

Earth System Initiative

The [Earth System Initiative](#) (ESI) was founded in 2002 to foster and facilitate multidisciplinary research and education efforts in earth and environmental sciences and engineering at MIT, and to enhance strategic communication of the new knowledge and insights gained to citizens, policy makers, and corporate decision makers—those whose decisions and actions ultimately determine how humanity interacts with the global environment: the Earth system. Participating ESI faculty come primarily from the Departments of Civil and Environmental Engineering and Earth, Atmospheric and Planetary Sciences. ESI also draws from the Departments of Chemistry, Electrical Engineering and Computer Science, Mechanical Engineering, Biology, Biological Engineering, Anthropology, and Urban Studies and Planning.

Research Support

As of June 30, 2013, ESI's active portfolio of sponsored research totaled just under \$39 million in obligated funds spread over 64 research accounts under 15 active ESI-affiliated principal investigators (PIs). Total research volume expended for FY2013 was just under \$8.5 million. Over the 10 years since sponsored research under ESI began in 2004, total research volume has totaled almost \$75.7 million, for an annual average of just under \$7.6 million (see table below). Since FY2004, 171 research accounts under 25 different PIs have been administered through ESI, with a total value of just over \$132 million. This amount includes \$56.5 million in research funds awarded and anticipated, but not yet spent on grants running through FY2018.

Currently funded research projects include collaborations amongst faculty in the School of Engineering and the School of Science; the projects bridge gaps between fields such as biology, geology, chemistry, atmospheric sciences, and electrical engineering and computer science.

ESI's research volume for FY2013 rebounded more than 7% relative to FY2012, ending two consecutive years of decreases related to the global economic downturn and associated drop in federal funding. During its first seven years, ESI's research volume grew every year from just over \$2 million in FY2004 to just over \$10 million in FY2010. Total research volume for FY2013 was thus just over 16% below the FY2010 high-water mark. The total value of ESI's active portfolio of sponsored research increased 25% relative to FY2012, again snapping two years of decline following seven consecutive years of steady increases.

The slow global economic recovery and related U.S. federal funding sequester aside, ESI has now turned the corner back toward year-over-year growth, with FY2014 projected to continue this trend. Grant proposal activity for ESI-affiliated PIs during FY2013 is detailed below.

Earth System Initiative sponsored research volume, FY2004–FY2012

Fiscal year	Research volume (\$)
2004	2,013,987
2005	5,028,797
2006	6,901,764
2007	7,486,815
2008	9,054,250
2009	9,646,973
2010	10,084,605
2011	9,133,720
2012	7,873,709
2013	8,444,239
Total	75,668,859

Administration

Professor Dara Entekhabi (Civil and Environmental Engineering and Earth, Atmospheric, and Planetary Sciences) is ESI's faculty director; he also directs the Parsons Laboratory for Environmental Science and Engineering. Dr. Kurt Sternlof is the executive director and Mark Pendleton is the financial officer. ESI operates under the purview of the Office of the Vice President for Research.

Highlights and Activities

Proposals Submitted and New Grants Awarded

During FY2013, seven ESI-affiliated principal investigators received 14 awards for sponsored research totaling more than \$9 million in new funding from sources, including the National Science Foundation, NASA, U.S. Environmental Protection Agency, U.S. Department of Energy, Woods Hole Oceanographic Institution (WHOI), The Croucher Foundation, HDR Engineering, Exponent, Inc., and the universities of Southern California and Wisconsin-Madison. Additionally, 11 ESI-affiliated investigators submitted 40 new proposals to various funding agencies for a requested total of \$16.4 million. To date, 21 of these proposals have been funded for a total of \$7.5 million in new research support, while decisions are still pending on 16 of them for a potential total of almost \$5.7 million.

Support of the MIT Water Club

During FY2013, ESI became the founding sponsor of the new MIT Water Club, an independent group conceived of and run by graduate students representing all five schools at the Institute. During the course of the year, Dr. Sternlof provided strategic

advice, event planning assistance, and funding for the group's activities. In October, the group held its inaugural organizational event—The Water Opportunities Workshop—with all logistical arrangements for space and catering arranged and paid for by ESI. This event was well attended and very successful in putting the Water Club on the map at MIT. In March, the Water Club held its second major event—it first annual Water Night—an evening poster session representing the wide range of water-oriented research ongoing at MIT. The evening was a great success, with all event planning and funding provided by ESI.

Most importantly, as a condition of its support, ESI made clear to the founding leaders of the Water Club that they needed to take immediate steps to ensure the longevity of the group beyond their own involvement. By June 2013, the Water Club was fully registered as a formal MIT club, had drafted and enacted by-laws for its continued operation, had elected a full slate of officers serving staggered terms, and had launched a website (<http://waterclub.mit.edu>). The new club president, David Cohen-Tanugi (a doctoral student in Materials Science and Engineering) immediately met with Dr. Sternlof to begin planning the group's next major event—The Water Challenges Workshop—tentatively scheduled for December 2013 in conjunction with a symposium being planned by the faculty water group (see below).

Support of Oceans at MIT

In early 2012, Dr. Sternlof began working closely with Earth, Atmospheric and Planetary Sciences professor John Marshall to organize a new Institute community dedicated to ocean science, engineering, and policy—Oceans at MIT. The primary project and mechanism for this effort involved the creation of a new website to function as a virtual town hall for the group, which includes a large and diverse membership of faculty, researchers, and students from across MIT and its partner institution WHOI. This website (<http://oceans.mit.edu>) launched in late September and immediately proved instrumental in cementing the community together. ESI paid for the design of the site, and Dr. Sternlof was deeply involved in the strategic planning and content editing.

Oceans at MIT held two major meetings following the successful launch of its website, with ESI providing strategic, logistical, and financial support. The first was a half-day symposium in November entitled *Watching the Arctic Melt: Adventures in Polar Oceanography*, held in conjunction with the annual joint MIT-WHOI faculty meeting. The second was a two-day workshop in January dedicated to the southern oceans research. This working meeting attracted over 70 of the top ocean researchers from MIT, WHOI, and around the world.

In June 2013, ESI began working with Oceans at MIT leader John Marshall to create an outreach and fundraising brochure for the new entity, which is slated for initial use at special symposium, *Future of the Oceans*, to be held in September 2013 in conjunction with the America's Cup Races in San Francisco Bay.

Support of the MIT Sea Grant College Program

Dr. Sternlof has served on the MIT Sea Grant Marine Advisory Services Review Panel since 2010, and in May participated in his fourth annual review meeting for the program.

Support of Faculty Water Group

ESI continued its strategic and material support of the informal faculty water group, of which Professor Entekhabi is a leading member. Key activities during FY2013 included advance planning for two FY2014 symposia. The first—Rethinking Water II—will be a follow up to the group's May 2010 event, [Rethinking Water](#). Rethinking Water II is tentatively scheduled for December 2013, and will be held in conjunction with the Water Challenges Workshop being planned by the MIT Water Club.

The second event—a major symposium entitled The Future of Water and Food—is tentatively planned for May 2014, and will be jointly convened with the University of Nebraska, a leading land-grant college and center of agricultural research. ESI is again providing strategic, logistical, and financial support in planning this event.

Support of MIT Atmospheric Chemistry

In April, the MIT Atmospheric Chemistry faculty group launched their new website, <http://atmoschem.mit.edu>; ESI provided strategic consulting and paid for both the design and development. This effort was modeled on the Oceans at MIT project, and the two websites share a design aesthetic intended to make them visually compatible with each other and with any other such websites that ESI might sponsor in the future, or which might be launched under a broader environment initiative at MIT. The primary faculty leader and liaison for the Atmospheric Chemistry web effort was Civil and Environmental Engineering professor Colette Heald.

During May, ESI also began helping the Atmospheric Chemistry at MIT group to plan a major conference on Air Quality and Human Health, tentatively planned for spring 2014. ESI will continue to provide strategic, logistical, and financial support in mounting this event as well.

Support of Terrascope

Terrascope is a yearlong program for freshman designed to impart an appreciation for the complexity of global sustainability issues and a can-do approach to tackling them. Originally the educational component of ESI, Terrascope was placed under the Office of the Dean for Undergraduate Education in 2006. The two programs still share a suite of offices. Dr. Sternlof regularly consults with Terrascope faculty director Professor Sam Bowring on issues of fundraising, curriculum development, and program expansion, and ESI regularly provides logistical and financial support for the program's annual spring-break field trip.

Future Directions

ESI will continue to provide critical research administration support to its affiliated faculty while working to expand participation and the size of its active portfolio. ESI

will also continue to help incubate and nurture new research collaboratives, such as Oceans at MIT and MIT Atmospheric Chemistry, with support for such things as website development and major events. These new faculty collaboratives will be critical components for any new initiative on environment eventually launched at MIT, and it is anticipated that ESI itself would eventually be absorbed into such an initiative as a critical asset and building block.

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