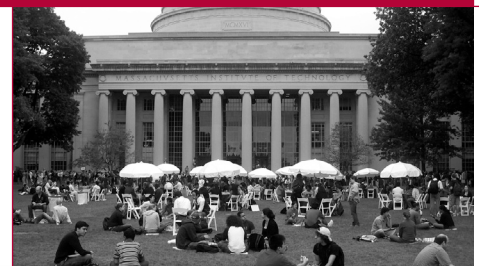


MIT Faculty Newsletter

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

in this issue we offer a call for nominations to the Newsletter Editorial Board (p. 4); Ernst Frankel on "America's Infrastructure Engineering Dilemma" (p. 10); an update on the recommendations of the Task Force on the Undergraduate Educational Commons (p. 12); and a "Who's Who in the MIT Administration" (p. 22).



MIT Community Picnic

From The Faculty Chair Faculty Representation? How?

Bish Sanyal

ONE KEY RESPONSIBILITY OF MIT faculty officers is to convey wishes and concerns of the faculty to the senior members of the administration. But how do we as faculty officers come to know of your preferences or concerns?

At the moment, there are three ways you can communicate with the faculty officers, even though some of you may not be aware of any of these options. In fact, some of you may not be aware that there are three individuals, including myself, who are your faculty officers! (In addition to myself, the two other faculty officers for 2007-2009 are: Melissa Nobles, Vice Chair of the Faculty, and Bevin Engelward, Secretary of the Faculty.) Nevertheless, we want you to know that your first option is: You can contact any one of us directly and meet with us either in our offices, or you can

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Newsletter Most Popular Among MIT Faculty

Newsletter Staff

MIT FACULTY READ THE *Faculty Newsletter* more than any other campus publication, according to results of the Institute Communication Survey administered last March. Nearly 87% of faculty who responded said they regularly or occasionally read the *Newsletter*, while only 2.5% said they were aware of the *Newsletter* but never read it. *Tech Talk* was the second most read publication by faculty, with a little more than 78% reading it regularly or occasionally (see graph, page 8).

Regarding MIT online resources or Websites, 73% of faculty who have visited it said they found the *Newsletter* Website either very or somewhat valuable, second in percentage to only the MIT News Website, with a little more than 77% of faculty finding it very or somewhat valuable (see graph, page 8).

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20th Anniversary of FNL: A Brief History of its Founding

John Belcher and Jonathan King

THIS COMING MARCH 10, 2008 will mark the twentieth anniversary of the "zeroth" issue of the *MIT Faculty Newsletter* (FNL). Institutional memory at MIT is short lived, and many at the Institute now have little knowledge of the events 20 years ago that led to the founding of the FNL. We think it is appropriate at this juncture to review that history.

This is not a question of revisiting events long past that are no longer relevant. Indeed, the recent near-death experience of the *Newsletter* underscores the fact that many of the same issues that motivated its founding are alive and well today (see the article entitled "The Saga of the Struggle for Survival of the Faculty Newsletter" in the March/April 2007 issue at web.mit.edu/fnl/volume/195/me.html). There are many reasons we think that the continued existence of the FNL is impor-

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Aeronautics & Astronautics/Engineering Systems

Ernst G. Frankel

Mechanical Engineering

Stephen C. Graves

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Jean E. Jackson

Anthropology

Gordon Kaufman

Management Science/Statistics

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Biology

*Stephen J. Lippard

Chemistry

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Civil & Environmental Engineering/Engineering Systems

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David Thorburn

Literature

*George Verghese

Electrical Engineering & Computer Science

Rosalind H. Williams

Science, Technology, & Society/Writing

David Lewis

Managing Editor

*Editorial Sub-Committee for this issue

Address

MIT Faculty Newsletter
Bldg. 11-268
Cambridge, MA 02139

Website

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

Telephone 617-253-7303

Fax 617-253-0458

E-mail fnl@mit.edu

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Photo credit: Page 1, David Lewis

20th Anniversary of FNL
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tant to the MIT community, and the best way to illuminate those reasons is to review the events that led to its founding in the first place.

On January 6, 1988, faculty members of the 43-year-old Department of Applied Biological Sciences, then Course 20, were informed by the MIT administration that the department would be phased out over the course of the coming 18 months. The department at that time consisted of about 200 members, including 24 faculty, 86 graduate students, plus undergraduate majors and support personnel. In a subsequent article in *The Boston Globe* of February 2, 1988, MIT officials were quoted as saying that the plans to phase out the department arose “. . .because it is not meeting the intellectual standards expected of a department at MIT. . .” The following paragraph is from the same article:

“While no jobs will be immediately lost, MIT officials said some tenured and non-tenured faculty may end up leaving the Institute. They said ‘every effort’ would be made to place tenured faculty in other departments, but no guarantees have been extended to faculty, or to secretaries and other support staff. Four non-tenured assistant professors may lose their jobs when the current contracts expire. Graduate students in the department will be allowed to finish their degrees.”

The response to this disbanding of the department was immediate and overwhelmingly negative. Graduate students in the department circulated a petition with over 110 signatures, maintaining that statements by the administration in the *Globe* as well as those “. . .appearing in *Science* and in other scientific journals seemed to publicly label the faculty and students as second rate. The question is not only whether MIT will award degrees to current students, but whether those degrees have been discredited, said a research associate who had gotten a grad-

uate degree from the department. . .” [*The Tech*, February 19, 1988]. At the regularly scheduled faculty meeting in February, every faculty member who spoke deplored the decision-making process used in disbanding the department. “Professor Gerald Wogan, the head of the department, read a letter from the department faculty which expressed ‘disagreement with the decision’ and ‘disappointment with the surprising process’ by which the department was disbanded. The letter said the process lacked ‘due process and adequate review’ and noted that the faculties were not given ‘the opportunity to respond professionally and effectively to criticism’” [*The Tech*, February 19, 1988].

As a result of the March faculty meeting, an Ad Hoc Committee on Reorganization and Closing of Academic Units was formed whose members were Glen Berchtold, John Essigmann, Morris Halle, Henry Jacoby, Phillip Sharp, Arthur Smith, and Sheila Widnall (Chair). The complete report of this committee was distributed to the faculty prior to the May 18, 1988 faculty meeting. The conclusions of that report are online at web.mit.edu/jbelcher/www/ABS/, and we quote two of the paragraphs from those conclusions.

“It is the view of this committee, and we believe of the faculty at large, that a key to the success of the Institute has been the maintenance of a system of shared governance. Few of the MIT faculty see themselves in an employee-employer relationship with the Administration. Rather, most feel that the Administration and faculty share a joint responsibility for sustaining the excellence of the Institute. They expect that, when important choices arise about mission or internal organization, they will naturally be involved in the process leading up to decisions and in the planning of implementation.”

. . .

“Aside from the issue of shared responsibility, a source of concern in this case arises from the collective regard of the faculty for one another. It is the perception of the

faculty that members of ABS were poorly treated in the process: the unfavorable publicity that impacted their careers, the lack of understanding and communication by the Administration as to the nature of the Institute’s commitment to their careers, the lack of consultation prior to the decision, and the announcement of the decision without a detailed plan for assuring the continuity of the careers of the faculty. This is not acceptable treatment of faculty members at MIT by its administration. The incident raised apprehension in the minds of many about the meaning of tenure and the obligations to junior faculty, other MIT personnel and students. We believe the faculty needs a clear statement on these issues and below we make recommendations to this effect.”

One of the lasting results of the ABS closing was the fact that the changes in *Policies and Procedures* recommended by the Widnall Committee were subsequently adopted. In the recent merger of the Mechanical Engineering and Ocean Engineering Departments, these procedures were carefully followed, but few current faculty members know the history that led to the adoption of those procedures.

The second lasting change (at least so far) resulting from the ABS closing was the founding of the *MIT Faculty Newsletter*. At the time of the dissolution of the ABS department, MIT faculty members preparing a petition calling for a reversal of the administration’s actions had difficulty in circulating the draft broadly due to the unwillingness of the administration to make faculty mailing lists available. In addition, with the faculty meeting agenda set and the faculty meeting chaired by the President, fully open discussion was not easy. The FNL emerged as an effort to establish open lines of communication among faculty. In the zeroth issue of the *Newsletter*, which is online at web.mit.edu/fnl/volume/201/fnl00.pdf, Vera Kistiakowsky wrote:

“A group of faculty members which has been discussing the recent events concerning

continued on next page

20th Anniversary of FNL

Belcher and King from preceding page

the Department of Applied Biological Sciences has concluded that difficulty in communication prevents faculty consideration of the problems except in crisis situations. There exists no channel for the exchange of information between faculty members for the discussion of problems at MIT, since neither Tech Talk nor the faculty meetings serve these purposes. Therefore, we decided to explore the desirability of a newsletter, and one purpose of this zeroth edition is to see whether there is support for such a publication.”

There was significant support for such a publication, and the subsequent 19+ years of issues of the *Newsletter* after the “zeroth” issue can be found in the *Newsletter* archives. Initially the *Newsletter* was supported by contributions, but given that the faculty brings into MIT a large amount in research income, it seemed reasonable to the first FNL Editorial Board that a tiny fraction of that be returned directly to the faculty to

finance the *Newsletter*. It was a full nine years after these origins that President Vest formally agreed to support the publication costs and a salary for the managing editor of the *Newsletter*. This battle has had to be fought continually in the years following, as described in the article in the last issue referenced above.

During the ensuing years, the *Newsletter* has provided a forum for expression of faculty concerns and views, a major channel of communication among the faculty, and a means for candid debate on difficult issues. The primary guiding principles have been to provide open access for faculty and emeritus faculty to express views on issues of concern through control of editorial policy by the faculty Editorial Board, independent of influence by the MIT administration. Areas where the independence of the *Newsletter* have been important include the first public release, on our Website, of the report on the “Status of Women Faculty at MIT;” the publication of the recent Special Edition *Newsletter* devoted to responses to the Report of the Task Force on the

Undergraduate Educational Commons, to which more than 40 faculty contributed; exploration of health insurance, pension, and retirement issues; compacts with foreign governments; and minority recruitment and promotion.

Since its inception, the *Newsletter* has been maintained by a volunteer Editorial Board, over time involving more than 30 members of the faculty from all Schools of the Institute. As described below, we are now moving to a more formal nomination process, and direct election of Board members by the full faculty.

The *Newsletter* has come to be widely read, not just at MIT but outside as well, through the online edition at web.mit.edu/fnl. The FNL Website also can potentially serve as a forum for discussion of national and international issues. With the support and involvement of MIT’s faculty, the *Newsletter* will continue to play an important role at MIT and beyond. ■

John Belcher is a Professor of Physics (jbelcher@mit.edu);

Jonathan King is a Professor in the Department of Biology (jaking@mit.edu).

A Call for Nominations to the Newsletter Editorial Board

AS ANNOUNCED IN THE last issue of this newsletter (Vol. XIX No. 6, May/June 2007), a change in the *Policies and Procedures of the Faculty Newsletter* now calls for direct election by the faculty of *Newsletter* Editorial Board members.

The *Newsletter* Nominations Committee (Alice Amsden, John Belcher, Fred Moavenzadeh, Ron Prinn) will

review nominees, and faculty-wide, electronically based elections are planned for early next year.

Nominees for the Editorial Board should give evidence of commitment to the integrity and independence of the faculty, and to the role of the *Faculty Newsletter* as an important voice of the faculty.

Please forward all nominations to: fnl@mit.edu. Nominating faculty should include, both for themselves and their nominee, full name, department, Institute address, phone number, and e-mail address, as well as a brief explanation of nominee qualifications to serve on the Board. ■

Editorial

Transparency and Communication

SCIENCE AND TECHNOLOGY PLAY critical roles in the formulation of international policies on challenges facing the global community. They also contribute substantially to the development of enabling technologies for implementation of these policies and for coping with their consequences. Global issues such as climate change, renewable energy sources, and the security and privacy of individuals are matters in which science and technology take a lead. Many of these issues benefit from the core competency of MIT, thereby ensuring that the Institute will be called upon more frequently to participate and contribute to their resolution.

Some new technologies are highly controversial and will generate substantial debate and opposing points of views within the MIT community. For example, a national information system for tracking activities of suspected individuals could raise significant concerns about protecting the privacy of the innocent. Similarly, formulation of energy or

environmental policies that may favor a specific technology or a particular national resource could create similar controversy. As we have witnessed over the past few years, the manner by which the federal government has handled several of these issues, especially those related to security and privacy, has resulted in a great deal of disagreement, resignations of officials, and even discussion of indictments of some senior members of the government. We at MIT need to put in place a process that is transparent, extensively debated, and well accepted by the community.

We welcome the recent emphasis on increased communication within MIT and with the outside world that the MIT administration has initiated in support of these undertakings. The *Faculty Newsletter* will carry more reporting on administration policy and planning. At the same time we caution that the administration not confuse transparency and communication with public relations.

This edition includes an article on the history of the *Faculty Newsletter* (p. 1) and its roles both in correcting policy errors at MIT and in broadening discussion, debate, and participation on a variety of important matters. The topics were not just internal to MIT, but represented interaction with national and even international constituencies. As we move forward toward increased communication and transparency within MIT and outside, having the FNL as a channel for discussion and debate becomes even more critical. In the coming year we will be developing the *Newsletter Website* as a mechanism for timely consideration of national and international policy issues, along with items of primarily internal interest. We also will be increasing the clarity and transparency of our editorial policies, as well as moving to an Editorial Board that is elected by the full faculty. ■

Editorial Sub-Committee

Hockfield to Write on “State of the Institute” in Next *Newsletter*

PRESIDENT HOCKFIELD AND other senior administrators have agreed to write for future editions of the *Faculty Newsletter*, with topics of interest to the faculty agreed upon with the *Newsletter* Editorial Board.

President Hockfield will lead off in the November/December issue by writing on the “State of the Institute,” based on her October 2 Institute forum of the same name. Much like the town meetings held during President Vest’s tenure, the forum

will be open to all members of the MIT community and will feature a question and answer period.

Following President Hockfield, other senior administration members will write for each issue of the *Newsletter* for the remainder of the academic year. Other potential participants include the Provost, Chancellor, and the Executive Vice President.

The *Newsletter* wishes to thank the administration for recognizing the value

David Lewis

of communicating with the faculty through its pages. We expect that the administration will address topics of interest and concern to the faculty. The Editorial Board requests suggestions from the MIT faculty.

You can reach us at fnl@mit.edu, and we strongly encourage you to make your desires known. ■

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

Faculty Representation?

Sanyal from page 1

also talk to us at the reception which is held after every faculty meeting on the third Wednesday of each month. Your second option is to speak to any member of the Faculty Policy Committee (FPC), which includes the three faculty officers, and 12 other senior faculty members from the five Schools. The FPC meets on alternate Thursdays; and even though its agenda focuses on faculty governance issues, other issues are discussed as well. The third option is to voice your concerns at the monthly Random Faculty Dinners hosted by Jay Keyser. The guest list for this dinner is randomly selected, as Jay always reminds the guests; but the Faculty Chair is invited to all the dinners and participates actively in the discussions, which are animated by good food and decent wine.

These three options are, of course, far from adequate in their current form for you to voice your aspirations and concerns. Very few of you attend the monthly faculty meetings, and even fewer make the effort to walk up to the R&D Pub after the meeting to attend the reception. The timing of the faculty meeting – ending around 5:30 pm – and the spatial distance between the meeting room (32-141) and the R&D Pub may explain, partly, the poor attendance at the reception.

The FPC as well has yet to serve its role fully as a truly representative forum for in-depth discussions of the wide-ranging faculty issues at MIT. The FPC members are nominated by the Nominations Committee, which usually nominates knowledgeable and like-minded faculty members who attend the luncheons, but rarely debate any issue beyond the polite luncheon conversations.

In contrast, the dinners hosted by Jay Keyser have been more lively, at least during the last few years. I have often wondered the reasons for their success. Is it because the number of guests is relatively small? Is it because the guests are selected randomly? Is it because senior members of the administration do not usually attend these dinners? Or, is it because Jay sends

personally addressed invitations to each invitee and then plays the role of a witty, smart, as well as a knowledgeable host who makes everyone feel at ease in speaking their mind? Whatever the reason, these dinners have turned out to be a good setting for interactions among the faculty and for evoking genuine faculty concerns on various issues.

Based on this informal assessment of how faculty officers may learn about the

... on the first Wednesday of every month, the faculty officers will be available to meet with you over lunch at 12:30 pm in the faculty lunchroom. If this turns out to be a popular venue, we may expand the frequency of the luncheons.

wishes and concerns of the faculty, we – the incoming officers – have decided that it may be worthwhile for us to introduce a few incremental changes intended to evoke more discussions. First, the agendas of the monthly faculty meetings may need to be set with the aim of generating discussion on important general topics – which means fewer agenda items and more deliberations on issues prior to decision making. Second, we need to shift the location of the faculty reception closer to the room where the faculty meets (Room 32-141). My preference is that the reception be held right outside Room 32-141, so faculty can have a glass of wine if they like on the their way out of the meeting, and engage in informal conversations providing feedback on the issues raised at the meeting.

Third, the FPC needs to go beyond the usual Thursday luncheons and engage more deeply with a few issues, generating brief written documents (not more than five to 10 pages) that would capture well the views of the faculty on such issues. This may require FPC members to spend a few more hours in addition to attending the wonderful luncheons. At the moment,

we are finalizing the issues to be deliberated by the FPC in 2007-2008, and I will inform you in my next note to the faculty which issues we will focus on next year. Fourth, on the first Wednesday of every month, the faculty officers will be available to meet with you over lunch at 12:30 pm in the faculty lunchroom. If this turns out to be a popular venue, we may expand the frequency of the luncheons. Finally, we are always open to hear from you

directly, either via e-mail, phone conversation, or a personal meeting, regarding your wishes as well as concerns. In the past, faculty officers did receive such feedback, but only when there was a controversy or dispute of some kind. It will be nice to have discussions without any such particular case looming over our heads. So, please, do send us your comments if you want us to convey your position on any issue to the MIT administration.

And how would the faculty officers convey your views to the senior members of the administration, you may ask; after all, the faculty officers are not part of the administration! Fortunately, the channels of communication between the administration and the faculty officers are quite open: the President, the Provost, and the Chancellor meet with the faculty officers every month to finalize the agenda for the faculty meetings. The President attends FPC meetings at least once every semester, and the Vice President for Institute Affairs attends these meetings regularly. Other members of the administration do not attend FPC meetings regularly, but do so whenever requested by the FPC. In addition, the

Provost meets weekly with the Chair of the Faculty; and there are numerous occasions, sometimes held in the beautiful Gray House, where the faculty officers interact closely with senior members of the administration. In addition, as Chair of the Faculty I regularly attend the weekly Academic Council meetings, affording me yet another opportunity to convey the faculty's interests.

And, much like you who can make a personal appointment to talk to either

the President, the Provost, the Chancellor, or any other member of the administration, the faculty officers can also converse with the senior administrators, one to one, on any issue we may consider important.

This open communication is possible because most top-level administrators at MIT are also faculty members who are quite aware of the institutional constraints and opportunities that shape faculty life. It is true that the concerns of the faculty

are not the only concerns of the senior administrators: They also have to consider the concerns of students, staff, alumni, Corporation members, prospective donors, and so on. In that regard, it is the responsibility of the faculty officers to convey your concerns to the members of the administration; but we can best serve that role only if you and we begin to communicate well. ■

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

Teaching this fall? You should know ...

the faculty regulates examinations and assignments for all subjects.

Check the Web at web.mit.edu/faculty/termregs for the complete regulations.

Questions: Contact Faculty Chair Bish Sanyal at x3-3270 or sanyal@mit.edu.

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

First and Third Week of the Term

By the end of the **first week** of classes, you must provide a clear and complete description of:

- required work, including the number and kinds of assignments;
- an approximate schedule of tests and due dates for major projects;
- whether or not there will be a final examination; and
- grading criteria.

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

For all Undergraduate Subjects, Tests Outside Scheduled Class Times:

- may begin no earlier than 7:30 P.M., when held in the evening;
- may not be held on Monday evenings;
- may not exceed two hours in length; and
- must be scheduled through the Schedules Office.

No Testing During the Last Week of Classes

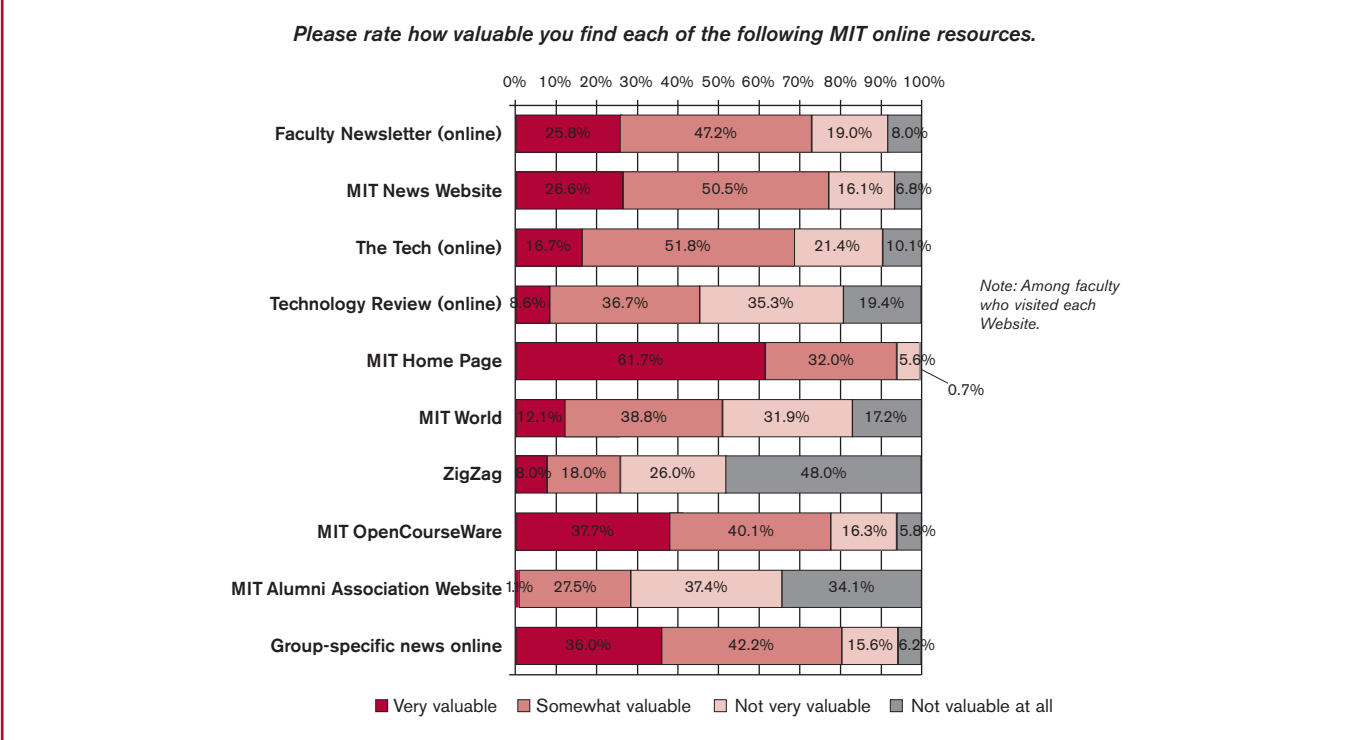
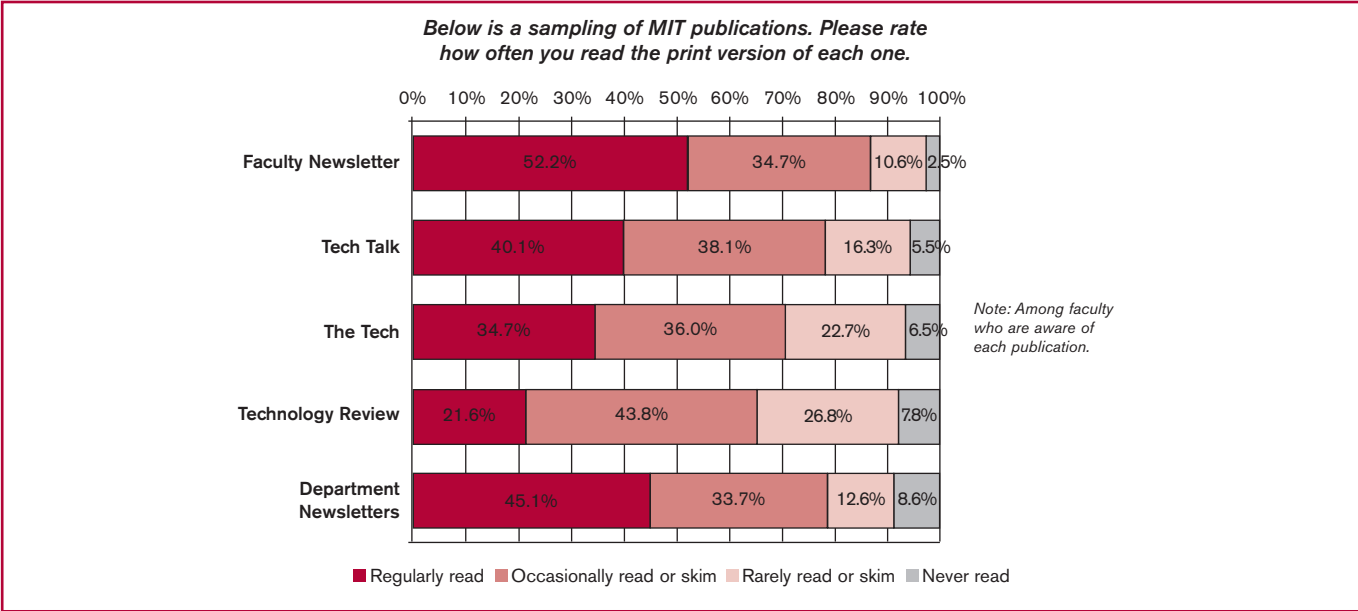
Tests after Friday, December 7 must be scheduled in the Finals Period.

Newsletter Most Popular
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The student newspaper, *The Tech*, also rated quite highly among faculty members, with nearly 71% reading the print version regularly or occasionally, and 68.5% finding *The Tech* Website very or

somewhat valuable. Not surprisingly, the MIT Home Page was the Website rated highest among faculty, with more than 93% finding it very or somewhat valuable. Other online campus sites fared less well among faculty, with the following percentage reporting they have *never visited or can't rate* the online resource:

- ZigZag (83%)
- MIT Alumni Association (70%)
- MIT World (62%)
- Technology Review (54%)
- Faculty Newsletter Website (47%)
- MIT News Website (37%)



MIT Poetry

by Joe Haldeman

machinegunner

last night and afternoon I cleaned each round
with a gasoline-soaked rag, and inspected each round
before snapping it into the belt
so that when my loader is killed
the belt will run true
for as long as I am allowed to live

forgive me my sin

at a cyclic rate of fire
the bipod would dig into the sand
and restrict lateral movement,
so I took a sandbag
and invested a canteen of water
to make a firm base for the weapon
for as long as I am allowed to live

forgive me my sin

I hear the muted cough and clank of their tanks
and I hear the whip of the helicopter blades
from just below the near horizon
and with my loader I stare at the horizon
and wait, and keep touching the safety
pushing it uselessly forward
so the weapon will fire
at the first man that I see

forgive me my sin

I will die here
and my loader will die here
before noon
we will be dead and crushed by the treads of tanks

Allah

forgive me my sin

but they are just men,
like me and my loader,
and it hurts me to glory in killing them
as it hurts me
to be afraid of dying.

Joe Haldeman teaches in the Program in Writing and Humanistic Studies and is best known for his award-winning science fiction novels. This poem appeared in a 2007 collection titled *On Our Way to Battle: Poetry from the Trenches*. This is his second appearance in the FNL.

America's Infrastructure Engineering Dilemma

Ernst G. Frankel

PHYSICAL INFRASTRUCTURE, ONCE the pride of America and a major contributor to its economic and social growth and success, has in recent years become an acute embarrassment to this nation. Infrastructure failures, ineffectiveness, and the inability to properly plan, construct, manage, and maintain it now pose an acute challenge to America's claims of economic, social, environmental, and technological leadership.

Most of our road, rail, water, sewer, electric power, wired telephone, and other distributed systems infrastructure are old and in need of repair. Our ports, airports, and rail terminals are archaic, ill designed, badly run, and poorly maintained. Levees, coastal defenses, and dams often lack effective inspection and maintenance. In New Orleans, the core of many levees had been washed out, causing them to fail – a fact not discovered by simple visual levee surface inspection. Yet seismic measurements would have readily identified the growing problem for timely remedial action. Similarly, the recent Minnesota highway bridge collapse should have been prevented by proper timely inspection and maintenance. But most of our infrastructure is 50 years old or older, uses outdated designs and engineering, and has experienced little if any maintenance updating or repair. We do not have or use advanced infrastructure testing, inspection, or maintenance management methods.

Performance of recent infrastructure projects such as Boston's "Big Dig," its Kenmore Square bus station, New Orleans' levee reconstruction, and various dams, bridges, port and airport projects are a reminder of how far this country has

sunk in its public infrastructure development capability. Rapidly developing new economies such as China, Vietnam, Korea, Singapore, and others all place great emphasis not only on the timely and efficient development of infrastructure, but also on effective maintenance, updating, and constant improvements of these essential systems.

I just returned from Shanghai and Ningbo in Central China, two cities

Performance of recent infrastructure projects such as Boston's "Big Dig," its Kenmore Square bus station, New Orleans' levee reconstruction, and various dams, bridges, port and airport projects are a reminder of how far this country has sunk in its public infrastructure development capability.

which, in 1998 when I planned their ports, were connected by one 2x2-lane highway. Since then, this roadway has been enlarged to a 4x4-lane highway, and an additional new 80 km causeway bridge road connector with 4x4 lanes will soon be inaugurated. Large American construction firms, once global leaders in their field, are increasingly being shunned for large projects abroad such as this because of their lack of advanced engineering, planning, and implementation.

Much of this may be the result of educational priorities given to high technology, with fewer students interested in infrastructure-type problems that include civil and mechanical engineering, as well as electrical and nuclear engineering. MIT established many of the norms and procedures that still serve some

sectors, such as the nuclear power industry. Professor Norman Rasmussen established the standards for reactor safety and taught reliability, maintenance, and repair of nuclear reactors for many years. The enviable safety records of that industry are a monument to his contribution to engineering education. Similarly, excellent courses were offered in engineering project and risk management that served generations of engineers to

effectively plan, design, and maintain large-scale and often sophisticated infrastructure projects.

Significant research also went into the development of materials, fabrication processes, surface treatments, material handling and forming. All this allowed America to advance its infrastructure and thereby economy and quality of life for a long time. Yet, today we are faced with a debt-ridden economy, decrepit infrastructure, and an educational system that largely trains engineering scientists and not engineers, and an infrastructure badly in need of complete rework, update, and modernization. We teach logistics but not transport planning and engineering, and as a result have some of the world's worst airports, train stations, bus terminals, roads, and rail networks.

Infrastructure engineering offers many technically and scientifically exciting challenges, and American ingenuity could again lead the world in developing a new generation of infrastructure. But this will only happen if American universities reverse their priorities and reemphasize the challenges in infrastructure engineering by developing formal programs in the field. There are many technological and scientific challenges in the planning/design, use, and maintenance of future infrastructure that are no less exciting than those in so-called high tech areas, from advanced design to sophisticated testing, control, and operations management methods.

Infrastructure is the lifeblood of an economy and continued failure to address its needs will invariably lead to decline,

particularly in an American economy increasingly based on services and not on manufacturing and agriculture. Unless we train a larger cadre of new, well-educated, committed engineers to develop a new generation of essential infrastructure, America's economic future may well be in danger. Our competitors, such as China, India, and others, train proportionally a much larger number of engineers committed to and capable of advancing their infrastructure. This will give them an enormous advantage in facing increasingly complex economic challenges.

Many of our competitors build major infrastructure in less than half the time and at less than half the cost as we do. They increasingly dominate the global infrastructure engineering and project market, a sector in which U.S. firms led

not too long ago. In many Asian countries as much as 30% of engineering research funding is for infrastructure design, technology, materials, testing, and fabrication research – and that percentage is growing.

There are estimates that the U.S. will have to spend as much as 5% of its GNP (or over \$600b/year) for infrastructure repair, replacement, and expansion for many years to come if it wants to remain competitive in the international economy. Unless American institutions of higher learning recognize these needs and develop required programs to train the professionals needed, America's infrastructure will continue to atrophy and its competitiveness decline. ■

Ernst G. Frankel is a Professor Emeritus in the Department of Ocean Engineering (efrankel@mit.edu).

Is it Time for a New Manhattan Project?

William Schreiber

ALBERT EINSTEIN HAD NO trouble helping to convince President Roosevelt of the importance of designing an American atom bomb to counter the one thought to be under development by Germany. Roosevelt understood both the significance and difficulty of the work to be done, and concluded that such a massive (and in that case, secret) project could only be done by the government itself, and not by contracting out the work to non-government entities. Eventually the code name for the resulting effort was the Manhattan Project. After World War II, the government did many large projects, such as dams, in this way.

Now may very well be the time for another Manhattan Project, this time with regards to solving the energy problem. Of course today, with the widespread misperception that the U.S. government can never do anything right, the idea of a large-scale scientific workforce led by the government is likely to be a much harder sell. Nevertheless, it's my opinion that there is really no other way to completely solve the energy problem.

The technology of my proposed solution to the energy problem was discussed in my article in the last *MIT Faculty Newsletter* ("Solving the Energy Problem," Vol. XIX

No. 6, May/June 2007). It was only after publication that I realized that perhaps the best argument for proceeding in the way I suggested was to compare the scope of the work needing to be done with the highly successful project conceived by Roosevelt.

I urge readers to examine my article from the last *Newsletter*, and encourage any responses (pro or con). For unless we have a solid foundation on which to build a solution, the chances of effectively solving the energy problem decrease dramatically. ■

William Schreiber is a Professor Emeritus in the Department of Electrical Engineering and Computer Science (wfs@mit.edu).

Update on the Implementation of the Recommendations of the Task Force on the Undergraduate Educational Commons

Diana Henderson

WITH THE NEW ACADEMIC year and new energy, faculty and staff are busily working on implementing those recommendations made by the Task Force on the Undergraduate Educational Commons that have found favor within the MIT community. Generating both heat and light since its release in October 2006, the Report has now been discussed at numerous Institute faculty meetings, in School Councils and departments, and in regular faculty committees. These responses, as well as those garnered online and through the Dean for Undergraduate Education's and Faculty Officers' "listening tours," have spurred additional ideas for improving the undergraduate educational experience at MIT.

Some results have already been achieved, and others are imminent. The number of faculty serving as first-year advisors, after averaging around 62 from 2002-2006, has risen from 66 in 2006-7 to 87 in 2007-8. Dean for Undergraduate Education Dan Hastings has appointed Professor John Brisson of Mechanical Engineering to head an advisory committee focusing on classrooms and teaching spaces. Anticipating the recommendations on international education in Chapter 4 of the Task Force Report, a new residence linked with international development courses, iHouse, is opening this autumn in the New House dorm complex; Professor of Urban Planning Bish Sanyal, D-lab lecturer Amy Smith, and director of the Public Service Center Sally Susnowitz are among those involved in this "living and learning community." Dean Hastings also created a committee now known as GEOMIT, headed by

Professors Linn Hobbs and Hazel Sive, to explore ways for MIT to expand its global educational offerings. In an aligned effort, the DUE (Office of the Dean for Undergraduate Education) sponsored two sets of workshops in April and June 2007, both to build on "lessons learned" and generate new ideas for the ongoing Cambridge-MIT undergraduate exchange program (CME). The workshops were also designed to generate clearer principles, conditions, and support structures for any new study abroad and exchange programs, and relied upon the remarkable experience, efforts, and thoughtful participation of MIT faculty members.

Curricular Innovations

As has been true everywhere such reviews have occurred, at MIT the faculty paid most attention to suggestions involving core curricular redesign. The discussions already have helped to generate numerous curricular innovations, including five new "HASS experiments" and eight project-based subjects supported in part by the d'Arbeloff Fund for Excellence in Education. [See the related article on the results of the six project-based subjects offered in 2006-7, page 14.] Other new classes are being assisted by the School Deans and by the Alumni Class Funds administered through the DUE; all those involved encourage their faculty colleagues to keep suggesting new and better ways to ignite a passion for learning in our first-year students and to prepare all our undergraduates for an increasingly globalized, ever-changing world.

Several programs sharing and disseminating "best practices" learned

through pedagogical and curricular experimentation will be held this autumn. [See the Faculty Calendar in this issue for some key dates, and for the application deadlines for d'Arbeloff and Alumni Class Funds, page 16.] The hope is that our community (as well as individual faculty members and subjects) will begin to benefit more broadly from these sponsored experiments.

However, curricular redesign is also the area that takes the longest to resolve, and will require the dedication of a new implementation subcommittee of the CUP (Committee on the Undergraduate Program) which this year will refine and modify the Task Force proposals in accordance with the views of the teaching faculty. This co-chaired subcommittee is charged with developing a concrete proposal built on the full work of the Task Force as well as its final report and the public response, and will present its final proposals to the full faculty for a vote before the end of 2008.

Of course, educational improvement involves more than new or different required subjects, no matter how highly we value these. Thus the Task Force made numerous recommendations in other – many would argue, more – important areas. Some suggestions aim to streamline and simplify administrative processes, while others advocate fairly fundamental cultural changes. Encouraging more active forms of learning and valuing diversity in education are long-term projects that will require the ongoing efforts of department chairs and well-trained, well-supported faculty. Those implementing the Task Force recommenda-

tions wish to acknowledge and increase the incentives and rewards (be they financial, intellectual, or intangible) for faculty who dedicate their time and energy to teaching and serving in the Commons with excellence. The Campaign for Students, now in its “whispering phase,” will be crucial for raising sufficient resources to sustain the kinds of innovative classes, infrastructure, and training envisioned by the Task Force.

Faculty and staff alike must continually address the wide diversity of twenty-first century student needs and aspirations, through and beyond our curriculum. The DUE has several offices now dedicated to:

- expanding the use of pedagogies that foster learning (the Teaching and Learning Lab, headed by Lori Breslow),
- supporting the exploration and adoption of innovative uses of technology in educational practice (Office of Educational Innovation and Technology, headed by Vijay Kumar), and
- understanding and promoting the benefits of diversity at all academic levels (Office of Minority Education, headed by Karl Reid).

All these offices welcome faculty participation and suggestions.

Double Degrees to Double Majors

Among the recommendations in Chapter 5 of the Report that met with general approval was the change from double degrees (requiring substantial extra elective credit units for students wishing to pursue two major programs) to double majors (acknowledging completion of the GIRs and two major programs within a single MIT degree). As a result, the Office of the Registrar, the Undergraduate Officers, and the Committee on the Undergraduate Program have all proceeded to study the details of enacting such a change, and hope to bring legislation to the Institute faculty meetings for a vote this year. This is the time for those

The Office of Faculty Support

Established in July 2006, the mission of the Office of Faculty Support (OFS) is to help the faculty develop and coordinate the undergraduate curriculum and educational programming; to support faculty governance and to provide useful information related to undergraduate education; and to improve communications and educational community-building, both within MIT's unified faculty and among faculty, staff, the five Schools, and the central administration.

The OFS works closely with other offices under the supervision of the Dean for Undergraduate Education, in order to help faculty provide MIT students with the best education possible. Faculty members are encouraged to contact the OFS at 617-253-6776, ofs@mit.edu, or in person (12-127), and they will provide assistance or direct you to the appropriate help.

Among current OFS projects are:

- distribution of the d'Arbeloff Grants for Excellence in Education and Alumni Funds
- oversight of the Communication Requirement
- distribution and compilation of student subject evaluations
- staff support and archiving for the CUP, SOCR, the Task Force on the Undergraduate Educational Commons, and other committees related to the undergraduate curriculum
- outreach and communications regarding the undergraduate program generally and the General Institute Requirements in particular, both online and person-to-person.

For more information, see the OFS Website: web.mit.edu/facultysupport/.

with further comments and suggestions to share them: the staff members who are collecting these comments are Elizabeth Cooper (edc@mit.edu) and Gen Filiault (filiault@mit.edu) in the Office of Faculty Support.

An overlapping aim is to simplify the regulations and reduce the number of “cannots” (you cannot double-count, etc.), instead explaining the basic goals and rationale for the GIRs so that faculty, students, and staff can better understand and support them. Within departmental programs, this means emphasizing the positive minimum expectations for any

degree program. The Task Force advocated that there be enough flexibility in students' schedules to allow them to make effective choices and changes as they discover their more advanced talents and preferences. The idea of a “flexible major” option in any field with a large number of required units is one solution that relies on departments' willingness to consider and support the varying goals and career trajectories of their undergraduate majors. One goal this year is to encourage and support programs that are attempting to create such flexible options.

Meanwhile, the Undergraduate Advising and Academic Programming Office, guided by Julie Norman, has expanded its attention to advising beyond the first year, and Donna Friedman has completed a report on good practices in advising across the Schools. The hope is that soon every first-year student will have at least one faculty mentor via UROPs, advising, and small class instruction. The Office of Faculty Support (OFS) is working with faculty across the Schools interested in creating new cross-disciplinary and cross-School collaborations, such as:

- an “ethics concentration” that has been initiated by faculty in SHASS,
- discussion of learning objectives and coordination among project-based pilot classes, and
- interdisciplinary faculty seminars and brainstorming sessions.

These and other initiatives will receive attention in future *Newsletter* articles. Please feel free to send your suggestions and queries to this Office in its entirety (ofs@mit.edu) or to me specifically (dianah@mit.edu), as we stand ready to assist the faculty in maintaining and improving our undergraduates' educational experience, and in sustaining our own vibrant teaching community. ■

Diana Henderson is Dean for Curriculum and Faculty Support and a Professor in the Literature Section (dianah@mit.edu).

Experimental Project-Based Subjects: A Hit with Students

Dennis M. Freeman
Elizabeth D. Cooper
William A. Lucas

SIX EXPERIMENTAL PROJECT-BASED (PB) subjects were taught for the first time during the 2006-2007 academic year. The impetus for these subjects came from the deliberations of the Task Force on the Undergraduate Educational Commons, which has recommended freshman projects as one way to increase freshman motivation and enthusiasm as well as to introduce more active learning in the first year. Specific goals were established for the project-based subjects that included:

- learning opportunities that involve either design or creation,
- the synthesis of ideas and techniques,
- the use of real-world problems to motivate the acquisition of disciplinary knowledge,
- cross-disciplinary interactions needed to address design problems,
- outcomes that are not narrowly prescribed in advance, but rather defined through informed decisions. [*Report of the Task Force on the Undergraduate Educational Commons*, p. 49.]

MIT has traditionally taught a number of project-based subjects at the upperclass level. Only a few project-based subjects are offered in the first year: 2.000 (How and Why Machines Work), 12.000 (Solving Complex Problems), and 16.00 (Introduction to Aerospace and Design). Faculty from these highly successful subjects provided valuable insight and experience to faculty developing the six new subjects taught this past year.

Funding for subject development and resources for the first year of classes came

from the d'Arbeloff Fund for Excellence in Education. [See web.mit.edu/darbeloff for more information.] Subjects included:

- **Exploring Sea, Space and Earth: FUNdaMENTALS of Engineering**
Joint subject listed in Aero/Astro and Mech E
Faculty: A. Techet (Mech E), A. Slocum (Mech E), D. Newman (Aero/Astro), E. Crawley (Aero/Astro).
- **Solving Real Problems**
Mech E subject
Faculty: D. Wallace (Mech E), D. Frey (Mech E, ESD)
- **CityScope Destination 2007: New Orleans**
Joint subject listed in Architecture and Urban Planning
Faculty: J.P. Thompson (Urban Planning), J. Fernandez (Architecture)
- **Energy, Environment and Society**
Chemistry subject
Faculty: J. Steinfeld (Chemistry), J. Tester (Chem E), A. Graham (LFEE)
- **Freshman Projects in Microscale Engineering for the Life Sciences**
Joint subject listed in EECS and HST
Faculty: D. Freeman (EECS), A. Aranyosi (RLE), M. Gray (HST)
- **Physics of Energy**
Joint subject listed in EECS and Architecture
Faculty: J. Kirtley (EECS), S. Leeb (EECS), L. Norford (Architecture).

Faculty Comments

Most, but not all, faculty taught these subjects in addition to their regular teaching load. Generally faculty felt positive about the PB subjects; they generally agreed they were pleased with the student outcomes

and learning. One stated, "I'm converted." Most felt it was a lot of work, but very worthwhile. Several faculty spoke about having to adjust the amount of work and expectations from the students during the semester. They all hoped to offer the subject again.

There is some concern about the number of credit units for PB subjects. Several subjects offered 12 units credit, while others offered nine. Some faculty felt it was easier to drop the nine-unit courses as evidenced by serious attrition in one of the nine-unit subjects, but that the 12 units could push students into an overload or make it impossible for them to fit a PB subject into their schedule. Several subjects made significant revisions to the syllabus to make them eligible for CI (Communication Requirement) credit. Undesignated CI credit was offered on an experimental basis for one year for the project-based subjects. Students, however, were not convinced, in spite of assurances, that this CI credit would help them.

Resources remain a concern for the project-based subjects. All relied heavily on TA support. Departmental support for subjects was uneven. Space remains an issue. The general consensus of the faculty was that flexible space was needed because classes had different needs on different days. Those subjects that required specific, non-portable machinery were meeting in evenings and on weekends to access the appropriate space. The ideal space described was one that had access to a machine shop or fabrication facilities, lecture space, design space, and seminar rooms.

Student Outcomes

Out of a class of 999 first-year students, 147 (14.7%) took project-based subjects in either the first or second semester. The gender breakdown was 71 (48%) men, 76 (52%) women, compared with the general first-year population of 55% men and 45% women. A number of assessment methods were used to ascertain whether the project-based subjects had an impact on students. All of last year's freshmen were surveyed at the beginning and end of their first year, focusing mainly on first-year expectations and on self directed learning styles. In addition, all students in the project-based subjects were surveyed before and after taking the subject to assess self-efficacy in communication, teaming, and other technical areas. The last survey closed mid-July; all findings reported here are preliminary. One student focus group was conducted at the end of the year.

Student expectations. A series of questions were asked on the post-test to see if the freshman year had met student expectations. While there were no differences between PB and non-PB students on several items, and some of the differences would be expected (see below), a general conclusion is that expectations tend to have been better met if the students took a PB subject. The larger positive and statistically significant differences were found for the following:

- My classes have stimulated my interests in new areas.
- Some of the subjects I studied this past year were so interesting that I did more than the required work.
- I have had opportunities for hands-on activities.
- This past year at MIT I have conducted experiments and/or projects using scientific methods.
- Since coming to MIT I have been involved in a research project.
- Some faculty now know me well enough to write a good letter of recommendation for me.

Supporting the faculty concern about the possibility that these courses could

contribute to heavy course loads, there was a negative and statistically significant difference, with PB students being *less likely* to agree that:

- I have been able to maintain a balance between my academic work and other aspects of my life.

Additional differences were found that suggest that PB subjects have particular benefits for first-year women. Females in PB courses were significantly more likely to agree than the rest of the females in the freshman class that the following expectations had been met:

- I have been able to talk to faculty outside of class about my interests.
- Some faculty now know me well enough to write a good letter of recommendation for me.
- Faculty have been encouraging and helpful.

Student self-confidence in skills. Confidence in task performance, or self-efficacy, is a widely used concept that, among other outcomes, predicts improved learning practices and persistence in careers. The assessment used this concept to examine whether first-year students had confidence they could perform specific tasks in the area of communications, working on teams, and working with technology. In the case of communications, while PB students were somewhat more confident of their communications skills than non-PB students, the differences were small and not statistically significant.

By contrast, differences are found between PB and non-PB students on both their confidence to perform teaming and technology-oriented tasks. Confidence in teaming skills was significantly higher among PB students than for non-PB students. When a check was made by making separate comparisons of PB and non-PB males and females, the differences for the males were modest, but the differences for PB females alone were significantly different than non-PB students. For confidence in working with

technology, a similar difference was found only among females, with PB females appearing to benefit with significantly higher self-confidence in their ability to perform technology-oriented tasks than non-PB females.

The women students uniformly "loved" the classes; found them to be a lot of work, but worthwhile.

The findings for women on self-efficacy are most interesting. Self-efficacy is linked to academic task goals associated with motivation to master material, deeper learning, and a view of learning as an end in itself. [Pajares, Frank, Shari L. Britner and Giovanni Valiante (2000), "Relationship between achievement goals and self-beliefs of middle school students in writing and science," *Contemporary Education Psychology* 25: 406-422.] Further, young women with higher self-efficacy in given fields are more likely to persist in a career in science or engineering. [Mau, Wei-Chang (2003) "Factors that influence persistence in science and engineering career aspirations," *The Career Development Quarterly*, March 2003, 51: 3, pp 234-243.] Both genders benefited from increases in project-based planning and teaming skills.

Results of the surveys were validated by the focus group which was, interestingly, all women. The women students uniformly "loved" the classes; found them to be a lot of work, but worthwhile. They were a welcome break from more lecture-based classes. Students appreciated the real-world implications and felt that they learned useful skills such as research and public speaking. Students valued the increased exposure to and attention from the faculty.

Conclusions

The first experimental year for the six new project-based subjects appears to be a

continued on next page

Experimental Project-Based Subjects
Freeman, et al. from preceding page

success when measured against the initial criteria set by the Task Force. Faculty developed subjects that involved creation or design, but did not prescribe the outcome. Most involved individuals from several departments and academic disciplines. The “real-world” approach appeared to increase student satisfaction

that they were receiving the education they had expected, and it resonated particularly with women students.

These six subjects will be taught next academic year and will be joined by two additional subjects. The same assessment activities will continue next year. If findings are consistent, one might posit that the hands-on, real-world approach represented by the project-based subjects is a pedagogical tool that is of

general value for MIT freshmen, and of particular value for women in their first year at MIT. ■

Dennis M. Freeman is a Professor in the Department of Electrical Engineering and Computer Science (freeman@mit.edu);

Elizabeth D. Cooper is a Senior Project Manager in the Office of Faculty Support (edc@mit.edu);

William A. Lucas is Executive Director of the Cambridge-MIT Institute (walucas@mit.edu).

Faculty Calendar		
Talk with your colleagues about ways to improve teaching and education.		
Thursday, October 4	Crosstalk Seminar on Educational Change	web.mit.edu/acs/crosstalk/
Thursday, October 11	Speaker: Dr. Grant Wiggins, author of <i>Understanding by Design</i>	web.mit.edu/tll/
Friday, October 26	Panel Discussion: Alumni Class Funds Projects	web.mit.edu/alumnifunds/
Thursday, November 15	Crosstalk Seminar on Educational Change	web.mit.edu/acs/crosstalk/
Thursday, December 13	Crosstalk Seminar on Educational Change	web.mit.edu/acs/crosstalk/
Monday, January 28 – Friday, February 1	Better Teaching @ MIT Series	web.mit.edu/tll/programs-services/teaching.html
Tuesday, February 19	Crosstalk Seminar on Educational Change	web.mit.edu/acs/crosstalk/
Friday, March 7	MacVicar Day	web.mit.edu/provost/macvicar/index.html
Monday, March 31	Crosstalk Seminar on Educational Change	web.mit.edu/acs/crosstalk/
Friday, May 16	Crosstalk Seminar on Educational Change	web.mit.edu/acs/crosstalk/
Apply for funds to develop new curriculum.		
Friday, October 12	Preliminary proposals for d'Arbeloff Funds due	web.mit.edu/darbeloff/
Monday, December 3	Final proposals for d'Arbeloff Funds due	web.mit.edu/darbeloff/
Friday, February 1	Proposal for Alumni Class Funds due	web.mit.edu/alumnifunds/
Nominate your colleagues for Institute awards.		
Friday, November 2	Nominations for MacVicar Faculty Fellows due	web.mit.edu/provost/macvicar/index.html
Friday, February 1	Nominations for Killian Faculty Achievement Award due	web.mit.edu/committees/faculty/Rosters/Killian.pdf
Friday, February 1	Nominations for Edgerton Faculty Achievement Award due	web.mit.edu/committees/faculty/Rosters/Edgerton.pdf

Student Systems – A Vision for the Future

Larry Benedict
Jerry Grochow
Dan Hastings
Steve Lerman

WITH A PUSH FOR more international experiences, a desire for increased advisor/student interaction, updated GIRs, and changing student expectations, how will MIT's student information systems support an ever changing landscape while still supporting everything we currently do? What are the requirements of a system that ensures a stable yet flexible platform to support our current needs and services and, at the same time, is sufficiently forward looking to make certain future innovations can be incorporated? These are the types of questions we will answer as part of an exciting project to develop a vision and strategy for the future of student systems at MIT.

The Student System Vision (SSV) study is a once-in-a-generation opportunity to assess the evolving needs of the community and improve the student experience. This collaborative project is being sponsored by Dan Hastings, the Dean for Undergraduate Education; Steve Lerman, the Dean for Graduate Students; Larry Benedict, the Dean for Student Life; and Jerry Grochow, the Vice President for Information Services and Technology.

MIT's student information system is a large and complex set of applications (often referred to as MITSIS and WebSIS) supporting our students' administrative life cycles starting with their admissions application and following them through their entire MIT experience. Faculty depend on the student system to help them in advising students, by providing online access to their advisees' current registration, grades, and GIR audit report. Instructors use the student system for class lists, student pictures, and prerequisite reports.

Today's students have grown up in a world where information and services are available at any hour of the day or night via the Internet. The expectation, shared by students, faculty, and staff is that MIT

The various student applications now in use were developed over a period of years, without a consistent architecture or user interface . . .

will provide services to support administrative, classroom, and informational needs through state-of-the-art Internet-based services that ensure the protection of student privacy. The various student applications now in use were developed over a period of years, without a consistent architecture or user interface; they lack the flexibility to add new functionality in a consistent, well-planned fashion. Many of the core applications were developed prior to the popular use of the Internet and are implemented using outdated, inflexible technologies. The original system focus was for administrative office use. In order to meet the expectations of today's students and faculty, a more student- and faculty-centric design approach is needed.

Understanding the needs of all of the constituents who work with student systems is of the utmost importance and requires Institute-wide collaboration. Throughout this study, the SSV Project Team will host workshops, meetings,

focus groups, and presentations that involve faculty, staff, and students from across the Institute. These activities will tap into MIT's collective intelligence to ensure that the long-term vision and not just the immediate needs are fully understood. An SSV Faculty Advisory Group with participation from MIT's Council on Educational Technology will inform this effort, and an outside consulting firm has been engaged to facilitate the overall process. We want to ensure that the recommendations coming out of the study represent a broadly-based evaluation of where MIT would like to be – a true "vision" of student systems in the future.

In the spring of 2008, the SSV team will present its findings along with a plan for implementing this next generation of MIT's student system. Although the study will be completed in a relatively short time, the implementation will likely span many years. Ultimately, the new Student System will provide the community with the tools that evolve to support MIT student services effectively for years to come. To learn more about the Student System Vision Study, please visit the project Website at <https://web.mit.edu/stu-future/www/>.

If you have any ideas or suggestions or if you have a question or comment please e-mail studentsystemsvision@mit.edu. All feedback is welcomed and encouraged. ■

Larry Benedict is Dean for Student Life (larryben@mit.edu); **Jerry Grochow** is Vice President for Information Services and Technology (jgrochow@mit.edu); **Dan Hastings** is Dean for Undergraduate Education (hastings@mit.edu); **Steve Lerman** is Dean for Graduate Students (lerman@mit.edu).

MIT 1st in Engineering, 7th Overall in Latest U.S. News Rankings

Newsletter Staff

MIT MAINTAINED ITS PLACE as the number one undergraduate engineering school in the latest *U.S. News & World Report* rankings, announced in the magazine's "America's Best Colleges" issue published in late August. The Institute also remained second to the University of Pennsylvania in the undergraduate business school category. [See web.mit.edu/fnl/201/usnews.html for complete details.]

MIT was seventh in the overall rankings for undergraduate national universities, continuing its decade-long history of finishing between third and seventh. Traditional leaders Princeton, Harvard, and Yale again grabbed the first three spots (see table below).

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

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

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

Engineering

- Aerospace/Aeronautical/Astronomical (1st)
- Chemical Engineering(1st)
- Civil Engineering (3rd)

- Computer Engineering (1st)
- Electrical/Electronic/Communications (1st)
- Environmental/Environmental Health (5th)
- Materials (3rd) [tied with Michigan]
- Mechanical Engineering (1st)

Business

- Entrepreneurship (4th)
- Finance (5th)
- Management Information Systems (2nd)
- Productions/Operations Management (1st)
- Quantitative Analysis (1st)
- Supply Chain (2nd) [tied with ASU] ■

Data was taken from the 2008 edition of the *U.S. News & World Report's* "America's Best Colleges." Charts used were prepared by the Office of the Provost/Institutional Research.

U.S. News Rankings for National Universities (1999-2008)										
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Princeton	1	4	1	1	1	1	1	1	1	1
Harvard	1	2	2	2	2	1	1	1	2	2
Yale	1	4	2	2	2	3	3	3	3	3
Stanford	4	6	6	5	4	5	5	5	4	4
CalTech	9	1	4	4	4	5	8	7	4	5
UPenn	6	7	6	5	4	5	4	4	7	5
MIT	4	3	5	5	4	4	5	7	4	7
Duke	6	7	8	8	4	5	5	5	8	8
Columbia	10	10	10	9	10	11	9	9	9	9
UChicago			10	10					9	9

Combining Investment with Philanthropy: Faculty and the MIT Endowment

Sarah E. Rowley

FACULTY WHO WISH TO receive income while making a gift to MIT can now invest in the MIT Endowment. In November 2006, the Internal Revenue Service issued a private letter ruling providing this opportunity to those who establish a charitable remainder unitrust (CRUT).

A CRUT is a fund managed by MIT that pays variable income for life. Specifically, the unitrust pays 5% of its fair market value each year to one or two beneficiaries. At the end of the trust's term, any remaining assets support MIT students or faculty. Thus the CRUT combines investment with philanthropy.

CRUTs have long been popular because they let faculty and other friends of the Institute avoid capital gains taxes on highly appreciated assets, such as stocks or real estate. Now, with the new ruling, the Institute can commingle the CRUT investments with those of the MIT endowment. In other words, a faculty member who establishes a CRUT can now request that it be invested in the endowment and receive approximately the same results as does the endowment.

The new option permits CRUTs to be invested in part in nonmarketable securities, or "alternative assets," which form a significant portion of MIT's endowment. These assets, including private equity, venture capital, real estate, and natural resources investments, are rarely available to smaller investors and will significantly increase the trusts' diversification and growth potential.

The MIT Endowment

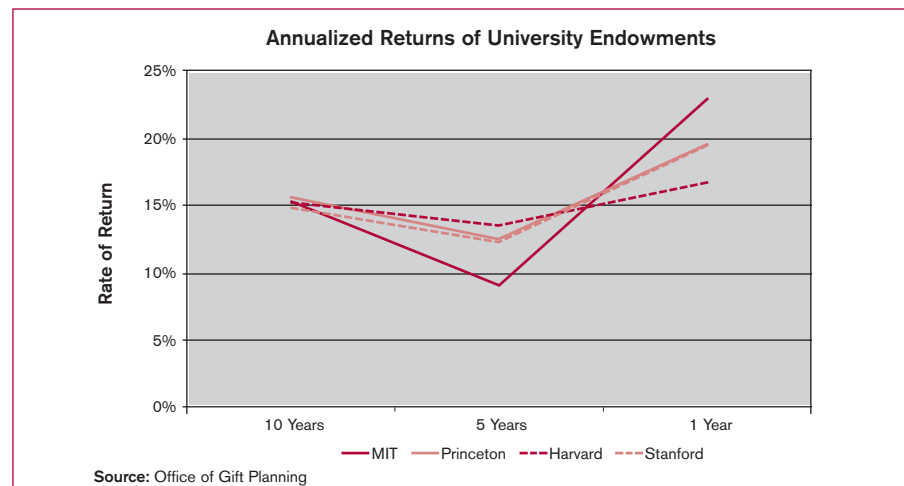
CRUTs invested in the new option will

benefit from the MIT endowment's historically strong performance. For example, if a CRUT earns 15% in a given year, it will pay 5% as income to its named beneficiaries. The other 10% would be reinvested, increasing the trust's market value. Thus faculty can make a gift to MIT that will pay variable income and further diversify their portfolios, with the potential for very attractive income growth over time.

As of June 30, 2006, the MIT endowment totaled \$8.36 billion, with an annual return of 23.0%. The MIT endowment has averaged a 15.3% return over the past 10

diversified portfolio. Thus the CRUT converts the full value of the assets into investments that generate income for its beneficiaries. (Currently MIT requires all CRUT beneficiaries to be age 55 or older at the time of the gift.)

When the trust terminates (usually at the end of the beneficiaries' lives), its remaining assets support MIT scholarships, fellowships, professorships, the MIT Libraries, or general educational purposes, according to the donor's preference. For example, a faculty member could fund fellowships in a specific



years (see chart). As always, past performance does not guarantee future results.

Because a CRUT and any additional gifts to it are irrevocable gifts to MIT, the donor also receives a series of tax benefits, including an income tax deduction and the opportunity to avoid capital gains tax. When a faculty member contributes highly appreciated assets to a CRUT, MIT can sell them without paying capital gains tax, and reinvest all proceeds in a more

department, or support or establish a faculty chair.

The minimum to establish a charitable remainder unitrust is \$100,000. For more information, contact Judith V. Sager, Director of the Office of Gift Planning, at 617-253-6463 or jsager@mit.edu. All inquiries are strictly confidential. ■

Sarah E. Rowley is Gift Planning Coordinator, Office of Gift Planning (srowley@mit.edu).

Proficiency in Customary Units

Eduardo Kausel

WITH THE NOTABLE EXCEPTION of the U.S., most of the world has universally adopted the metric system of units, and this includes the United Kingdom, Canada, and Australia. Nonetheless, some sectors in the U.S. went metric a while ago, such as the automobile industry, wine and spirits or beverages, and so on. However, the full conversion of the U.S. to the metric (or SI) system has consistently been held back by a vocal group of politically influential individuals who liken the changeover to an unpatriotic and un-American act, indeed, the possible cause for economic and cultural disaster.

I, for one, am fluent in, and use, both systems, so I won't take sides – at least not herein – as to whether or not we should complete the conversion. Nonetheless, I can share at least one anecdote that may hint as to my preferences. When I took the license exam for professional engineer in Massachusetts some three decades ago, I had a memorable question that challenged my proficiency with units. The question went roughly like this: Determine how many horsepower must an electrical motor of efficiency E have if it drives a water pump that elevates water at the rate of R gallons per minute over a height of H feet using a pipe of D inches in diameter and the head loss in the pipe is L inches per linear foot (where, of course, E , R , etc. were just numbers). What a mix of units! I first converted all the parameters to metric, computed the power in KW, and then back into HP, remembering from high-school days that one HP equals approximately $3/4$ of a KW, and sure enough, it worked!

Personally, I use both systems depending on context, and my measuring tapes and calipers are dual metric and English. For technical work, I stick mainly to metric units, but at home, when I build or install artifacts such as cabinets or picture frames and the like, I primarily employ inches, mostly because of my need to accommodate the standard American sizes that permeate all dimensions in the house. Still, even there I also resort often to centimeters and millimeters, especially when I need high precision – e.g., in a saw cut – or when I divide a non-integer measurement in inches into some integer fraction. It is easier and faster for me to compute, say, one-third of 13.8 cm than one-third of $5\ 7/16$ inches, and also, I can locate much faster the result of that division on the metric part of the tape.

To test this observation on others, I have on various occasions carried out an informal experiment in which I asked an American-born person (but not a carpenter or mason) to measure the length of some piece of wood to the nearest $1/16$ th of an inch, and in most cases that measurement demanded some fifteen seconds, if not more. Most of my test persons proceeded roughly as follows: let's see, this line must be $1/2$, $1/4$, $1/8$, $1/16$. . . and then proceeded to count those lines one by one from left to right starting from the nearest full inch. Then I repeated the experiment with that same person, and asked him/her to give me the same measurement in centimeters, accurate to the nearest millimeter. The response was consistently instantaneous and with no delay whatsoever: 27.4 cm. Some of them then smiled and nodded affirmatively while admit-

ting, "Yes, I read it right away, but I have no feeling for *what* I read." Hmmmm.

For all of their resistance to a change to the metric system in the U.S., you would believe that Americans are intimately familiar with their system and know their customary units like the palm of their hand. Further experiments with a pop quiz I carried out with two of my classes of both undergraduate and graduate students at MIT (a total of 46 students), and also with colleagues, friends, and neighbors, have shown me otherwise. Yes, they all know what an inch or a gallon is, but after that it gets really murky. Not everybody could tell me how many feet are contained in a mile, fewer still how many square feet in an acre, what the boiling temperature of water is in degrees Fahrenheit, or the atmospheric pressure in psi, and I have yet to find anybody who can tell me accurately how many gallons fit in a cubic foot (please guess that for now, and I'll give you the answer later on). For that matter, many could not even decide how many fluid ounces are contained in a pint, how many pints in a gallon, or how heavy a pint (or gallon) of water is. By contrast, most of my quiz takers knew the fundamental metric units reasonably well. I tallied the answers, distinguishing between American-born and/or educated and international students (about 60% vs. 40%), and also between males and females. The table on the next page shows my 10-minute questionnaire on English and metric units together with its resulting statistics.

As for the answers, there appeared to be no significant differences in scores between men and women, but there were

big differences between U.S. and foreign-born or educated. By and large, foreigners were wholly ignorant of U.S. customary units, with the exception of the mile and the temperature for freezing water, for which about half knew the correct answer. Among American respondents to my quiz, 86% gave an answer within 10% of the actual length of the mile and 66% knew the correct boiling temperature of water, but less than half knew the number of fluid ounces in one pint, only about one-fifth knew the atmospheric pressure in pounds per square inch, and barely 17% knew the weight in pounds of one pint of water. Likewise, only 10% could estimate even approximately the size of an acre. In case you wonder, an acre is the rectangular plot of land that can be plowed by an ox in one day, and its size is

one chain by one furlong, the chain being 22 yards and the furlong 10 chains, which results in an area of $66 \times 660 = 43,560 \text{ ft}^2$. Interestingly, this number has no integer square root, so there is no square plot of land of integer dimensions in feet that contains an acre.

Concerning the metric system, both Americans and foreigners knew pretty much most of the important units and equivalences, and not surprisingly, foreigners scored somewhat higher in this category. Overall, only 36% of respondents gave correct answers for U.S. customary units, but 71% did so for metric units. Interestingly, only 20% of American-born students at MIT prefer the use of U.S. customary units. The overwhelming majority prefers either the metric system (54%), or the use of both

systems (25%). I'll let you judge the practical and political implications of these results. And whatever your thoughts on the matter, we should also not forget the unfortunate loss of the \$125 million Mars Climate Orbiter in September 1999, which occurred because the Lockheed-Martin engineering team used English units in their code of navigational commands for the orbiter, in lieu of NASA's usual metric system.

And by the way – believe it or not – a cubic foot contains nearly seven-and-a-half gallons, or 7.481 to be precise. Indeed, a gallon is *exactly* equal to 231 cubic inches, a cabalistic number that you shouldn't soon forget. ■

Eduardo Kausel is a Professor in the Department of Civil and Environmental Engineering (kausel@mit.edu).

POP QUIZ ON MEASURING UNITS

Fill out the appropriate equivalence of units (guessing and approximate values is OK):

Number of students		US 29	Foreign 17	Total 46
I. U.S. Customary Units ("English" or "Avoirdupois" units)				
1 mile	= feet	25 86 %	8 47 %	33 71 %
1 acre	= ft ²	3 10 %	0 0 %	3 7 %
1 cubic foot	= gallons	4 14 %	0 0 %	4 9 %
1 gallon	= pints	18 62 %	1 6 %	19 41 %
1 pint	= fluid ounces	14 48 %	0 0 %	14 30 %
1 pound	= ounces	24 83 %	2 12 %	26 56 %
1 (short) ton	= pounds (lb)	24 83 %	1 6 %	25 54 %
Atmospheric pressure	= psi (= lb/in ²)	6 21 %	1 6 %	7 15 %
Specific weight of water	= pcf (= lb/ft ³)	10 34 %	2 12 %	12 26 %
Specific weight of concrete	= pcf	10 34 %	4 24 %	14 30 %
Weight of 1 pint of water	= lb	5 17 %	0 0 %	5 11 %
Weight of 1 slug	= lb	8 28 %	1 6 %	9 20 %
Acceleration of gravity	= ft/s ² (or in/s ²)	18 62 %	8 47 %	26 56 %
Power: 1 HP	= lb-ft/sec (or BTU/s)	2 7 %	1 6 %	3 7 %
Temperature of freezing H ₂ O	= °F	29 100 %	9 53 %	38 83 %
Temperature of human body	= °F	29 100 %	5 29 %	34 74 %
Temperature of boiling water	= °F	19 66 %	5 29 %	24 52 %
II. Metric (SI) units				
1 kilometer	= meters	29 100 %	17 100 %	46 100 %
1 meter	= millimeters	28 96 %	17 100 %	45 98 %
1 hectare	= m ²	5 17 %	6 35 %	11 24 %
1 cubic meter (m ³)	= liters	14 48 %	13 76 %	27 59 %
1 liter	= milliliter	27 93 %	13 76 %	40 87 %
1 milliliter	= cm ³	24 83 %	10 59 %	34 74 %
1 kg	= grams	29 100 %	17 100 %	46 100 %
1 metric ton	= kg	18 62 %	15 88 %	33 72 %
Atmospheric pressure	= kPa or kg-force/cm ²	18 62 %	8 47 %	26 57 %
Density of water	= kg/liter (=kg /dm ³)	19 66 %	10 59 %	29 63 %
Density of rock (or concrete)	= kg/liter	3 10 %	8 47 %	11 24 %
Weight of 1 liter of water	= N	15 52 %	12 71 %	27 59 %
Acceleration of gravity	= m/s ²	27 93 %	17 100 %	44 96 %
Power: 1 kW	= N-m/s (= joule/s)	11 38 %	8 47 %	19 41 %
Temperature of freezing H ₂ O	= °C	29 100 %	17 100 %	46 100 %
Temperature of human body	= °C	14 48 %	12 71 %	26 57 %
Temperature of boiling water	= °C	27 100 %	17 100 %	46 100 %

Pop Quiz on Units Given to MIT Students
You may wish to take this quiz yourself to see how well you do, but please do not allow more than 10 or 15 minutes for its completion. Also, do not take time to carry out hard conversions and hand computations; what matters is what you have in your head, and not what you can estimate or derive given enough time.

III. Personal info (choose one)

		(ratios indicated are US/Foreign)			
Gender	Male	19/12	Female	10/5	
I grew up in	US	29	Abroad	17	
In primary/secondary school, I was educated in	US-units	9/0	Metric	2/14	Both 18/3
I prefer/use/think in the following system:	US-units	6/2	Metric	13/13	Both 10/2

Who's Who in the MIT Administration

Because of the recent large turnover in the upper administration, the FNL thought it would be helpful to print photos and list top priorities for each of the Deans and Vice Presidents.



Adèle Naudé Santos
Dean, School of
Architecture and
Planning

Top Priorities:

- academic excellence
 - faculty renewal
 - hiring of well-known and distinguished faculty
- play a greater role in the university
 - more participation in undergraduate programs
 - strengthen offerings in the arts
 - collaboration in MIT initiatives like the energy initiative
- one school identity
 - consolidation of space from six locations into two
 - building collaborations across programs



Subra Suresh
Dean, School of
Engineering

Top Priorities:

- To ensure that the School of Engineering remains the most attractive place of work for the highest quality engineers, educators, and scientists of diverse backgrounds who work together in an exciting academic environment that fosters the creation of knowledge, innovation, and the education of the world's most gifted students.
- To facilitate new activities aimed at defining and shaping the next frontiers of engineering and technology that will help solve society's most challenging problems as, for example, those related to energy, global environmental sustainability, and human health.
- To promote innovation in education and research that lies at the intersections of multiple disciplines.



Deborah Fitzgerald
Dean, School of
Humanities,
Arts, and Social
Sciences

Top Priorities:

- Strengthen the core educational mission of SHASS by providing MIT students with the analytical and imaginative tools they need to be global leaders.
- Encourage and support innovation in research and teaching.
- Build collaborative relationships with colleagues in the other four Schools.



Marc Kastner
Dean, School of
Science

Top Priorities:

My dream for the School of Science is that we continue to win a Nobel Prize every other year, help translate basic science discoveries into technology to make the world a better place, and educate the future leaders of the world.

- My first priority is to make it even more attractive than it already is to be a faculty member at MIT, especially for women and minority candidates.
- My second priority is to make life better for our graduate students and postdocs.
- My third priority is to strengthen ties between the School of Science and the other schools, especially the School of Engineering, to make the most of our unique strengths.



Steven Eppinger
Dean (Interim),
Sloan School of
Management

Top Priorities:

In my current position as Interim Dean, my priorities focus on effective administration of the Sloan School's programs and initiatives, of which there are many. Here are three of the top priorities:

- Implementation of program and curriculum developments
 - The new Entrepreneurship and Innovation option within our MBA program, a proposed Masters in Finance, and enabling of more international experiences for our students.
- Keeping building E62 on track
 - Construction has begun for the new Sloan building, even while we develop the final design details and create plans for occupancy in 2010.
- Preparations for the new dean
 - I look forward to welcoming David C. Schmittlein as the new dean to the Sloan School and helping to ensure a smooth leadership transition.



Steven Lerman
Dean for
Graduate
Students

Top Priorities:

- Working with all the academic units to recruit more women and underrepresented minority graduate students, particularly in PhD programs.
- Expanding the number of fellowships to support doctoral students in their first year at MIT.
- Supporting a strong sense of community among graduate students in general, and providing a wide range of opportunities to graduate students for activities outside their departments, labs, and centers.



Daniel Hastings
Dean for
Undergraduate
Education

Top Priorities:

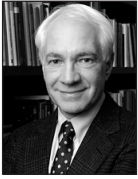
- Support the curricular reforms outlined in the Task Force for the Undergraduate Educational Commons.
- Provide opportunities for all our students to have global educational opportunities without any penalty.
- Work with the Dean for Student Life in integrating life and learning including developing programs for improving advising/mentoring, understanding how to incorporate diversity in our curriculum and helping the faculty focus on improving learning for our students.



Larry Benedict
Dean for
Student Life

Top Priorities:

- In coordination and collaboration with others, oversee the completion of NW35, the new Graduate Residence Hall, as well as the initial steps at renovating W1 to open as an undergraduate hall. We expect both halls to be opened by September, 2008.
- Conduct a comprehensive review and analysis of campus dining to insure that our programs and services are as flexible and responsive to the needs of our students, faculty, staff, and visitors as possible.
- Continue to develop our Student Leadership Development initiatives, especially the new Allan G. and Terri Spoon Community Catalyst Leadership Program for rising Juniors who have shown leadership potential.



Claude Canizares
Vice President for
Research and
Associate Provost

Top Priorities:

- Foster an outstanding research environment for MIT's faculty, students, and staff.
- Enable major research initiatives that cut across the Institute.
- Maintain a research administration infrastructure whose excellence matches that of MIT's research itself.



Theresa Stone
Executive Vice
President and
Treasurer

Top Priorities:

- Bring MIT's operations and finance to the level of excellence worthy of MIT.
- Assure that physical and fiscal are integrated by creating a unified financial organization which performs effective stewardship of MIT's financial assets and recruiting and developing Facilities leadership which provides credible, effective stewardship of MIT's physical assets.
- Create an environment where we can and do attract the best talent to serve the Institute's mission and develop collegial, effective working relationships in support of the mission of MIT.



Kirk Kolenbrander
Vice President
for Institute
Affairs and
Secretary of the
Corporation

Top Priorities:

- Ensure strong corporate governance through effective connections between the Corporation and the Institute's senior leadership.
- Work closely with MIT's first Vice President for External Affairs to establish a communications strategy for MIT that serves Institute and external interests through transparent processes.



Israel Ruiz
Vice President
for Finance

Top Priorities:

- Integrating the Financial Groups
 - Organizational Dimensions
 - Leadership
 - Structure
 - Functions
 - Roadmapping of Activities
 - Inventorying
 - Prioritizing
 - Trade-Offs
- Fostering Cross-Functional Collaboration
 - Internal
 - External
- Rationalizing Communications



Deborah Bohren
Vice President for
External Affairs

Top Priorities:

- To establish the Office of External Affairs as a respected and valued member of the MIT community with MIT deans, faculty, center directors, and staff.
- To develop a research-based strategic external communications plan in support of MIT's educational and research objectives.
- To enhance MIT's relationship with the media, businesses, community groups, and local and state elected officials.



Jeffrey Newton
Vice President
for Resource
Development

Top Priorities:

- Deliver campaign plans for the Energy and Cancer Initiatives.
- Complete the silent phase of the Campaign for Students and launch the public phase in October 2008.
- Establish productive working relationships with the academic and development leadership of the Schools and centers.



Jerrold Grochow
Vice President
for Information
Services and
Technology

Top Priorities:

- In association with the Dean for Undergraduate Education and the Director of the Libraries, better coordinate our activities supporting technology used in teaching and learning, including enhancements to Stellar.
- In association with the Dean for Graduate Students, and the Dean for Student Life, develop a vision for future student information systems at MIT, and develop a new approach for provisioning spaces for student computer use.
- In association with the Associate Provost and Vice President for Research, develop plans for supporting research computing at MIT including the potential for shared data centers.



R. Gregory Morgan
Vice President
and General
Counsel

Top Priorities:

- To build the Office of the General Counsel by aligning the lawyers and staff of the office, in combination with outside legal counsel, to meet MIT's needs for legal services.
- To bring the office to bear on MIT's most important risk-management issues.



Alison Alden
Vice President for
Human Resources

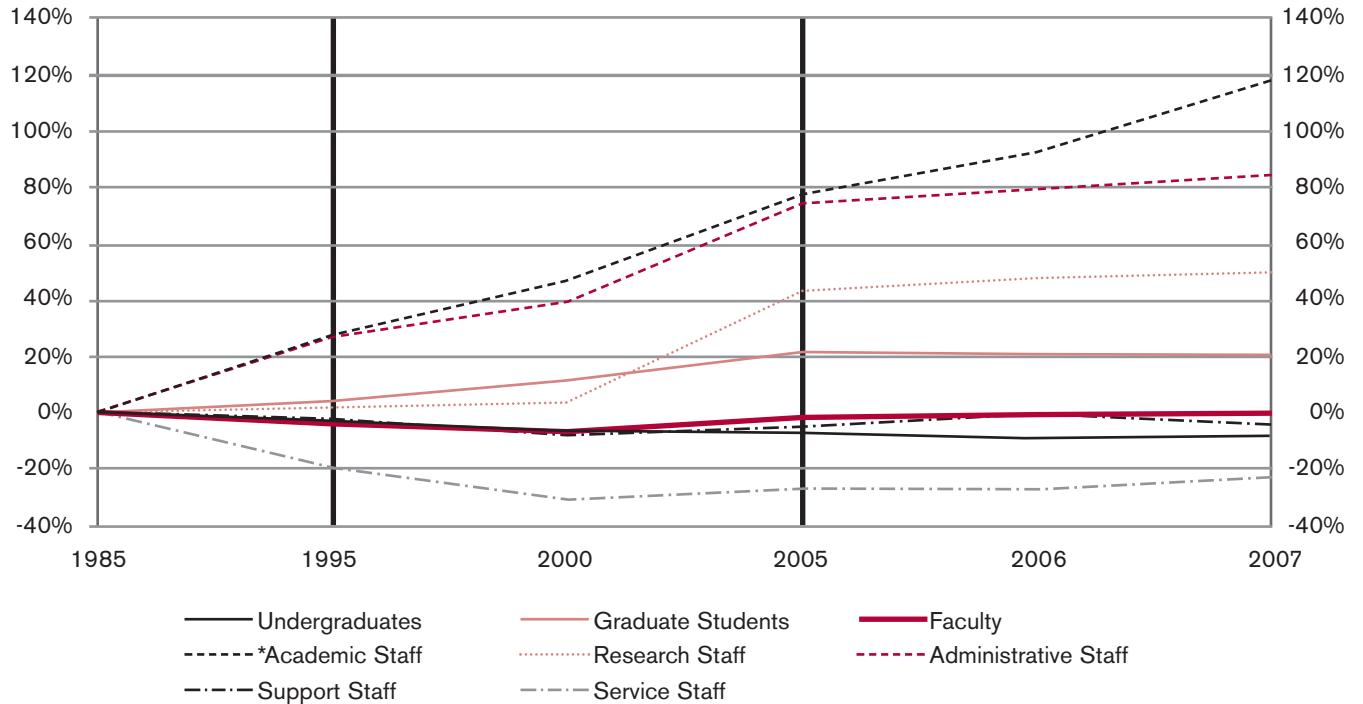
Top Priorities:

- Learn from all my MIT constituents what key human resource issues I should help address at MIT.
- To build the community of HR professionals and key administrative officers who are embedded in all the DLCs, so that together we can bring effective human resource solutions to faculty and staff alike.
- To build needed HR services, such as more recruiting assistance, broader leadership programs, and more professional development for staff.

Photo Credits: **Donna Coveney** (Deborah Fitzgerald, Daniel Hastings, Marc Kastner, Steven Lerman, R. Gregory Morgan, Subra Suresh); **David Lewis** (Deborah Bohren, Jeffrey Newton)

M.I.T. Numbers

Campus Population in Representative Years: % Change and Absolute Numbers



	1985	1995	2000	2005	2006	2007
Undergraduates	4,536	4,472	4,300	4,136	4,066	4,127
Graduate Students	5,090	5,302	5,672	6,184	6,140	6,126
All Students	9,626	9,774	9,972	10,320	10,206	10,253
Faculty	989	954	931	983	992	998
*Academic Staff	1,739	2,224	2,552	3,093	3,350	3,794
Research Staff	984	999	1,022	1,411	1,456	1,474
Administrative Staff	1,024	1,301	1,427	1,784	1,837	1,886
Support Staff	1,645	1,611	1,517	1,565	1,637	1,575
Service Staff	1,151	929	797	839	843	890
Faculty and Staff	7,532	8,018	8,246	9,675	10,115	10,617
Campus Total	17,329	17,962	18,370	20,097	20,424	20,980

* **Academic Staff** = Lecturers, Instructors, Adjunct Faculty, Professors of the Practice, Retired Faculty, Professors without Tenure, Faculty Emeriti, Visiting Faculty, Visiting Lecturers, Visiting Instructors, Senior Scientists/Engineers, Postdoctoral Associates, Research Fellows, Academic Administrators, Affiliates

Source: Office of the Provost/Institutional Research