



MIT Faculty Newsletter

<http://web.mit.edu/fnl>

in this issue we offer "Should MIT Increase the Size of the Faculty?" by Provost Reif and Chancellor Clay (p. 8); "Avoiding a Rush to Judgement: Implications of the Star Simpson Affair" by Professors Winston and Manning (p. 10); an update on the MIT Energy Initiative (p. 12); and "A White Paper on How MIT Should Think About Institutional International Exchanges," by Dean for Undergraduate Education Dan Hastings (p. 18).

A Beacon Beyond Our Borders

Susan Hockfield

JUST 10 MEN COMPRISED THE FIRST FACULTY after MIT's founding in 1861. With a handful of students in rented space these professors built the foundations of the great academic enterprise we enjoy today. In 2007, with almost 1,000 faculty members across our five schools, more than 10,000 students, an annual budget of over \$2 billion, and a campus of more than 168 acres, framing MIT's goals is a significantly more complex task. However, while the magnitude and number of MIT's activities have increased since our founding, our core mission remains little changed. And, like our predecessors of almost 150 years ago, we share the knowledge that our work together will reach far into the distant future of MIT and the world.

The Institute's most important work lies in inventing the future of research and education, expanding the frontiers of human knowledge and educating our students along those frontiers, and ensuring that our work serves the nation and the world. Threading through each of these tasks is the need to prepare our students to address these challenges as leaders in their careers and communities. MIT's faculty is the most important steward of our tradition of service and excellence, and I welcome this forum as part of our ongoing dialogue about how to preserve and promote the very highest level of scholarship and teaching.

Setting aspirations high: "The sky's the limit"

I articulated some progress and important achievements in the October State of the Institute address, and I will highlight a few of them here as well.

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Editorial M.I.T.'s Most Valuable Assets

RECENT FACULTY DISCUSSIONS

have focused on MIT's roles and responsibilities regarding major global problems. The President's state of the Institute report in this newsletter, "A Beacon Beyond Our Borders," describes the new initiatives surrounding energy and the confluence of the life sciences and engineering, as well as the expansion of international relations. The update on the MIT Energy Initiative by Ernie Moniz and Robert Armstrong provides important details. Dean for Undergraduate Education Dan Hastings summarizes new features and programs in our undergraduate education, emerging from two years of faculty discussion, which will enhance student appreciation of these global problems.

Issues such as climate change, sustainable energy sources and economic devel-

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Photo credit: Page 1, terrapass.com

M.I.T.'s Most Valuable Assets

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opment, eradication of disease and provision of a modern health care delivery system, as well as the decay of our national infrastructure system, cannot be successfully addressed incrementally. Small steps will not be adequate to cope with the consequences of past neglect. We need bold, imaginative, long-range solutions.

Fully mobilizing MIT's research activities in areas of global concern will certainly require new financial resources. However, MIT has an additional untapped major resource that needs to be fully utilized in developing out-of-the-box solutions: It is the talent, curiosity, and willingness to be bold when motivated that is innate within our student body. This scientific and technological creativity together with the willingness to explore new frontiers needs to be fostered and encouraged. The student Energy

Fellows and Campus Energy Task Force initiatives are good examples of fostering student engagement with sustainable energy sources. The recent efforts to join forces by the Center for Global Change Science and the Earth Science Initiative should open up new opportunities with respect to global environmental issues.

The faculty has an obligation to our students to provide the focus and support students will need in tackling these global problems. *Silent Spring*, published in 1962, mobilized global concern over chemicals in our environment. The work of two dedicated chemists made us aware of the hole in the ozone, resulting in a major global accord on eliminating CFCs. The UN Global Climate group, together with the book and movie "An Inconvenient Truth," have broadened world consciousness to the serious threat of global climate change, and the dangerous consequences to us all of benign neglect on the part of governments, cor-

porations, and societies. These were the works of excellent minds with a great deal of curiosity and a determination to protect the well being of humanity.

MIT is blessed to have thousands of penetrating young minds among us. We need to mobilize their energies, provide intellectual context and guidance, and support their innate enthusiasm for tackling serious problems. The financial support provided by external sponsors is a measure of their trust in MIT's ability to tackle these critical issues in creative and imaginative ways. Although we welcome such support, MIT needs to step forward in the utilization of its own resources to provide independent support for student/faculty initiatives addressing pressing issues. With respect to the many problems beyond sustainable energy, we do not need to wait until additional financial resources are in place to address them. Our key task is to rally the troops. ■

Editorial Sub-Committee

A Call for Nominations

THE FACULTY NEWSLETTER IS now accepting nominations for candidates to serve on the *Newsletter* Editorial Board. All current faculty members or professors emeriti are eligible to serve.

Reflecting last spring's change in the *Policies and Procedures of the MIT Faculty Newsletter*, all Editorial Board members will now be directly elected by the faculty.

The Nominations Committee for the *Newsletter* (Alice Amsden, John Belcher, Fred Moavenzadeh, Ron Prinn) will review all nominations and recommend candidates, in anticipation of faculty-wide, electronically based elections to be held in early spring.

Nominees will be asked to give evidence of commitment to the integrity and independence of the faculty, and to the

role of the *Faculty Newsletter* as an important faculty voice.

Please forward all nominations to: fnl@mit.edu, and include Institute information (department, address, etc.) for both the nominee and the nominating faculty member, as well as a brief explanation of the qualifications of the nominee to serve on the Board. ■

From The Faculty Chair Disagreements and Community Building

Bish Sanyal

WHEN I BECAME THE Chair of the Faculty in June 2007, I was aware that MIT needed to forge a new consensus – a new “social contract” among the faculty, administration, staff, and students – regarding what we could expect of one another, and what each of us are willing to contribute towards strengthening the MIT community. It is not that MIT is the only academic institution struggling to manage internal disputes. The intensity of the disputes – be they regarding the fairness of the tenuring process, hiring of underrepresented faculty, or restructuring of the academic administration – is apparent at universities across the board, as should be evident to anyone familiar with the *Chronicle of Higher Education*.

Nevertheless, at MIT these general trends have taken a particular trajectory, creating a level of disagreement and distrust which I had not witnessed since I joined the MIT community in 1984. This posed a clear but difficult challenge for the incoming faculty officers: that we had to help reestablish a sense of trust and collegiality that is essential for academic institutions, particularly for a research university such as MIT, which serves as a model for other universities both at home and abroad.

How is trust and collegiality to be reconstructed? Would open deliberations backed up by accurate information help or further deteriorate the institutional environment? The answer is not as clear as it may seem at first glance. Why so? First, if deliberative settings are used not to forge consensus but to nail one another and score points in a continuing battle, then distrusts can deepen, further delegitimizing the role of deliberative settings. Second, accurate information is necessary

but not sufficient for open deliberations. Accurate information conveyed without a sense of mutual respect and an appreciation of what holds us together, despite our differences, can shed light on issues, but may not evoke the kind of sentiment necessary for the reconstruction of trust. That is why deliberations are best conducted face to face, and not via information-heavy and somewhat impersonal e-mails. And, finally, deliberations among individuals who are unwilling to ever change their point of view can be engaging, as in a Harold Pinter play, but may not contribute to the strengthening of a learning environment, which is the central purpose of educational institutions.

As your faculty officers, we want to make our small contribution to the repair of the learning environment we know as MIT. We, in consultation with the Faculty Policy Committee (FPC), have decided to focus on one particular issue that generated much disagreement last year – namely, the transparency and fairness of the tenure process, including the way grievances should be dealt with. This is not a straight forward and one-dimensional issue, as you well know; there are multiple and interconnected concerns, ranging from how standards are set, to the role of mentoring, to ways of respecting the confidentiality of reviewers – just to highlight three aspects of a very complicated process. We hope our effort is not yet another search for the “Holy Grail.”

Our first task is to better understand the processes in place in different Schools and departments. We are starting with an assumption long known among organizational theorists [my late colleague Donald Schon first introduced me to this concep-

tualization]: That most organizational actions can be best explained by two types of “theories:” “Espoused Theories” of how organizations claim they operate; and “Theories In Use,” which is what organizations actually do in the face of organizational constraints. This difference between “Espoused Theories” and “Theories In Use” cannot be dismissed as hypocrisy; both serve vital roles in inspiring organizational performance, but their differences must be appreciated if the goal is organizational learning that is necessary for enhancing organizational performance.

Towards that end, the FPC had a first informational meeting with the Deans of the five Schools, and we intend to start a campus-wide process in which, we hope, you will participate in a learning mode. We want to hear from a wide section of the faculty, not just the ones with grievances, and not the ones who are already tenured, though both these groups can provide good insights about how the process works in practice. We are particularly interested to hear from junior faculty and faculty who recently received tenure.

Initially, we have to maintain a level of confidentiality as we gather information, but our ultimate goal is to facilitate open deliberations for organizational learning and, if necessary, changes in organizational practices. But, as I mentioned earlier, such deliberations require curiosity, not predetermined and unalterable views; they require patience and not finger pointing. As your faculty officers we can initiate the process, but ultimately it is you who will shape the quality of the deliberations by your willingness to engage sincerely in such a process. ■

Bish Sanyal is a Professor of Urban Planning and Faculty Chair (sanyal@mit.edu).

A Beacon Beyond Our Borders
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Without question, the primary role of the Institute's leadership is to support our faculty and students in their research and education, and the new appointments in the senior administration will further support that service (web.mit.edu/orgchart/). Since the end of the last academic year we have also had transitions in the leadership of the Schools. We cannot sufficiently thank the former deans for their great service to their Schools and the Institute; they have left their Schools in very strong positions, providing powerful momentum for their successors. At a retreat of the Academic Council this summer, it was already clear that MIT's new academic and administrative leadership approach MIT's opportunities and responsibilities with great enthusiasm, powerful intellect, and shared purpose.

Last year's financial performance also shows increasing strength, which will enable us to pursue the goals most important to us. As you know, in preparation for MIT's 150th anniversary in 2011, we launched a "Campaign for Students" last December. The Campaign's four themes will amplify funding for undergraduate financial aid, graduate fellowships, educational initiatives growing out of the report of the Task Force on the Undergraduate Educational Commons, and programmatic and capital investments in student life. (A glimpse of the campaign materials can be viewed at: thehumanfactor.mit.edu.) These themes have resonated profoundly with our alumni and friends, who have made this a record-breaking year for fundraising. Last year's total of \$332 million in cash gifts is the highest annual level in MIT's history and represents a 37% increase over the previous year. In addition, last year's 22.1% return on the endowment adds further strength to our financial position. Between fundraising and investment returns, the endowment's total assets have increased to almost \$10 billion.

The new financial foundation for MIT's future rolled out by the Provost and EVP over the course of last year will drive more of our designated funds to support their intended purposes and will liberate unrestricted funds for investment in our

often require seed funds at their genesis. We need to support our faculty's commitment to innovation in curricula and pedagogy. Implementation of the non-voted recommendations of the Task Force on the Undergraduate Educational

Our history and continued momentum of excellence in research and education have established the Institute as the destination for people who want to be at the cutting edge. However, the global and national competition for the very best talent continues to grow.

human and physical infrastructure and to embark on new directions.

The strong financial results of the last two years, together with the new financial foundation, have made the current set of capital projects possible. The new Green Center for Theoretical Physics and the improvements for the Department of Material Science and Engineering and the Spectroscopy Lab also provide contemporary infrastructure that will permit the renovation of one-quarter of the Bosworth Buildings, and establishes a model for renovation of the entire Bosworth complex. Projects currently underway will provide much needed teaching and research space for the MIT Sloan School, and, in the extension of the Media Lab, will unite programs in Architecture and Planning and will provide connections with Sloan and with the School of Humanities, Arts, and Social Sciences. This year we will complete a review of the status of our existing buildings to ensure the campus' substantial deferred maintenance burden will be addressed. We must renew our facilities to enable continued innovation.

Perhaps most important, sound financial management and ongoing fundraising allow investment in our faculty's research and teaching. Cutting-edge research projects, especially those that cross standard disciplinary boundaries,

Commons will call for investments in faculty and infrastructure. Already the Task Force's thoughtful work has encouraged teaching innovation, with several new subjects offered this fall. One of these new subjects, "How to Make a Revolution," a Communications Intensive subject that draws on the expertise of four of our History faculty, has generated enormous student enthusiasm and has energized the faculty as well.

Magnet for Talent

Recruiting the most talented individuals to our campus is the most critical element of our success. Interest among young people to study at MIT has increased markedly in the last two years, after having remained steady for several years. In each of the last two years we received 9% more applications over the previous year. In addition to a record high number of applications last year (12,445), we admitted only 12.3% of applicants, a record low rate, and 69% of those students admitted chose MIT, a record high yield.

Our history and continued momentum of excellence in research and education have established the Institute as the destination for people who want to be at the cutting edge. However, the global and national competition for the very best talent continues to grow. We need to ensure that MIT remains preeminent at

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recruiting the most promising young minds and in creating an environment where they can flourish.

We must continue to be a magnet for talent and foster success for all who join our community. The best intellect and the strongest ambition reach across race, gender, and ethnic lines. Although we have done well at recruiting a diversity of talent to MIT, we can and must do more. Last spring, following on his early committees to examine how we can improve the recruitment and retention of members of underrepresented minority groups to our faculty, Provost Reif charged a new group to set out a framework for this work. Under the leadership of Professor Paula Hammond, the Race and Diversity Initiative released a first report in July, "Initiative for Investigation of Race Matters and Underrepresented Minority Faculty at MIT," describing a plan to identify and eliminate impediments that exist for minority faculty to succeed at MIT (web.mit.edu/provost/reports/RaceInitiative07162007.pdf). An important step in this direction was the appointment of Professor Barbara Liskov and, starting in February, Professor Wesley Harris, as Associate Provosts for Faculty Equity.

Adding their efforts to the ongoing work in the Office for Minority Education under Karl Reid's leadership, and new initiatives in graduate and staff programs, we have committed ourselves to accelerating progress and ensuring that people from different backgrounds can excel at MIT.

The powerful force that brings people across departments and Schools to work together draws on the "architecture of collaboration" laid out in the Bosworth Buildings, interconnected into a single structure. The Institute's ability to bring people together cultivates an unrivaled, dynamic exchange of ideas, and with the accelerating pace and complexity of discovery, collaborations across disciplines will figure more importantly than ever in the coming years. A remarkable array of

activities demonstrates MIT's strong history and culture of leveraging collaborative partnerships in service to the world. New directions in the School of Architecture and Planning, including the Media Lab's new work in Human

over \$50 million to the Initiative. These partners include BP, Ford Motor Company, and Ormat Technology, a geothermal research company; several more partners will be announced in the coming weeks.

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Adaptability, reach into the other four Schools, and additional executive programs in the BP Projects Academy build on the already strong connections between Sloan and the School of Engineering. Our activities in energy and at the convergence of engineering with life science also have relied on work across departments and Schools.

MIT Energy Initiative

The MIT Energy Initiative (MITEI) was formally launched in the fall of 2006, following over a year of serious study by the Energy Research Council. MITEI's faculty council includes members from all five Schools, led by Director Ernie Moniz and Deputy Director Bob Armstrong. MITEI's design brings together MIT researchers with results-oriented industry partners, and government officials, to work toward a transformation of the world's energy market place with a strong focus on environmental issues. MITEI will forge collaborations between MIT researchers and the best and brightest minds from the entire energy industry continuum, from large global firms that deliver the world's energy at scale, to small companies that focus on innovative new technologies.

In recent months, MITEI has signed on several inaugural industry research partners who together have committed

Investing in next-generation ideas and researchers is a critically important principle of MITEI. Two programs within MITEI, the student Energy Fellows and the Energy Research Seed Fund, will build capacity for the more distant future. In addition to supporting research projects, MITEI's inaugural partners will fund over 100 student energy fellows over the next five years. These students, the future technologists, scientists, policy makers, and energy economists, will help work toward a future with a clean, secure, and stable supply of energy. Through the Seed Fund, MITEI's partners will also support new ideas and funding for early stage, high-risk, high reward projects. The campus-wide call for proposals for novel energy concepts with particular emphasis on encouraging proposals from junior faculty can be found at: web.mit.edu/mitei/news/seed-fund.html. [For a report on the status of the MIT Energy Initiative, see "The MIT Energy Initiative: One Year Later," on page 12 of this *Newsletter*.]

I have often described one of my roles at MIT as simply encouraging the development of gardens for the thousands of beautiful flowers that dot our campus at remarkable density. In the realm of energy and the environment, the campus puts forth a seemingly endless array of blossoms. Over 15% of the

faculty have already authored or co-authored white papers, and, with the new call for proposals to the Seed Fund, I anticipate many more will participate. During the year of the ERC's study, the student-led Energy Club hosted over 200 activities, and now almost every day they host more than one! MITEI's two task forces, on Education and on Campus Sustainability, have started their work, drawing on interest from faculty, students, and staff.

Engineering with the Life Sciences

Another area where MIT's architecture of collaboration manifests itself is the growing number of projects that bring engineering together with the life sciences. On October 9 we announced a gift of \$100 million, to support the David H. Koch Institute for Integrative Cancer Research. Under the leadership of Tyler Jacks, this new facility will provide a hub for cancer biologists to work side by side with engineers and will house core technology labs that will support work at this intersection from the broader campus community.

Earlier this year we also announced the Novartis-MIT Center for Continuous Manufacturing, a \$65 million collaboration under the leadership of Bernhard Trout that will bring chemical engineers and chemists together with industry leaders to invent more effective ways to produce pharmaceuticals to serve the world's medical needs. MIT's Department of Brain and Cognitive Sciences is a key node in the Boston Area Autism Consortium, which brings together over 60 faculty from 11 different institutions to promote the understanding and treatment of autism and related developmental brain disorders. Also reaching across institutional boundaries, MIT scientists at the Broad Institute have launched the Stanley Center for Psychiatric Disease to mount a new attack on the seemingly intractable causes of schizophrenia and bipolar disease.

In addition to our academic partners, MIT sits in the midst of a super-cluster of 150 life science companies and 70 energy

companies, ranging from small start-ups to major firms, which create a dynamic mix for innovation. All of these partnerships signal MIT's willingness, and ability, to leverage the resources around us to make progress as we address national and global problems.

As a community we face the very difficult task of imagining and configuring the right international engagements to provide our students with the skills and knowledge to be global leaders, and for our faculty to engage in research at the leading edge anywhere in the world where opportunities exist.

A Beacon Beyond our Borders

Our community and impact extend well beyond the confines of Kendall Square, of Boston, or even of the United States. Advances in communication and technology have eroded traditional borders and diminished the confines of geography. Although we live in an exciting time, it is also a challenging one. We receive a great many inquiries for new international collaborations with the Institute. As a community we face the very difficult task of imagining and configuring the right international engagements to provide our students with the skills and knowledge to be global leaders, and for our faculty to engage in research at the leading edge anywhere in the world where opportunities exist. We have already taken several steps in this direction.

Provost L. Rafael Reif convened an International Advisory Committee, with Associate Provost Philip Khoury and Vice President for Research and Associate Provost Claude Canizares as co-chairs, (i) to contribute to the design of an MIT-wide international strategy, (ii) to advise the MIT administration on the appropriateness and viability of new institutional initiatives and partnerships, and (iii) to report regularly to the administration and the faculty on their progress in these roles.

One of several recently launched international programs, the Legatum Center for Development and Entrepreneurship,

will provide fellowships for aspiring entrepreneurs to explore practical, enterprise-based solutions to address deep-rooted problems in developing nations. The Center, with its home in the School of Architecture and Planning, will draw from all five Schools.

OpenCourseWare has become among our most important global outreach activities, now accessed by people in more than 215 countries, territories, and city-states around the world, with 40,000 visits to its content each day. We will celebrate a very important milestone this November when 1,800 of MIT's courses will be available online for free for anybody with a desire to learn. To me this represents the MIT ideal of technology used in the service of the public good.

Continuing MIT's Impact

Though the topics I've mentioned here range across the academic landscape, they share a common theme of collaboration and innovation. They also reflect the shared values that hold across the Institute regardless of department, School, or discipline. We take a certain pleasure in our hard work, a pride in our pursuit of truth, and an appreciation for our meritocracy. We cannot take these values for granted; we preserve them only through constant and vigilant stewardship by each of us. Our individual and community stewardship will sustain our critical contributions for generations to come and will let MIT continue to serve as a beacon of inspiration for the power of analytical thought and innovative scholarship. ■

Susan Hockfield is President
(hockfield@mit.edu).

Should MIT Increase the Size of the Faculty?

L. Rafael Reif
Phillip L. Clay

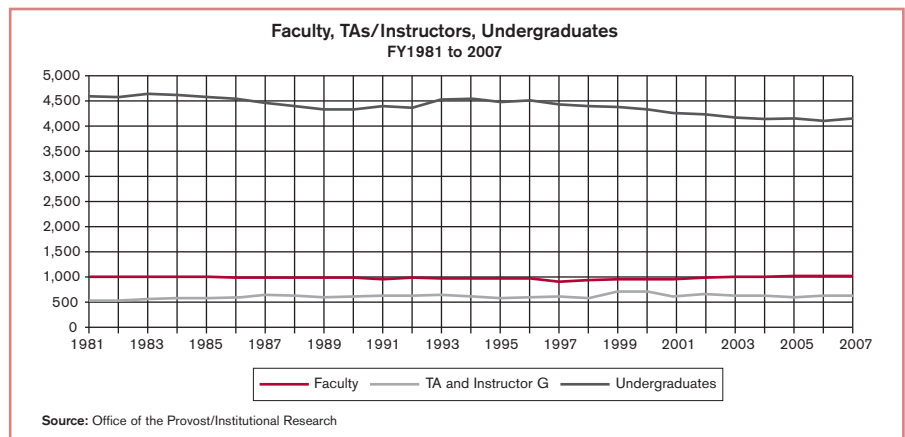
WE ANNOUNCED SOME TIME ago a plan to return the MIT undergraduate population to ~4,500 from the present number of ~4,100. As many of our faculty colleagues may remember, our undergraduate population was 4,495 as recently as 1996 (see chart, next column). Since that time, housing availability has restricted our undergraduate population in order to provide all freshmen with on-campus housing, while not displacing the many upperclass students who desire to live on campus. This housing demand resulted in a decrease in the undergraduate population to 4,112 by 2004, even though it has always been MIT's intention to return to an undergraduate population size of ~4,500. Before returning to the traditional size of our undergraduate student body, a careful assessment of what needs to be done to maintain the same quality of education and student services without increasing the workload of our faculty and staff is necessary. This article briefly focuses on the potential student/faculty impact of these plans. It is important to point out that returning to our undergraduate base of ~4,500 students will occur gradually as we develop our housing capacity and our ability to preserve a quality educational experience for our students, inside and outside the classroom.

An argument has been made that, since we plan to "increase" our undergraduate student body by 10%, we should increase our faculty size by 10%. We will try to explain here that, although this position is understandable at first sight, a more careful analysis may not justify this across-the-board approach. However,

modest increases in faculty size and/or instructional staff may need to be considered. Modest increases in faculty size to respond to strategic directions will also be considered.

1. We taught ~4,500 undergraduates with ~1,000 faculty as recently as 1996. While the undergraduate student popula-

2. Our undergraduate student (UG)-to-faculty ratio is one of the lowest among our peer institutions (see chart, next page). In AY2005-2006 (the most recent year for which peer data is available), our UG/faculty ratio was 4.13, higher than Caltech's 3.48, but significantly lower than those for Harvard (5.74), Yale (6.09),



tion decreased starting in 1997, and reached its lowest point in 2004, the number of faculty lines was not reduced. In fact, there has been a marked increase in individuals in instructional roles over the past decade. In 1996, when the undergraduate population was 4,495, the faculty size was 960 and the number of teaching assistants (including instructor G) was 580. In 2006, the undergraduate population was 4,066, the faculty size was 992 and the number of teaching assistants (including instructor G) was 610, representing a 9.5% decrease in undergraduates, and a concurrent 3.3% increase in faculty, and a 5.2% increase in the number of teaching assistants during this 10-year period (see chart, above).

Columbia (6.11), Princeton (6.87), Stanford (7.10), CMU (8.81), and Berkeley (15.93), to cite just a few. These kinds of comparisons are never perfect, but they do provide some idea of relative workload.

3. We have already enrolled a class size that would bring the undergraduate population closer to ~4,500. In steady state, about 1,125 students would be enrolling each year. This year's freshman class has 1,067 students, so we are close to the targeted number of freshmen. Moreover, as the data in the chart above indicates, the reduction from ~4,500 to ~4,100 took place from 1996 to 2004. Growth to a larger class size would occur gradually as we are able to absorb a larger class.

Avoiding a Rush to Judgement: Implications of the Star Simpson Affair

Patrick Henry Winston
Kenneth R. Manning

The Arrest of Star Simpson

ON FRIDAY MORNING, SEPTEMBER 21, Star Simpson was arrested at Logan Airport. Before Ms. Simpson, '10, was able to return to MIT to seek help following her release, MIT issued the following press statement:

“MIT is cooperating fully with the State Police in the investigation of an incident at Logan Airport this morning involving Star Simpson, a sophomore at MIT. As reported to us by authorities, Ms. Simpson’s actions were reckless and understandably created alarm at the airport.”

The Manning–Winston Resolution

Shortly before October 17, Professors Manning and Winston, noting the congruence of their reaction and that of many colleagues, determined to introduce the following resolution at that day’s faculty meeting:

“In light of the Star Simpson event, we, the MIT faculty, request that the MIT administration refrain from making public statements that characterize or otherwise interpret – through news office releases, legal agents, or any other means – the behavior and motives of members of the MIT community whose actions are the subject (real or potential) of pending criminal investigation. We offer this resolution to foster mutual trust within the MIT community and to promote due process for all.”

Why We Acted

As the premier university of science and engineering, MIT has a special obligation, to the nation and to the world, to conceive solutions to complex global problems,

and to ensure that tomorrow’s leaders will include people technically grounded, not just technically literate.

To honor our obligation, MIT must be a place we join for high purpose, not merely a place for which people work and at which students study. We must have camaraderie and a strong sense of com-

Many of our colleagues feel a chill passing through our community. They sense a shift toward a cold, corporate atmosphere, of which the triggering incident and issue are merely indicators.

munity. Our contributions should be understood and valued. Our opinions should be sought and considered. We must be colleagues, not cogs in a machine. And in return, we must relish the expectation that we will do great things and maintain high standards that are the envy of the world.

None of these thoughts are new, or highly controversial, or outside a century-and-a-half of tradition. What is new is that in our present century, crises seem to emerge with greater frequency, and evolve with more urgency, and draw more public attention. Accordingly, there is a greater need to understand how we translate our general principles into policies that we can fall back upon at times when circumstances demand action without the benefit of reflective thinking, thorough discussion, and thoughtful review.

We think that adhering to due process should be high on our list of such policies. Whenever any member of our community is accused of a crime, or seems in danger of being accused of a crime, we should not rush to characterize that person’s actions or motives. It is incon-

ceivable that such characterization would appear in advance of the facts.

We think that we should resist media pressures for quick sound bites. It is unthinkable that any word, especially a prejudicial word such as *reckless*, could be the right word to use in advance of the facts.

We think that we should resist pressures to pander to public opinion. It is wrong to issue hasty statements, *ex cathedra*, that could harm a person legally and further harm the morale of those in the community who see the action as an indicator of how readily fear of embarrassment drives our institution to distance itself from its people.

We do not ask our colleagues to take sides for or against anyone. We ask only that the faculty take a position on whether or not we want our administration to resist impulses leading to a characterization of the actions or motives of people in our community in trouble.

Why act? Many of our colleagues feel a chill passing through our community. They sense a shift toward a cold, corporate atmosphere, of which the triggering incident and issue are merely indicators. In the MIT tradition, we must air our views, analyze the problem, and find a solution. ■

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The purpose of faculty meetings?

Michel DeGraff

MY ENTHUSIASM WAS KINDLED by our new Chair of the Faculty's first public comments at our first faculty meeting of the fall, on September 19, 2007. Professor Bishwapriya Sanyal proposed various constructive ways to make faculty meetings more relevant to the faculty and to issues we care about, and he asked for suggestions on how to increase attendance at faculty meetings and, more generally, how to improve communication between faculty and faculty officers. According to the minutes, Professor Sanyal stated, among other things:

"... what underlies the ability of the officers to perform their roles is their ability to convey your wishes and concerns to the administration. Communication is essential in order that the Faculty Officers really represent the broad view of the collective faculty."

MIT Faculty Meetings have lost their luster as a locus for serious discussion. Attendance is generally quite low."

In this light, I was puzzled by Professor Sanyal's (and other administrators') response at our second faculty meeting of the semester (on October 17) to the important resolution proposed by Professors Kenneth R. Manning and Patrick H. Winston (see page 10 for the full text and a defense of that resolution; also see the faculty meeting minutes for details of the debate). There, Professor Sanyal stated that he felt it more appropriate that the Manning-Winston resolution first be discussed within the Faculty Policy Committee (FPC) rather than on the floor of the faculty meeting. Yet the October faculty meeting was unusually well attended, so it was a good and timely opportunity to gauge "the broad view of the collective faculty" on the critical issue at stake in the resolution.

My own impression was that most of the opposition to the resolution at the October faculty meeting came in unison from past and previous members of the administration, while the rest of the faculty in attendance remained silent, perhaps ready to vote. I myself certainly was, and so seemed nearby colleagues, until the resolution was tabled by Professor Winston after the administration voiced its opposition to the proposed vote.

In addition, the FPC is comprised of only 14 members, as compared to the large numbers in attendance at the October faculty meeting, which was virtually standing-room-only at the time the resolution was introduced. I still fail to understand why it needed to be first discussed off-the-record at the FPC, especially considering our Faculty Officers' objective to make faculty meetings more relevant to faculty concerns. Such extra relevance, it seems to me, should be accompanied by more transparency and more accountability.

The Manning-Winston resolution, as introduced at the October faculty meeting, was the perfect occasion to foster "a locus for serious discussion." And if the Manning-Winston resolution deserves serious discussion, then why should the discussion be delayed and pushed away from faculty meetings, to a 14-person committee that is not so fully representative of the larger faculty?

When it comes to critical and time-sensitive issues that affect our community as in the handling of the Star Simpson case, the key choice points here are these:

- Should these issues be promptly debated and acted upon in transparent and participatory fashion at faculty meetings in the presence of all interested constituencies from our community? (This is the view advocated by the authors of the Manning-Winston resolution.)
- Or should these issues be discussed behind closed doors and off the record at

the FPC *before* reaching the floor of faculty meetings? (This is the view advocated by the Chair of the Faculty and other administrators at the October faculty meeting.)

Though these questions have been made most salient in the context of the Manning-Winston resolution and related comments at the October faculty meeting, I hope that the ensuing debate, if any, can substantially address the above procedural issue as a matter of principle.

This note is written in the spirit of transparent and constructive communication that Professor Sanyal has advocated. May it convince a larger number of our colleagues to enter into an open and fruitful debate about "The purpose of faculty meetings" for the sake of the objectives advocated by the Chair of the Faculty on September 19, 2007. ■

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letters

Not the Way to Treat Family

To The Faculty Newsletter:

MIT IS A COMMUNITY and in many ways an extended family. For our younger students in particular, we act in the absence of parents. If my son had been arrested at Logan Airport under the same circumstances as Star Simpson, and *The Boston Globe* had called me up for a comment, I would not have characterized him as reckless, and neither should MIT have made any such comment regarding Simpson. *The Boston Globe* is not family. Star Simpson is.

John Belcher
MacVicar Faculty Fellow
Class of 1922 Professor of Physics

The MIT Energy Initiative: One Year Later

Ernest J. Moniz
Robert C. Armstrong

THE MIT ENERGY INITIATIVE (MITEI) was formally established in November 2006, with a broad mandate to address global energy and associated environmental challenges:

- *Meeting growing energy demand:* Most projections anticipate doubling of global energy use and tripling of electricity use by mid-century, even with a continuing decline in energy intensity of the economy. Energy delivery systems will be similarly challenged.
- *Enhancing energy security:* Among a host of intersections between energy use and security concerns, the geophysical and geopolitical realities of oil stand out in the public discussion. At its core, this issue arises from the near-total dependence on oil for transportation fuel.
- *Mitigating the environmental impacts of energy production, delivery, and use,* most especially climate risks associated with greenhouse-gas emissions and global warming.

It can be plausibly argued that these energy imperatives form a blueprint for the preeminent science, engineering, and analysis challenges of the twenty-first century: meeting our energy requirements in ways that serve basic human needs for security, a healthy environment, and a sound economy.

Why MIT?

President Hockfield set the MIT Energy Initiative in motion during her May 2005

inaugural address which highlighted MIT's "... institutional responsibility to address the challenges of energy and the environment."

MIT is both one of the world's premiere research universities and a recognized leader in moving ideas into the marketplace. The Institute's strengths as an engine for innovation include:

- exceptional faculty, staff, and students
- excellence in research
- a creative but grounded approach to complex problems
- an interdisciplinary research tradition
- long-established experience with industrial collaboration
- education of innovators and entrepreneurs
- international partnerships
- convening power for key dialogue on critical issues
- and a practiced ability to serve as an "honest broker" in framing and analyzing important societal issues with significant scientific and technological content.

Building on these attributes, MITEI is designed to accelerate innovation in energy science, technology, and policy through the integrated application of the Institute's cutting-edge capabilities in the physical and life sciences, engineering, management, planning, and social science. MITEI is also working to harness the talent and dedication of its students to address these critical energy and environmental challenges. Finally, MITEI seeks to elevate the energy policy discourse as an "honest broker," providing leaders in gov-

ernment and industry with unbiased analysis of energy issues, informed energy policy options, and opportunities for critical energy dialogue.

A Brief History

President Hockfield's call to mobilize the resources and capabilities of the Institute was met by the formation of the Energy Research Council (ERC) – 16 faculty from all five Schools charged with recommending an implementation plan. Well over 100 faculty and senior staff came together in multidisciplinary groups to provide the ERC over 40 concept papers that laid out research capabilities and interests. In addition, a faculty task force chaired by Professor Jefferson Tester, supplemented by numerous student inputs, shaped both the recommended education plan and a proposal to address campus energy management as a learning opportunity. The ERC report can be found on the MITEI Website at web.mit.edu/mitei.

Following an extended campus comment period, the implementation plan was largely adopted and a new Energy Council, again drawn from all five Schools, was appointed by the President and Provost in November 2006 to carry out the plan. The Council now includes Professors Steven Ansolabehere, Robert Armstrong (Deputy Director), Angela Belcher, John Deutch, Leon Glicksman, Rebecca Henderson, Ernest Moniz (Director), and Emanuel Sachs.

To achieve its objectives, MITEI has established four initiative components: education; campus energy management; industry research partnerships, and; out-

reach. Two task forces help MITEI implement its mandate from President Hockfield. The Education Task Force, co-chaired by Professors Belcher and Tester, includes two subcommittees. The Energy Curriculum Subcommittee chaired by

established an External Advisory Board, comprised of high-level members from industry, NGOs, academia, and think tanks. It will be chaired by former Secretary of State George Shultz, an MIT alum and former faculty member, and is

With current commitments, MITEI will be able to make about 20 graduate fellowships available to departments for fall 2008, and to allocate about a million dollars of research seed funds through a campus-wide competitive process.

Donald Lessard is assessing the existing curriculum, and evaluating and coordinating undergraduate and graduate energy-related subjects. The Undergraduate Energy Minor Subcommittee chaired by Susan Silbey is considering the development of an Institute-wide energy minor.

The Campus Energy Management Task Force, co-chaired by Professor Leon Glicksman and Theresa Stone, MIT Executive Vice President and Treasurer, combines input from faculty, students, and MIT administrators responsible for all campus facilities. Activities include improving and planning campus energy use and supporting student activities that use the campus as a laboratory for research and education. This Task Force is focused on transforming the MIT campus into a learning laboratory and providing input to new campus construction.

The Laboratory for Energy and the Environment has been brought under the MITEI umbrella, providing essential administrative support for MITEI. Similarly, MITEI is leveraging the strong Corporate Relations/ILP network to attract corporate financial support, and Resource Development to attract individual donors and foundations. This avoids duplicating efforts and minimizes the buildup of support infrastructures.

Finally, to help guide the Initiative and shape the MIT response to our energy imperatives, President Hockfield has

scheduled for its first meeting in mid-January, 2008.

Status Report

MITEI's industry partnership supports research, education, fellowships, seed funding, UROPs, student activities, colloquia, and outreach. Founding Members and Sustaining Members (minimum \$5M/ or \$1M/year for five years) support sponsored research projects aligned with their strategic interests. They also support fellowships and contribute to a seed fund to support innovative start-up projects solicited from across the entire campus. MITEI's inaugural Founding Member is BP, supporting a flagship research program in coal conversion with minimized CO₂ emissions. Ford is the inaugural Sustaining Member with a focus on advanced automotive technologies and associated fuels. Other Sustaining Members include Chevron, working on remote, ultra-deepwater research, and b_TEC (Barcelona), with an interest in renewable energy.

Two additional categories of Associate and Affiliate Members have been established to involve smaller companies, investors, entrepreneurs, alumni, individuals, and others who do not provide sponsored research funding but wish to become part of a robust community of energy innovators. The inaugural Associate Member is Ormat Technologies,

a leader in geothermal systems. The inaugural Affiliate Member is Phil Rettger (another MIT alum) of OptiSolar. The student-organized Energy Club is an important partner in MITEI activities, helping to manage the Affiliates program and hosting the first Affiliates' "energy salon" in early December.

With current commitments, MITEI will be able to make about 20 graduate fellowships available to departments for fall 2008, and to allocate about a million dollars of research seed funds through a campus-wide competitive process. The first solicitation for innovative seed projects was issued with a November 13, 2007 due date for proposals. Ongoing discussions with prospective members strongly suggest that several more memberships will materialize in each category over the remainder of this year, thereby increasing both the number of fellowships and the available seed funds.

There is, of course, ongoing energy-related research by many faculty, and this has been the case for many years – estimates of total MIT faculty involved in some type of energy research are about 15%. A goal of MITEI is to supplement these efforts with sustained multi-faculty multi-disciplinary efforts focused on research thrusts central to the energy/environment challenges indicated earlier. It is also the case that, in parallel with MITEI, other programs with significant energy-related components have been established under the leadership of various faculty; examples include substantial collaborative programs with Cyprus, Portugal, and Masdar (Abu Dhabi), and a developing one with Singapore.

While a number of commitments remain to be nailed down, the prospective MITEI-facilitated research portfolio may have the following outlines based on the recommendations in the ERC report:

Transformations: A clean energy future will demand deployment at scale of renewable energy sources and of key

continued on next page

The MIT Energy Initiative

Moniz and Armstrong, from preceding page

enabling technologies such as economical energy storage. We envision substantial programs in solar energy, in biofuels, and in designer materials for applications such as batteries, fuel cells, and thermoelectrics. Nanotechnology and biotechnology will be key tools in these programs.

Estimates of replacement costs of the global energy infrastructure – a possible requirement for moving off fossil fuels and onto alternatives – are in the \$12 trillion range.

Innovations: The slow turnover of energy infrastructure and the dominance of fossil fuels will require improving today's energy systems – improved efficiency in the use of fossil fuels, elimination of atmospheric CO₂ emissions, smart delivery systems, and advanced nuclear power, for example. Substantial programs are likely to center on advanced coal conversion processes, enhanced oil and natural gas production, carbon dioxide sequestration, advanced nuclear fuel cycles with a focus on waste management, and intelligent infrastructure that combines sensors, controls, communications, and distributed decision-making for improved energy efficiency.

Global systems: Many of the energy/environment challenges are inherently global in nature. Climate change is obviously in this category and the successful MIT program on the science and policy of global change has seen and will see substantial expansion – for example, higher fidelity treatment of the transportation sector and comparative analysis of climate policies have been supported. The School of Architecture and Planning will expand work in China, while major new programs in efficient building design and in

transportation systems are in the early development stages.

Notable advances in MITEI's education focus this year include a very generous grant from the Kabacoff Foundation supporting a variety of curricular initiatives. MIT has also been awarded a Clare Booth Luce Postdoctoral Fellowship Program for Women in Energy, to be filled starting fall 2008. Other opportunities,

such as a MITEI Practice School, are under discussion.

Similarly, the Campus Energy Task Force is into its second round of funding student grants for campus energy projects and is developing the concept of the campus as a learning laboratory. The group is providing input to new campus construction. A very exciting parallel development is the generation of student projects, such as a dorm efficiency competition (won by McCormick) and an award for producing biodiesel from campus waste. Sloan and Architecture faculty are also planning a research project to understand the barriers to energy efficiency in complex institutions such as MIT.

“A New Global Energy System”

The enormity of the global energy supply chain and its centrality to nearly every societal activity presents a daunting innovation challenge. Meeting energy security, increased demand, and climate change imperatives is made more difficult by the scale of the need. A multi-trillion dollar per year business supplies 450 exajoules of energy each year, or an energy “burn rate” of 14 terawatts. Estimates of replacement costs of the global energy infrastructure –

a possible requirement for moving off fossil fuels and onto alternatives – are in the \$12 trillion range. Climate change introduces urgency into the equation, as the 50-year time scale for exhausting a prudent global CO₂ emissions “budget” is roughly the same as that for major transformation of our fossil fuel-based energy infrastructures in a business-as-usual future.

Within this context, the energy innovation challenge will be met by combining the strengths of the energy incumbents – with their highly developed distribution systems and customer base – with the entrepreneurial innovation culture that has strong roots at MIT and the surrounding “innovation ecosystem.” In addition to working directly on the underlying science, technology, and analysis, MIT and its faculty and students offer a focal point for an important conversation that must take place across the entire “energy innovation supply chain” – from the largest energy incumbents to the innovative technology risk-taking startups, from the policy community to the investment community.

This takes us back to President Hockfield's 2005 address where she noted MIT's “. . . responsibility to lead in this mission.” Since President Hockfield committed the Institute to a new initiative in energy, hundreds of students, faculty, and research staff have come together to help shape and implement this vision. The structure of the MIT Energy Initiative is evolving to elicit and support the convergence of new ideas from MIT faculty, staff, students, and external partners – forming an intellectual engine that will underpin MIT's leadership in helping to meet one of the preeminent challenges of the twenty-first century: establishing a new clean, secure, and sustainable global energy system. ■

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Robert C. Armstrong is a Professor of Chemical Engineering and Deputy Director of the MIT Energy Initiative (rca@mit.edu).

Faculty Renewal

Lorna J. Gibson

AS MEMBERS OF THE FACULTY, we all recognize the critical importance of our ability to recruit the very best faculty in our fields of education and research, in order to maintain a faculty that is continually strengthened and renewed. With this in mind, the Provost's Office, in partnership with MIT's Human Resources Department, has recently begun to examine ways in which the faculty renewal process can best be sustained.

Together with Vice President for Human Resources Alison Alden, I convened a small group of staff from Human Resources, the Provost's Office and the Finance Office, as well as the Chair of the Faculty, Bish Sanyal, that began working last spring to identify ways to address faculty renewal issues and to develop a process for engaging faculty discussions on this topic beginning this fall.

A key ingredient in successful faculty renewal involves understanding how faculty members form their plans related to retirement, an important personal decision that normally includes such issues as timing, financial and health-related concerns, and opportunities for post-retirement activities that allow an ongoing connection with the Institute. In our academic culture, it is clear that "retirement" does not normally signify a complete disengagement from one's professional career, and there is no single formula for making the transition from a tenured appointment to a retired status. For many of us, retirement will represent a rearrangement of priorities related to the teaching, research and service activities that have formed our careers, influenced by personal interests and goals.

As background to considering how MIT might address these issues, we reviewed the Early Retirement Incentive Program that the Institute offered as a one-time, voluntary option in 1996, which provided cash payments and other financial benefits in return for a commitment to retire. The 1996 program was viewed to have had generally successful results in terms of the numbers of faculty who chose to participate in the program coupled with the extent to which new faculty hires were made over subsequent years to replace those who had retired. In contrast to the 1996 program, which provided a limited period of time during which faculty had to decide whether or not to participate in the program, we are hoping to develop an ongoing, sustainable program that would provide a continuing framework of retirement options for faculty. Like the 1996 program, any new program would be completely voluntary.

We have also examined the retirement programs that several of our peer institutions have in place which are designed to facilitate the transition from a full-time tenured faculty appointment to a retired status. Many of these other programs involve options for faculty to receive incentive payments linked to retirement. Some of them also permit the opportunity to phase out teaching or research duties over a certain number of years in order to provide a more gradual approach to retirement. These are the kinds of possible options that we wish to consider for an eventual MIT program that we hope will emerge from our discussions.

In examining these issues, we want to engage the faculty to the fullest extent

possible in helping to formulate a set of policies that will guide MIT's faculty retirement process in the future. As you may know, I introduced this issue at the October 17 faculty meeting, and there have been discussions held this fall with each of the five School Councils and at a recent meeting of the Faculty Policy Committee (FPC). In addition, we have held ongoing discussions within small focus groups organized by a subcommittee of the FPC and at Random Faculty Dinners during this time period. The feedback on these issues that we have been collecting from the faculty to date has been extremely valuable, and this process is continuing throughout the fall. Our goal is to arrive at a set of faculty renewal guidelines by the spring of 2008 that will provide MIT faculty with clear and positive options for making the transition to retirement that are in harmony with the goals of our academic departments for intellectual renewal and that are sustainable on an institutional level.

I very much look forward to your continuing participation in these important discussions in the coming weeks and months. We have established a Website dedicated to this topic at web.mit.edu/facultyrenewal/, which provides a brief overview of the faculty renewal project as well as some general background on MIT retirement benefits policies, and provides a mechanism for sending comments and feedback to the faculty renewal working group. I encourage you to visit the site and send us your thoughts on this topic. ■

Lorna J. Gibson is Associate Provost
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MIT Poetry

by Anne M. Hudson

Can't Stop Laughing

At first, I ascended next to Troilus
in the seventh sphere
looking down on our planet
with its great Wheel of Fortune
churning and crashing,
having my cosmic belly laugh.
O Fortuna! How you rise and fall!

Next, I reconstructed my descent
into the deepest pit,
the one you're not supposed to climb out of.
There was more than one pit.

Now that I'm up from the pits
with my feet on the ground,
I can't stop laughing.
I was supposed to fall,
and I fell.
Rather, I was supposed to vanish,
but I've reappeared.
I've reappeared,
and can't stop laughing.

Anne M. Hudson has worked at MIT since 1985, first in the Department of Nuclear Science and Engineering and since 1998 in the Department of Chemistry. In 2005, she received the MIT Excellence Award for her contribution to Artists Behind the Desk. She has published poetry in print and on-line magazines, including *3d Muse Poetry Journal*, where this poem first appeared.

Making a Mountain Out of a Molehill: Understanding the *U.S. News* Rankings

David Lewis

THE RECENT *U.S. NEWS* & *World Report* rankings of colleges, in which MIT fell from fourth to seventh, has resulted in much discussion and consternation within the MIT community. Before too much more sleep is lost over this ranking, the following should be noted: It's all a tempest in a teapot.

Last year MIT was ranked fourth; well, actually, tied for fourth with CalTech and Stanford (so effectively we were fourth, fifth, or sixth). And sixth is not that far from seventh.

MIT's overall score this year was 93 – one point behind CalTech and U. Penn (who were tied for fifth) and two points behind number four Stanford. (The college ranked highest receives 100 points.) Last year we received 94 points. But a higher point total does not necessarily correlate with a higher ranking. In 2001 we were fifth with 96 total points; in 2002

we were tied for fifth with 95 points; and in 2003 we were tied for fourth with only 93 points.

And just how are these points derived?

U.S. News uses the following categories and weights to judge colleges:

- Peer Assessment (25%)
- Faculty Resources (20%)
- Graduation and Retention Rate (20%)
- Student Selectivity (15%)
- Financial Resources (10%)
- Alumni Giving (5%)
- Graduation Rate Performance (5%)

There are several subsets under each category, but for MIT perhaps the most difficult one to accurately assess is class size (under Faculty Resources). At MIT there are a significant number of classes that include both a large lecture and a small (under 20 students) section. The

way *U.S. News* defines small class size significantly limits the number of those sections which can be included, and this negatively affects our overall score.

MIT is clearly one of the elite universities in America (and, for that matter, in the world). And yet even here there is certainly room for improvement. And that improvement might result in a higher *U.S. News* ranking – but it just as easily might not, as performance is judged relative to our peer schools.

One final point: With 25% of the overall score attributed to Peer Assessment, it's important to note that MIT received the highest peer assessment score (4.9 out of a possible 5.0) tied with Princeton, Harvard, and Stanford. And that MIT has received a score of 4.9 every year for more than a decade. ■

David Lewis is Managing Editor of the Faculty Newsletter (dlewis@mit.edu).

Faculty Quality of Life

IN 2004, 10% OF MIT FACULTY reported spending 80 or more hours per week doing MIT-related work, and 13% reported sleeping, on average, five hours or fewer per night.

This January, faculty will be invited once again to participate in an online survey regarding quality of life issues. Topics queried will include workload and stress, satisfaction with resources and

services, department atmosphere, the tenure and promotion process, and life outside the Institute.

Many of the survey questions are also being asked at peer schools, allowing for comparative analysis. MIT administered a similar survey to faculty in 2004 (results available online at web.mit.edu/ir/surveys/faculty.html). The results of that survey directly contributed to policy

changes in faculty housing, professional support, and personal and family support.

In 2004, 73% of faculty responded to the survey. The hope is to improve on that rate. Provided there are a sufficient number of responses, individual department reports will be provided by the Office of the Provost/Institutional Research. ■

A White Paper on How MIT Should Think About Institutional International Exchanges

Daniel Hastings

MIT, LIKE MANY INTERNATIONALLY oriented universities, is discussing how to lead in an era where there are global economies and global collaborations. Like all modern research universities, MIT is dedicated to education and research. The research enterprise has long had strong international components. Increasingly, education is taking on more of a global flavor.

Given this more international flavor in education, MIT finds itself both wrestling with how to provide global experiences in its education and being approached by universities worldwide who want to partner in some educational fashion. The purpose of this paper is to elucidate the need for a globally oriented education, outline a value statement for our engagements, and lay out some of the principles by which MIT will engage.

The Need for a Globally Oriented Education

At MIT we are committed to continuing to provide an education which is grounded in science and technology that:

- Ignites a passion for learning,
- Provides the intellectual and personal foundations for future development, and
- Illuminates the breadth, depth, and diversity of human knowledge and experience,

in order to enable each student to develop a personal, coherent intellectual identity [Robert Silbey, *Task Force on the Undergraduate Educational Commons*, MIT (2006)]. The need for this kind of education is greater than ever.

At the same time that we are confronted with ongoing Big Problems in society, we find ourselves in a world where major parts are undergoing economic and cultural globalization. This is sometimes referred to as the “world is flat.” [Thomas Friedman, *The World is Flat*, Farrar, Straus and Giroux, New York (2005).] The global economic order is shifting before our eyes. The implications of this are profound. Our graduates must be able to move seamlessly and add value in many different cultures while competing with people who may be willing to work for substantially less. As always, the answer in these situations is that our graduates must be able to innovate to add value for the good of society.

What is also clear is that science and engineering continue to evolve on a global scale. New technologies and scientific discoveries make for new products that engineers create all over the world. Witness the iPod, for example. In the area of biological engineering, there is much intellectual ferment that is bringing together biology and engineering in ways that create new systems for human beings. Further, the impact of millions of innovative users on the information super-highway is creating new opportunities for software engineering. In addition to new products, new lean processes have sprung up and engineers need to be able to understand and control these processes in predictable ways. Thus many products are now made through global supply chains which are themselves engineered. Finally, large-scale complex systems continue to be created. In some ways, science and engineering have never been as exciting as in this globally competitive world.

Our science- and technology-centric education of today and tomorrow needs to prepare our students to cope with all these emergent complexities. These challenges cannot be addressed by working only within national boundaries or by working only with people whose ideas about defining problems, organizing teams, recovering from failures, or measuring success are like their own. Instead, students need to develop an understanding and appreciation of the challenges inherent in participating in a global economy.

Value Statement for a Globally Oriented Education

In light of this changing world, MIT wants to produce global leaders with global awareness. This will be accomplished on the basis of the mission and core values of MIT combined with clear definitions of the educational goals for our students.

Mission, Values, and Aspirations of MIT

The mission of MIT is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the twenty-first century.

This mission is best served by having an international focus consistent with the core values and aspirations of MIT. These core values include:

- A commitment to a meritocracy
- High Quality (not doing everything but doing everything we do with quality)
- *Mens et Manus* (Mind and Hands)
- Service to mankind.

Number of Students Who Participated in Study Abroad

	2006-2007*	2005-2006*	2004-2005	2003-2004	2002-2003
Cambridge-MIT Exchange (CME)	35	34	33	28	41
MIT-Madrid Program	9	5	n/a	n/a	n/a
Killam Fellowship Program	0	1	0	0	0
IAP-Madrid	21	n/a	n/a	n/a	n/a
IAP-Germany	20	n/a	n/a	n/a	n/a
Departmental Exchanges	5	2	unknown	unknown	unknown
Direct Enrollment	6	5	13	15	12
Outside Providers	13	23	12	16	20
Total	109	70	58	59	73

*Includes Summer

Source: MIT Study Abroad Office

We are also affected by our culture and aspirations. We describe the culture as one of energetic entrepreneurialism with a deeply ingrained belief that there is great value that comes from “bumping” into each other. Thus, MIT is sometimes described as a modern day “Silk Road.” In this sense, MIT the place “02139” is very important. The co-mingling of the best faculty with the best students and staff in a physical location is one of the engagements that have made MIT well known. We also aspire to:

- Have others copy us (this is, after all, the essence of leadership)
- Collaborate with the world’s top universities to share and understand best practices.

Existing Opportunities for Global Education Abroad

In keeping with the spirit of MIT, many smaller-scale pilot programs have been set up. These provide proof of principles for a global educational experience and are the basis on which we can build. These opportunities fall into three classes. Opportunities which are based on work (internships or research), opportunities which are based on overseas education (either exchanges or unilateral study abroad), and opportunities which are based on public service abroad.

Existing opportunities include:

Internships:

MISTI industry and research internships, G-Lab, departmental internships, DUSP-PSC internships, PHRJ internships

Research:

International UROPs (IROP), DUSP, Architecture, RWTH-Materials exchange, Progetto Roberto Rocca (Italy), Consorzio Italia-MIT, MIT-France and MIT-Spain Seed Fund for collaborative research

Public Service Learning:

Public Service Center, D-Lab and other service learning courses, IDEAs competition, IDI, I-House

Study-Abroad Exchanges:

Cambridge-MIT Exchange, Oxford-MSE exchange, Architecture Delft and Hong Kong exchanges, Aero/Astro exchanges

Unilateral Study-Abroad:

MIT-Madrid, IAP language courses in Madrid and Germany, competitive foreign fellowships

MIT Goals for Global Education Opportunities

We want the students who take advantage of the Global Education Opportunities that we offer to:

- 1) Return better than if they had stayed at MIT (with new skills and competencies specific to their global experience)
- 2) Be stretched outside of their comfort zones and gain self-confidence and leadership skills
- 3) Develop an international network of links that will serve them for years
- 4) Not suffer any academic or financial penalty.

For MIT, the institution, we want to learn best practices and pedagogy from our educational international engagements and continue to be a leadership institution for others.

A recent EECS committee that was asked to address issues of global education concluded (March 2007): “The world facing our graduates is changing dramatically. We need to change the culture at MIT to make international engagement for students and faculty as pervasive as UROPs are for undergraduates.” This is a high goal, since currently we believe that approximately 20% of each class engages in some international experience while 85% engage in a UROP. We must also raise the resources so that all our students can participate in these engagements without financial barriers. This will mean additional resources so we are able to maintain our proud tradition of need-based aid.

Principles for International Engagements

The MIT Faculty Policy Committee in 2005 laid down some principles for all MIT international engagements (education and research). These principles are designed to preserve the MIT name, protect the precious resource of faculty time, and ensure that we deliver with the highest quality. These principles are:

- The effort has to be “mission centric” to MIT’s focus in education and research. It should not be a service.
- The MIT name must be protected.
- Political and social sensitivities must be addressed.

continued on next page

Institutional International Exchanges

Hastings, from preceding page

- MIT should always stand by its policies relative to open access and information.
- MIT faculty must be clearly behind the effort in significant numbers for major projects.
- Each major effort must have an MIT officer/dean behind it, guaranteeing performance and delivery of expectations at the institutional level.
- The effort must be sustainable economically and intellectually.
- MIT does not outsource the granting of degrees (this ensures that only MIT guarantees quality).
- Significant international efforts should not detract from our ability to serve our students at MIT.
- Care is needed to make sure that activities do not create uneven loads on faculty not involved in the programs.
- Guidelines on pricing and costs are necessary.

Types of Global Engagements

A taxonomy for understanding the types of engagements we have is as follows:

- Research (i.e., the primary purpose of the engagement is addressing research questions)
- Work (i.e., the primary purpose is providing work experiences for our students)
- Education (i.e., the primary purpose of the engagement is providing an educational experience for students registered at MIT. This can include a service learning experience. This can also be subdivided into undergraduate and graduate engagements)
- Public Service Projects (i.e., the primary purpose is to improve the human condition in underdeveloped countries)
- Thematic (i.e., oriented around a theme such as energy or material science)
- General (i.e., not specific to any theme)
- Small (i.e., involving one or two faculty and a small number of students)
- Large (i.e., involving multiple faculty or multiple departments or tens of students)

The Cambridge-MIT Exchange Program (CME)

In considering the MIT goals for global education, the Cambridge-MIT Exchange Program (CME) is a stellar example of how it is possible to give some of our students in science and engineering a meaningful experience abroad without hindering their time to degree. During the past seven years, 196 MIT students from 14 departments spent their junior year studying at Cambridge University. CME has brought value to our students because it stretches them beyond their comfort zones through a different pedagogy and different curricular emphases within the context of a first-rank university. It forces our students to take a more proactive approach to their learning and helps produce some of the leadership experiences that we want our students to have. CME students serve as an example to other MIT students; the program serves as a model for other universities.

In addition, the CME has proven to be a significant experimental opportunity for our faculty to observe and test new methods of teaching and learning. This value continues and there is much unfinished work in this area. Thus it has brought institutional value to us.

Finally, the CME stands as an example of the twenty-first-century partnership between two great universities that was heralded when the Cambridge-MIT Institute (CMI) was established. The program forged strong ties between Cambridge and MIT faculties and, particularly during the first years of the alliance, provided our faculties a mutual point of concern and interest that sparked other interests. The student exchange has created a natural and deep bond between the schools, and is an important lesson in how we might approach alliances with other great universities.

Within the context of principles for study abroad exchanges outlined in this paper, it is clear that the Cambridge-MIT Exchange is a good fit. As we think about the small number of additional exchanges we may want to consider, CME will serve as a valuable model. In light of the value of CME to MIT and its students, we have committed to continuing the CME Program for the next five-year period.

Details of the CME program can be found at: web.mit.edu/cmi/ue/cme-mit/mit-home.html.

- Minor (i.e., not involving MIT at the level of Academic Council. Usually this would be an engagement which is at the level of a department or lab or center or below and usually is not at a senior level on the other side.)
- Major (i.e., involving a member of Academic Council. Usually this is a multi-department effort or is at a senior level on the other side [government or head of a university].)

The nature of an entrepreneurial institution like MIT is that there are many small thematic research-oriented international engagements. These are organized and supervised by the MIT faculty and are essential to a modern set of research

engagements. MIT should have as many of these as the faculty desire and can maintain with quality. There is also a smaller set of large research collaborations. These are also very desirable. MIT must pay attention to all these engagements. However, since our undergraduates are the least mature of the groups participating in engagements, MIT must pay particular care to educational engagements, especially large, major undergraduate educational engagements. These have the potential to affect many students (with whom we have a duty of care) and, if things do not go well, to increase risk for MIT. Thus we turn to the principles that should govern large, major undergraduate educational engagements.

Principles for Study Abroad Exchanges

As we expand our international educational offerings, we are faced with a large number of possible choices of partners with whom to have an exchange. In general, we will only engage with the best universities in any country. The partners with whom we engage must have enough similarities for us to make a fruitful connection and enough differences for the exchange to be worthwhile for our students and us. The right partners can help MIT engage in certain issues (e.g., a thematic exchange around energy) and we can help our partners learn (e.g. help Cambridge University learn how to run undergraduate research programs).

The principles that should guide us are:

- 1) The educational goals of an exchange must be clearly defined initially.
- 2) MIT will only engage in a small number of large exchanges (typically fewer than three and diversity of exchanges is desirable).
- 3) Exchanges must have a minimum size (probably 25 students per year) for institutional learning to take place.
- 4) Exchanges must be with a high-quality institution so that students get comparable quality to MIT instruction (the best institutions in a country).
- 5) Faculty connections associated with the exchange are highly desirable.
- 6) MIT will preferably exchange with institutions that are different from MIT in ways such as courses, education system, learning style, contexts; so the exchange offers our students a different educational experience to reflect on their MIT experiences.
- 7) MIT will only exchange with institutions where there are good and effective advising systems in place.
- 8) Exchanges must be for a minimum of a semester, preferably for a year.
- 9) Exchanges do not have to be symmetrical but should not be substantially advantageous to only one side.
- 10) Exchanges will not be approved to places where there is substantial risk to our students.
- 11) Students sent on exchanges should learn in the language of instruction of the other institution and take appropriate language courses before they leave.
- 12) Exchanges must be consistent with Faculty Policy Committee guidelines.
- 13) All exchanges will have a periodic review (3-5 years) and a graceful exit strategy.

Conclusion

The Task Force on the Undergraduate Education Commons called on MIT to

shift its core education so as to be the premier undergraduate education for this century. It is now clear in this globalizing world that providing significant global educational opportunities for our students is one of the things we must do. Not to do so will shortchange our students and MIT for the future. The recently released report of the Global Educational Opportunities at MIT committee (GEOMIT) calls on us to increase by more than a factor of two the programs that we know work in the MIT context. These include programs such as MISTI, D-Lab, public service opportunities and international UROPs, as well as exchanges. Since a key part of this growth might come from exchanges, this paper has outlined a set of principles that MIT can use as a guide in considering which exchanges make sense for us.

The Office of the Dean for Undergraduate Education is committed to working with the programs, departments, and faculty to facilitate the desired growth in our current suite of global educational opportunities. We will help to provide the infrastructure as well as work to raise the resources necessary to make this sustainable in the MIT context. ■

Daniel Hastings is Dean for Undergraduate Education (hastings@mit.edu).

M.I.T. Numbers Student Global Experiences

International Educational Experiences of 2007 MIT Graduates Earning an SB*

Question: Since at MIT, have you had any international educational experiences?

	# Graduates	% of Total
Yes	158	25.8%
No	452	73.7%
Don't Know	3	0.5%
Overall	613	

*From the 2007 MITCO Graduating Student Survey

IROP* Participation by Year

	Acad. Year	Summer	Total
2004-2005	7	14	21
2005-2006	6	11	17
2006-2007	3	9	12

*International Research Opportunity Program

Source: Office of Undergraduate Advising and Academic Programming

The MIT Office of Admissions: Choosing the Best Candidates and Handling Them With Care

Stuart Schmill

AS THE OUTSTANDING STUDENTS in the class of 2011 settle into their lives as the newest members of MIT, I thought it would be a good time to provide you with a window into the process through which the Admissions Office brings our talented undergraduates to campus.

There are three phases to the undergraduate admissions cycle. First, we spend a significant amount of energy building the highest caliber pool of applicants. Second, we engage in a thorough, committee-based process to select those candidates who are best matched to an MIT education. Third, we look to convince the group of admitted students that MIT is the best choice for them. The goal of the entire process is to yield the very best incoming students – those who will take full advantage of, and contribute fully to, our very special community.

As I write this (October 2007), the Admissions staff is scattered across the country talking with as many students and parents as possible about the Institute. While it is true that most students are familiar with the MIT name, many of them are far less familiar with the “real” MIT – in other words, the reality of our culture, community, and people. In fact, we find that the conception that many students have about MIT is about a generation old. This makes sense – according to a study we did last year surveying high school students, the primary influence on a student’s college choice is his or her parents.

Last year I was visiting the Missouri Academy of Science, Math, and Computing, and a student actually asked me if there were any women at MIT. So we

need to be out on the road pro-actively informing students about the current realities of MIT and correcting the false stereotypes that perpetuate. We are clear about what MIT is and what it is not – we

When we talk with students on the road, one of their foremost concerns is faculty-student interaction. . . . what they really want to know is how likely it is that they will have close and meaningful contact with faculty.

do not want to encourage students for whom MIT would not be a good fit. But there are many talented students who have both a central interest in math and science and the capacity and desire to make a real difference in the world who do not apply to MIT, simply because they don’t fully understand what we are about. And, while we have a strong Web presence – indeed, our Website (web.mit.edu/admissions) is often cited as the gold standard of Admissions Websites – we need to reach those students who might not make the effort to visit us online due to the mistaken thought that we’re worlds apart from what they’re looking for in a college.

Although the core culture at MIT has remained the same for many decades, things have certainly changed on campus in the last generation. Things have changed in the world as well. Nineteen percent of students entering MIT in 1977 reported being involved with some type of community service project or civic group. In the current freshman class, that number rises to 93%. A cynic might note that much of the community service in which students participate is required or forced upon them, and he or she would be

right. But my view is not cynical. I think that just as a person’s behavior follows from his or her attitude, a young person’s attitude will follow from his or her behavior. The increase in community service

projects among our applicants will lead to a generation of students more interested in making a difference in the world. (Witness, for example, the explosion in the number of students participating with the Public Service Center.)

We see this change all the time on the road. At one school I visited in Seattle this month, the head of the school talked to me about the school’s main focus of instilling in their students a mindset of service. While visiting a school in Portland, Oregon, I happened to be there on the day they had a service learning fair. In each of these cases I had the chance to talk with students, teachers, and school administrators about how central these things are at MIT, and seeing their heads nod with interest, as if this was news to them.

When we talk with students on the road, one of their foremost concerns is faculty-student interaction. They question this in many different ways, asking about average class size, research opportunities, and whether graduate students teach classes. But what they really want to know is how likely it is that they will have close and meaningful contact with faculty.

This is highly valued and fortunately, with the enthusiasm that our faculty show in teaching and mentoring students in the classrooms and in the labs – notably through programs such as UROP and as freshman advisors – we have many good stories to tell.

After the Admissions staff comes back to campus at the end of October, we will begin reading application files. Through the winter we will focus on reading the applications we receive and selecting the class. All faculty are invited to participate. Indeed, each year many faculty, including the faculty members of the Committee on Undergraduate Admissions and Financial Aid (CUAFA), read application folders and provide their inputs to the selection process. If you are interested in being part of this activity, please contact either Steve Graves (sgraves@mit.edu), the current chair of CUAFA, or me.

The process is rigorous and thorough. Admitted students pass through no fewer than five stages of evaluation, with the final selections all being done by multiple committees to ensure as fair a process as possible. All applications are read at least once, and many are read multiple times.

Last year 69% of the students we admitted chose to enroll (our highest yield ever), and one of the highest yields in the country. . . . [and] students who visit campus once they have been admitted yield at an even higher rate: 81% last year.

The staff puts a great deal of energy into the process, reading the cases with great care, researching programs, and spending time on the phone and e-mail clarifying information with school counselors, teachers, and our alumni interviewers. We discuss, argue, and finally, make decisions.

The process is quite difficult because we receive applications from so many more highly qualified candidates than we could possibly admit, more so now than ever before (see table). And, while we look for students who show qualities that would make them a good match for MIT – academically talented students interested in an analytical-based, hands-on

Entry Year	Applications	Admitted	Enrolling
2007	12,445	1553	1069
1997	7836	1938	1067
1987	7371	1826	1001
1977	4838	1939	1073
1967	3751	1367	883
1957	3344	1752	850

education, who have shown true engagement, initiative, curiosity, and community mindedness – there is no one specific profile of student that we are looking for. The students we admit will have a wide range of interests, activities, backgrounds, and experiences. And we value that.

Once we admit them, our job is far from done. We spend a great deal of energy connecting with the admitted students and fully informing them of the opportunities at MIT so they will make the best decision as to whether to choose to enroll. Because we chose them, we think that they are great matches for MIT and hope very much that they will, in turn, choose us. And many of them do.

Last year 69% of the students we admitted chose to enroll (our highest yield ever), and one of the highest yields in the country. Of particular note is that students who visit campus once they have been admitted yield at an even higher rate: 81% last year. While some of this is selection bias (students who are more inclined to enroll are more inclined to visit), our surveys indicate that the campus visit – notably during Campus Preview Weekend – is a big reason students choose to enroll at MIT. Seeing first-hand how vibrant the atmosphere is on campus is enough to convince many of them that this is the place to be.

Personal interaction is supremely important in helping students feel connected to the campus community, and therefore make them more likely to choose to enroll. Here is another place where faculty can be helpful, and we would very much appreciate your participation. As I mentioned earlier in this article, students are very interested to know what kind of faculty interaction and research opportunities they will have. There is no better way for us to communicate this than directly through our faculty.

As the competition for these top students heats up – as other schools out there are now emphasizing science and engineering programs and recruiting the top students interested in those fields – we have to continue to communicate well the exciting opportunities that await these students at MIT, and how much we want them to join us.

There is a fair bit of work that goes into recruiting and selecting our remarkable student body. I cannot praise enough our talented and hardworking staff, who are completely committed to MIT, to its students, and to the ideals of a meritocratic, rigorous, and transparent process. But we also rely on literally thousands of others, from alumni who volunteer to do outreach and interview our applicants, to the current students, staff, and faculty who make countless connections with our prospective students, all in the service of bringing the best students who are well matched for us to campus. Something this important deserves nothing less. ■

Stuart Schmill is Interim Director of Admissions (stucrow@mit.edu).

A Meeting with Disaster: Planning for Emergencies and Extended Outages

Bill VanSchalkwyk

WOULD YOU BE PREPARED to be locked out of your office or lab for 40 days? MIT occupants at One Broadway, in Kendall Square, had that experience last winter. A transformer fire in the basement, which killed an NStar worker, shut down the building on December 8, 2006.

While the events of that day were extremely traumatic, from reports of the experiences of Sloan faculty and staff and of the OpenCourseWare staff who occupied E70 at the time, not having a comprehensive plan to recover and resume work was another critical anxiety that lasted for weeks. They were unprepared, for example, for the amount of work kept on paper that could not be retrieved from the building. Occupants also found it disconcerting to not have alternative working accommodations – space and equipment – immediately available because prior arrangements for such an extended outage were not made in advance. What the building occupants now wish they had known in advance of the disaster was: a) recovery assistance that the Institute could provide, and b) planning and disaster recovery activities that are the responsibility of the individual office or group.

The One Broadway experience occurred against a backdrop of a heightened sense of vulnerability following the events of September 11. Since 9/11, incidents like the library bombing at Yale University and the Virginia Tech shooting in April 2007 have only underscored the emergency planning challenges that are unique to the university setting. These events, and their lessons learned, also underscore the fact that planning for a spectrum of emergencies – including extended outages – is a layered process, one that requires constant adaptation as research changes, technologies evolve, and the campus boundary shifts from discrete geographical locations to dis-

tance learning and fluid partnerships with universities abroad. What remains the same, however, is the need to ensure the safety and security of our campus community. After the Virginia Tech and other more recent campus shootings, MIT faculty asked for guidance about what to do should such an incident occur in their classroom. In the days following the Virginia Tech incident, the buzz at a faculty meeting and amongst the Institute leadership revolved around the status of the Institute's own emergency communication plan, and the steps in place – or planned – to ensure timely, informative, and accurate alerts to the MIT community. At the heart of the communication plan is MIT's emergency preparedness structure.

MIT's Existing Emergency Preparedness Structure

The Environment, Health and Safety (EHS) Office is responsible for overseeing and for providing services to departments, labs, and centers on matters spanning environmental sustainability and occupational safety to chemical, radiation, and biological controls. In recent years EHS, working closely with partner offices such as the MIT Police Department and the Medical Department, has been increasing its focus on issues related to the Institute's preparedness for extended outages – from localized outages that affect a single floor or building (like One Broadway) – to campus-wide disasters that might result from a hurricane, winter storm, or a pandemic illness. The emergency structure consists of multiple layers connecting the Institute leadership to individual laboratories and residence halls, and is at the heart of emergency planning, communication, response, and recovery efforts.

For many localized incidents, the Emergency Response Team, the EHS Management System network, and

Emergency Preparedness Coordinators are sufficient to mitigate the situation. For larger-scale emergencies – recall the campus-wide power outage in 2004 and the campus-wide water outage in 2005 – response and resources across a broader section of campus must be marshaled. In these instances, an Emergency Operations Center (EOC), consisting of representatives from key MIT operational areas, is activated to muster the resources of MIT to oversee and resolve impacts of emergencies affecting multiple portions of the campus. In parallel, key members of the senior administration form an Emergency Executive Committee (EEC) and make policy decisions in collaboration with faculty governance entities (e.g., the Faculty Policy Committee and the Officers of the Faculty) and the Academic Council. The EEC is the public face of any emergency, including any communications to the MIT community, parents, and the press. Its policies not only impact the public's perception of MIT during an emergency, it also drives the direction of emergency and business continuity efforts.

Previous Emergency and Business Continuity Planning Efforts

Many of us recall the frenzy in the months preceding January 1, 2000, the dreaded "Y2K syndrome." Numerous entities, including MIT, undertook planning efforts to ensure business operations continued smoothly. The scope of the effort, however, focused on only a handful of MIT offices: Facilities; Information Services and Technology and Student Information Services; and Human Resources. Each of these groups formed FARM (Functional Area Recovery and Management) Teams, developed plans, and identified key department contacts.

Prior to 9/11, emergency planning focused on the safe evacuation requirements of the Occupational Safety and Health Administration (OSHA's) Emergency Action Plan standard. After 9/11, the plans that the Medical Department, the Division of Student Life, and research labs developed were based on Homeland Security "threat levels," and gave consideration to such items as additional staffing needs. Alongside these efforts, the Division of Student Life developed their "Dean on Call" emergency response guide, which provides protocols for various emergency situations. Simultaneously, MIT embarked upon the development of a comprehensive Environment, Health and Safety Management System (EHS-MS). The hallmark of the EHS-MS was the concept of partnership between the various Institute departments, labs, and centers (DLCs) and the EHS Office.

Where the inception of the EHS-MS originally focused on building a culture of safety-compliance, the lessons of One Broadway make it clear other areas of campus not historically served by the EHS-MS may now benefit from its organization in order to better plan for emergencies. To coordinate and consolidate the various planning efforts and nodes within the emergency preparedness network, in 2007 Executive Vice President Stone created the Security and Emergency Management Office. Housed in the Environment, Health and Safety Headquarters, this new office now strategically positions the Institute to address emerging security issues in tandem with the traditional EHS-based emergency preparedness and business continuity planning efforts.

Continuing the Continuity Planning: Efforts Currently Underway

In 2006, the Emergency Operations Center working group and the EHS Office began a dialogue with faculty groups and the central deans' offices to understand how an extended outage emergency (such as a flu pandemic) might impact the education program as well as the research program at MIT. As discussions have matured, a set of guiding principles and objectives has

evolved. First and foremost is ensuring the well-being of MIT students, faculty, and staff, as well as visitors and guests.

The flu pandemic scenario is perhaps the "mother of all emergencies" in that it targets our most valuable resource: people. Numerous policy issues, affecting research and teaching alike arise, including:

- how do we effectively apply "social distancing" measures to mitigate the spread of illness? It may mean that we suspend many of our normal operations, including classes, and that students and staff who can leave and stay away from the campus do so. Do we enforce such a policy, however, and if so, how?
- what are the financial, educational, and – primarily for students – the psychological implications of truncating an academic term? The spectrum of considerations spans everything from possibly using IAP or summer as a make-up term to how MIT continues to support graduate student stipends if the students are unable to work.
- how do MIT's administrative units continue to support the research mission without exacerbating any safety hazards created by a pandemic flu? Estimates of absentee rates associated with pandemic flu are in the 30%-40% range. Many of the hazardous laboratory operations could create very unsafe and possibly damaging conditions for the Institute. Who is willing to hibernate lab activity?
- to what extent is MIT willing to share its resources? On a personal level, this may mean volunteering expertise (caring for the sick); on a campus level, it may mean opening our doors to the Cambridge community either by will or by command of city, state, or federal agencies.
- finally, how do we begin to assess the costs and plan for recovery?

It is often said that it is not the plan itself that is used at the moment of emergency,

rather it's the think-on-your-feet capability and the second-nature ability to work together that the act of planning instills. The One Broadway fire and our discussions over the past year about extended outages have catalyzed preparations for a planning exercise that will involve all units at the Institute – from the administrative and operational units to the academic schools and research laboratories. In the planning process we ask that individual faculty and DLC administrators consider the following:

- how would you stabilize your research activity if water service or power was lost for more than a day or a week; your building was closed due to a major fire, gas leak, or other building system emergency for an extended period of time; or a significant natural disaster renders your research area indefinitely inaccessible?
- what are the major supply chains for your lab operations? What contracts are currently in place with your vendors?
- is research data routinely backed up off site?
- have you thought of an alternate location where you could possibly share resources temporarily so you can continue your work?
- have you discussed how to handle an emergency or outage with your staff and students?
- do you have ready access to department phone lists and MIT office contacts that can assist you in an emergency?

In the coming months, all units will be asked to identify their critical activities and plan for the eventuality of an extended outage (e.g., implementing a local communications plan as well as ensuring support for activity that cannot be discontinued during an emergency). By being fully prepared, we can ensure a safe and orderly response to an emergency outage, should one occur, and protect MIT's most important assets: its people and our research. ■

Bill VanSchalkwyk is Managing Director, EHS (Environmental, Health and Safety) Programs (billv@mit.edu)

The Pitfalls of Digital Rights Management

Wai Cheng

HOW WOULD YOU FEEL about colleagues who wish to read a paper you wrote for a professional organization being limited in the number of times they were allowed to print it? Or you being restricted in the number of students to whom you could distribute another colleague's paper? These are precisely some of the limitations imposed by organizations who employ the use of Digital Rights Management (DRM) technology for their technical publications.

DRM technology – which controls the use and distribution of electronic files – has been traditionally used by the commercial book publishing and music industries. DRM in these industries is justified as a protection of Intellectual Properties (IP). However, now that DRM is being used by technical organizations and scientific and engineering publications, one has to ask who should be the rightful owner of the IP.

My experience with DRM involves my research in automotive engineering. In the United States, the technical organization that promotes and “controls” the business is the Society of Automotive Engineers (SAE). SAE is a large and successful non-profit organization with a membership base of 90,000. The organizational structure and governance of SAE is similar to professional organizations such as the IEEE, ASME, IMechE, AIChE, and others.

A key mission of SAE as stated on their Website is a “free exchange of ideas in order to expand [their] individual technical knowledge base.” In accordance with this mission, SAE organizes professional meetings several times a year where researchers and engineers can present

their work and publish their presentations as SAE Papers. These papers become the de facto knowledge base for automotive engineering – if one wants to disseminate, or conversely, to find, automotive engineering technical information, one goes to the SAE Papers.

The SAE Papers are a significant source of income for SAE. (Currently, the price of each paper is \$11.20 for SAE members and \$14 for non-members.) SAE papers are available digitally through subscriptions to a digital library. MIT and other universities/industries that have an interest in automotive engineering are subscribers to the digital library. The subscription is not cheap – \$18K per year in 2006 for MIT, but in line with other publishers' content.

In 2006, SAE began to demand Digital Rights Management (DRM) on the SAE Papers. DRM puts a software lock on the PDF file of the paper. Once an SAE paper is purchased, the PDF is permanently locked to your computer. You may view it as many times as you like, however you are not able to share the document with another computer.

The implication of the DRM on the digital library subscription is that the DRM comes with a limit on the maximum number of papers to be downloaded from the digital library. Thus if one wants to distribute a paper to five graduate students, each student has to download it individually. In this manner, the quota can be used up rather quickly. Also, one is not able to browse freely the content of the paper, because each “look” would constitute a download. The loss of the freedom to browse is

a serious setback on the accessibility of the knowledge base.

SAE papers contain work done with substantial effort and intellectual contributions by the authors. Industry, government, and various organizations and volunteers support the financial cost of the work. The primary goal of these publications is to benefit the technical community (and society as a whole) through dissemination of information. The authors and organizations that sponsored the work should clearly be the rightful owners of the intellectual properties associated with the publications.

Legally, however, SAE has ownership of the publication IP. They require authors to sign copyright release forms before their papers can be accepted for publication. The authors are usually willing to sign away their rights because (i) there is the trust and understanding that SAE will distribute effectively the papers to the widest audience; and (ii) the authors really have no choice, because SAE is the premium automotive knowledge base holder.

The authors, however, would like to get their papers read by as many people as possible. In an ideal world, the publications should be free of charge to maximize distribution. In practice, since there are costs associated with the distribution process, it is reasonable that SAE should charge a modest fee as the middleman. Thus there is an essential tension between SAE, who wants to maximize profits from the papers, and the SAE members, who want to maximize dissemination of and access to the knowledge base at reasonable cost.

In April of 2007, I went before the SAE Publishing Board to argue against the use

of DRM. I was supported at the meeting by colleagues from universities with significant automotive research. My arguments were as follows:

- DRM is a significant inconvenience to users. Because of the DRM print and distribution limitation, users will revert back to archiving via the paper medium; hence the whole “digital revolution” is defeated.
- The above inconvenience impedes the “free exchange of ideas;” therefore, the DRM is contrary to the founding principle of SAE.
- In theory, the DRM would suppress the illegitimate users, and increase sales by only allowing limited distribution by legitimate users (e.g., instead of giving my graduate students copies of a SAE paper to read, I would have to buy them each a copy). In practice, illegitimate users would still be there, and it is very unlikely that any individual who has purchased a paper would purchase extra copies for limited distribution. Individual sales will not increase, but there will be a substantial number of cancellations of the digital library subscription. Thus there will be a loss of revenue.
- The DRM practice has significantly alienated the SAE member community – including professors and students, engineers from industry, library staff from both academia and industry, SAE technical session organizers, and paper authors.

After the meeting a press release was issued, and a task group was formed to decide the future policy of DRM. The DRM practices for academic SAE Digital Library subscribers were suspended for the remainder of 2007. For MIT, however, this reverse of policy was too late, since our subscription ended in March 2007 after negotiations with SAE for a new digital library contract had broken down over their requirement that MIT implement DRM, along with accepting a substantial price increase and download limits.

Since April, there have been several meetings of the SAE DRM task force that

consisted of SAE staff and library representatives from two universities (Auburn University and Lawrence Tech). During the meetings the SAE staff side-stepped the bigger issue of technical information transfer and intellectual ownership from the perspective of the whole technical community, and instead argued narrowly that universities are “cheap,” and thus the issue is specific to academia. The proposed solution only addresses student and faculty uses by slightly relaxing DRM control on the number of printed copies to be made or the number of computers on which the files could be distributed – in other words, DRM is here to stay.

The SAE DRM case has been watched closely by universities, professional societies (e.g., IEEE) and the technical publishing world. Most technical literature is now available electronically. The MIT Libraries have not purchased any technical papers or journals that are subject to DRM and no other journal publisher or technical paper publisher has proposed access with DRM restrictions.

There are two possible pathways to getting rid of DRM and to making technical information exchange a free and open process. One is to find another market for technical communication. Web publishing is emerging, but it has not been widely accepted (think: tenure and promotion cases in academia). A significant deficiency in this model is the lack of organization and quality control. Some of us, however, are serving or have served as editors of professional journals, so what we can do is to switch the effort to become editors of Web journals; thus the resources are there. We just need to do it – both to do the work and to lend our names to legitimize the endeavor. Furthermore, professional services are needed to support Web journals in terms of both hardware and software support. The overhead, however, is much lower because of the electronic means. Therefore, with start-up money from foundations, modest subscription charges from libraries, and advertisement revenues (the Google model), the enterprise is entirely plausible. Therefore, I am calling for my colleagues to play a leadership role in Web publishing.

The other pathway is to make DRM an unattractive option for the publisher. Libraries should make it a policy not to subscribe to any publication with DRM. The MIT Libraries are doing just that, including cancelling subscriptions to the SAE Digital Library. This act was joined by the leading universities with significant automotive research (e.g., U. of Michigan; U. of Wisconsin, Madison; U. of California, including Berkeley, Los Angeles, and Davis campuses; U. of Texas, Austin; U. of Minnesota; Virginia Tech; Purdue). The subscription cancellation does mean some hardship for the users, but we will all learn how to cope. For SAE, the financial impact may be small, but not insignificant, and it is of vital interest to the technical community to resist the DRM implementation. ■

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Editor's Note:

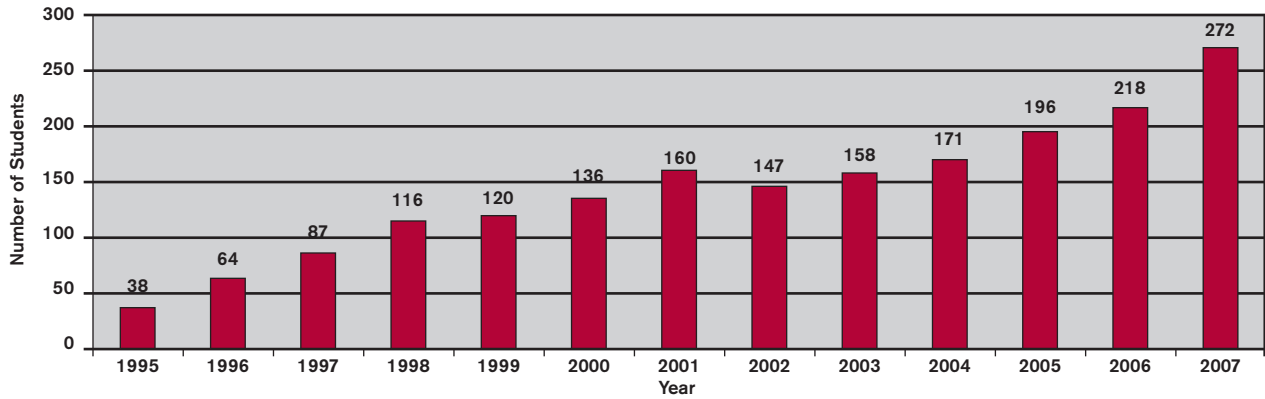
As we went to press, SAE announced that “In 2008 students and faculty will be able to use SAE International's Digital Library of Technical Papers in academic settings without the former restrictions.”

Based in part on the concerns expressed by Professor Cheng (and others) at the SAE Publications Board meeting last April, the press release went on to say that “As recommended by a special task force, the SAE International Publications Board voted Oct. 31 to eliminate the use of the ‘FileOpen’ plug-in on digital library products for licensees at colleges, universities and other academic institutions.

“Composed of university professors, librarians, publications board members and staff publishing professionals, the Special DRM Task Force was charged with making recommendations to improve the ‘ease-of-use’ of the Society's Digital Library of Technical Papers in academic settings. This group concluded that the special information needs of students and faculty members would be best served in a more open environment – without the digital rights management restrictions imposed by a file security system resident at the client computer level.”

M.I.T. Numbers Student Global Experiences

**Participation in MISTI* Programs
(Internships, Research, and Study Abroad)**



	Japan	China	Germany	India	Italy	France	Mexico	Spain	Total
1995	36	2							38
1996	42	22							64
1997	37	28	22						87
1998	25	48	37	6					116
1999	32	35	33	15	5				120
2000	28	48	38	17	5				136
2001	17	57	36	14	8	28			160
2002	28	44	36	0	8	31			147
2003	35	15	40	6	13	49			158
2004	33	35	25	16	9	52	1		171
2005	32	42	45	26	9	33	9		196
2006	35	33	50	26	9	51	11	3	218
2007	32	40	64	26	25	40	20	25	272

*MIT International Science and Technology Initiatives
Note: Approximately 1/3 of MISTI Participants are Graduate Students
Source: MISTI Office