

Office of Experiential Learning

The [Office of Experiential Learning](#) brings together the Edgerton Center, D-Lab, Concourse, the Experimental Study Group (ESG), and Terrascope. Its director is J. Kim Vandiver, dean for undergraduate research and director of the Edgerton Center, which includes the D-Lab program. The faculty directors for Concourse, ESG, and Terrascope are, respectively, professors Anne McCants, Leigh Royden, and Samuel Bowering. Each director has provided separate annual reports, which follow this brief introduction.

Edgerton Center

The mission of the [Edgerton Center](#) is to uphold the legacy of Harold “Doc” Edgerton— inventor, entrepreneur, explorer, and longtime MIT professor—by promoting hands-on and project-based learning, offering subjects in engineering and imaging, supporting student clubs and teams, maintaining student machine shops, upholding MIT’s expertise in high-speed and scientific imaging, offering the D-Lab international development program, and offering a year-round K–12 science and engineering program.

K–12 Engagement

Eighteen years ago, the Edgerton Center began a program bringing fourth- through eighth-grade Cambridge Public School students to MIT. The goal was to enrich their studies with hands-on science and engineering activities. The program now hosts approximately 3,000 student visits annually from public, private, and home schools in the greater Boston area. The academic field trips are organized as half-day, project-based lessons (11 unique activities) that are aligned with Massachusetts state standards. Edgerton Center instructors Amy Fitzgerald and Jessica Garrett lead the lessons, with assistance from MIT students involved in Undergraduate Research Opportunities Program (UROP) projects or working as student staff. When the program began, MIT was receiving no college applications from Cambridge Rindge and Latin School. This year six Rindge and Latin students were admitted, with five entering MIT in fall 2014.

Eleven years ago, thanks to the support of a Department of Aeronautics and Astronautics project sponsored by the National Aeronautics and Space Administration (NASA), the center began working with the John D. O’Bryant School of Mathematics and Science in Roxbury, MA. The initial project on solar energy brought the O’Bryant teachers, students, and our staff together in the spirit of collaborative education. Staff member Ed Moriarty became a fixture at O’Bryant, engaging students in hands-on science and engineering projects. Today, Edgerton staff member and O’Bryant alumnus Alban Cobi ’12 is on site a few times weekly at the O’Bryant School, developing and implementing the Engineering Pathways Program. Six O’Bryant graduates have matriculated at MIT since the program’s inception. This year we received a \$25,000 grant from the Harold Whitworth Pierce Charitable Trust to support the advancement of our K–12 model of education in Boston, with particular interest in the O’Bryant School. On Saturdays, Moriarty and Cobi host a wide-ranging, hands-on science, technology, engineering, and mathematics (STEM) project, The Saturday Thing, that has been replicated in states from Alaska to Florida. In the summer, they run a month-long engineering design workshop for local high school students.

Jessica Garrett and Amy Fitzgerald are in the fourth year of a collaboration with General Electric (GE) and its plant in Lynn, MA. They created a girls' summer program model for dissemination to other GE sites and partner educational institutions across the nation. We piloted the program, GE Girls at MIT, in 2011, with 25 rising seventh-grade girls from the Lynn public schools. Members of the GE Women's Network shared stories of their careers and assisted in engaging the girls in hands-on engineering activities. Garrett and Fitzgerald consulted with the first follow-on programs at Rensselaer Polytechnic Institute, the Milwaukee School of Engineering, and Georgia Tech and continue to lead the MIT program. Similarly, Fitzgerald's You GO Girl! summer program (in its 15th year) exposes rising ninth-grade girls to hands-on, project-based lessons in science and engineering.

Jessica Garrett continues the seventh year of a teacher professional development collaboration with the Gloucester Public Schools and Gloucester Education Foundation. Summer 2013 brought another 40 Gloucester students to enjoy the one-week Summer Engineering Adventure on MIT's campus, in collaboration with the MIT Museum and the Scheller Teacher Education Program. Also, this is the third year of Garrett's Telling Your Story workshop, which connects MIT graduate students, scientists, and engineers with classroom teachers and, through classroom visits, helps demystify STEM and excite the next generation of learners. Forty local science and multisubject teachers came together with an equal number of scientists and engineers for the fall workshop.

Classroom science teachers seek out our "Atoms and Molecules" sets made from basic LEGO® bricks, which enable educators to teach concepts in biology, chemistry, and earth science. Over the past year, we have fulfilled more than 60 requests from schools across the nation. We are in the production stage of our first set of 100 DNA kits, with distribution to classrooms to begin in fall 2014.

Our partnership with i2 Camps—a network of middle school STEM camps—has expanded in its second year through an additional five-year curriculum development grant. With other MIT groups, we have developed and implemented additional science and engineering curricula at 20 locations nationwide and two international locations.

This is the first year of our Science on Saturday program. The program, overseen by MIT alumnus Todd Ryder and facilitated by MIT students, takes place six times per year and introduces the K–12 community to demonstrations in areas such as optics, robots, and underwater vehicles.

D-Lab

D-Lab (Development through Dialogue, Design, and Dissemination) is building a global network of innovators to design and disseminate technologies that meaningfully improve the lives of people living in poverty. The program's mission is pursued through interdisciplinary courses, technology development, and community initiatives, all of which emphasize experiential learning, real-world projects, community-led development, and scalability. Founded by Amy Smith, senior lecturer in the Department of Mechanical Engineering (and a MacArthur Fellow), D-Lab has developed a range of

technologies and processes, including community water testing and treatment systems, human powered agricultural processing machines, medical and assistive devices for global health, and clean-burning cooking fuels made from waste.

Student Engagement

D-Lab courses continue to be popular among MIT students. This past year 180 students, predominantly undergraduates, enrolled in 13 D-Lab subjects and one independent study. A new course, EC.729 Design for Scale, was developed to focus on the late stages of product design. Through relationships with businesses in countries such as India, Tanzania, and Nicaragua, students worked in interdisciplinary teams to transform previously established technologies into manufacturing-ready product designs.

Over the course of the year, through Independent Activities Period trips as well as spring break and summer fieldwork, 79 D-Lab students traveled to Uganda, Kenya, Ghana, Zambia, South Africa, India, Indonesia, Brazil, El Salvador, Nicaragua, and Panama to work intensively with community partners. D-Lab also reengineered its study abroad program, a collaboration with the Global Education and Career Development office that gives students the chance to spend a semester living, working, and learning in a developing country while earning MIT credit. Finally, D-Lab oversaw 44 undergraduate research projects during 2013–2014.

D-Lab Scale-Ups

The D-Lab Scale-Ups social entrepreneur fellowship program was created in mid-2011 to identify and support technology ventures with the potential for wide-scale poverty alleviation. To date, the program has sponsored 16 fellows working on four continents, with seven new fellows accepted during 2013–2014. The 16 fellows have proceeded to garner significant support and recognition beyond MIT. With the \$350,000 that Scale-Ups has awarded to these entrepreneurs, they have gone on to raise more than \$900,000 from such organizations as MassChallenge, Saving Lives at Birth, Echoing Green, World Vision International, and the Bill and Melinda Gates Foundation.

The first full year of Scale-Ups' Harvest Fuel Initiative, which provides assistance to biowaste charcoal enterprises in East Africa, saw those enterprises surge forward in production, efficiency, and profitability. D-Lab hired a full-time biomass fuel specialist to work closely with the enterprises in the field and to establish a unique charcoal and cook-stove testing laboratory at D-Lab. Research and development work in other sectors and geographic areas, supported by corporate gifts, included major studies on water storage and transportation solutions in Kenya and assessments of access to livelihood technologies in Morocco.

At the same time, Scale-Ups has rallied the international development ecosystem within MIT to work toward a more comprehensive vision for the way the Institute addresses global poverty issues through technology and business innovation. In February 2014, Scale-Ups, working with the Media Laboratory and the Public Service Center, organized the second annual MIT Scaling Development Ventures conference, a daylong event attended by over 200 participants from around the world. Finally, with advice and support from MIT's Industrial Liaison Program, Scale-Ups laid the

groundwork for the Practical Impact Alliance at MIT, which will promote collaborative action and shared learning among corporations, academic institutions, social ventures, and nongovernmental organizations in order to scale market-driven poverty solutions worldwide.

International Development Innovation Network

Initiated in 2013, the International Development Innovation Network (IDIN) is a five-year program funded by the Global Development Lab of the US Agency for International Development (USAID). IDIN empowers a diverse, global network of innovators to design, develop, and disseminate low-cost, practical solutions to alleviate poverty.

In its second year, IDIN fostered and supported its growing network of nearly 400 inventors, technologists, and social entrepreneurs from 50 countries. IDIN local chapters, which provide innovators with support for different prototypes and ventures, were established in Brazil, Ghana, Kenya, and Zambia. Over the course of the year, IDIN awarded 21 micro-grants for promising prototypes and ventures and helped connect its network members to other funding opportunities. IDIN also developed a new micro-grants mentorship program to facilitate collaborations among innovators across the globe. In addition, IDIN trained 76 innovators at two International Development Design Summits this year: one month-long summit in Lusaka, Zambia, and a two-week-long maternal health summit in Arusha, Tanzania. Seventy-five percent of projects begun at the summits are still active, and all of these projects are receiving support from IDIN.

IDIN's work is led by D-Lab and a consortium of universities and local partners including Colorado State University, the Kwame Nkrumah University of Science and Technology in Ghana, the National Technology Business Centre in Zambia, the Olin College of Engineering, and the University of California, Davis.

Comprehensive Initiative on Technology Evaluation

The five-year Comprehensive Initiative on Technology Evaluation (CITE), also funded by USAID's Global Development Lab and created in 2013, is developing a methodology for evaluating technology solutions intended for use in global development work to help donors and implementing organizations identify the best technology solution for their work. CITE is led by the Department of Urban Studies and Planning with support from D-Lab, the Department of Mechanical Engineering, the Center for Transportation and Logistics, and the Sociotechnical Systems Research Center.

CITE evaluates technologies according to three key components: suitability, scalability, and sustainability. This year, CITE conducted its first product evaluation on solar lighting options available in Uganda. CITE also embarked on its second product evaluation of water filters in India. The main product of each of these evaluations is a comparative rating chart that graphically displays how each solar lantern or water filter stacks up to its competition along one or more of the three axes of evaluation.

D-Lab Youth

D-Lab continued with a second-year pilot of youth outreach activities, engaging K–12 students through hands-on STEM and creative design activities at D-Lab, at schools in the greater Boston area, and at public events aimed at youth. Through international fieldwork, D-Lab has also worked with more than 100 youth of primary and secondary school age in the past year. Additionally, D-Lab has conducted trials of programs designed to support the development of teacher creative capacity, reaching out to 10 US educators and 20 international educators. Partner groups include the Advent School in Boston, the Putnam Avenue Upper School in Cambridge, the Science Club for Girls, and the Kasiisi School in Uganda. In May, D-Lab Youth hosted a designer and educator in residence: Elius Muhumbise, a primary school teacher at the Iruhura government primary school in Kabarole District, Uganda.

In 2014, highlights include joining with the MIT Museum and Edgerton Center K–12 staff for the Needham fifth-grade science teachers' Professional Development Day; running design activities and joint ideation sessions with teachers from the Advent School in Boston as they prepared for their summer programs; hosting visiting teachers from Colorado, California, Rwanda, and Afghanistan; and, through a collaboration with the Brookwood School, bringing in Muhumbise, our first international teacher in residence.

Hands-On Learning for MIT Students

Student Clubs and Teams

For over 20 years, the Edgerton Center has supported student clubs and teams with seed funds, safety and administrative oversight, and provision of work space, equipment, and mentorship. The center is home to more than a dozen student teams (over 150 students) such as the Solar Electric Vehicle Team, the Electric Vehicle Team, and the Formula SAE team. In June 2014, members of the Formula SAE team raced their electric car in the Society of Automotive Engineers race in Lincoln, NE, placing seventh in a field of 20. The newly formed MIT Robotics Team placed second in the June NASA-sponsored Robo-Ops RASC-AL competition. In 10-150, the former Compton Gallery, the center joined with the MIT Museum to create the MIT Museum Studio, which expands project-based learning for students with museum display opportunities. A new student team, the Engineering Design Group for Exhibitions, is in place to support these projects.

Alumni team members from the 2004 Remotely Operated Vehicle Team (ROV) played a role in the documentary film *Underwater Dreams*, a story of four Mexican American teenagers from an impoverished area of Arizona who challenged and beat the ROV team in a national contest. The MIT and Arizona team members came to the Edgerton Center to film a commentary on the impact of the 2004 Marine Advanced Technology Education ROV competition.

Hands-On Academic Offerings

The Edgerton Center offers 20 to 25 subjects for credit each year, including 13 subjects associated with D-Lab, and 6.163 Strobe Project Lab, taught by James Bales, the center's associate director. Staff instructor Ed Moriarty assisted in STS.035 Exhibiting Science.

Former 6.163 teaching assistant Kyle Hounsell '13 (MNG '14) and Dr. Bales shared a photo credit in the November 2013 issue of *Nature* magazine and the May 2013 issue of *National Geographic*. The photo, a high-speed image of water drops on a butterfly wing, was produced in collaboration with Adam Paxson and professor Kripa Varanasi of the Department of Mechanical Engineering and professor James Bird of Boston University.

Student Machine Shops

Well-equipped workshop space for students is a vital component of the center; essentially, it is the stage upon which students can put their education into practice. In fall 2013 we transformed the N51 space, in partnership with the Singapore University of Technology's International Design Center, into a state-of-the-art fabrication lab. Acquired in 2007, the renovated 6,000-square-foot space now gives individual students, clubs and teams, staff, and faculty access to CNC Shop tools and equipment—bed mills, lathes, a machining center, a water-jet cutter, a mini-mill, 3D printers, and an injection molding machine.

Now in its 17th year, the Edgerton Center Student Shop in 44-022 continues to draw students, and our free machine training (12 hours in duration) is booked months in advance. Students spend nearly 6,000 cumulative hours annually in the Student Shop.

Communications

This year, we launched a new Edgerton logo identity and website. The center's programs are now organized into a visually dynamic presentation accompanied by related social media channels (Facebook and Twitter). We also delivered the first issue of our biannual email newsletter to approximately 700 Edgerton Center subscribers.

Personnel

Several hires have been made this past year to build D-Lab's capacity. Full-time hires to support IDIN include Tricia Matthews, program manager; Lauren McKown, communications coordinator; Elizabeth Hoeffcker Moreno, research coordinator; and Laura Budzyna, monitoring, evaluation, and learning coordinator. Additional full-time hires at D-Lab include Nadia Elkordy, Scale-Ups research project coordinator; Rich Fletcher, research scientist; Libby Hsu, instructor and study abroad coordinator; Dan Sweeney, biomass fuel research scientist; Melissa Mangino, administrative assistant; and Eric Verploegen, technology evaluation specialist.

Additional staff hired this year to support our growth are Pat McAtamney (technical instructor), who manages the expanded shop facility in N51; Roberto Melendez SB '12 (MS '14), who acts as a liaison with our student clubs and teams; and Robert Vieth, who manages i2 Camp curriculum development. Ed Moriarty has retired but continues part time with our outreach programs.

Concourse Program

[Concourse](#) is a freshman learning community of students and instructors dedicated to exploring foundational questions at the heart of humanistic inquiry and the relationship of these questions to science and engineering. Our curriculum covers the standard

science core curriculum (mathematics, physics, and chemistry), offers its own core humanities classes, and integrates both the sciences and humanities into a larger context in the program's weekly freshman advising seminar. Concourse math and science classes follow the standard curriculum, with scheduled lectures, recitations, problem sets, and quizzes. The humanities classes are communication-intensive HASS (CI-H) classes. Their small size (maximum of 50 students) permits the class to focus on careful reading, cogent analysis, thoughtful discussion, and good writing. It also allows for an intimate atmosphere in which a passion for learning and thinking beyond the traditionally strict disciplinary boundaries is fostered and flourishes.

Personnel

Members of the Concourse faculty and staff during AY2014 were Paula Cogliano, program administrator; Linda Rabieh, Robert Winters, Saif Rayyan, and Beth Vogel, lecturers; Lee Perlman, senior lecturer; John Pope, instructor; and professor Anne McCants, program director. In addition, 12 undergraduates were employed as tutors and graders.

Enrollment

Concourse had 52 students registered for the fall term. Spring enrollment was 31.

Teaching and Curriculum

CC.110 *Becoming Human: Ancient Greek Perspectives on the Best Life* and CC. 113 *Ancient Greek Philosophy and Mathematics* were offered as a communication-intensive HASS subjects in the fall term. In math and science, we offered CC.801 *Physics I*, CC.1802 *Calculus II*, and 18.01A/18.02A. In the spring, there were two humanities offerings: CC.116 *How to Rule the World*, which was also a CI-H course, and CC.112 *The Philosophy of Love*. In math and science, we offered CC.802 *Physics II* and CC.1803 *Differential Equations*. For the first time in many years, we also offered CC.5111, our own version of *Principles of Chemical Science*.² CC.A10/CC.010 *The Concourse of Core Questions and Ideas* was our freshman advising seminar in the fall, and it continued with CC.011 *Thinking Across the Disciplines* in the spring. We also offered two seminars during the year: CC. S11, a book club, in the fall and CC.S20 *Aristotle's Physics—A Close Reading* in the spring.

Accomplishments

This year Concourse has flourished under the continued direction of Professor McCants, who won the Arthur C. Smith Award this spring for meaningful contributions and devotion to undergraduate student life and learning at MIT. Our enrollment has doubled since her tenure began, and we continue to develop and strengthen the unique interdisciplinary aspect of our program that permits students to learn deeply in each course as well as to reflect upon and discuss the connections among their courses and between science and the broader world.

To advance our goals, this year we added a chemistry instructor to our staff. We now offer the chemistry General Institute Requirement (GIR) and are thereby able to add another discipline to our ongoing conversation between the sciences and humanities.

This year we also received a \$25,000 award from the T.W. Smith Foundation that will support two goals. First, these funds support the increased program involvement of Concourse alums, both as mentors and tutors for freshmen but also as participants in our new upper-class seminars, which allow alums to continue the interdisciplinary thinking they began as freshmen. Our upper-class seminar this spring, which focused on a close reading of Aristotle's *Physics*, attracted two current Concourse students and seven alums. The award also helped support a two-day retreat for the entire Concourse staff where we began to develop a truly integrated fall advising seminar in which staff from all disciplines will lead seminars that explore the larger issues raised by each field. The progress we made in devising a more integrated syllabus was aided substantially by the generous participation of three invited guests, including, from MIT, professor Diana Henderson.

We continued to use our spring seminar, CC.011 Thinking Across the Disciplines, to expose our freshmen to other faculty at MIT. Most importantly, our guest speakers offered students insights into how their own research and discipline touch on the core questions that are at the heart of Concourse's focus. Concourse also served as a home for piloting creative, new classes. This past year included an arts-based seminar led by recent PhD Ellan Spero; the seminar, "Object-ive Narratives," culminated in a gallery showing of the students' work. In an effort to address our students' physical as well as their intellectual well-being, we offered a yoga class that counted toward the physical education requirement.

We have continued our commitment to robust and supportive advising. All staff members serve as advisors, with upperclassmen as associate advisors. Because the staff meets weekly, we soon learn about any student who is struggling academically, emotionally, or socially, and we are able to offer support in a timely way. Developing supportive relationships with students and among the students themselves is a crucial part of our mission. To promote community and stimulate conversation, we organized regular outings to plays, concerts, and films.

This spring, the student leadership mantle was passed to a new group of rising sophomores who were voted in to run various Concourse student and student/faculty activities. Our excellent group from last year once again helped us recruit our incoming class during Campus Preview Weekend.

Experimental Study Group

Student Statistics

Fifty-four first-year students were enrolled for one or more terms in the [Experimental Study Group](#) this year. Sixty-one percent of our students were female, and 27% were underrepresented minorities. Ten percent were international students from a diverse group of countries including Cambodia, China, Ethiopia, Iraq, Jamaica, and Myanmar. Sixty-six students (86% of whom were not in ESG as freshmen) enrolled in five pass/fail undergraduate seminars sponsored by ESG in the spring of 2014.

Staff and Faculty

ESG's administration was headed by Leigh Royden and included associate director Holly Sweet and program coordinator Graham Ramsay. For the first four months of fiscal year 2014, Professor Royden acted as interim director of ESG, and she accepted the official post as director in November.

Graham Ramsay moved into a full-time staff position at ESG with two separate appointments. One appointment expanded his duties as program coordinator to incorporate all of the financial responsibilities for the program, including staff appointments and budgeting. The other appointment created a new position implementing video communications in the teaching of GIRs. In this capacity, Ramsay worked with staff to teach them how to create video content as supporting materials for their GIR teaching.

Analia Barrantes continued to head the ESG physics staff, joined by Paola Rebusco. Postdoctoral student John Cuffe provided additional help with the 8.012 Physics I and 8.022 Physics II offerings during fall 2013.

The mathematics staff was headed by Dr. Jeremy Orloff and included Dr. Gabrielle Stoy. The chemistry and biology offerings at ESG were taught by Dr. Patricia Christie. In the fall term, Dave Custer taught ES.033J Science Writing and the New Media. This year Custer and Ramsay codeveloped and cotaught (in spring 2014) a new humanities CI-H credit subject, ES.333 Production of Educational Videos: Skills for Communicating Academic and Professional Content. The subject enrolled 12 undergraduates, nine of whom had been freshmen at ESG. ESG staff were assisted by 43 undergraduate teaching assistants (TAs), over half of whom were women. These TAs provided excellent service to our freshmen, learned valuable teaching and leadership skills, and maintained an impressive overall median grade point average of 4.8 while doing so.

The ESG faculty advisory committee, composed of faculty representatives from the Departments of Biology, Chemistry, Mathematics, and Physics and the School of Science, continued to advise ESG staff on educational policy, staffing, and educational initiatives.

Educational Initiatives

Impact on Undergraduate Education at MIT

In February 2014, the Institute-wide Task Force on the Future of MIT Education met with ESG staff and students to discuss the teaching and learning styles that are the hallmarks of the program. This meeting was organized in response to the initial task force report released in the fall of 2013 that outlined educational goals for the Institute that are strongly aligned with ESG's mission. The result of the meeting was recognition of ESG as a positive example of student/staff engagement at MIT. References were made to ESG in the final task force report, citing the program for taking a leadership role in active learning pedagogy in which teaching is seen as a two-way process.

Undergraduate Seminars

In fall 2013, ESG offered ES.200 ESG Teaching Seminar (taught by Dr. Christie, Ramsay, and Dr. Stoy) to 22 undergraduates who were new teaching assistants in ESG. A new seminar, ES.S10 There's More to Physics than Newton, was offered in the fall by Dr. Barrantes and Dr. Rebusco. This seminar brought in speakers from the MIT Physics Department who presented on a variety of current physics research topics of interest. In spring 2014, ESG sponsored seven undergraduate seminars, including ES.010 Chemistry of Sports (taught by Dr. Christie and Steve Lyons), ES.S10 Introduction to Psychopharmacology (taught by ESG alumnus Zachary Fallows '09), ES.S20 The Math of Toys and Games (taught by ESG upperclassman Robert Sloan, with Erik Demain as faculty advisor), ES.S11 From Farm to Table (taught by Dr. Christie and Naomi Carton, associate dean for residential life and dining), and ES.S41 Speak Italian with Your Mouth Full (taught by Dr. Rebusco). All ESG seminars were funded by gifts from ESG alumni.

Video Projects

In addition to ESG's educational video projects and the ES.333 subject, which teaches undergraduates the skills required to conceive, design, create, and evaluate educational videos based on content taken directly from the MIT core curriculum, ESG hosted documentary filmmaker and producer John Copeland for a series of workshops. Copeland worked closely with ESG students to create a student-driven documentary film about the ESG experience. The film, slated for completion in fall 2014, is intended for entry into various student documentary film competitions around the United States.

Singapore University of Technology and Design

ESG continued its relationship with the Singapore University of Technology and Design (SUTD). Dr. Christie and Dr. Rebusco mentored new faculty by demonstrating how to present effective and interactive lectures and discussions. Dr. Christie continued her mentoring relationship by making a trip to Singapore in January and again in June 2014 to help with the organization of the next cohort chemistry class. Dr. Rebusco made her first visit to SUTD in June 2014 to teach physics and to mentor SUTD faculty.

Mathematics and Physics Initiatives

This past year, Dr. Stoy continued her supervision of a mathematics teaching UROP project for Joel Schneider '15, who produced instructional videos for use in 18.02. A number of videos were created and used by students reviewing material for their spring term exams.

Awards

Winners of the Peter and Sharon Fiekowsky Community Service Award (for outstanding contributions to the ESG community) included Dou Dou '17, Erik Erslund '17, Katie Gohres '17, Stephanie McHugh '17, and Kayla Truman '17. Winners of the Peter and Sharon Fiekowsky Excellence in Teaching Award (given to graduating seniors who have demonstrated excellence in teaching at ESG over a sustained period of time) included Jonathan Abbott, Coyin Oh, Naomi Schurr, and Ed Valle.

Dr. Christie received a 2014 Infinite Mile Award from the Office of the Provost. This award recognizes individuals or teams who have made extraordinary contributions within their own organizations to help the Institute carry out its mission: to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century.

Fundraising

Dr. Sweet continued to work closely with staff from the Alumni Association and the Office of Resource Development to develop a strategy to raise a \$1 million endowment within the next few years. This endowment will be used to fund ESG educational initiatives such as seminars, educational video projects, and community activities that are not covered under ESG's base budget.

Conclusion

Now in its 45th year, ESG continues to thrive and grow. The staff is dedicated to offering MIT undergraduates small group learning in a community-based setting that fosters opportunities to teach and learn in a collaborative environment. ESG hopes to serve as a catalyst for positive change and experimentation both within the greater MIT community and outside the Institute, as exemplified through collaborations with academic institutions such as SUTD.

Terrascope

Terrascope is designed to encourage first-year students to develop the skills to analyze and solve complex problems, work effectively as part of a multidisciplinary team, and communicate in a variety of formats, including formal presentations, web pages, interactive displays, and radio broadcast segments. Each year, freshmen are challenged with a complex problem focused on issues of sustainability and the environment in the fall credit-bearing subject 12.000 Solving Complex Problems (known as Mission 20xx, where xx is their graduation year). While the problem, which forms the focus for the year's curriculum, typically involves aspects of the Earth system, Terrascope is designed to be a valuable experience for all students, no matter their chosen field of study; it is unlike any other class they will take at MIT, and many students find that the skills they learn can be applied to the rest of their academic studies and in employment. In Terrascope, first-year students are treated as scientists and engineers from the first day of class and are empowered to think about solving major issues facing the planet. Students may opt to continue work begun in the fall by enrolling in one or both of a pair of Terrascope subjects offered in the spring. Each year students can participate in a weeklong field project to gain firsthand experience of issues they have studied from a distance during the year. Core science and mathematics subjects are taken outside the program. Program faculty and staff advise all students who initially join the program each fall.

Personnel

Samuel Bowring, Robert R. Shrock professor of geology and MacVicar Faculty Fellow, directs Terrascope. In fall 2014, he taught 12.000 Solving Complex Problems with the help of teaching assistant Ann Bauer and a dedicated group of undergraduate

teaching fellows and alumni mentors. Charles Harvey, professor of civil and environmental engineering, was lead faculty member for 1.016 Communicating Complex Environmental Issues and was assisted by lecturer Ari Epstein. Research supervision was provided by Mark Jeunnette, a graduate student in the Department of Mechanical Engineering; Jesse Thornburg, an alumnus of Terrascope who now works with Amohoro Energy Ltd. in Rwanda; Dan Sweeney, a research scientist in D-Lab; and Amy Mueller, a postdoctoral associate in the Department of Civil and Environmental Engineering. Epstein also taught SP.360 Terrascope Radio. Debra Aczel was the program administrator.

Program Highlights

In AY2014, freshmen in [12.000](#) were given the task of developing a strategy to ensure that all nations, including those that are developing, have access to adequate supplies of clean fresh water while protecting fresh water ecosystems. At the end of the semester, they presented their comprehensive plan before a panel of experts as well as the general public. The presentation was also available as a live [webcast](#) for those who were not able to attend the event on the MIT campus, and students developed a [website](#) that included full details of their solution.

In Terrascope's spring subject, [1.016](#), small teams of students built on their fall experience by developing prototypes, models, and demonstrations of ideas and technologies related to the year's focus on strategies to ensure global supplies of clean water. Teams presented their work to the public and a panel of experts in an end-of-semester "bazaar of ideas." This year's projects included developing a drip-irrigation apparatus capable of delivering specific amounts of water to different areas at different times, developing a system to deliver filtered water to a village in Rwanda from a nearby stream containing varying levels of sediment and impurities, and devising a sensor system capable of assessing water quality in rivers that communicates data automatically to a central hub.

In SP.360, students produced a radio segment called "[The School That Had No Water: Water Security in South Africa](#)." In this piece, students interviewed the head of a South African school that once had no water. They explored the idea that water security is about more than water and must consider education, poverty, history, and politics. All student-produced radio segments from the last three years have been picked up by the Pacifica Radio Network's most popular show, *Sprouts: Radio from the Grass Roots*, and will play in summer 2014.

In the spring, Terrascope hosted a successful dinner for 80 program alumni and current students, with attendees from nearly every class of Terrascope graduates. Terrascope alumna Zehra Ali was the guest speaker. Ali is the CEO and founder of Ghonsla, an innovative technology company that provides sustainable insulation products to underserved markets in Pakistan.

Terrascope Field Trip to South Africa

Fifty Terrascope students, faculty, and staff traveled to South Africa over spring break to work with their counterparts at Nelson Mandela Metropolitan University (NMMU).

During an intense week, participants from Terrascope and NMMU engaged in discussion and debate on how to solve water issues in South Africa and the rest of the world, visited informal communities to see firsthand problems associated with flooding and lack of access to clean water, met with the principal of a school that once had no water, and talked with scientists, educators, and community members to learn about the challenges of global water access. Discussions focused on water issues associated with mining, shale gas fracking, and agriculture. In addition, two public debates that were very well attended by the community were held, and both led to vigorous discussions. To learn more about this field trip, visit the [blog](#) written by Terrascope and NMMU students to record their weeklong experiences.

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