

Earth System Initiative

Overview

The Earth System Initiative (ESI) was formed in 2002 to encourage and coordinate multidisciplinary research and education efforts in earth sciences and engineering at MIT, and to develop strategies to communicate this new knowledge to the citizens, policy makers, and corporate decision makers whose actions determine how earth's resources are managed. It is also home to an experimental new freshman learning community, Terrascope. The faculty involved in the initiative are drawn primarily from the department of Civil and Environmental Engineering (CEE) and Earth, Atmospheric, and Planetary Sciences (EAPS), but ESI also has representation from the departments of Chemistry; Electrical Engineering and Computer Science; Biology; and even Anthropology

Research

ESI currently has a research portfolio that includes over \$30,000,000 in funded projects (an average of approximately \$4,000,000 per year), and over \$30,000,000 in pending proposals. These projects, which represent a broad spectrum of earth system science and engineering research, include, for example:

- A multidisciplinary effort in microbial systems, funded by the Gordon and Betty Moore Foundation, Department of Energy and National Science Foundation (NSF), designed to understand how these systems transform energy and materials from the genomic to the ecosystem level
- A major NSF program to recalibrate the "clocks" used by geologists to determine the age of certain rocks
- A multidepartmental project to assimilate remote-sensing data into atmospheric and hydrological models

Based upon the interests of ESI-affiliated faculty and the scope of ESI's research portfolio, four research focus areas were formed:

- Wireless sensor networks
- Microbial systems
- Biogeochemistry
- Geochronology

These projects and focus areas include collaborations among faculty in the schools of Engineering and Science and bridge the gaps between such as biology, geology, atmospheric sciences, aeronautics and astronautics, and electrical engineering and computer science.

Efforts to broaden the scope of ESI's research portfolio are ongoing.

Education and Outreach

Terrascope

Terrascope, a freshman learning community focusing on the earth system as a context for interdisciplinary learning, looked at the Galapagos Islands as a case study for ecotourism and sustainable development. For more details, see the Terrascope report to the president.

Education and Public Outreach Infrastructure

ESI has developed an education and public outreach (EPO) infrastructure to assist faculty in developing, implementing and evaluating EPO activities as part of their sponsored research projects. This is particularly attractive for NSF proposals, which increasingly require substantial EPO efforts. EPO activities already in place include a partnership with the Boston Museum of Science to develop educational exhibits based on funded research projects within the ESI portfolio. Several research proposals that utilize this infrastructure have been funded, and the first results of these projects will be presented at the Museum of Science in summer 2005.

MIT Visibility and Fundraising

Considerable effort has been expended to inform the broader MIT community, as well as potential corporate and foundation donors, about ESI activities. In addition to our website, we have developed and disseminated a variety of materials that describe ESI research and education activities.

The most recent successes from these efforts include an award of \$11,000,000 over five years from the Gordon and Betty Moore Foundation to support research in marine microbiology, and a \$50,000 award to fund our fall symposium. Terrascope has received \$440,000 over four years from the Henry Luce Foundation to support freshmen field experiences.

Advisory Committee

We have invited eight distinguished alumni and colleagues to serve on the ESI Advisory Committee. All have accepted and will meet for the first time in fall 2005. Invitees to the Advisory Committee include:

- Dr. Lawrence Ybarrando founder, former president and CEO of Scientech Inc.
- Earl Killian '78 cofounder of several high-technology companies
- Dr. Lawrence Linden, '76 advisory director, Goldman Sachs
- Dr. David Kingsbury deputy chief program officer for the Gordon and Betty Moore Foundation's Science department
- Dr. John Hayes '66 senior scientist, Woods Hole Oceanographic Institution
- Dr. David Karl professor of oceanography, University of Hawaii
- Arunas Chesonis '84 president and CEO, Paetech Communications Corporation
- Ronald Crane '72, founder of LAN Media Corporation

Linden Earth System Fellowship Program

In 2002, ESI received a donation from the Lawrence and Dana Linden Family Foundation to create the Linden Earth System Fellowship program. These fellowships provide support for outstanding new graduate students who plan to pursue graduate studies in the environmental sciences and engineering. The third class of fellows has been selected, and will arrive on campus fall 2005.

Symposium, Workshops, and Seminar Series

In 2004, ESI hosted a major international symposium on the evolution of the earth system, *Was...Is...Might Be... Perspectives on the Evolution of the Earth System*. Over 250 participants registered for the event, which was met with praise and enthusiasm for the wide array of perspectives it presented on the evolution of the earth system. A second symposium, *Vital Signs: The Diagnostics of Earth System Evolution*, is scheduled for November 7 and 8, 2005. It will focus on new technologies, data-handling methods, and modeling systems that are being applied to studies of the earth system. ESI will also continue its regular seminar series, faculty retreats, and workshops in order to continue to raise the profile of ESI within MIT and the broader academic community.

Personnel

ESI has two codirectors, Professor Penny Chisholm (Biology and CEE) and Professor Kip Hodges (EAPS), and an executive director, Matthew Gardner.

Penny Chisholm

Professor of Civil and Environmental Engineering and Biology

Kip Hodges

Professor of Geology

More information about the Earth System Initiative can be found on the web at <http://web.mit.edu/esi/>.