Laboratory sponsored an aeronautics/astrophysics course and presentations by Christ Richmond of the Advanced Sensor Techniques Group and Virginia Goodwin of the Surveillance Systems Group on why they chose their careers.

MIT Science of Baseball Program (MSBP)

This four-week summer program for eighth grade boys from Boston, Lawrence, and Cambridge featured an integrated academic and athletic curriculum to channel the students' enthusiasm for baseball into a renewed excitement for and increased proficiency in the math, science, and culture behind the game. Lincoln Laboratory partially sponsored one local middle-school student and offered tours of Laboratory facilities and presentations by Heriberto Garcia of the BMDS Integration Group and Rodolfo Cuevas of the Systems and Architectures Group. The highlight of this visit to the Laboratory is the "brains versus bats" softball game in which the students play against a team of scientists!

The STEM Program helps middle-school students who want to ***get ahead*** *in math and science.*

Science, Technology, Engineering, and Mathematics (STEM) Program

STEM is a year-round academic enrichment program including mentoring and a summer institute for middle-school students from Boston, Cambridge, and Lawrence, Massachusetts. The courses use lectures, projects, and experiments to help participants develop mathematical thinking and problem-solving abilities in preparation for high-school "gateway" math and science classes, in an attempt to increase the number of local students seeking careers in the technical workforce. Lincoln Laboratory sponsored a robotics course for 20+ students, provided tours of Laboratory facilities, and presented a Science on Saturday demonstration at a school location. Virginia Goodwin of the Surveillance Systems Group and Jeffrey Palmer of the Chemical and Biological Defense Systems Group presented briefings on their educational and career choices.

Ceres Connection

Under the Ceres Connection program, minor planets discovered by the Lincoln Near-Earth Asteroid Research program are named in honor of science students in grades 5–12 and their teachers. The honorees are selected through science competitions directed by the Science Education Department at the Society for Science & the Public. To date, approximately 2750 students and their teachers have been honored. Each year, the Ceres Connection program awards about 250 students with this honor.

The Ceres Connection names minor planets ***in honor of students*** *and their teachers.*

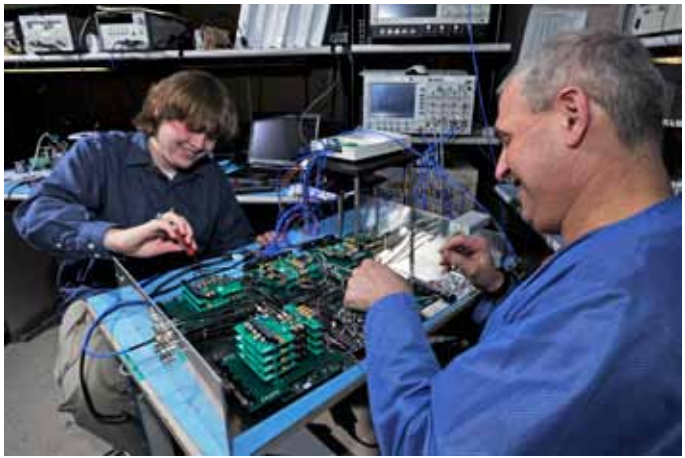
Daughters and Sons Days

Lincoln Laboratory extends their outreach to the students of many local schools by way of the annual Daughters and Sons Days offered for employees' children. The 2011 event featured nine activities designed to spark interest in science and technology, including hands-on demonstrations of robotics, space control, flight simulation, and a scanning electron microscope. Each day began with presentations by Dr. Kathleen Bihari, Ngaire Underhill, and Dr. Jeremy Muldavin, who described their paths to their current careers and explained interesting projects on which they work.

AFCEA International Program

The Laboratory hired three AFCEA (Armed Forces Communications and Electronics Association) interns from local Massachusetts towns in 2011. These interns assisted the Optical Systems Technology Group, the Chemical and Biological Defense Systems Group, and the Engineering Division. AFCEA arranges summer internship opportunities for graduating high-school seniors interested in STEM careers. While three to four students are offered Laboratory internships each summer, at least 40 students tour the Laboratory facilities, seeing the latest research performed at the Laboratory and learning about various career options in math and science.

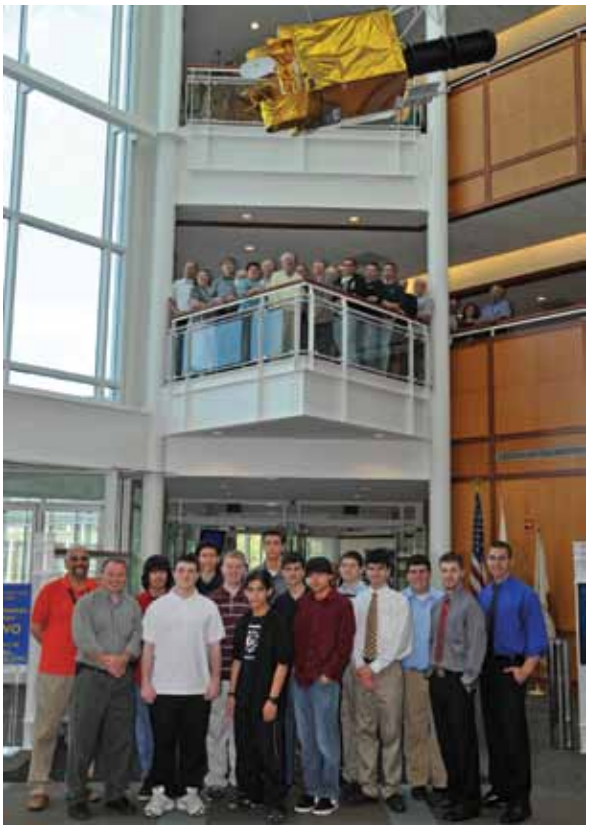
Eli Barkovic (left) from Bedford High School interned with the Optical Systems Technology Group. Harold Payson acted as his mentor.



Cameron Houdlette, student intern from Shawsheen Technical Vocational High School, worked with Barry Romkey of the Optical Communications Technology Group.

Technical High School Student Internships

This cooperative internship program hires two students from the Minuteman Career and Technical High School and one student from Shawsheen Technical Vocational High School, and the students get hands-on experience in a real-world setting. This 20-week internship helps interns gain a perspective on the daily work of engineers and technicians.



Interns from Minuteman Career and Technical High School stand underneath their LES-9 model, while Laboratory mentors view the satellite from the second floor.

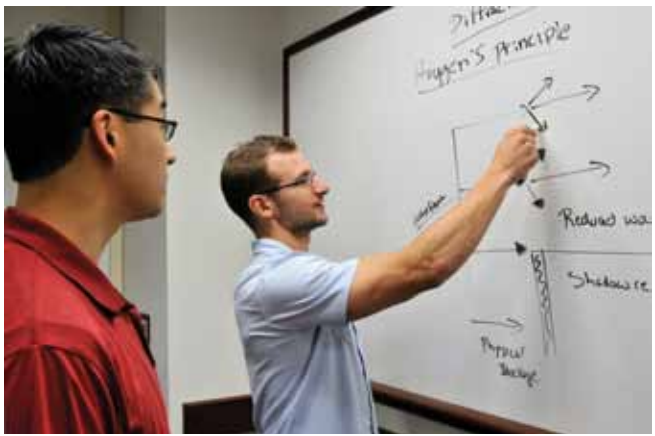
Minuteman Career and Technical High School

Lincoln Laboratory partners with a teacher at Minuteman Career and Technical High School to provide the opportunity to practice real-world engineering skills as part of a pre-engineering class. In June 2011, high school juniors worked throughout the year to build a model of the Lincoln Experimental Satellite (LES-9). Students worked in the evenings and weekends with the help of their teacher, Patrick McColl, and with many mentors at Lincoln Laboratory, including John Kangas, Al Richard, and Don MacLellan.

John D. O'Bryant School of Math and Science Partnership

Students from the John D. O'Bryant School in Roxbury, Massachusetts, visit the Laboratory twice each year. Technical staff members provide insight to the inspirations that led them to STEM majors and careers. After hearing about the history and current research performed at the Laboratory, the students receive tours of the Flight and Antenna Test Facility. In 2011, the students listened to Bryan Reid of the Optical Systems Engineering Group and Son-Ca Nguyen of the Engineering Analysis and Testing Group explain why they chose careers in engineering. Lincoln Laboratory volunteers also mentor two robotics teams at the John D. O'Bryant School.

Leadership Initiatives for Teaching and Technology



The Leadership Initiatives for Teaching and Technology (LIFT^2) program provides middle- and high-school teachers with summer internships in a technical field in an effort to help teachers relate classroom curriculum to authentic and relevant applications in the 21st-century workplace. Each summer, two to four teachers participate in this program, gaining insight into new skill sets needed by today's technical workforce and better helping their students prepare for future careers. In 2011, Everest Huang (at left in photo) and Michelle Schuman of the Advanced Satcom Systems and Operations Group mentored Brendon Ferullo (at right in photo), a math teacher at Framingham High School, to help perform tasks related to ongoing studies to define performance for future communication architectures.

Professional Development for Teachers

Lincoln Laboratory entered new territory this year by hosting a professional development workshop for middle-school teachers in November 2011. Hands-on activities designed to assist students in understanding abstract science concepts in concrete ways. Teachers practiced using Lego bricks to build representations of atoms, molecules, and chemical transformations. The workshop participants also observed chemical reactions, experienced a photosynthesis reaction, and learned about a new activity on atmospherics. The Laboratory hopes to develop this type of mentorship program and offer more opportunities for professional development in the near future.

Massachusetts State Science and Engineering Fair

Lincoln Laboratory technical staff have been volunteering as judges for the Massachusetts State Science and Engineering Fair since 2000, evaluating six to eight high-school projects. At the 2011 Massachusetts State Science and Engineering Fair, Lincoln Laboratory continued as a bronze donor of the event by sponsoring winners in the physics and engineering competitions. Sixteen Laboratory scientists participated in the science fair as judges, almost doubling the number of volunteers from the prior year. This year's judges included David Brown, Miriam Cha, Shourov Chatterji, Kenneth Cole, Phillip Evans, Caroline Fernandes, Claude French, Caroline Lamb, Christopher Lloyd, Bernard Malouin, Scott Philips, Alex Pina, Todd Rider, Zachary Weber, Erica Wiken, and Jung Yoon. Bernard Malouin volunteered as a judge for the state's middle-school science fair in Worcester.

Lincoln Laboratory has also provided judges for InvenTeams competitions in which high-school teams from around the country send research proposals to MIT for judging and potential funding.

Lexington High School Science and Engineering Fair

In 2011, seven technical staff (Mykel Kochenderfer, Brie Howley, Zachary Weber, Christi Cull, Evan Cull, Dan Weidman, and Grant Stokes) from Lincoln Laboratory supported Lexington High School by volunteering as judges for the school's Science and Engineering Fair.

The Cambridge Science Festival ***makes science accessible,*** *interactive, and fun.*

Cambridge Science Festival

In coordination with MIT, Lincoln Laboratory Community Outreach partnered with Robotics Outreach volunteers to man a booth in the Cambridge Science Festival, a week-long celebration showcasing Cambridge as an internationally recognized leader in science, technology, engineering, and math. Laboratory volunteers Jonathan Williams, Greg Ciccarelli, Kenneth Cole, and Wendy Birdsong provided robotics demonstrations and hands-on activities such as helping robotic bugs swarm and controlling a robot to capture a ball. Masahiro Arakawa reprised a Science on Saturday demonstration called "How Computers Work" at the Cambridge Public Library as part of this city-wide science festival, visited by 15,000 people from the New England region.

Science on the Mall

The USA Science and Engineering Festival, the country's first national science festival, was held in Washington, D.C., in late 2010. Lincoln Laboratory was one of 850 organizations participating in the festival. Visitors to the Laboratory's booth played robot soccer with robots built from kits utilizing Lego Mindstorms and Tetrix Education parts. ROLL representatives John Peabody and Kenneth Cole participated in the grand finale exposition of the festival, called Science on the Mall, which was the largest multidisciplinary celebration of science in the United States.

Laboratory employees represented ROLL at the USA Science and Engineering Festival, where they taught people of all ages how to play robot soccer.

Science on Saturday on Tour

Lincoln Laboratory took the already successful Science on Saturday demonstration "Hot Science" to the MIT Museum to celebrate the 150th anniversary of MIT and the Laboratory's 60th anniversary. This demonstration shows children how to measure heat, how heat transfers from one object to another, and how it can be used to run an engine. Topics included how to keep a house cool in the summer, but warm in the winter.

Attendees to the special Science on Saturday demonstration used flashlights to investigate how heat can transfer to other objects.

The Boy Scouts of America merit badge for robotics.

Scouting at Lincoln Laboratory

Late in 2010, a community to promote Scouting at Lincoln Laboratory (S@L) was developed to focus on hosting merit badge workshops and lunchtime discussion groups.

This group began by participating in the inaugural class for a robotics merit badge and hosting activities at the kickoff of National Robotics Week at the Boston Museum of Science. They have also organized and hosted merit badge classes in aviation and invention, and have served as merit badge counselors and subject matter experts for merit badge workshops.

To promote further development of their group, S@L has worked with the regional scouting executive to develop the new STEM merit badge camp, including ideas for two new merit badges to be developed: game design and computer animation. Other technical fields of interest were considered that could easily translate into a merit badge, such as web design, digital media, environmental science, and sustainability.

This group is still in its infancy and hopes to grow in service, resources, and membership.

S@L often participates in outreach activities and educational presentations for all levels of scouts.

Under instruction from Gabriela Galaviz of the Safety and Mission Assurance Office, students learn the principles of chemistry and materials science.

Society of Women Engineers Workshops

Lincoln Laboratory partnered with Boston Chapter of The Society of Women Engineers (SWE) to host outreach workshops for the community. Twice in 2011, "Wow! That's Engineering!" was held for 100 girls in sixth through eighth grade with the help of Damaris Sarria of the Engineering Analysis and Testing Group and SWE. Activities included building a toy solar car, programming a Lego Mindstorms robot, building an electrical circuit, mixing chemical compounds, and practicing reverse engineering by taking apart common office and household electrical appliances. SWE also hosted a Space Night Workshop with astronomy-related activities, and an event featuring one-on-one discussions with NASA astronaut Catherine Coleman.

Group Tours

As part of the Lincoln Laboratory Community Outreach Program, tours of Laboratory facilities, such as the Microelectronics Laboratory, Air Traffic Control Laboratory, and Flight and Antenna Test Facility, are given to a number of groups such as the following:

- New Jersey Institute of Technology Cadets
- DARPA Program Managers
- Air Force Cadets
- USAFMC
- MIT Minority Engineering Interphase Group
- Army Test and Evaluation Command
- U.S. Army Natick Laboratory
- West Point Cadets
- National Reconnaissance Office Fellows
- Leader-to-Leader Group
- Armed Forces Communications and Electronics Association
- ESC Hanscom Air Force Base personnel

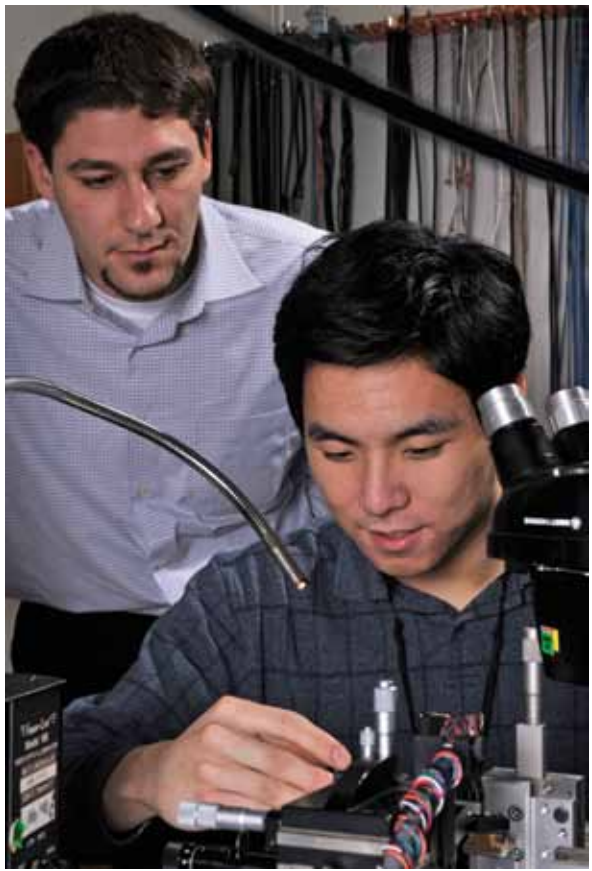
EDUCATIONAL COLLABORATIONS

Technical Staff Seminars

The technical staff stay current in their field by presenting technical seminars at area universities and hosting technical seminars at Lincoln Laboratory. Seminar series are built to motivate and inspire while facilitating working relationships. The Technology Office coordinates a series of seminars in which invited lecturers discuss results and implications of their innovative research or offer insights on new technologies. Seminar series are conducted with researchers at MIT, Northeastern University, Cornell University, Harvard University, Princeton University, and the University of Illinois. Lincoln Laboratory also has an in-house education program that offers courses in technical subjects such as electro-optics, classes in software applications, one-day technical seminars, and workshops in leadership and business skills. Last year, the Laboratory hosted 17 seminars under this educational outreach program.

Integrated Photonics Initiative

The Integrated Photonics Initiative (IPI) is a multiyear, Lincoln Laboratory–funded collaboration between the Laboratory and the MIT campus to support the research of doctoral candidates working on integrated photonic materials, devices, and subsystems. The program gives the students a broader awareness of Department of Defense missions that could benefit from integrated photonic technologies, develop these technologies through graduate research, and work to insert the technologies into current systems. William Loh, a current MIT graduate student performing his thesis research at Lincoln Laboratory as a member of the IPI, has been working to understand the noise properties of both high-power semiconductor optical amplifiers and narrow-linewidth semiconductor external-cavity lasers. Loh collaborated with on-campus colleagues to use an interference lithography resource to fabricate gratings that will be used to implement integrated distributed feedback lasers.

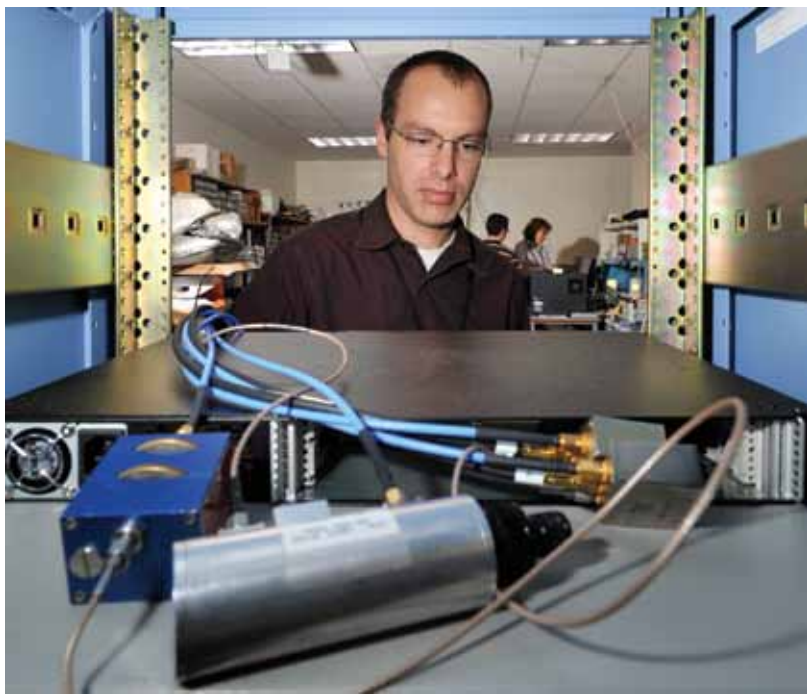


Graduate Fellowship Program

Lincoln Laboratory offers a limited number of graduate fellowships to science and engineering students pursuing MS or PhD degrees at partner universities. The fellowship program awards funds to support a Fellow's stipend, supplement a graduate assistantship, or subsidize other direct research expenses during a student's thesis research. In 2010–2011, this program awarded grants to seven students.

Lincoln Scholars Program

Currently, 33 technical staff members are enrolled in the Lincoln Scholars Program, a competitive program for which technical staff are eligible to apply and under which participants are funded by the Laboratory for full-time pursuit of an advanced degree at MIT or another local university. Over the past 16 months, one staff member earned a doctorate and eleven earned master's degrees through the program.



MIT Department of Aeronautics and Astronautics

Students from two courses in the MIT Department of Aeronautics and Astronautics built an unmanned aircraft that will carry a Lincoln Laboratory payload for measurement of ground-based antenna patterns. The two-semester project required students to design, construct, and flight test the vehicle. Staff from the Laboratory's Tactical Defense Systems Group provided design guidance and test-range support while acting as the "customer" for the aircraft. This project gave students a real-world experience of developing a product to meet customer specifications.

Build a Small Radar Course

Lincoln Laboratory technical staff conducted a three-week course at MIT in January 2011. The goal of "Build a Small Radar System Capable of Sensing Range, Doppler, and Synthetic Aperture Radar Imaging" was to generate student interest in topics such as applied electromagnetics and signal processing through the construction and demonstration of a short-range radar sensor. Jonathan Williams, Drs. Gregory Charvat, Alan Fenn, Stephen Kogon and Jeffrey Herd served as instructors.

Dr. Eric Evans (standing far left) presented the trophy to the winning team of student designers.

MIT VI-A Master of Engineering Thesis Program

Six MIT students in MIT's Department of Electrical Engineering and Computer Science VI-A Master of Engineering Thesis Program were hired in 2011 (double the typical annual number of VI-A students) to work with a Laboratory mentor while acquiring experience in testing, design, development, research, and programming. The students are paid as research assistants while completing their thesis research at Lincoln Laboratory. Hana Adaniya (shown at right) said, "VI-A has been one of the best experiences I've had. Working at Lincoln Laboratory over the past three years has allowed me to develop an exciting thesis topic and create relationships with my group members that will prove invaluable."

WPI Major Qualifying Program

Ten students were accepted in 2011 as Laboratory interns under the Worcester Polytechnic Institute's (WPI) Major Qualifying Project (MQP) Program, which requires students to complete an undergraduate project equivalent to a senior thesis. The MQP program allows students to demonstrate the application of skills, methods, and knowledge to problems typical of those encountered in industry.

Summer Research Program

Lincoln Laboratory offers undergraduate and graduate students the unique opportunity to gain hands-on experience in a leading-edge research environment. Program participants contribute to projects and gain experience that complements their courses of study. The Laboratory typically hires 100 students from top universities every summer to participate in Summer Research Program internships. However, in 2011, 140 students were hired to assist in Laboratory research during their summer break from universities and colleges across the nation.

The synergy between the campus focus on basic research and the Laboratory knowledge of defense applications has ***benefited both communities.***

University Cooperative Education Studies

Technical groups at Lincoln Laboratory hire students from area colleges as co-ops working full time with mentors during the summer and part time during the academic term. Co-ops can become significant contributors to project teams as they build prototypes, help solve problems, assist in research activities, and test applications in the field.

In January 2011, 20 students joined the Laboratory, and 25 more students were hired as co-ops in July. Colleges and universities that regularly send co-ops to Lincoln Laboratory are Northeastern University, Wentworth Institute of Technology, Boston Architectural College, and Rochester Institute of Technology.

MIT Undergraduate Research Opportunities Program

Ten undergraduates were hired in the summer in 2011 as part of the MIT Undergraduate Research Opportunities Program, which allows students to participate in every aspect of onsite research. Students develop research plans, write proposals, perform experiments, analyze data, and present research results.

Undergraduate Diversity Awards

Lincoln Laboratory established the Undergraduate Diversity Awards to expand opportunities for women and minorities pursuing bachelor's degrees in engineering and science at selected colleges and universities. The award is typically in the form of tuition assistance, support for technical paper presentations, or funds for independent research projects. Awards are provided each year at colleges and universities where Lincoln Laboratory has little or no presence, such as Bryn Mawr College, Howard University, Mount Holyoke College, New Mexico State University, North Carolina Agricultural and Technical University, Smith College, Spelman College, Stevens Institute of Technology, the University of Puerto Rico, and Wellesley College.

Naval War College and Maxwell Air University

Lincoln Laboratory staff teach an elective at the Naval War College in Newport, Rhode Island, entitled, Net-Centric and Cyber Operations: Implications for National Security. This course, co-taught by Lincoln Laboratory staff and the Fletcher School at Tufts University, prepares O-4 and O-5 level officers for technology and policy challenges they will face as the Department of Defense enhances information superiority through increased data sharing and collaboration and ensures its ability to operate in cyberspace by securing and defending critical information. In 2011, students described the Net-Centric and Cyber Operations course as "one of the best at the Naval War College."

Based on the popularity of this course, Lincoln Laboratory now offers a similar elective at the Air Force Center for Professional Military Education (also known as Air University) at Maxwell-Gunter Air Force Base in Alabama.

Another elective at the Naval War College co-taught by Lincoln Laboratory staff and Tufts University is Homeland Security and Counterterrorism: Technological and Policy Foundations. This course explores in a systematic fashion the critical technologies, capabilities, operational concepts, and policies that will influence how the United States defends its homeland and deals with the threats posed by terrorism.

Staff from Tufts University and Lincoln Laboratory teach similar courses in Space Technology and Policy, and Ballistic Missile Defense.

Jeff Gottschalk of the Net-Centric Operations Group and Joshua Haines of the Cyber Systems and Technology Group served as instructors for the Net-Centric and Cyber Operations course. The students are shown here during their tour of the Laboratory.

COMMUNITY GIVING

Lincoln Laboratory employees are actively engaged in many activities supporting worthy causes contributing to the overall quality of life within and outside of our community. LLCO strives to raise awareness of local needs by organizing fund-raising and outreach events that support selected charitable organizations. A diverse range of opportunities is provided for employees to volunteer their time and resources.

Walk to End Alzheimer's

The MIT Lincoln Laboratory Alzheimer's Awareness and Outreach Team is committed to providing support and information to those in the Laboratory community who have been impacted by Alzheimer's. This informal volunteer group organizes educational and awareness events throughout the year and provides education about Alzheimer's disease and the Alzheimer's Association. The outreach team also participates in the Greater Boston Walk to End Alzheimer's. In 2011, this 18-member team raised $17,500 to benefit the regional chapter of the Alzheimer's Association, and of all the teams participating in the event, the Laboratory team ranked third in amount of dollars raised. The 2011 event "Purple for a Purpose" was hosted to promote awareness of Alzheimer's disease, inviting all those in the Laboratory community who know someone afflicted with Alzheimer's to wear purple. This gathering fostered support for one another as caregivers and provided the opportunity to stand together to fight the disease.

Multiple Sclerosis Society Bike and Hike

Lincoln Laboratory forms teams to participate in the annual "Bike and Hike the Berkshires" event to raise funds for the Multiple Sclerosis Society. The most recent hiking and cycling teams totaled 15 members and raised more than $9,000 for the Multiple Sclerosis Society.

"[We] were so touched by all the letters of support."
– MSG Michael Hanssen

Support the Troops Program

Lincoln Laboratory runs an ongoing campaign of support for deployed U.S. troops. Donations of food, books, games, and toiletries are collected daily, boxed by volunteers, and mailed weekly to military personnel serving in Iraq and Afghanistan. Typically about 60 soldiers are on the mailing list. Each year, more than 200 care packages are mailed to approximately 35 troops.

Lincoln Laboratory Troop Support provides extra support to the soldiers around the holidays by hosting a "Crafting for a Cause" event that sells handmade goods. Profits from the sales go toward holiday items to be included in every box sent to the troops. Many soldiers thanked Lincoln Laboratory Troop Support specifically for the holiday extras and described how their holidays were a little merrier as a result of the items sent.

Joanne Knoll of the Troop Support team also made it possible for children to express their thanks to a soldier while visiting the Laboratory on Daughters and Sons Days. Master Sergeant Michael Hanssen, a security guard at Lincoln Laboratory whose Army Reserve unit was stationed in Afghanistan, wrote in his thank-you letter, "the 26th Maneuver Enhancement Brigade and I were so touched by all the letters of support by the kids of parents from Lincoln Lab. I can't even begin to tell you how that makes a soldier feel. I got a big kick out of all the young people drawing and writing words of encouragement. We were all so moved by the patriotic support the kids gave us."

Holiday Drives

The MIT Credit Union in Lincoln Laboratory serves as a drop-off point for **Toys for Tots** holiday toy drive, providing toys for local children in needy families. Each year, numerous toys are generously donated for holiday delivery. In December 2011, more than 300 toys were collected for local children.

Paula Mason of the Air Defense Techniques Group organizes a **"giving tree"** during the holidays to respond to specific wishes from local families in need. This program is paired with a food drive, so that each recipient receives a requested gift and a food Item for the holidays. Laboratory participation in this program helps collect gifts annually for more than 350 people who would otherwise go without a gift of any kind.

Lincoln Laboratory participates each winter in the **Coats for Kids drive**. The Laboratory collects warm coats for all ages and delivers them to Anton's Cleaners. All coats are cleaned free of charge and given to those in need through an extensive distribution partnership. The Coats for Kids program provides 60,000 coats in the greater Boston area each winter. Lincoln Laboratory donated more than 400 coats in the December 2011 drive.

In coordination with MIT, Lincoln Laboratory sponsors an annual campaign to donate to **United Way** through paycheck donation or a direct one-time contribution to the United Way charity of the employee's choice. The United Way helps human service agencies respond to urgent needs in the community and builds a brighter future for those in need.

Habitat for Humanity

Lincoln Laboratory's New Employees Network supported Habitat for Humanity by building an affordable house in the local area for a needy family. The Laboratory is happy to aid Habitat for Humanity in its mission to eliminate poverty housing and provide safe, healthy living conditions while strengthening community ties. In July 2011, volunteers from Lincoln Laboratory joined together to hang dry wall and spackle, prime, and paint walls. They also hung siding and installed doors and insulation. Twenty-four individuals participated this year.

Clothing Drive

For the second year in a row, LLCO sponsored Hannah's Socks, a program collecting new socks for the homeless. The program is named for a four-year-old girl who gave a homeless man her socks because he had none. Hannah's Socks seeks to collect the least given, but most needed, articles of clothing for shelters around the country. In 2011, Lincoln Laboratory donated 565 socks and other cold-weather items to the Veterans' Hospital in Bedford, Massachusetts.

Food Drive

Lincoln Laboratory Community Outreach supports several venues for food donation. Each September, a canned goods drive is held to support the Food for Free organization, which provides healthy food to more than 60 local emergency food programs and over 20,000 individuals. The Laboratory also provides donations every November to the Burlington Food Pantry in Burlington, Massachusetts, helping local families provide a holiday meal for their families. Each week, excess food from the Laboratory cafeterias is donated to the Lowell Transitional Living Center, Inc. in Lowell, Massachusetts, in order to curb waste and to provide food where it is needed.

Marshallese student interns are ***mentored at a Laboratory facility*** *and encouraged to pursue further education.*

Marshallese Island Outreach

Lincoln Laboratory operates a field site at the U.S. Army Kwajalein Atoll located about 2500 miles WSW of Hawaii. Twenty staff members work at this site, serving two- to three-year tours of duty. The amiable relationship enjoyed by the Laboratory staff and the local community prompted the initiation of the Marshallese Outreach program, developed to enrich educational and life experiences of the Marshallese people.

Lincoln Laboratory technical assistant Ranny Ranis (left) helped interns Toshiop Langbon and Kimi Jiwirakunderstand the hardware aspects of computers. The internship included a trip to Roi Namur to tour facilities and learn about the radars there.

Each summer, two Marshallese college students are supported for ten weeks as interns at a Laboratory facility. The internship provides mentoring, resources, and assistance in an effort to encourage interns to pursue further education and subsequent employment in the Marshall Islands, while they contribute to the Reagan Test Site information technology needs.

Other forms of outreach at Kwajalein include a scholarship awarded each fall to a local student choosing a career in science, technology, engineering, or math. Laboratory staff at Kwajalein also contribute to the student lunch program for the local elementary school and assist artisan residents by displaying and selling Marshallese handcrafts.

5K Fun Run

Lincoln Laboratory holds an annual fun run in collaboration with the onsite MIT Fitness Center. Participants run on a prescribed path in the Laboratory/Hanscom Air Force Base neighborhood. This fun run supports a different charity each year while promoting fitness and community service. In 2011, 61 runners participated in this fun run over their lunch time, raising $678 from the Laboratory community for the Veterans' Hospital in Bedford, Massachusetts. The newly established Veterans Networking Group also supported the Veterans' Hospital by participating in a Veterans' Day Fun Run. Eleven Laboratory employees raised $335 to help support programs for veterans at the hospital.

Used-Book Drive

In coordination with the MIT Community Giving Fund, Lincoln Laboratory holds an annual used-book drive each February. Proceeds support the MIT Community Service Fund, which offers grants to charities in Boston and Cambridge. In 2011, the book drive raised $1211 and provided plenty of new reading material for all patrons.

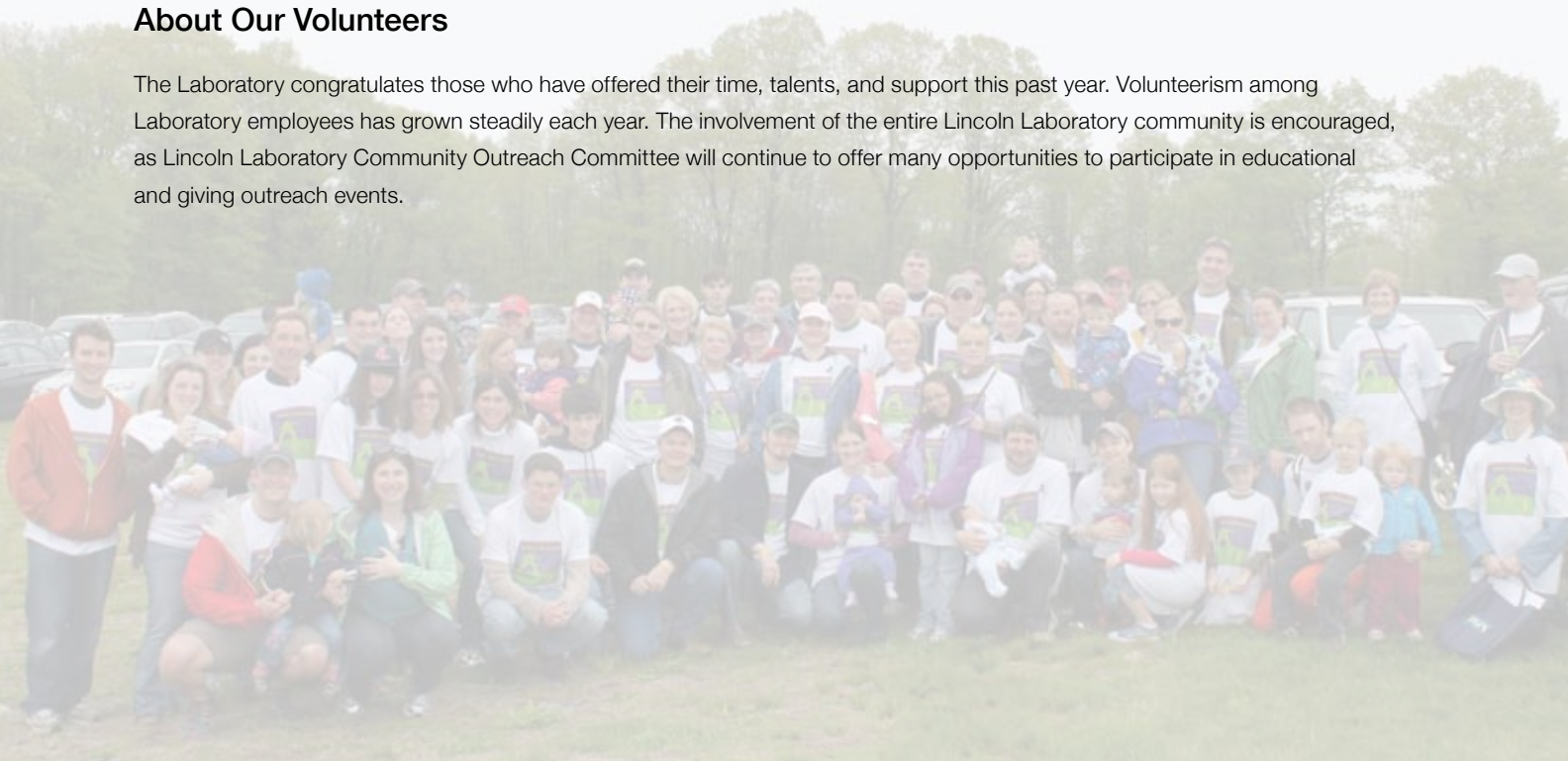
Other Community Outreach Events

The Laboratory encourages its staff to support a variety of causes on their own and to join colleagues in their charitable efforts. In the past year, Lincoln Laboratory staff members have supported the following causes:

- PanMass Challenge
- TeamWalk for CancerCare
- Great Strides for Cystic Fibrosis (shown on opposite page)
- Catie's Closet for homeless teens
- Free to Breathe 5K Fun Run for the National Lung Cancer Partnership
- Autumn Escape bike trek for the American Lung Association
- Loaves and Fishes
- ReVision Urban Farm
- Blanket drive for the homeless for the Massachusetts Coalition for the Homeless

About Our Volunteers

The Laboratory congratulates those who have offered their time, talents, and support this past year. Volunteerism among Laboratory employees has grown steadily each year. The involvement of the entire Lincoln Laboratory community is encouraged, as Lincoln Laboratory Community Outreach Committee will continue to offer many opportunities to participate in educational and giving outreach events.



Lincoln Laboratory Community Outreach

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