MIT Faculty Newsletter

in this issue we feature his initial "From The Faculty Chair" by Tom Kochan (page 4); two reports on international programs for students, MISTI (page 10) and iHouse (page 13); and two pieces on EHS safety concerns (pages 19 and 20).

The Koch Institute

Teach Talk
Communicating Across the Curriculum

Les Perelman

MIT HAS A LONG HISTORY of integrating writing instruction throughout its undergraduate curriculum. However, strangely in keeping with MIT's long tradition in acoustics and electronics, the history of integrating writing and speaking into the academic curriculum for the first half of the twentieth century resembled not so much a straight line but a sine wave. The pattern has been that efforts to make writing an integral part of education in science and technology were followed by periods in which writing was the sole concern of the humanities, particularly literature, and then a new communication-intensive (CI) initiative would arise.

Robert Grosvenor Valentine, who came to MIT in 1896, not only taught students to write reflective essays on trout fishing and baseball, but also taught them

Turmoil at Student Support Services

Editorial Subcommittee

THE EDUCATION, DEVELOPMENT, and creativity of our students is central to a university's mission. In recent decades pressures on students have intensified, particularly as they observe their future employment and professional opportunities contracting.

At MIT and many other institutions, the psychological and mental health of students has increasingly become the province of a group of experienced and skilled counselors who take this as their central mission. It's therefore particularly disturbing to discover that one of MIT's leaders in these efforts has been dismissed under questionable circumstances, and apparently without due process or review.

Below the *Faculty Newsletter* provides a timeline for background, including faculty critiques of the events to date. We expect these events to be an agenda item at an upcoming faculty meeting.

Editorial
Altering the Culture of MIT

AT THIS TIME, ALL U.S. social institutions, colleges, and universities are feeling the pressure of the economic downturn. The convergence of critical trends – such as declining endowment value; budget cuts for state-supported institutions due to lower tax collection; and parental unemployment reducing student budgets – has created a crisis in higher education of unprecedented proportions. To some extent, research universities remain somewhat buffered by the distribution of ARRA (American Recovery and Reinvestment Act of 2009) funds through the NIH, NSF, and other R&D agencies. But this buffer is limited and does not compensate for this critical financial shortfall. Most of the nation's universities are currently engaged in efforts to cut operating budgets as a response to unambiguous financial signals.

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Photo credit: *Page 1,* David Lewis

Altering the Culture of MIT

MIT is no exception to the general trend. The Institute's efforts to steer through these difficult times are summarized in the August 16 Preliminary Report of the Institute Wide Planning Task Force (web.mit.edu/instituteplanning/). This is an important document. We appreciate and commend the time and effort that the 90 staff, 85 faculty, and 20 student members devoted to this difficult task. The Report covers a wide range of options in a balanced and thoughtful way. All of us will find proposals that make us hopeful, skeptical, or nervous – as the case may be. The proposals harbor powerful potentials for altering the fundamental "culture" of MIT. It is therefore important, indeed necessary, for MIT faculty to read the proposals carefully and stay apprised of changes under consideration – not only for their own departments or units, but also for other parts of the Institute.

To the extent that we can engage in a self-examination process, we will all contribute to help steer MIT through this highly difficult period. This process is necessary, but of course difficult, and needs the full intelligence and experience of Institute personnel to ensure a valid assessment. We believe that surgery such as that proposed in the Report is delicate and must be considered in all of its multi-dimensional perspectives. Most important of all, it is imperative that we explore the unintended consequences so that we are not caught unaware when the results are not what we have intended. It is all too easy for the rationale of cost savings to create trajectories that will harm, not help, an already tenuous situation. We recognize that no one can foresee all of the consequences – intended or otherwise – but a careful reading of the Report points to some powerful self-defeating impacts.

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It is common knowledge that MIT is a research-driven institute. Faculty, students, and staff all engage in exploring the frontiers of knowledge in their respective fields. It is also well known that faculty and students do not consider their work at MIT subject to an arbitrary allocation of their time to a variety of activities. Indeed, many surveys have shown that both students and faculty dedicate a disproportionate amount of their time to their MIT activities. Perhaps unintentionally, but most certainly inadvertently, the Task Force Report seems to suggest a new administrative involvement in the faculty's own allocation of its time among activities such as teaching, research, advising, etc. This, in itself, is worthy of careful scrutiny.

A related, and seemingly arbitrary, proposal is to increase the teaching load of faculty accompanied by a concomitant reduction of the number of graduate students. At first glance, this proposal appears economically valid in the short run. But it will have severe negative consequences that we must not overlook. If the teaching load is increased, then by definition the research activities and the productivity of the faculty will be reduced.

We base this expected result on the evidence provided by several surveys pointing to the absence of any slack in faculty and students' time. Indeed, anyone familiar with the Institute would find the notion of "slack" to be at variance with both dominant values and observable behavior. Increasing the teaching load of the faculty is a worthy proposal, as long as we all understand its consequences and are willing to reduce time allocated to other activities, most notably research.

To begin with, this is a very serious and fundamental change in the operation of the Institute. It should not be ignored nor accepted without significant discussion on its unintended consequences. More teaching means less research. Less research means lower research volume. Lower research volume means reduced research contracts, grants, or other forms of financial resources for the Institute. All of this is simple arithmetic. There is nothing interpretive or "ideological" here. Is this a direction that we wish to travel? Can we put the research volume at risk and expect no impact on the Institute's overall mission? What about the unintended financial consequences?

We encourage debate and discussion, and invite your views on this most important issue. Please e-mail your submission to *fnl@mit.edu*, or contact any member of the *Newsletter* Editorial Board.

Editorial Subcommittee

From The Faculty Chair

Testing our Capacity to Govern, Change, and Be True to our Values

Thomas A. Kochan

I WOULD LIKE TO USE this *Newsletter* column to share some impressions gained in my first three months in the role as your faculty chair about the unique constellation of roles and processes that constitute the MIT governance system. In doing so I want to challenge us all to use this system to good effect in addressing the problems and opportunities we face in ways that are true to the values we hold as a university community. I outlined some of these issues in my recent e-mail letters to the faculty, so this column is essentially an update on where we stand and how I'd like to see our governance processes engage these issues in the months ahead.

Finalizing and Implementing the Institute-wide Planning Task Force Recommendations

We have in hand a broad set of Task Force recommendations for changing the way MIT delivers education, conducts research, manages human resources and operations, and relates to the world. We have to demonstrate we can discuss, decide, and implement the ideas that have merit in a timely fashion. Doing so will set MIT apart from all other universities that are experiencing similar budgetary crises. We should be proud of the fact that MIT has chosen to directly engage over 200 faculty, staff, and students (including over 80 faculty) in the generation of the 204 recommendations included in the Task Force report.

We are now in the midst of an intensive and extensive effort to get community feedback on the recommendations. As I write this, plans are underway for two community-wide open forums and mul-

tiple decentralized briefing sessions in the dorms, across departments, with student leadership groups, and at faculty meetings. Now is the time for each of us to weigh in, ask the tough questions, and

raise concerns where we believe the recommendations might have dysfunctional consequences. Where we see potential problems, we should be proactive in proposing alternatives to the recommendations that would better serve the Institute in the short and long run. Just saying no to all change is neither an option nor the MIT way.

These inputs will inform the drafting of the final Task Force report. Then the hard work of implementation will begin. I've asked each of our standing faculty committees to clear time on their busy calendars to take up those recommendations that fall within their charters, and there are many that do so. I also am urging our administration colleagues who are responsible for deciding and/or implementing specific recommendations to make an extra effort to consult with the standing faculty committees with which they work. In cases where changes would have significant effects on faculty but there is no standing committee, such as

the recommendations for changes in compensation and benefits, new ways need to be created to get faculty input. In this specific case, the Vice President for Human Resources and the Executive Vice

> We are now in the midst of an intensive and extensive effort to get community feedback on the recommendations [of the Institute-wide Planning Task Force]. . . .plans are underway for two community-wide open forums and multiple decentralized briefing sessions in the dorms, across departments, with student leadership groups, and at faculty meetings.

President and Treasurer are working with a faculty advisory committee to review options.

Some might worry this will slow down the change process. Based on my own professional experience I believe otherwise: Engagement of the stakeholders, properly managed, leads to both better quality and broader ownership of decisions reached and therefore increases the likelihood that the changes will be implemented in a timely fashion and achieve their intended results. My prediction will be put to the test. Let's all work hard to prove it's right!

Resolving the S^3 Issues

Other articles in this *Newsletter* chronicle the series of development and deep concerns that surfaced out of the layoff and intended restructuring of Student Support Services. As I noted in my earlier letter:

"...steps are now underway to address some of these concerns. The Chancellor and I

have created a joint faculty-administration task force co-chaired by Professor Eric Grimson and Vice Chancellor Steven Lerman and charged it to take a clean sheet of paper approach to analyzing and recommending how to structure and deliver student counseling services within current budgetary realities. The task force will report to us by October 30th. In addition, I have asked two of MIT's leading human resource and organizational scholars, Professors Lotte Bailyn and Robert McKersie, to work with Vice President of Human Resources Alison Alden to review the experiences with layoffs and redeployment efforts over this first year of budget cuts, including but not limited to the layoff in the counseling unit, and to offer suggestions for how to better manage these processes going forward."

The two groups we set up have done excellent work in a very short time frame. Lotte, Bob, and Alison are finalizing recommendations to (1) make sure all units explore alternatives before turning to layoffs,

(2) carry out and communicate layoffs in ways that are true to our values and respect the dignity of those affected, and (3) strengthen redeployment/placement of those laid off in job openings occurring in other parts of the Institute.

The Task Force is hard at work. It has already taken steps to ensure our student counseling needs are met during this interim period.

I know that some question the make up of the Task Force because it includes administration leaders from the Division of Student Life and the Chancellor's office. But the Task Force also has strong faculty representation and the administrative representatives are exactly the people who will need to implement the ultimate recommendations. I see this as a model of how we can work together to get new things done – through direct engagement of the faculty and administrative leaders with deep interests and shared responsibility for governing MIT. I've seen joint sub-groups like this work in industry (and in some very tough labor-manage-

ment settings). This is a test of our unique collaborative governance process. I'm confident it will work.

Finally, let me offer a personal perspective on how I hope to carry out my responsibilities as your faculty chair. I've learned in these first three months that this is a unique role, one that requires engaging in strong, frank, and determined advocacy of faculty interests while at the same time working collaboratively and in partnership with other Institute leaders to meet our shared responsibilities to the overall MIT community. I can only hope to find the right balance of advocacy for deeply held values and collaboration in solving problems, if all of us take a similar approach to engaging the challenges and opportunities we face. Let's keep at it!

As always, I welcome comments on these thoughts either via e-mail or via the comments section on the faculty resource page Website: *mit.edu/faculty/discussions/.* ■

Thomas A. Kochan is a Professor of Management and Faculty Chair *(tkochan@mit.edu).*

Teaching this fall? You should know …

the faculty regulates examinations and assignments for all subjects.

Check the Web at *web.mit.edu/faculty/termregs* for the complete regulations.
Questions: Contact Faculty Chair Tom Kochan at x3-6689 or *tkochan@mit.edu*.

No required classes, examinations, exercises, or assignments of any kind may be scheduled after the last regularly scheduled class in a subject, except for final examinations scheduled through the Schedules Office.

First and Third Week of the Term
By the end of the **first week** of classes, you must provide a clear and complete description of:
 • required work, including the number and kinds of assignments;
 • an approximate schedule of tests and due dates for major projects;
 • whether or not there will be a final examination; and
 • grading criteria.

By the end of the **third week**, you must provide a precise schedule of tests and major assignments.

For all Undergraduate Subjects, Tests Outside Scheduled Class Times:
 • may begin no earlier than 7:30 P.M., when held in the evening;
 • may not be held on Monday evenings;
 • may not exceed two hours in length; and
 • must be scheduled through the Schedules Office.

No Testing During the Last Week of Classes
Tests after Friday, December 4, 2009 must be scheduled in the Finals Period.

*It is important to define your expectations and academic integrity to your students at the beginning of each semester.

Chronology of S^3 Events

S^3 Description and History
S^3 is an acronym for Student Support Services, presently under the Dean for Student Life. It has gone under other names in the past, e.g. Counseling and Support Services (CSS). It is an important support service for students, for example, see the following description at *studentlife.mit.edu/dsl/s3* .

….asking for help ...can be hard. Whether classes aren't going well, problems arise at home, or romantic relationships are imploding, it's tough to think of sitting with a stranger and telling them the personal details of your life. Student Support Services, S^3 is a low-key, safe place that makes asking for help a little easier. A diverse staff is available to you for confidential conversation and support. We can help you in other ways too – Take a look!

As of June 2009, S^3 had six Associate and Assistant Deans, an Assistant Dean for Disability Services, and two administrative assistants. This number included two Co-Directors, Associate Dean Arnold Henderson and Associate Dean Jacqueline Simonis. Dean Simonis was the most senior member of the staff, having been a counselor at MIT for 23 years and holding a doctorate in Counseling and Administration from Harvard.

Before 2000, S^3 was under the Office of the Dean of Students and Undergraduate Education (ODSUE). At that point, ODSUE was divided between the Dean of Undergraduate Education (DUE) and the Dean for Student Life (DSL), and S^3 was put under DSL.

S^3 Reporting in 2000
According to the former Dean of ODSUE, Rosalind Williams:

"When the separation [of ODSUE into DUE and DSL] was made in 2000, I believed that the separation was in theory a good arrangement, but from the start I worried and wondered about placing the student counseling and support office under the DSL. Some people in the office argued strongly that it should be under the DUE."

Subsequent Questions about S^3 Reporting 2004-2006
Professor Tom Greytak was chair of the Committee on Academic Performance (CAP) from 2004 to 2006. In this capacity he worked closely with S^3 and with Dean Simonis.

"I recognized that there were management issues between S^3 and those to whom it reported in DSL. S^3 is deeply involved with the academic difficulties of students. It has a close working relationship with the faculty on the CAP and with individual faculty members throughout the Institute. Thus it seemed to me that S^3 was ill placed in DSL which is more concerned with other aspects of the students' lives. Some other line of management and support, perhaps in DUE, appeared to be more appropriate. I brought up this issue during the search for a new dean for DUE and the search for a new dean for graduate education. After Steve Lerman was chosen for the latter position, I discussed the issue with him in person on June 19, 2008."

Monday June 22, 2009
On this date, Dean Simonis was laid off. She:

"…went to a scheduled meeting … Jackie was told that her position had been eliminated for financial reasons, that she was being laid off, and that her last day at work was that day. She was told that she was expected to be available to coordinate the transfer of her responsibilities while working from her home. She was not allowed to speak with her colleagues in private, nor to return to work in her office…".

This text is from a letter to former chairs of the MIT faculty and the MacVicar Fellows dated July 9, 2009 (see below).

Friday June 26, 2009
Upon learning of these developments, in his role as Faculty Chair, Tom Kochan began a series of meetings with concerned faculty and leaders from the administration to learn more about the facts and different perspectives involved in this situation.

Thursday July 2, 2009
A letter is sent to Chancellor Phillip Clay, with copies to the President, the Provost, the Dean for Student Life (Dean Colombo), and the Chair of the Faculty (Thomas Kochan). The letter was signed by the Chair of the Committee on Academic Performance, Professor David Pesetsky, the entire faculty membership of CAP from 2008-9 and 2009-2010, and three former chairs of the CAP (one of whom is also a current member of the committee). The letter says in part:

"…In her 23-year career at MIT's S^3, Dean Simonis was a builder of the very office from which she was just laid off. The academic careers (and even lives) of innumerable MIT students have been saved and put back on track thanks to her work.

These recent actions that affect S^3 have created a tentativeness within the Student Support Office and the overall support system for our students. We do not believe that CAP can properly fulfill its duties to the faculty in collaboration with a Student Support Office in such a state.

Upon careful consideration, we therefore respectfully ask for the following actions:

1. The suspension of those aspects of the DSL reorganization that involve S^3, and the provisional restoration of the previous administrative structure.

2. The restoration of Dean Simonis to her position at MIT, including her reinstatement as Co-Director of S^3. …"

The letter concluded with

"…In our many years here, MIT has been known as a place where faculty and administration work together collegially to optimize our students' experience, and where professional staff, like Jackie Simonis, can expect to be honored for their decades-long contributions to our students' quality of life. We feel compelled to act to preserve that culture in the face of actions that, intended or not, can only undermine it….

"Though we understand the necessity of restructuring and reevaluation throughout the Institute, it has always been said that this can and must be done without putting the Institute's core mission at risk. In difficult times such as these, we expect an actual increase in student need for the services provided by S^3, and a corresponding increase in the demands on committees such as CAP. We believe that the events that prompt this letter do put the Institute's core mission at risk, and therefore look forward to a speedy resolution of our concerns."

Thursday July 9, 2009

A letter is sent to former chairs of the MIT faculty and the MacVicar Fellows signed by (in alphabetical order) Paul Gray, Thomas Greytak, Robert Jaffe, David Pesetsky, Margery Resnick, and Art Smith, which said in part:

"…A broad study of counseling at MIT is exactly what many of us had been advocating for some time. However, we do not understand how it can make sense to embark on such a study after completely reorganizing the very unit whose future structure is the supposed topic of the study (in effect pushing it another layer deeper into the organizational chart of the office of the Dean for Student Life) and after dismissing one of two leaders of the office, whose insights should be critical input to such a

study. Both decisions were apparently made without any faculty input whatsoever. We also take note of the fact that Dean Colombo's message [to Greytak on June 22, stating that he (Colombo) had initiated an evaluation of S^3] does not mention either the restructuring or the layoff, despite the fact that both must have been planned long before this message, and were literally in progress at the time it was sent…."

Tuesday July 14, 2009

Chair of the Faculty Thomas Kochan invites members of the CAP, former chairs of the MIT faculty, and the MacVicar Fellows to an informal luncheon meeting at the Faculty Club, to discuss the issues raised in that letter and in the letter to the MacVicar Fellows of July 9 and to report on his discussions with administration leaders on ways to address the range of issues raised by the S^3 restructuring and the layoff process.

Wednesday July 15, 2009

Kochan convenes a joint meeting of concerned faculty with Chancellor Clay, Dean Lerman, and Dean Columbo to discuss the issues and options for addressing them. All parties at the meeting acknowledge the seriousness of the issues and the concerns raised by the faculty. Chancellor Clay states that in retrospect the faculty should have been consulted before starting the restructuring of S^3. A tentative agreement is made for the Faculty Chair and Chancellor to jointly create and charge a faculty-administration task force to study and recommend how to best structure student counseling services. All options are to be open for consideration.

Thursday July 16, 2009

Kochan, Chancellor Clay, and Dean Lerman meet and agree on the charge, membership, and timeline for the task force.

Wednesday July 29, 2009

The Chair of the Faculty sends an email to the members of the faculty who attended

the July 14 informal meeting at the Faculty Club, which announces the formation of the S^3 Task Force, and includes its charge.

Thursday August 6, 2009

Professor John Belcher, a member from 2006-2009 of the Committee on Student Life (CSL), the standing faculty advisory body to the Dean for Student Life, sends an e-mail to the Chair of the Faculty and the faculty who met at the Faculty Club on July 14, which says in part:

"…I particularly emphasize this with respect to Dean Colombo, who is relatively new to the Institute. My opinion, based on my experience as a member of the Committee on Student Life since he [Colombo] first arrived, which has met every two to four weeks, is that Dean Colombo should not be making this kind of decision about S^3 without input from faculty. He had ready access to that input, through his own standing faculty advisory body, if he had chosen to consult it.
…….

"Every faculty member whose opinion I respect has nothing but praise for the way S^3 functioned, as it was constituted, and I think you are far from resolving the legitimate issues and questions that have been raised about the events of the last few weeks, or about what the long-term consequences of these events will be to the morale and functioning of this group. Whatever this Task Force does, it is crucial that S^3 emerge as a highly functional team, and the faculty are going to want to be convinced that this is going to happen.…"

Wednesday August 26, 2009

The S^3 Task Force met for the first time on this date.

Wednesday September 9, 2009

The members of the CAP and of the MacVicar Fellows, and others, who met on Tuesday July 14, meet again to hear a progress report on the situation. ■

Student Support Services: The Way Forward

Phillip L. Clay

BUDGET REDUCTIONS, CHANGES required to bring staffing in line with resources, a commitment to excellence, and a goal of keeping MIT as a wonderful place to study and work combine to challenge us. This spring and summer, the Dean for Student Life (DSL) [Costantino Colombo] announced layoffs in his area to meet required budget reduction targets. A total of 18 positions were eliminated. The layoff of staff, including some long-serving colleagues, was difficult and painful for all involved. The DSL layoffs included one position in Student Support Services (S^3). S^3 assists students by directing them to appropriate MIT resources for academic assistance, for support for residential life, and for crisis management. While the office also supports faculty committees and works with housemasters and MIT Medical, the majority of its work is directly with individual students.

In the 2008 search for the new Dean for Student Life, I asked the search committee to seek insight into the needs of the division and identify areas where the new dean might want to focus attention. The report of the search committee and discussions with faculty pointed to S^3 as one area where the new dean should focus. This was not to suggest that S^3 was not doing a good job. The office has enjoyed strong support from faculty and students. The concerns called out missed opportunities for student support and differing views about S^3's scope, reporting arrangements, and the coordination of its services with other units, including the Office of the Dean for Undergraduate Education and the Medical Department.

Soon after Dean Colombo arrived, he was required to meet the serious, Institute-wide budget cuts, even while he addressed areas for improvement. This summer, the dean announced budget cuts

Several highly respected faculty colleagues with a long record of working on student issues expressed to me deep apprehension and disappointment over the layoff [in Student Support Services] and the interim reorganization.

for S^3 and proposed a review that would address the concerns raised about the office. He also announced an interim reorganization.

Several highly respected faculty colleagues with a long record of working on student issues expressed to me deep apprehension and disappointment over the layoff and the interim reorganization. First, they were surprised that the changes were made without more consultation. Some of them disagreed with the layoff of a particular individual. They were concerned that the interim reorganization would degrade services to students and, finally, they were also concerned that the stories they had heard about the layoff process were inconsistent with Institute culture and procedures. In recent weeks, my colleagues and I have communicated with many faculty about these concerns. In addressing these concerns, I have engaged deeply with the Chair of the Faculty who has played an active role by fostering communications and convening interested parties.

I learned a lot. I acknowledge the deep and genuine feelings of concern the

faculty expressed. I understand the basis of their concern. I also feel that in hindsight, even with the review of S^3 provided by the search committee, we should have consulted more broadly about the reorganization of student services before making even interim changes. The input from faculty in the search process, as described above, was insufficient, and while we had planned to bring stakeholders into the more wide-reaching process of reviewing S^3, the intent was inadequately communicated. We certainly did not intend to degrade S^3, but we now understand how reasonable people might perceive that this could be an unintended consequence.

Before addressing the substantive issues related to S^3, let me first speak to the concerns expressed about layoffs. All of the layoffs in student life were the result of budget reductions. The Dean made difficult decisions that included layoffs of staff that had been at the Institute for many years. The layoffs, at all levels, were initiated and conducted according to Institute policies and procedures, in consultation with, and with the full participation by, MIT Human Resources. The process is consistent with MIT culture and values.

Academic and administrative managers necessarily have broad discretion in

personnel matters. In making decisions about layoffs, they do not usually consult openly with other interested parties outside of the area; and, consistent with these practices, in making decisions about layoffs in S^3, we did not consult with faculty, students, or other parties. It is fundamental that personnel decisions are kept confidential before and after they are made. Employees have the appropriate expectation that managers will not disclose information regarding their employment with others, except when it is necessary to advise those in the line of supervision or other very limited circumstances. Given this commitment, we simply cannot comment on any specific personnel decision. MIT has an established internal grievance procedure that allows any employee who feels unfairly treated to raise such concerns in writing; those concerns are then investigated thoroughly and objectively. Those review processes also contain a commitment to confidentiality to the extent possible. This expectation of privacy and confidentiality applies not only to the employee who may be the subject of a decision, but also to those other community members who might participate in a review. The employee also has the right to raise any concerns externally through legal proceedings. If a complaint is submitted, we will respond appropriately.

I feel confident that established processes were followed and layoff decisions were based on legitimate reasons. However, in a process of self study, the Chair of the Faculty and I decided that several steps should be taken to address the concerns expressed by the faculty. First, there has been an exchange of information with a small group of respected faculty to better understand the layoff process that has been in place this past year. At MIT, we always strive to improve our processes and in this spirit, Alison Alden, MIT's Vice President for Human Resources, has been shepherding this examination.

More central to S^3, we have begun a process designed to review the unit. The Chair of the Faculty and I have appointed and charged a task force to determine how S^3 should best be organized to provide the best resources for our students. As described in more detail below, the goals of the task force review are to recommend: (1) ways to improve the operations in S^3 and (2) how to best position the functions of S^3 within the MIT organizational structure to improve coordination among offices, faculty, and other stakeholders that work with S^3 in serving students who need academic, social, and mental health support. The interim reorganization has been rolled back.

We have reaffirmed that S^3 performs several critical functions. It serves as the locus of support for academic issues, including providing input to the Committee on Academic Performance (CAP) decision process. It provides student advising and counseling and is a resource for faculty who are trying to assist individual students. The office also assists housemasters in supporting students in our residence halls who experience academic or other problems. S^3 is an important part of the health support structure for students, often serving as a gateway for students who are then referred to Mental Health Service at MIT Medical for further care. Its continued success is important to MIT.

While the office has served us well, this review will determine how to improve S^3's coordination with other student support activities so that it can better serve MIT's students and faculty. Positioning S^3 for greatest effectiveness is particularly important as offices across the Institute face further budget reductions.

Specifically, the Chair of the Faculty and I charged the S^3 task force to review and assess the following:

1. Student Support Services' scope of services, organization, and reporting relationships.
2. Coordination of services provided by S^3 and other offices in DSL, DUE, and the Medical Department.
3. S^3's communication with faculty on individual cases and on policies and procedures for student support.
4. Relationships and communications with various stakeholders – CAP, Committee on Student Life (CSL), other elements of the Division of Student Life, the Office of the Dean for Graduate Education, housemasters, students, and any others deemed relevant by the committee.
5. S^3's outreach and prevention activities.

The task force will be co-chaired by Professor William "Eric" E. Grimson and Vice Chancellor Steven "Steve" L. Lerman. Other members include Dr. Alan E. Siegel, Chief, Mental Health Services at MIT Medical, Deans Costantino "Chris" Colombo and Daniel "Dan" E. Hastings, Professors David Pesetsky and Ann E. C. McCants, Dean Blanche E. Staton, Senior Associate Dean for Graduate Students, and two student members: Elizabeth A. Denys (2012) and Ying Zhang (HST). The task force will present its report to us by October 30, 2009.

In carrying out its work, the task force will consult faculty, staff, and student stakeholders. The task force will be mindful of the need to empower staff and faculty to collaborate more effectively in support of students in the environment of diminished resources. We also want our student service organizations to increase their focus on outreach and prevention as well as their response to student problems.

We cannot avoid the unfortunate fact that MIT will face further budget reductions. No unit or office at MIT can be exempted from consideration for further cuts. Human Resources will continue to review its processes to ensure that these processes continue to be fair and humane. Insight from the task force will help us utilize our resources effectively. The task force will illuminate how we support students, reinforcing the efficacy of S^3 and other units, so that we will be able to preserve our tradition of deep and strong support for the outstanding students who come to MIT. None of us will be satisfied with anything less.

Phillip L. Clay is Chancellor *(plclay@mit.edu).*

MISTI Matches Students with International Work and Research Opportunities

Suzanne Berger

THIS MONTH THE CLASS OF 2013 started classes at MIT and I thought back to my own freshman year in a Midwestern college. At the time, the outside world was a distant and troublesome speck on the horizon: my uncle had fought in the war in the Pacific; my relatives had died in the holocaust in Europe. The Cold War separated us from large stretches of the globe. My own greatest aspiration with respect to foreign countries was to make a summer trip to France. The only cars we saw on the streets, and the only products in the stores, were American. Today, by any economic or cultural or political standard one can conceive, the world is a wholly different place.

The globalization of the economy, the rise of major new industrial societies in Asia, the technological revolution that followed the silicon chip – all these have totally altered the international horizon of our students and faculty. The quality of their lives as citizens and as professionals will depend critically on understanding societies outside their own. Success today as an engineer or a scientist or a manager takes the ability to access and create knowledge outside of national borders. It requires knowing how to build networks with colleagues in centers of rapid growth and innovation across the world. Educating students capable of learning and leading in global projects is the main objective of MISTI, the MIT International Science and Technology Initiatives. In 2009, MISTI sent over 400 undergraduates and graduate students to internships and research labs around the world. MISTI also provided close to $500,000 to MIT faculty for international projects and collaborations.

MISTI's approach to international education builds on MIT's distinctive tra-

> MISTI's approach to international education builds on MIT's distinctive traditions of combining classroom learning and hands-on experience in UROPs, cooperative programs with industry, practice schools, and internships. In contrast to other universities' internationalization programs that mainly involve study abroad, MISTI matches individual students with work or research opportunities in their own fields.

ditions of combining classroom learning and hands-on experience in UROPs, cooperative programs with industry, practice schools, and internships. In contrast to other universities' internationalization programs that mainly involve study abroad, MISTI matches individual students with work or research opportunities in their own fields. The internships last three months to a year, and many of the students who go for a summer end up returning again for another stay. MISTI draws students from all over the Institute: 47% from the School of Engineering; 29% from the School of Science; 11% from Architecture and Planning; 7% from the School of Humanities, Arts, and Social Sciences; and 6% from Management.

An increasing number of MISTI projects are entry-level ones that offer second- and third-year students who might not yet be ready for a company or research lab assignment a chance to work abroad. These entry projects often involve teams of students adapting OCW (OpenCourseWare) materials for univer-

sities and high schools – in western China, India, Italy, and Germany. Students return from these experiences interested in doing more. Scot Frank (EECS '09), for example, first worked on setting up OCW and iLab test equipment at a Chinese university and later returned to China as an intern with a Shanghai-based startup. Inspired by the experience of learning Chinese to prepare for MISTI, Frank and two fellow students created Lingt Editor, software for classroom-based language learning. Their company was recently featured as the "coolest college start-up" by *Inc. Magazine*.

Here are a few other current examples – from the more than 3000 students MISTI has placed since it began by sending a handful of interns to Japan at the end of the eighties:

- Chemical Engineering student Nathalia Rodriguez worked on gene therapy for muscular dystrophy at Genopole, a French biotech cluster;
- Matthew Zedler, a Mechanical Engineering graduate, examined Chinese auto growth and energy at

Cambridge Energy Research Associates in Beijing;
- Physics major Jason Bryslawskyj designed superconducting magnetic bearings for electric motors at Siemens in Germany. He wrote two patents at Siemens;
- Ammar Ammar, an EECS undergrad, designed and tested a Google/YouTube project at Google Israel;
- Civil and Environmental Engineering student Dina Poteau worked on water stress detection at the Technion in Haifa;
- Math major Elizabeth Theurer worked at Global InfraSys, an energy consulting firm in Gurgaon;
- Mechanical Engineering student Rachel Licht tested oil reservoirs for Total, a French energy company;
- Chemical Engineering major Christopher Love designed geothermal and solar thermal energy plants at ENEL, in Pisa, Italy;
- Brain and Cognitive Science major Shirin Kasturia explored healthcare technologies for the disabled at Innovaciones SocioSanitarias, Valencia, Spain;

- Management undergrad Ken Lopez worked on a Braille screen at Tecnologico de Monterrey in Cordoba, Mexico;

- Alexander Patrikalakis returned for several internships to Ricoh, in Japan, developing software for videoconferencing and 3D virtual realities.

Because international experience should be a core part of education – not a frill or an extra or a vacation trip for those whose families can afford it – MISTI makes these opportunities available at no additional cost to students. To participate in MISTI, however, a student must make a serious investment in learning about the

country in which he or she wishes to intern. For entry-level MISTI activities, this involves at least one semester of course work on the country. For students

> By preparing our students to work, lead, and thrive in cultures around the globe, MISTI equips them with crucial skills for tackling the world's great challenges.
>
> –Susan Hockfield, President of MIT

seeking to be placed as regular interns, language courses are also required. MISTI students also participate in sessions led by MISTI staff on how to hit the ground running once they arrive and learn everything from how to buy train tickets, how to stay healthy, and how to work with colleagues.

Perhaps the most important part of these sessions is preparing students to discover that the same problem can be tackled in many different ways. A lab working on a project in France may have a very different problem-solving approach from an MIT lab. What looks like people wasting time drinking coffee and chatting may actually be the team exchanging ideas about next steps. If colleagues at work are polite, but non-committal, how do you get into the project? How can you figure out who makes the decisions in the organization and how ideas move ahead? "Teaching students not only about other countries, but about how to collaborate with peers abroad, is a primary mission of the School of Humanities, Arts, and Social Sciences," says Dean Deborah Fitzgerald. MISTI is located in the Center for International Studies in SHASS.

The underlying idea in requiring students to learn about a country's culture, language, history, and politics as prerequisite for an internship, is that context matters. Erica Fuchs, a MISTI alumna who had internships in Germany and China and today is an assistant professor at Carnegie Mellon in the Department of Engineering and Public Policy, explained

MISTI Annual Internship Placements

Number of Interns vs. Year
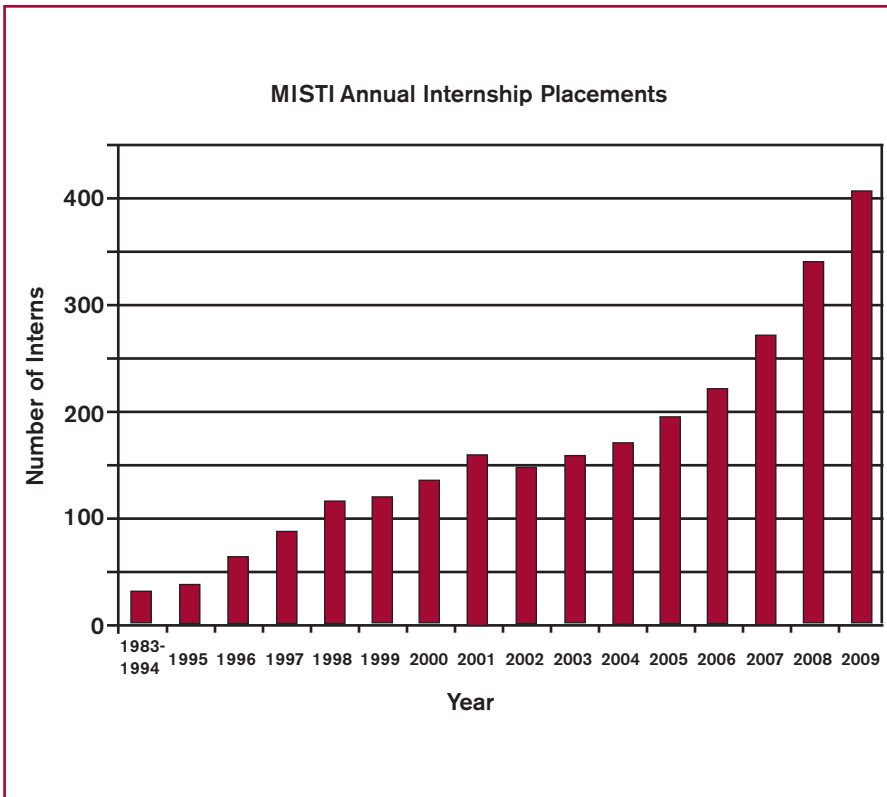
how critical it was for her research to see the ways in which the same technology plays out in different national settings. She looked at optoelectronic designs being developed for telecommunications

competitiveness if I hadn't spent the extensive time I did through MISTI on the manufacturing shop floors of developing East Asia. I continue to emphasize the importance of this on-the-ground experience with all of my students today." As we talk with students returning from the internships, their insights about the

Seed Fund, the program provides support for MIT faculty to launch international projects and research anywhere in the world and encourages them to involve students in the projects.

Of the 104 proposals received for the inaugural 2008 round, 27 were awarded $457,400 in funding. Faculty and research scientists from 26 departments across the Institute submitted proposals for projects in 42 countries. All awardees included undergraduate, graduate, or post-doctoral student participation.

Teams are using the grant money to jump-start international research projects and collaboration with faculty and student counterparts abroad. Funds cover international travel, meeting, and workshop costs to facilitate the projects. MISTI provides cultural preparation for students before their departure.

Today MISTI has 10 country programs: China, France, Germany, India, Israel, Italy, Japan, Mexico, Spain and – the latest – Brazil. New programs for Switzerland and for Africa are in the works. Each one of the country programs has a faculty member who serves as director and a full-time staff member as coordinator. Faculty leadership has been critical to the development of MISTI, and is drawn from departments across the Institute. Financing these programs involves a significant effort since funds have to be found for the students and for staff salaries. Today about a quarter of MISTI funds come from the Institute budget, and the rest is raised from gifts from alumni, corporations, and foundation grants. In a time of economic crisis and tough decisions about MIT's priorities, some might wonder whether international learning is an activity we can afford. When we think about the shifts in the international economy, the emergence of high-powered centers of knowledge creation around the world, and the lives of our students over the next quarter-century, it seems like a necessity. ■

Suzanne Berger is a Professor of Political Science and Director of MISTI (szberger@mit.edu).

2009 MISTI Placements by Country
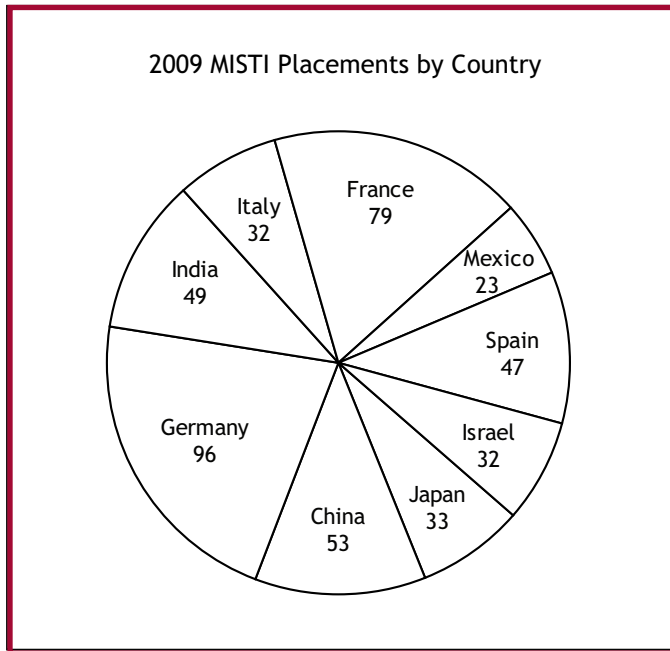
and computing industries. The sponsoring companies for the research on which her dissertation was based wanted to understand the economic viability of a process technology called "monolithic integration." Many of the firms were offshoring manufacturing, and Fuchs thought that location might matter for how efficient and profitable the new technology was. With funds from MISTI, she compared the newly established plants in China with ones in the U.S. She discovered that the new monolithically-integrated technology was the most economically competitive technology when manufacturing occurred in the U.S., but the monolithically-integrated design could not compete in the U.S. or developing East Asia against the old technology produced offshore. Fuchs says: "I would never have known the importance of manufacturing location for technology

connections between context and science suggest that a unique form of learning is taking place.

EECS Department Head Eric Grimson observed that "to compete in today's world, students have to appreciate global perspectives, global markets, different cultures, national priorities, nuances of communication in different languages, even the impact of social and religious norms on commercial and technological behavior." EECS has been one of the most active departments in developing international internships in collaboration with MISTI.

The MISTI Global Seed Funds program provides yet another avenue for students to participate in global learning and knowledge creation. The program started last year with funding from the Office of the Provost for the internationalization of MIT research and education. Building on the model of the MIT-France

iHouse: An International Living-Learning Community

Zahir Dossa

THE INTERNATIONAL HOUSE FOR Global Leadership, or iHouse, is a living-learning community consisting of 21 undergraduate students passionate about international development. iHouse was established on the vision that a community promoting a combination of academics, project-based learning, mentorship opportunities, and leadership skills development is necessary at MIT to foster the next generation of global leaders solving international problems. Our mission is therefore to complement the academic offerings in international development at MIT with the principles, tools, networks, and experiences necessary for undergraduates to become leaders in international development.

To fulfill this mission, we have created a close-knit, collaborative community that promotes the international development-related programs that MIT offers, encourages project-based learning, exposes students to various opportunities that enhance leadership skills, and provides a strong mentorship network for students.

iHouse is a student-governed living group that is guided by the Chancellor-appointed faculty advisory council, which is headed by Ford Professor and former MIT Faculty Chair Bish Sanyal. The programming for iHouse was developed by the Housemasters of New House, Sandra Harris and Professor Wesley Harris, Donna Denoncourt (Associate Dean of Residential Life), and the iHouse Program Coordinator, Zahir Dossa (a PhD Candidate in the Department of Urban Studies and Planning). iHouse promotes the academic offerings of MIT in international development. Residents are required to participate in at least two international development courses, with MISTI and D-Lab being the most popular. [See page 11 for an in depth look at MISTI.] Beyond the courses in international development that MIT offers, there is a strong emphasis on project-based learning. This is furthered through the iHouse Freshman Advising Seminar, in which all entering iHouse freshmen enroll, and international service leadership projects, which all iHouse residents are required to conduct.

The Freshman Advising Seminar, facilitated by Professors Wes Harris and Leon Trilling and designed by Professor Diane Davis, Laura Sampath (Manager of the International Development Initiative), and myself, introduces freshmen to a methodology for approaching communities to identify, understand, and solve problems in an international development context. This year, by working extensively with a local Cape Verdean community, students will learn to use a variety of social science and engineering tools, methods, and techniques to clarify international development problems with an applied problem-solving approach. By teaching a more effective and impactful method of approaching communities, understanding problems, and structuring solutions, this course prepares students for their international service leadership project. The Public Service Center works closely with iHouse residents in developing and planning their international projects, which are funded by the 484 Phi Alpha Foundation. Students are currently leading community service projects in countries such as China, Ghana, Israel, India, Paraguay, the Philippines, and South Africa.

Leadership skills development and a mentorship network are two other essential aspects of iHouse. With funding from the Alumni Fund Grant, iHouse will be launching a leadership development module in spring 2010, that teaches students how to manage international projects – something students have complained they are unprepared for. We are collaborating with the Sloan Leadership Center, Global Education and Career Development Office, and Alumni Association to launch this initiative. The Alumni Association is also being utilized to develop a strong mentorship network between alums who are international development practitioners and iHouse residents. A peer-to-peer mentoring also occurs between MIT undergraduates, SPURS/Humphrey Fellows, and Sloan Fellows through the iHouse Speaker Series. This Speaker Series features MIT students involved in international development and creates a stage for students to share ideas and discuss challenges.

Through this multi-faceted approach to develop global leaders in international development, iHouse brings together a diverse group of students, from various countries, majors, and backgrounds to create a living-learning community. This living-learning community fosters collaboration between iHouse residents and coordination with various departments and partners at MIT to further opportunities in international development. ■

Zahir Dossa is a graduate student in the Department of Urban Studies and Planning (dossa@mit.edu).

OpenCourseWare: Working Through Financial Challenges

**Cecilia d'Oliveira
Steven Lerman**

MIT OPENCOURSEWARE (OCW) IS widely acknowledged both around the world and here on campus as a tremendously successful act of intellectual philanthropy by the MIT community. Evaluation research shows that about 60 million people have used OCW for a broad spectrum of teaching and learning purposes, and more than 90% of them find the materials well suited to their needs.

OCW has also proven to be an enormously valuable resource for the MIT community. Over half of incoming freshmen are aware of OCW prior to choosing MIT, and a third of those cite OCW as a significant influence in their choice of school. Ninety-four percent of students at MIT access the site, and half of alumni surveyed use the site for one or more educational purposes.

Eighty-four percent of MIT faculty surveyed access the site in developing their courses. One-third of faculty who contribute to OCW report the process improves their course materials; a similar number developed greater comfort with teaching on the Web; and one-third also report that publication of their course's materials on OCW has improved their professional standing in their field [OCW faculty and student surveys, 2005-2008].

The initial publication of virtually the entire MIT curriculum, completed in November 2007 with the publication of OCW's 1,800th course, set a standard for sharing of open educational resources and inspired a global movement. More than 250 universities have committed to openly publishing course content in the OCW model and there are now more than 100

live sites and materials from over 9,000 courses available. MIT is clearly recognized as the global leader in what has come to be called the Open Educational Resources movement.

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The Cost Side of the Equation

Less well known is the effort and associated expense (nearly $4 million per year) required to maintain the relevance and vibrancy of OCW – with new courses, updates to existing courses, and other improvements to the Website – and to distribute the content worldwide.

The level of effort required to maintain and improve the OCW publication is not readily apparent. At first glance, OCW may appear incidental, a simple posting of materials already prepared for MIT students on an open platform. However, the fact is that the materials used internally at MIT exist in a wide variety of formats and include significant amounts of content that for copyright or privacy reasons cannot be included in the external publication.

To collect and reformat the materials, clear restricted content, and ensure a quality publication without significant impact on faculty time requires a dedicated OCW publication staff. Three OCW publication managers and five department

liaisons currently provide primary support for participating faculty across MIT, a staff size that has kept the time commitment of publishing a course below five hours for most faculty [OCW 2007 faculty survey]. This team allows MIT to publish OCW course materials at both high volume and high quality, maintaining a landmark open educational resource.

To date, this effort has been funded by a combination of grant funding (41% of FY 2009 expenditures and 72% of total OCW expenditures since inception), Institute funds (49% in FY2009 and 22% of total to date), and donations and other revenue (10% in FY2009 and 6% of total to date).

In the next two years the grant funding that has supported OCW since its earliest stages will run out, and foundations generally do not provide new funding to support ongoing operations. Meanwhile, Institute funding has become tighter with the financial downturn, and like all units at MIT, OCW is under pressure to further reduce its reliance on the General Institute Budget. In the current economic climate, it is increasingly difficult to attract corporate support. Accordingly, OCW must develop new ways of financially sustaining the program.

A Multi-Pronged Approach to Financial Sustainability

OCW has been hard at work to ensure long-term financial sustainability. Key components of the effort include reducing our costs, increasing donations, and implementing approaches to enhancing the revenue we generate to support OCW.

On the cost cutting front, OCW reduced its base operating budget by $500,000, or 12% from the original FY 2009 of $4.1 million. In the wake of the economic downturn, OCW reduced spending by cutting certain staff positions, reducing technology expenses, and shaving costs in many other areas. Key elements of technology savings included taking advantage of free video hosting on YouTube for the expanding collection of highly popular video materials, moving video production in-house, and renegotiating contracts with some of our technology service providers.

OCW already has a modest but growing online visitor donation program, which generated just under $150,000 last fiscal year, an increase of more than 50% over the prior year. Additional improvements and experiments with new approaches for online fundraising and donor stewardship are in the works.

In FY 2010, OCW will be piloting other fundraising approaches, including a "Course Champions" campaign targeted at individual donors of $5,000 per year and a corporate underwriting program in the style of National Public Radio. More traditional fundraising is also part of the sustainability plan. The Resource Development Office has recently appointed a leadership gifts officer who will be providing part-time support to OCW for major gift solicitation.

OCW already derives modest income – about $30,000 per year – from referral links to Amazon.com. Over the last six months, an *ad hoc* Working Group of faculty and senior administrators has been exploring much more significant opportunities for generating new revenues. Proposals for generating revenue based on OCW are also reflected in the Institute-wide Planning Task Force Report (*ideabank.mit.edu*). These ideas include various types of certificate, credit, or degree-granting distance education programs that rely on the OCW materials. At this writing, a pro bono team from management consultants Bain & Company is helping us assess the Working Group's ideas in terms of their potential for financial return, alignment with OCW's core principles as well as the perceptions of OCW's stakeholders and users, and the cost of implementing those ideas. We expect that a similar consideration of the ideas from the Institute-wide Planning Task Force will occur.

Staying Ahead of the (Learning) Curve

Sustaining the value of OCW and MIT's leadership position in open education requires more than just "keeping the lights on." As new technologies develop and user expectations shift and grow, a digital resource like OCW will become increasingly less valuable if it does not innovate and grow along with these expectations. This requires updating materials on the site and adding new features that provide even greater global benefit. To ensure benefits here at MIT, OCW must also remain relatively up to date with the curriculum used in the classroom.

From 2003 to 2007, at the rate of around 400 courses a year, OCW published a "snapshot" of nearly every Institute course as it was taught in a particular semester by a particular faculty member. Since completing the initial publication, OCW has scaled back its effort and staffing and now publishes 130 updated versions of previously published courses and 70 new courses each year. Altogether, OCW has updated 600 previously published courses to date. In addition, OCW has added innovative new

> No single sustainability approach will fully meet OCW's future funding needs, but the goal is that by FY 2012, a combination of cost containment, fundraising efforts, and new revenue streams will provide the support needed to sustain OCW as a premier open educational resource for MIT and the world far into the future.

features such as the *Highlights for High School* section, which seeks to inspire the study of science, technology, engineering, and mathematics subjects at the secondary level. OCW is also actively exploring the use of social media (such as Facebook), mobile platforms (such as the iPhone), and partnerships with for-profit and non-profit groups that will extend the reach and impact of OCW.

No single sustainability approach will fully meet OCW's future funding needs, but the goal is that by FY 2012, a combination of cost containment, fundraising efforts, and new revenue streams will provide the support needed to sustain OCW as a premier open educational resource for MIT and the world far into the future. Part of making OCW successful in the future will be balancing the need to fund the core program as it currently exists with the opportunities to further expand and enhance the value of the materials we openly provide.

OCW will be holding a series of faculty forums later this academic year to discuss the present and future of OCW. We invite ideas from the community about the best way to sustain, and ideally enhance, OpenCourseWare. ■

Cecilia d'Oliveira is Executive Director, OpenCourseWare *(cec@mit.edu)*;
Steven Lerman is Vice Chancellor, Dean for Graduate Education, and Chair, OCW Faculty Advisory Committee *(lerman@mit.edu)*.

New CUP Subcommittee to Implement HASS Distribution Reform

Jeffrey S. Ravel

AT ITS MEETING ON May 20, the Institute faculty voted to simplify the Humanities, Arts, and Social Sciences (HASS) Requirement, one of the General Institute Requirements (GIRs) for all MIT undergraduates. The faculty motion mandates a change in the distribution component of the Requirement from the current five-category distribution to one that consists of one subject each from three categories – humanities, arts, and social sciences. The faculty vote specifies that the change to the Distribution Requirement must be implemented *no later* than fall 2011, and preferably by fall 2010.

Important aspects of the HASS Requirement remain the same: students must complete eight HASS subjects, three to four of which must form a concentration in a HASS discipline. The HASS Requirement will continue to overlap with another GIR, the Communication Requirement, because all MIT undergraduates must complete two CI-H subjects that also count towards the eight-subject HASS requirement prior to graduation.

In the same vote, the faculty approved the creation of a new subcommittee of the Committee on the Undergraduate Program (CUP) to oversee the HASS Requirement. The subcommittee will focus this year on the reform of the HASS Distribution Requirement. It will also monitor the ongoing efforts to create a program focused on first-year undergraduates, known as the First Year Focus Program. The May 20 faculty motion calls for the CUP to recommend to the faculty no later than AY 2014-2015 whether all students should be required to take one First Year Focus subject in partial fulfillment of the HASS Requirement.

The newly formed CUP subcommittee will work closely with groups across MIT to consider the implications of the new HASS Distribution Requirement. The fall 2010 implementation goal imposes a strict timeline on these efforts. To facilitate its work, the subcommittee has asked all departments and sections that teach subjects with HASS-D and HASS-E designations to provide a preliminary classification of these subjects into the three new distribution categories. The departments have also been asked to submit a rationale for their classification schemes. The subcommittee will determine the official distribution designation of each HASS subject after carefully reviewing department and section input.

In addition to classification, the subcommittee will also recommend which students should be subject to the new HASS distribution categories beginning in fall 2010. The subcommittee is considering whether to make the new HASS Distribution Requirement retroactive for undergraduates who entered MIT prior to fall 2010. If students who entered the Institute prior to fall 2010 are not subject to the new rules, the Institute will need to keep a robust roster of current HASS-D subjects on offer for several more years.

More information on the subcommittee's work will be available by the end of the fall semester. All comments and questions can be directed to me as the subcommittee chair. ◼

Jeffrey S. Ravel is an Associate Professor of History (*ravel@mit.edu*).

New Course Catalog for 2009-2010

TO HELP REDUCE PAPER consumption at MIT, beginning this year the Reference Publications Office is changing the way it produces the MIT Course Catalog. The main change – removing MIT subject descriptions from the print catalog – will reduce its bulk by one-half and save some two million pages, or four tons of paper, each year.

A majority of catalog users should be little affected by this change. Indeed, survey results indicate that two-thirds of the MIT community currently prefer to obtain MIT subject information online. For these users, updated subject information will continue to be available via the Subject Listing and Schedule maintained by the Registrar's Office: *student.mit.edu/catalog/index.cgi*.

There are others, however – especially among the faculty and staff who advise undergraduates and facilitate student registration and enrollment – who have depended on the convenience of a paperbound volume. To meet their needs, a small print run of MIT Subject Descriptions, containing the subject information current as of July 1, 2009, is available for limited campus distribution. Faculty and staff who want a copy should first check with their departmental academic office. Copies are also available at the Reference Publications Office, and anyone on campus can pick one up at E28-100, from 9 am to 2 pm, while supplies last.

In addition, the PDF files used to produce this volume are available for download on the catalog Website (*web.mit.edu/catalog/subjects.html*). They are also available on the catalog CD.

General information on how to obtain the MIT Course Catalog is available at *web.mit.edu/referencepubs/catalog/getacopy.html*. ◼

MIT Fourth in Latest *U.S. News* Poll

MIT REMAINED FOURTH (tied with CalTech, Stanford, and the University of Pennsylvania) in the latest *U.S. News & World Report* undergraduate national universities rankings, announced in the magazine's "America's Best Colleges" issue published in late August. The Institute also maintained its place as the number one undergraduate engineering school in the country.

MIT remained second (tied with the University of California at Berkeley) to the University of Pennsylvania in the undergraduate business school category, while Harvard, Princeton, and Yale were ranked first to third, respectively, in the national universities rankings, the same as in the 2009 rankings.

Categories (and weights) used by *U.S. News* to judge colleges include:

• Peer assessment (25%)
• Faculty resources (20%)
• Graduation and retention rate (20%)
• Student selectivity (15%)
• Financial resources (10%)
• Alumni giving (5%)
• Graduation rate performance (5%)

U.S. News also rated individual engineering and business departments. [Note that not all programs are rated each year.] Several of the Institute's programs in these areas were ranked in the top five. They are:

Engineering
• Aerospace/Aeronautical/ Astronomical (1st)
• Biomedical/Biomedical Engineering (5th)
• Chemical Engineering (1st)
• Civil Engineering (5th) [tied with Purdue]
• Computer Engineering (1st)
• Electrical/Electronic/ Communications (1st)
• Materials (1st)
• Mechanical Engineering (1st)

Business
• Entrepreneurship (5th) [tied with Indiana University]
• Finance (5th)
• Management Information Systems (1st)
• Productions/Operations Management (1st)
• Quantitative Analysis (1st)
• Supply Chain (1st)

Data was taken from the 2010 edition of the *U.S. News & World Report's* "America's Best Colleges."

See "MIT Numbers" (back page) for the top 10 rated schools. ■

letters

Balancing the Equities

To The Faculty Newsletter:

THE RECENT LETTER ON the state of the Institute from President Susan Hockfield has gotten me thinking about fairness in the sacrifice of various stakeholders as we adjust to new budget realities. Executive compensation is the topic of concern and conversation today and it is timely to take a look inside MIT.

In her letter President Hockfield mentions that about 100 employees (all non faculty) have been laid off across the Institute. For these individuals this is a big hit to their economic status and wellbeing.

Now for a thought exercise: Why were these employees let go? Answer: the MIT endowment has declined significantly. And who was responsible for this happening? Certainly the state of the economy is a main culprit, but also the managers of the endowment bear some responsibility.

This prompts a series of questions:

• Were our fund mangers exercising any independent judgment or just following the lead of other fund managers who were riding the bubble as it grew bigger and bigger?

• Given the fact that many of the holdings in the MIT portfolio are not liquid and hard to "mark to market," is it possible that the pricing of these assets was inevitably inflated? Prudence would suggest that such assets should be assessed in a very cautious way when computing the value of the endowment and when rewarding its managers.

• In view of the large bonuses that were paid to MIT's fund managers (for example, in one recent year income to the lead fund manager topped $1.5 million) can we now say in hindsight that there may have been over payment?

The most important question going forward is whether the compensation policies for the stewards of our assets are structured in a way that rewards them for true long-term appreciation and not what in the short term are only capital gains on paper.

Robert B. McKersie
Prof Emeritus
Sloan School of Management

A Realistic Way to Deal with Global Warming

William F. Schreiber

GLOBAL WARMING, CAUSED BY A ring of greenhouse gases (mainly carbon dioxide) surrounding the earth, is, according to experts working on this problem, a threat to the future ability of our planet to support human life. As such, it is the main problem facing mankind, even exceeding the economic and political issues that fill the news on TV, in the newspapers, and on the Internet every day. Thus the question is how to reduce, or at least not to increase, the quantity of such gases, hoping that the current gases will slowly dissipate into outer space.

Human societies require a growing amount of energy every day. This energy cannot continue to be obtained by the use of fossil fuels such as petroleum and coal, as their use produces the greenhouse gases. Actually, all the energy available to us is derived from sunlight; both from the sun shining every day as well as the stored fossil fuels produced by sunlight that reached Earth eons ago. That sunlight supported the growth of vegetation that eventually died and decayed, sinking underground and becoming oil, coal, and "natural" gas.

It is, however, possible to produce power from sunlight without generating greenhouse gases. One way to do this is by using the sunlight to heat water sufficiently to make steam, using the steam to pump water up behind a conveniently located dam (man-made dams with water storage facilities can be constructed virtu-

ally anywhere) and then letting the water down to drive a hydroelectric generator making electricity. With electricity, one can carry out almost any human function by the use of battery-powered cars, trucks, electrically driven trains, and buses.

Actually, all the energy available to us is derived from sunlight; both from the sun shining every day as well as the stored fossil fuels produced by sunlight that reached Earth eons ago.

There are a number of really "clean" power-generating methods, such as wind and wave power and some schemes for extracting power from deep below the Earth's surface. Nuclear power is often mentioned as well, but reactors have noxious residues and it takes power to produce nuclear fuel.

My first publication on this subject appeared in the *MIT Faculty Newsletter* in 2007 ["Is it Time for a New Manhattan Project?" Vol. XX No. 1, September/October 2007]. In that paper, I emphasized that what was needed was a complete solution to every part of the problem:

1. The foreign policy problem due to the ability of major petroleum producers to withhold supplies;

2. Global warming made visible by melting ice and rising sea levels, and the arguments of those pushing poor alternative solutions (such as ethanol, a loser from day one). It takes more energy to produce ethanol than it provides and greenhouse gases are still produced when ethanol is used.

Many other alternative solutions have been proposed, but none that is both affordable and complete. In particular, unless we can find a fuel that can be used with the same technology as petroleum is used today (but without noxious residues – clearly impossible) we shall have to rebuild our entire energy structure. While this surely will be very expensive, it is useful to take a long-term view of the problem and concentrate on the eventual operating cost.

3. Sunlight is free. If all our power was derived from sunlight, then we could literally see the light at the end of the tunnel.

The general idea is to collect sun power on giant steerable mirrors in geostationary orbit. The mirrors are inexpensively constructed as thin plastic balloons, one of the concave surfaces of which is aluminum-coated, the internal pressure adjusting the focal length. A mirror about a mile in diameter would collect about the same amount of power as a typical power plant on earth; and the technology to redirect the light to a fixed position on earth is already used in communication satellites. ■

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What Goes Around Comes Around: H1N1 and Extended Outage Planning Viewed Through the Lens of the Blizzard of '78

Susan Leite

A Week of Snow Days

"JUST AS IT WAS ABOUT TO BEGIN, the spring term was abruptly aborted Tuesday by the area's worst blizzard in almost a century….Thus students missed the first week of classes whether they liked it or not." Thus began an article in the February 10, 1978 edition of *The Tech* [Vol. 98, No. 2, p.1], one of a series that chronicled the challenges of continuity of operations across the Institute and an unwavering spirit of volunteerism during times of need, undaunted by the Blizzard of '78. A second article in that same issue spotlighted the volunteer efforts of 60 Baker House residents who aided the National Guard in reaching snowbound residents of various Cambridge neighborhoods [Vol. 98, No. 2, p. 5].

To read these and the succeeding articles – over 30 years after their initial publication – is to see the printed words as a reflecting pool of the challenges currently facing the Institute in light of heightened concerns over the predicted H1N1 flu resurgence in the coming months, the general financial pressures reaching all corners of the Institute, and the moving target of when the next catastrophic natural disaster will strike.

Yet, among these angst-ridden ripples, appear glints of the ingenuity and goodwill that emerge when the MIT Community uses its considerable human assets to fulfill a need, whether it is continuity of our own operations or providing assistance to the greater community. In the event of a major emergency the question is not whether MIT will find a way to prevail, for this Institute was founded on the concept of using Mind and Hand to prevail over the challenges impeding mankind's betterment. This driving passion also explains why the Institute never truly sleeps, never completely closes, and why any Institute emergency pre-

> As much as MIT may feel like a small city unto itself, the Institute's ties to the macrocosm of global research collaborations, external funding entities, recruiters, and the local Cambridge and Boston governments serves as a reminder that the effects of suspending campus activities do not remain neatly enclosed within our campus borders.

paredness campaign must empower departments not only to care for themselves, but potentially to care for others if need arises.

The Institute as Biological Organism

Our Institute is an ecosystem of research, educational, and residential life functions facilitated by a web of infrastructure, information, and administrative services. As much as MIT may feel like a small city unto itself, the Institute's ties to the macrocosm of global research collaborations, external funding entities, recruiters, and the local Cambridge and Boston governments serves as a reminder that the effects of suspending campus activities do not remain neatly enclosed within our campus borders. Consider how these external responses to a public health emergency or natural disaster might affect your group(s):

• The Massachusetts and/or Cambridge Department of Public Health may command the use of MIT and Harvard facilities to set up an Emergency Dispensing Site (EDS) or Influenza Specialty Care Unit (ISCU) if area hospitals and clinics reach carrying capacity;

• Faculty, staff, or students may be called upon – or may volunteer – to lend their expertise;

• MIT Community members returning from abroad may encounter difficulties resuming on-campus activities if federal or state authorities institute travel bans;

• Day care, school, and community program closures may force staff and students to adopt alternative measures to care for family members; or

• One or more buildings might experience a catastrophic failure as a secondary result of a natural disaster, or delivery of essential services may be jeopardized by an ongoing public health emergency that critically strains campus staffing levels. One's ability to circulate about campus does not guarantee that all of the customary services will be available as usual.

Death of UCLA Researcher Heightens Lab Safety Awareness

Lou DiBerardinis

THE TRAGIC ACCIDENTAL DEATH LAST WINTER of UCLA researcher Sheharbano (Sheri) Sangji after an accident in her laboratory, has prompted faculty and administration at universities across the United States to review and re-emphasize the responsibilities of faculty for researchers and students who work in their labs. On December 23, 2008, Sangji was performing a fairly common procedure with a pyrophoric material when some accidentally spilled on to her polyester sweater and ignited. Over 40% of her body was burned and she died 19 days later. A subsequent investigation by California OSHA lead to citations and fines for inadequate training, improper use of protective clothing, failure to correct safety violations noted on the October 2008 inspection performed by UCLA's EHS (Environmental Health and Safety) Office, and non-existent records of training on the specific procedure being performed. Currently criminal and civil charges are being considered against the PI for wrongful death.

Labs are extremely diverse spaces that may contain many different types of potentially hazardous materials or equipment. At MIT all personnel who work with potentially hazardous materials or equipment are required to take the appropriate safety training provided by the EHS Office in either Web form or live. Lab Specific Training, which covers unique issues for each lab, is provided by some combination of the PI, his/her lab EHS Representative, or the department, lab or center's EHS Coordinator. This is required to be given by each lab as new people arrive or whenever a new procedure, hazardous material or equipment is introduced.

The Institute's Committee on Toxic Chemicals, chaired by Professor Rick Danheiser, has and will continue to review MIT's policies with respect to chemical use and recommend changes. Policies on the selection and use of lab coats and protective eye wear have recently been revised and are now being implemented.

Faculty should do the following:

- Review the safe use of hazardous materials and/or equipment with your lab group.
- Make sure everyone in your group (including you) has completed all the required EHS training. You, your department, lab, or center's EHS Coordinator or your lab EHS Representative can access the Institute's database to determine status of training.
- Enforce the use of protective clothing and eye protection when required in your lab.

The following information may be helpful to you:

EHS Office Website: *web.mit.edu/environment/*
PI Assessment Report: *web.mit.edu/environment/training/reports.html*
List of DLC Coordinators: *web.mit.edu/environment/training/dlc_coordinators.html*
EHS Training Site: *web.mit.edu/environment/training/index.html*
What PIs Need to Do: *web.mit.edu/environment/ehs/topic/new_pi.html*
CTC members: *web.mit.edu/committees/president/Rosters/toxicchemicals.pdf*

Even if the Institute is not broadly impacted, a local event such as a burst pipe in a Core Facility has the potential to jeopardize not only the work of Institute researchers, but any of hundreds of external collaborators who send materials to these Core Facilities or otherwise use their services.

A critical thinker might question the likelihood or duration of any of these community-wide impacts. In January 1978, then-Governor Michael Dukakis declared a state of emergency and travel ban that spanned several days from the initial storm on January 20. From this challenge rose positive accounts of the dedicated Facilities workers who, along with student volunteers, maintained delivery of essential services and snow removal, and how Dining Services and students enabled the MacGregor House Dining Hall to operate without disruption. From this challenge too rose physical losses as the J.B. Carr Indoor Tennis Facility, or the "Tennis Bubble," experienced a catastrophic roof collapse at a cost exceeding $60,000 – in 1978 dollars – and a building outage that lasted several months [*The Tech*, Vol. 97, No. 63, p. 1].

A critical thinker may also question the anecdotes presented here from *The Tech*, MIT's student-run newspaper. While it may not represent all of the myriad student views across MIT, as a publication in press since 1881, *The Tech* has been chronicler, from a student account, of the events that have shaped the Institute's history. On a day-to-day basis, how many of us stop to consider that students comprise at least 50% of the campus population? To view the Institute as a biological organism is to see the students as its lifeblood. They are the current and future graduate students, faculty members, employees, donors, entrepreneurs, collaborators, and joint patent-holders with MIT. The faculty at MIT attracts the students, the potential for boundless learning and innovation keeps students here, and the students' desire to give back to the Institute results in a remarkable web of

intellectual recycling and reinvention. They may not be conscious of it, but our students are an integral and permanent part of the MIT ecosystem. Our policies and plans – including those for continuity of operations – affect them as much as us in concrete and abstract terms.

The Janus Irony

Roman mythology depicts Janus, the ruler of time and transitions, as having two heads facing in opposite directions. Janus governed physical and temporal passages, and is the namesake of January, that transition from the old year to the new. How ironic that MIT's own transition between semesters – January IAP – was marked by the worst snowstorm in nearly a century, and delayed the start of the spring '78 semester. When, in this issue [p. 4], Professor Thomas Kochan writes of the cooperation necessary to address class suspension and make-up policies in light of a major Institute emergency, his statement evokes the February 14, 1978 front-page headline of *The Tech*: "Faculty May Cancel 4-day Breaks" [Vol. 98, No. 3, p. 1]. That article reported on the four spring term days lost to the Blizzard. Then-Chancellor

Paul Gray '54 was to meet with Chair of the MIT Faculty Robert Hulsizer, Dean for Student Affairs Carola Eisenberg and Provost Walter Eisenblith on February 15, 1978 to discuss a menu of options that included using the Washington's Birthday and Patriot's Day holidays; Saturdays; Spring Break; or extending the term. How uncanny that the same continuity of operations questions that arise now in the context of H1N1 resurgence surfaced then. The students wrote about it.

Over 30 years later, the specter of recovering lost teaching and research time remains a critical concern. Modern technology may aid MIT's plan to prevail, but technology does not obviate the need for the human factor of clear and responsive policy-making. How will the policies developed in the coming months affect the Institute in three decades? The emergency preparedness and resilience planning measures taken at the department level may feel local or temporary, but they have ripple effects spanning geography and time, for which words and numbers fail.

Recent *Faculty Newsletter* articles featured two MIT building outages as focal

points for continuity of operations questions for academic, research and administrative departments to consider. When sizing up the true impact on MIT of the Blizzard of '78, the February 14, 1978 article concluded: "Gray commented that the time lost to research efforts considerably outweighs the out-of-pocket expenses associated with physical plant." Take a look around your office, laboratory, or work area. If you were to lose your materials today, what is the one thing that you would find most irreplaceable and that places your research and/or education program most at risk? The past informs us that such a scenario exists. As we enter the gates of a new academic year and prepare to meet its challenges, perhaps a fitting resolution might be to reflect on what is most precious to our contributions to MIT as individuals and groups, seek ways to build resilience in those efforts, and prevail in a way that is sustainable for the MIT organism and its interconnected parts. ■

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Communicating Across the Curriculum
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to write effective peer-review comments on topics such as "The Recovery of By-Products of the Blast Furnace." Between the two World Wars, writing instruction became focused in the Humanities. In the early 1950s, however, Prof. Robert R. Rathbone began collaborating with Engineering faculty, including Prof. Jay W. Forrester, director of the newly created Digital Computer Laboratory, and faculty in Mechanical Engineering, to offer both lectures on technical communication and feedback on student technical reports. These informal arrangements soon evolved into the Undergraduate Technical Writing Cooperative (the Writing Coop), which, for the next 40 years, integrated writing and speaking into science and engineering

classes. After Rathbone's retirement, Prof. James G. Paradis, currently Head of the Program in Writing and Humanistic Studies, led the Coop, followed by Prof. Rosalind H. Williams, who later became Dean for Undergraduate Education, and finally by Dr. Edward C. Barrett.

In the 1990s, the Institute came to realize that its graduates needed more instruction and practice in writing and speaking if they were going to be successful as scientists, engineers, and entrepreneurs in the twenty-first century. Following pilot projects developed by the Communication Initiative and a grant from the National Science Foundation, the MIT faculty established the Communication Requirement to meet this need. The Writing Across the Curriculum (WAC) Group in the Program in Writing and Humanistic Studies assists faculty in incorporating

instruction and practice in writing, speaking, and visual communication throughout the undergraduate curriculum. (Although our title is "Writing Across the Curriculum" the WAC group teaches various forms of communication, including oral and digital communication. To avoid confusion, I am going to refer to the instructors not as WAC Lecturers but as Communication-Intensive (CI) Lecturers. Lecturers in CI-H classes, however, are called Writing Advisors.)

The way writing and speaking are taught differ considerably among successful classes. The examples here are representative of some basic principles and strategies that are shared by many of the successful collaborations at MIT, and evolved out of the 50-year-old Writing Coop:

- **The communication activities, whether writing or speaking, are integral to the purpose of the class rather than being just add-on exercises.** Except for some creative writing and other creative media, communication in the world is always doing something. The most effective way to teach writing and speaking is by teaching these skills as components in activities that students value.

- **Writing and speaking activities in themselves are modes of learning.** We all have experienced that we understand something better when we have to explain it or communicate it to someone else. Developing a well-organized, effective written or oral argument in any field, be it literary analysis or nuclear engineering, provides the student with a deeper, or at least different, understanding of the subject matter.

- **Writing or speaking activities or both are sequential and should occur in more than one place in the term.** Effective writing and speaking are skills that are developed through multiple experiences, each one building upon earlier ones.

- **The feedback given by the technical and writing staff complement each other and will help students improve and succeed in the class.** Confusing or disorganized writing is often connected to confusing or disorganized thinking. Improving one often leads to quick improvement of the other. There are many cases in which garbled syntax unravels into clear, effective sentences once a student understands completely what he or she is trying to communicate.

- **Effective communication is judged by the specific context, course goals, and conventions of the discipline.** The Writing Coop taught us long ago that one size or approach does not fit all. CI lecturers evaluate writing and speaking,

from sentence level issues to slide design, as communication within a specific community that has its own norms for effective discourse.

- **CI lecturers and the disciplinary faculty collaborate closely.** The collaborative roles, however, are quite different. The faculty determine the class goals and the overall metrics for successful writing and speaking. The CI Lecturers are enablers in the positive sense of the term. Our job is to help students meet these class goals and succeed.

Every year, disciplinary faculty and CI lecturers develop innovative ways to integrate writing and speaking into classes in engineering, science, business, the arts, the social sciences, and the humanities. Sometimes the technology enables the innovation.

Every year, disciplinary faculty and CI lecturers develop innovative ways to integrate writing and speaking into classes in engineering, science, business, the arts, the social sciences, and the humanities. Sometimes technology enables the innovation. Over one hundred years ago, Valentine had students write comments on the margins of each other's technical reports. Now we are able to have instructors and fellow students insert voice-overs and written comments into videos. But the most substantive innovations usually come from the faculty in the discipline. They extend their enthusiasm in teaching their subjects to making the communication activities in them more authentic in terms of the disciplinary activity or culture. Each year some faculty make the writing and speaking activities in their class more real science, more real engineering, more real scholarship.

Following are some examples of that work.

21L.004 "Reading Poetry"
Professor Mary Fuller
and Ms. Nora Jackson

[Note: There are several sections of 21L.004 and the specific details of this description apply only to Prof. Fuller's section, although all of the sections effectively integrate writing and speaking.]

This subject aims to help students make writing an efficient medium for developing and conveying ideas. The class therefore guides students through the individual stages of the writing process (reading and analyzing, discussing ideas, drafting, receiving feedback, revising). The students begin this process by choosing poems to present in groups and they attend an oral presentation workshop with the writing advisor to discuss the analysis of the poems and practice rhetorical skills (voice projection, debate skills, inciting audience participation with thought-provoking questions, and communicating the pleasure of reading poetry). The professor and classmates provide extensive written feedback on the presentation.

The presenters are subsequently invited to write an essay on the subject of their presentation, and benefit from their preliminary work and the feedback received. Students submit drafts to the advisor before the writing tutorial, which is devoted to refining argument, testing the validity of evidence, and fine-tuning style. The advisor raises counter-arguments and annotates paragraphs to strengthen the student's propositions and prose.

The professor provides commentary on each essay, and organizes a writing

workshop in which she offers a sample essay that illustrates the various stages of revision. The students can then once again discuss their revisions with the professor or advisor.

This trajectory mimics an ideal sequence for the composition of effective writing. While the various stages of writing are initially neatly separated, the class evolves toward giving the students the responsibility for incorporating these phases into their own writing routine.

2.009 "Product Engineering Processes"
Professor David Wallace, Ms. Jane Abbot Connor, and Ms. Jane Kokernak

As its name suggests, this subject guides MechE seniors through the design and engineering of an innovative product. From idea generation to modeling, research, testing and prototyping, teams of 15 to 19 students work on original products in a process including lectures, labs, industry mentoring, extensive fabrication, and intense collaboration.

Informal communication among team members, an elected system integrator, instructors, and course staff is vital to the process, as are five formal presentations given during the semester in sync with the design cycle. CI lecturers, who attend weekly labs as fully integrated team advisors, coach interpersonal communications, guide meetings, and help students draft, revise, visualize, rehearse, video, and review each presentation.

Two very different events bookend the semester. For the first, called "Three Ideas," each team divides in half, brainstorms potential products, develops three ideas, and pitches them concisely to their peers, mentors, and instructors. Each idea is illustrated by a poster with a simple sketch and key features. The event generates substantial oral and written feedback from CI and course staff, prompting teams to select ideas and focus wisely.

Ten productive weeks later, at their Final Presentations, teams introduce their high-quality, functioning alpha prototypes to the 2.009 core audience and 100

to 150 industry guests. Working intimately with their CI lecturers and technical staff, teams devise staging, props, even video and team-colored costumes. The stakes are high: teams invest these presentations with as much wit, commitment, and polish as they brought to their product's design and engineering.

The MechE faculty and CI team have collaborated on the communication focus, going beyond public speaking to train students in intra-group interaction as well. Over the semester, while presentation skills go from earnest to professional, team communications – in meetings, among individuals, via e-mail – shift from chaotic towards disciplined, deft, and effective.

7.18 "Topics in Experimental Biology"
Professor Mary-Lou Pardue and Dr. Karen Pepper

This subject teaches scientific communication to students doing biological research in various laboratories at MIT, usually as UROPs. Students meet as a group twice weekly with a biology professor and a CI lecturer. Each section of 7.18 includes students from diverse research laboratories so that students learn to communicate with scientists in many subfields. Before taking 7.18, students spend one semester or a summer working on their projects and continue to do their research during the semester of the course. Communications exercises, capped by a scientific paper (consisting of Abstract, Introduction, Materials and Methods, Results, Discussion), build around their laboratory projects.

Students first write a mini-review and annotated bibliography, putting their research project into the context of the field. As the semester continues, they submit drafts of sections of a research paper. Instruction is given for each section before the draft is due, and then drafts are critiqued by both instructors. Students revise for clarity, precision, and style. Students give oral presentations about their research. Receiving comments from

the instructors and fellow students helps them to improve as the semester goes along. Journal articles are critiqued both in writing and in class discussion, for scientific content, illustrations, and effectiveness. Aspects of publishing, writing for a non-scientific audience, and the ethics of laboratory practice are also discussed. Finally, students serve as editors of each other's papers, learning how peer review works in scientific publishing.

8.13 "Experimental Physics"
Prof. Joseph Formaggio and Ms. Atissa Banuazizi

8.13, the first semester of Junior Lab, is perhaps the most challenging course in the MIT Physics suite. At the core of Junior Lab is a set of experiments that replicate the major laboratory breakthroughs of the late nineteenth and twentieth centuries. Through these, students develop their ability to pose questions within proper theoretical frameworks, and to collect, analyze, and interpret data.

Equally important, however, is learning to communicate these ideas in ways appropriate to the discipline. For each experiment, students produce a four-page paper in the format of – and meeting publication standards for – Physical Review Letters. They also prepare twelve-minute oral presentations in the style of an American Physics Society talk, which they deliver to their laboratory instructor and TA.

After the first (ungraded) set of orals, each student meets one-on-one with the CI lecturer to analyze a video of his or her presentation. Together, the student and the lecturer also dissect the organization and design of the slides for the talk. The orals for the remaining four experiments are likewise videotaped, allowing students to track their own progress as they hone their skills.

The semester culminates with the public oral. Students each choose one experiment to present for a second time – this time in a celebratory end-of semester symposium, whose audience comprises

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faculty, fellow students, and assorted guests (from Junior Lab alumni to parents!). In preparation, the student and CI Lecturer meet again to examine that presentation's video and slides, with an eye towards revising the talk for a larger audience.

The ability to share one's discoveries with the broader scientific community is a critical skill, but one that often eludes even the most experienced scholars. Students emerge from this class confident in their ability to participate in professional discourse settings. The intensive practice MIT Physics students receive in writing and speaking is truly exceptional, and often the envy of our peer institutions.

8.287J-12.410J "Observational Techniques of Optical Astronomy" Professor Jim Elliot and Ms. Jane Abbot Connor

This subject, focused on independent student projects, presents the communication skills necessary for successful astronomical research. Astronomers compete for resources; peer-judged proposals for grants and telescope time have a 20 - 35% success rate. Furthermore, securing a desirable job presupposes the ability to present interesting seminars. Thus, effective communication can be as important to professional success as are technical abilities.

The course's first assignment is a brief proposal requesting telescope time; it states a project's goal, data required, and a plan for data acquisition and analysis. The CI lecturer gives significant feedback on the writing; course staff provide content feedback on the project's feasibility. The proposal is then revised accordingly. Next, an oral presentation of the proposal is delivered to the class, TAs and faculty; it receives extensive CI feedback, and requires students to sharpen and develop their ideas. These assignments, graded

entirely as communications efforts, provide a baseline for each student's work. Using the proposal revisions, the CI lecturer assesses each student's challenges.

Individual CI consultations cover grammar or ESL issues (with encouragement to use the Writing Center); organization and argumentation; coherence within and between paragraphs; graphics; conventions of formatting; and clarity of the required content. Students learn to think about their intended audience, and to craft their document to convey their ideas to that audience, accurately and efficiently. Questions that guide the consultation include: Will this piece of writing persuade your readers to entrust you with

the scarce resource of telescope time that you seek? Will they understand your needs quickly and effortlessly? Is the care taken in your writing predictive of that in your research? Does your writing demonstrate that you are competent and prepared? Are you – through content, language, and format – presenting yourself as a professional, establishing your credibility as a scientist, so that your audience can sense you would use the telescope time well?

The final assignment for 12.410, given both astronomy and communication grades, is a 15- to 20-page Project Report with a required revision. This report is built in stages beginning with anticipated Figures, Tables, and Outline. Graphics – clear, effective figures and tables – are emphasized. Students revise, based on feedback from technical and CI staff, and may choose to give a final presentation. The final revision is judged on

writing criteria established in the rounds of proposal writing, and on the quality and depth of scientific and technical thinking.

16.621 and 16. 622 "Experimental Projects I & II" Professor Edward Greitzer and Ms. Jennifer Craig

In these two classes, or as it is commonly known, ".62x," teams of two students select their own projects from a broad list of projects proposed by faculty and work with a faculty or staff advisor. They refine an hypothesis and then design, construct, and carry out an experiment.

Working with a communication instructor, student teams report their progress through the two semesters in a sequence of written documents and oral presentations that are less like conventional homework and more the kinds of communication in which professional engineers engage.

The small team size offers opportunity for close contact among students, faculty, and staff. The aim is to ensure that students are engaged with an advisor and a project about which they are enthusiastic.

Excellence in written and oral communication is an overarching theme. The communication-intensive curriculum is an Institute-wide mandate, and 16.621 and 16.622 are two of Course 16's communication-intensive subjects. Working with a CI lecturer, student teams report their progress through the two semesters in a sequence of written documents and oral presentations that are less like conventional homework and more the kinds of communication in which professional engineers engage. Thus, students learn about audience and persuasion, information organization, informational graphics and data presentation, and how to describe complex engineering decisions.

Written and oral communication are approached in similar ways. First, with the consultation of engineering faculty, assignments are designed around authentic activities taking place in the course. Students receive instruction just as they are about to write or to prepare a presentation. Written communication requires a draft and usually a conference with the CI lecturer after which the final draft is turned in for a grade. Oral presentations require a rehearsal with the CI lecturer before the student team presents to the engineering faculty and their peers. Engineering faculty work with the communication instructor to compose the rubric with which written and oral communication is assessed. Moreover, students receive not only a grade but also written and oral feedback from their engineering faculty as well as from the CI lecturer. The combination of mentoring from their engineering faculty and support and instruction from the communication instructor usually results in a sharp increase in skill level. Students also receive several opportunities to practice during the semester – a key factor in communication excellence.

Teams from 16.62x often present at student divisions at conferences, and their success rate is high. Over the past six years, our students at the AIAA and ASEE regional student conferences have won first place undergraduate awards in 2005, 2003, 2002, and 2001, as well as second or third place in 2002 and 2000.

24.06 "Bioethics"
Professor Caspar Hare, Professor David Jones, and Mr. Thomas Delaney

Bioethics (24.06) is a subject that provides students with a platform for improving their writing, no matter on what level their current skills may lie. Team taught by a historian and a philosopher, the class requires students to make and critique historical and philosophical arguments. Students often need to shed old writing habits, such as padding an argument with superfluous material. Instead, they need to learn how to reconstruct an argument in a succinct fashion by focusing on its essential elements. Their task then is to identify one or more of those elements as weak or strong, providing evidence to make their case.

The writing advisor works from drafts to help individuals make their words and syntax map the argument as closely as possible, applying philosophical concepts such as validity, soundness, and persuasiveness. In historical argument, a student must use the historical and cultural evolution of a bioethical issue to shed light on present stances. One technique that helps students is an initial conversation that focuses on understanding of the material and the nature of argument. The writing advisor then aids the writer in producing a conceptual outline, each point of which can be developed into a paragraph that makes an assertion or provides supporting evidence. ■

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Tech Talk Ceases Publication: MIT News Office Launches New Website

Jason Pontin

ON SEPTEMBER 16, MIT'S News Office published the final issue of *Tech Talk*. On September 15, a new daily Website was launched, MIT News.

The closing of any publication will sadden some of its readers. But we believe we can better inform our community using Web, video, mobile, and social technologies, and that those media will allow us to do entirely new things, as well.

Those who visit MIT News at *web.mit.edu/newsoffice/* will see a site that fulfills the old mission of *Tech Talk*: to bring together the MIT community with news of life on campus. But they will also see a site that will invite readers outside of MIT to better understand the Institute. Every day, readers inside and outside MIT will find three news stories about the Institute's research, innovations, and teaching, written by the News Office to appeal to the widest audience interested in science and technology. This approach – in which a university speaks directly to the public – will be an innovation unique to MIT.

To the immediate right of the day's top stories will be a video, "Sixty Seconds at MIT," that will bring out the life of the Institute in small, daily doses. Beneath the top stories and the daily video will be "Institute Announcements" from the administration. Beneath these elements is "Around Campus," which focuses on the MIT community directly. "Of Note" will spotlight an event or activity on campus that deserves promotion. To the immediate right is "Campus News," where selected faculty, staff, and students can submit news that will be edited, then posted, by the News Office staff. Another part of "Around Campus" will be a daily link to an MIT Website that we find curious, elegant, or new. Finally, MIT News will highlight the Institute's shared calendar.

We recognize that not everyone within our community will want a purely electronic publication. To address that concern, we will soon begin publishing a weekly e-mail newsletter that users can easily print.

All new Websites are (or should be) beta software. Their launches are collaborations, their development iterative. Please write to me with any suggestions or comments. ■

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UPOP Positions Students for Professional Success

Susann Luperfoy

ACCORDING TO THE NATIONAL Association of Colleges and Employers (NACE), just 19.7 percent of 2009 graduates who applied for a job had procured one by May [*www.naceweb.org/press/display.asp?year=&prid=301*]. Even graduates of leading schools like MIT faced stiff competition for scarce openings. More than ever before, experience – in the form of internships – can be the determining factor in employment decisions.

MIT's Undergraduate Practice Opportunities Program (UPOP) gives students hands-on experience to complement their MIT education. Classroom instruction and exposure to research with MIT faculty (UROPs) give students the grounding in engineering science they need to function at the highest echelons in industry, academia, and the public sector. Students graduate with unsurpassed technical knowledge, analytic skills, and the ability to teach themselves. But MIT graduates are often oblivious to the unwritten rules of organizations and get left to execute engineering decisions made by their less technical colleagues. UPOP creates in students an awareness of the "invisible forces" that exist in the world of work; UPOP faculty, staff, and industry professionals introduce them to the tools, techniques, and mentoring relationships they need to get started on mastering those forces.

UPOP is a full-year co-curricular program (open to all Institute sophomores) with an emphasis on two educational tracks: engineering effectiveness, and career ownership. Hands-on exercises in engineering specification, project management, teamwork, and communication expose students to key success factors for applied work. Coached practice in professional networking (versus "schmoozing"), principled negotiation (versus "winning"), empathy (versus "manipulation") and reputation-building all help students take active control of their prospective careers two years before they graduate.

UPOP also serves as the sophomore year of the Bernard M. Gordon-MIT Engineering Leadership Program. [See article by E. Crawley in the *MIT Faculty Newsletter*, Vol. XXI No. 4.] Students who complete the UPOP foundational year become eligible to continue in the Engineering Leadership Practice Opportunities Program (ELPOP) or the Gordon Engineering Leadership (GEL) program in their junior and senior years. Beginning with UPOP, the Gordon program provides a progressively challenging sequence of leadership experiences that position students for success in the job market and a career in engineering leadership.

Summer Internships: A Gateway to Employment

On-campus recruiting is the most common method of finding full-time employment at graduation. With the advent of the recession in AY 2007-08, MIT on-campus recruiting dropped by 26 percent, making internships an even more important method of finding work for MIT bachelor's degree recipients [*web.mit.edu/career/www/infostats/graduation08.pdf: 1, 4*]. According to the NACE study, over 75 percent of employers prefer to hire new college graduates who have relevant work experience, and nearly 20 percent of employers prefer any type of work experience to none at all [*www.naceweb.org/press/display.asp?year=&prid=295*]. Internship experience gives students a competitive edge in the job market and provides employers with early access to top talent. For many employers, summer interns comprise a primary pool from which to recruit full-time staff. In fact, employers surveyed by NACE reported that more than one-third of the new college graduates they hired in 2008 came from their internship programs[*www.naceweb.org/www.naceweb.org/press/display.asp?year=2009&prid=298*]. So the more on-campus recruiting declines, the more internships serve as the gateway to full-time jobs.

While UPOP is not a placement service and does not guarantee internships, the commitment to the student is "We won't give up on you until you give up yourself." In a typical year, 85 percent of UPOP sophomores find real hands-on work in a market that seeks only juniors and graduate students. Beyond matching sophomores to internships, UPOP instills students with job acquisition and performance skills and a career-focused outlook that will serve them over the course of their careers. They learn how to identify (or create) opportunities, obtain the offer, negotiate terms, and perform with excellence on the job.

The UPOP Community

After recruiting and internships, networking was the third most common vehicle for MIT undergraduates landing full-time employment. UPOP sophomores learn tools and techniques for networking, and

practice them by making personal connections with engineering leaders who participate in UPOP. This requires a strong community of seasoned professionals, mostly MIT graduates, who mentor, coach, and employ students. During IAP, students (in teams of 7-9) spend one week with an assigned mentor-instructor as part of an intensive engineering effectiveness workshop. The workshop is taught by MIT faculty and facilitated by the mentor-instructors who come from a variety of engineering disciplines and devote nine full days to the program. Many remain in contact with their students throughout the spring semester – and often long afterwards. Students benefit from the contact with professionals, and mentor-instructors enjoy re-connecting with the Institute. "It was invigorating to mentor and learn from the UPOP students," said Rick Stadterman '75, Head of Global R&D for Bayer Healthcare Diabetes Care. Steve Webster '78, the VP for Research and Technology Commercialization at 3M, has volunteered twice. "Since so much of my success and opportunities have been because of MIT, [participating in the IAP Workshop] seemed like a great way to give back."

Success on the Job

UPOP's emphasis on communication and teamwork resonates with employers. Angie Kelic PhD '05, who served as a mentor-instructor in 2008 and 2009, says the program "gives students the perspective that problems are not always just technical, which is something you don't always get in school. UPOP shows them that issues can be about communication .… Students need to understand that and be exposed to it." The data support Kelic's claim. According to NACE's Job Outlook 2009, communication skills, strong work ethic, ability to work in a team, and initiative are among the qualities employers value most [*www.naceweb.org/press/ display.asp?year=&prid=295*].

According to surveyed employers, UPOP students significantly out-perform their non-UPOP peers when functioning on multi-disciplinary teams and in making oral presentations [Charles

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In AY 2008-09, more than 300 students from across the Institute enrolled in UPOP. The yearlong program is delivered in five phases including academic training, hands-on practice, personalized coaching, and several networking opportunities.

• **A fall semester program of workshops and individual coaching** in which students learn to author an effective résumé, excel in a job interview, and establish the foundation of their professional network by meeting alums and engineering experts. Students complete a self analysis of problem solving styles and meet a panel of MIT alums.

• **A one-week intensive course of experiential learning over IAP** in which students receive instruction and coaching from MIT faculty (SoE, Sloan, and ESD) and a team of industry professionals who serve as Mentor-Instructors. The course is offered twice each January. Topics include: project engineering, specification, leadership, networking, conflict resolution, and effective presentation of technical arguments.

• **A spring semester program of workshops and individual coaching** in the job-search process. Includes finding and creating job openings, professional etiquette, and individual help in securing a summer internship assignment suited to their needs and aspirations.

• **A 10- to 12-week summer practicum** in which students apply their technical and interpersonal skills in real-world settings. During the internship, each student submits three entries to an electronic journal, conducts an interview of one engineering leader, and many host a site visit by UPOP staff. Meeting with the students, their supervisors, and HR representatives helps program staff to ensure a positive outcome for student and employer and strengthens the relationship for future students.

• **A reflective learning experience** upon return to campus the next fall. UPOP juniors attend a reflection event where they report on their summer experience to each other and to a team of industry mentors. They complete a coaching conference with UPOP staff to chart a course for the next year including the option of continuing in one of two tracks in the Gordon program: Gordon Engineering Leadership (GEL) or Engineering Leadership Practice Opportunities Program (ELPOP).

Leiserson, Barbara Masi, Chris Resto, and Dick K.P.Yue: "Development of engineering professional abilities in a co-curricular program for engineering sophomores." Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition.] Additional program evaluation data show a statistically significant advantage for UPOP students in the following areas:

• Asking for more challenging assignments
• Managing and organizing workload
• Addressing personal conflicts
• Addressing team conflicts
• Tailoring presentations to fit audience interests
• Appreciating the role of ethics in engineering

UPOP Welcomes All Students

All MIT sophomores are eligible for the instruction, coaching and summer practicum offered by UPOP. UPOP

requirements are compatible with MISTI, departmental internship programs, UROP assignments and most IAP offerings. UPOP's "open door policy" means that students are welcome in the office anytime: no appointment is necessary for résumé review, interview coaching, and negotiation support throughout the internship search and beyond. Juniors, seniors, and graduate students who have completed the program are welcome and frequently do return to the UPOP office for continued support.

UPOP is a strong program with a vast and enthusiastic community of faculty, staff, and volunteer supporters. New members are always welcome as are suggestions for improving the curriculum design or program operations to better serve student and department needs. ■

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M.I.T. Numbers
Undergraduate College Rankings
from *U.S. News & World Report* "America's Best Colleges" 2010

Year

	Harvard	Princeton	Yale	CalTech	MIT
	Stanford	UPenn	Columbia	Duke	Dartmouth