

## Experimental Study Group

### Overview

The Experimental Study Group (ESG), now in its 37th year, continues to offer undergraduates at MIT innovative opportunities in teaching and learning. In keeping with our original mission, ESG provides first-year students at MIT with personalized instruction in the core subjects within a close-knit and informal community environment. This includes flexibility in pace and scheduling and small classes where students can easily ask questions and get to know fellow students and instructors. Over the years, students have consistently said that ESG's small-group learning and community atmosphere were some of the most rewarding aspects of their MIT education. We are also able to offer flexibility and individualized attention to students with unusual educational needs, such as international students.

Each year, ESG offers approximately 30 undergraduates the opportunity to assist in some aspect of teaching at ESG. All student instructors receive midterm and end-of-term evaluations from freshmen and meet regularly with staff members for supervision. New student instructors participate in a weekly teaching seminar (SP.231) run by senior ESG staff. Experienced student instructors who have demonstrated excellent teaching skills are able to develop their own pass/fail seminars under faculty supervision or work relatively independently in teaching core subjects.

Over the past 12 years, ESG has served as a center for educational innovation in the undergraduate program by offering a series of hands-on, interactive seminars in a variety of subjects not otherwise offered at MIT. These seminars provide all MIT undergraduates with the opportunity to participate in the ESG learning style (small, interactive classes). Non-ESG students who participate frequently say that these seminars are the only opportunity they have had since their freshman year to take part in a small interpersonal class with a hands-on focus. This year, through a combination of funds from the dean of the School of Science and from our own alumni, we were able to run 18 seminars. We are strongly committed to continuing these seminars and promoting their growth by working closely with various parts of MIT, outside sources, and our alumni to secure funding.

### Student Statistics

Fifty-four freshmen were enrolled for one or more terms in ESG this year. Sixty-three percent of our students were female, 9 percent were underrepresented minorities, and 9 percent were international students. In addition to these 54 students, we enrolled 7 upperclassmen in our core subjects and 171 students in our seminar program (70 percent of these students had never been in ESG as freshmen). Nineteen undergraduates served as teaching assistants, graders, and student instructors. Another eight upperclassmen taught undergraduate seminars in our seminar program. These upperclassmen collectively maintained an impressive 4.6 grade point average.

## Staff and Faculty

ESG's administration was headed by Professor Alexander Slocum and included associate directors Dr. Peter Dourmashkin and Dr. Holly Sweet, and program coordinator Graham Ramsay. The physics staff was headed by Dourmashkin and included Toby Ayer (1996), Dr. Susan Brown, and David Custer (1983). The physics staff added Dr. Sahana Murthy, a specialist in physics education research, for the coming academic year. In June 2006, she began assisting Dourmashkin on two research projects: tracking the performance of ESG students compared with non-ESG students at MIT, and studying why the percentage of female ESG students who chose to be physics majors is higher than the corresponding percentage for non-ESG students

The mathematics staff was headed by Dr. Jeremy Orloff and included Brown and Dr. John Lewis. The chemistry and biology offerings at ESG were headed by Dr. Patricia Christie. ESG offered four humanities and social sciences (HASS) subjects to its students. In the fall term, Custer taught 21W.730 Expository Writing and Dr. Lee Perlman taught SP.2H3 Ancient Philosophy and Mathematics (a new HASS-D subject taught for the first time). In the spring term, Perlman taught 24.00 Problems of Philosophy, Custer taught 21.W735 Writing and Reading the Essay, and Marc Graham taught SP.2H1 Poetry in Progress, a new HASS subject designed to incorporate principles of design into poetry.

## Academic Initiatives

### Undergraduate Seminar Series

Because of ESG's small size and experimental educational focus, ESG provides an ideal environment for staff, faculty, and students to develop new subjects and new approaches to existing subjects. This year we continued expanding the ESG Undergraduate Seminar Series with 18 seminars. Seminars offered for the first time included SP.255 Physics of Rock Climbing; SP.257 Developing Physics Intuition; SP.258 Goedel, Escher, Bach; SP.259 Information and Communication Technology in Africa; SP.260 Women's Novels; SP.261 Poetry in Translation; and SP.262 Zen Arts. Eight undergraduates and four graduate students were involved in developing and teaching seminars under the auspices of ESG, including Alya Asarina (2006), Nadezhda Belova (2006), Raja Bobbili (2007), Colin Dillard (2006), Claudia Gold (2007), Jocelyn Rodal (2006), David Roe (2006), and Robert Speer (2006), and graduate students Heather Jones, Faye Kasemset, Dmitriy Rogozhnikov, and Joyce Wu. Zen Arts (taught by Dourmashkin) was cosponsored by the MIT Japan Program. Information and Communication Technology in Africa (taught by Bobbili) was supervised by Professor Shigeru Miyagawa and will be offered as a HASS subject in the coming academic year.

### Ad Hoc Study Group on New Orleans and Katrina

Dr. Sweet offered a study group for credit on New Orleans and Hurricane Katrina (SP.233 New Orleans: Sinking or Rising City?), which was attended by eight students who met weekly and examined the history of New Orleans as well as the aftermath of the Katrina disaster. The syllabus for this seminar was put together quickly and was

revised as the term wore on and new events arose in response to the disaster in New Orleans. The syllabus was posted on MIT's website and was used by several educators outside MIT for subjects taught in spring 2006. Interesting aspects of this study group are the rapidity with which it could be offered and the use of laptop computers in the classroom to actively access rapidly shifting material.

### **ESG Book Series**

Several members of the ESG staff have been working on books for the inaugural ESG Book Series. Ramsay and Sweet are coauthoring the book *Composing Our Lives: Exploring Ourselves through Visual Art and Writing*, based on a seminar of the same name they have been teaching at MIT for the past two years. Perlman has finished the first draft of his book, which is based on a HASS-D course he developed over the past year. Slocum, Custer, David Gessel (MIT class of 1989), and Noah Riskin and Halston Taylor of the Department of Athletics, Physical Education, and Recreation are collaborating on a textbook for 8.01S Sports Physics (physics with sports as a focus for labs). We hope to expand our series in the future, with a specific focus on books with an interactive and hands-on focus that can be used by high schools and universities. Initial funding for these books came from our alumni, from the dean of the School of Science, and from a grant from the D'Arbello Foundation.

In addition, Dourmashkin is currently working with Professor Eric Mazur at Harvard University to finish a first-year physics textbook that will be published by Prentice Hall in January 2007. He also finished a new text for 8.01 Physics I at MIT. It was available to students in fall 2005.

### **Subject Management Software System**

Dourmashkin is part of a Davis Foundation Grant to apply a subject management software system (Integrated Learning Toolkit) to core subjects in ESG. This will enable staff to easily access each other's curriculum and student progress in that class.

### **Student-Alumni Dinner Seminars**

This past year, 8.012 Physics I and 8.022 Physics II added a weekly evening dinner and seminar led by Dr. Alan Millner (MIT class of 1972) open to all 8.012 and 8.022 students. It focused on how to design real-life products such as artificial hearts, wind pumps, cables, plasma cells, ozone generators, and MRI machines, which are based on the core concepts developed in mechanics and electromagnetism.

### **MIT OpenCourseWare**

The MIT OpenCourseWare (OCW) program contacted MIT staff and students during spring 2006 about adding ESG-developed subjects to its website. As a result, ESG will have its own page on the OCW website and eight new ESG subjects will be posted there by September 2006. We will encourage staff to place all new subject offerings on the OCW site in the future.

## Presentation at Conferences

In August 2005, Sweet presented material on the book she is cowriting with Ramsay (*Composing Your Life*) at the annual American Psychological Association conference held in Washington, DC. In early June 2006, Dourmashkin presented the TEAL project at a special workshop conference (Conference on Systemic Change in Physics Teaching at Large Research Universities) at the American Center for Physics in College Park, Maryland. In late June 2006, Ramsay and Sweet presented a workshop on the material from their book for educators and psychologists in the Sunnyvale, California area.

## Awards

ESG gave its own set of annual cash awards, including the Peter and Sharon Fiekowsky Community Service Award (for outstanding contributions to the ESG community) and the Todd Anderson Excellence in Teaching Award (given to graduating seniors who have demonstrated excellence in teaching at ESG over a sustained period of time). Both Peter Fiekowsky and Todd Anderson are graduates of MIT and have established funding for annual ESG prizes. This year Adam Seering (2009) was awarded the Fiekowsky award for community service to ESG. The Anderson award was given to graduating seniors Brigid Dwyer, Kayla Jacobs, and David Roe for their outstanding teaching of core math and science subjects, and to graduating seniors Nadezhda Belova, Colin Dillard, Heather Jones, and Jocelyn Rodal for their work in developing and teaching new undergraduate seminars in anthropology, robotics, women's literature, and film.

## Alumni Involvement

### ESG West Coast Reunion

ESG staff members Dourmashkin, Ramsay, and Sweet joined more than 25 alumni in the Bay Area over the weekend of June 23–25, 2006, for an ESG West Coast reunion. The reunion's primary agenda was to reconnect with alumni and address how they can become more involved with the current ESG community. As a result of the reunion, we are working on ways to use the MIT alumni association to help our alumni keep in better touch with one another. We are planning an "ESG community gathering" of alumni, current students, and staff in the DC area next spring. We will be promoting our seminar series as taught by both staff and students, and funded primarily by our alumni, an arrangement we believe is unique in American higher education.

### ESG Alumni Steering Committee

The ESG alumni steering committee of Van Chu (1999), Ian Eslick (1991), David Henkel-Wallace (1986), Richard Hilliard (1976), Peter Fiekowsky (1977), and Matthew Wilbert (1980) met four times during the year to give input to ESG staff about a variety of issues, including the new ESG seminar series, community events, and mentoring of freshmen. After the June 2006 reunion, we decided to add four alumni—James Keller (1987), David Glazer (1981), and recent graduates James Rising (2003) and Jocelyn Rodal (2006). Adding younger alumni will help us bridge the gap between those who are now in their forties and fifties and recent alumni in their twenties.

## Future Developments

We are dedicated to offering undergraduates the opportunity to teach and learn in a collaborative and interactive environment. We are proud of our history of educational experimentation, including our undergraduate seminars, the development of staff textbooks based on materials developed at ESG, and our ability to respond rapidly to topical events such as Hurricane Katrina through the use of for-credit study groups. We will work on substantially increasing faculty and alumni involvement with ESG, especially in connection with our alumni-student dinner seminars and our seminar series. We will also continue to find ways to export successful ESG educational experiments to the regular curriculum and to educational settings outside of MIT.

**Peter Dourmashkin, Director and Senior Lecturer in Physics**

**Alexander Slocum, Associate Director and Professor of Mechanical Engineering**

**Holly Sweet, Associate Director**

*More information about the Experimental Study Group can be found at <http://web.mit.edu/esg/>.*