Massachusetts Institute of Technology

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MIT Faculty Newsletter

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this issue features the initial offering by new Faculty Chair Lorna Gibson, "An Agenda for the Year Ahead" (page 5); Matthew Silver and Olivier de Weck's "Expedition to 'Mars on Earth'" (page 8); "An Update from the Task Force on the Undergraduate Educational Commons" by Bob Silbey (page 12); and an explanation of how classrooms are assigned, "Classroom Scheduling 101" by Mary Callahan (page 20).

So, Just What Does an MIT Provost Do?

L. Rafael Reif

MANY OF YOU (INCLUDING A DEAN OR TWO!) have recently asked me: "So, what does an MIT provost do?" And, "What does the word 'provost' mean, anyway?" Taking the second question first, the Encarta Dictionary defines a provost as: a. "the keeper of a prison," b. "the senior dignitary of a cathedral or collegiate church," and c. "a high-ranking administrative officer of a university." By process of elimination, let's settle on c.

Now regarding the first question, the short answer is that the provost works with the president, the chancellor, and the academic deans to set the academic goals and priorities of the Institute, and with the executive vice president to coordinate the financial planning and budget process, all with an eye to furthering the academic mission of MIT. One of the provost's primary responsibilities is to help define our academic priorities. In doing so, the provost works closely with our deans and, most importantly, the provost listens to and learns from our faculty. It is, in fact, a critical part of the provost's job to understand the goals and aspirations of our faculty and to represent them in the highest decision-making councils of the Institute.

So, you may wonder, what are our academic priorities? It is too early in the administration of President Hockfield to roll out

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Editorial

Taking Responsibility

MIT AND OTHER RESEARCH UNIVERSITIES have a particular responsibility to bring clarity and truth to the technical issues underlying national policy decisions, whether military, environmental, or economic. MIT's reputation as an institution that deals openly and truthfully with such difficult issues is at risk. The longer the MIT administration fails to deal decisively with Professor Ted Postol's allegations of scientific misconduct at Lincoln Labs and efforts by the Department of Defense to block a fair and open examination of the case, the greater the risk of damage to our credibility and ability to convey an image as an institution that is willing to stand on principle. The national scientific journals and the popular media have reported on the controversy regularly.

The thumbnail public image of MIT with respect to this issue at this point is an administration that carefully crafts lawyerly responses to requests for information by MIT faculty, faculty at sister institutions, and the press, while acting indecisively within the MIT/Lincoln context and gingerly stepping around the key issues in its interactions with the government.

By contrast, President Vest's decision in the spring and summer of 1991 to challenge the U.S. government's push to dis-

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Taking Responsibility
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mantle a carefully balanced, workable system for recruiting students and awarding financial support (the "overlap" antitrust suit) was an example of a willingness to take political risks based on upholding bed-rock principles. We need the same courage with respect to the Lincoln Lab issues.

Many dimensions of the MIT-Lincoln relationship are not clear to most of our faculty. How deeply are our faculty and graduate students imbedded in this relationship? Who monitors the quality of research at Lincoln? How dependent is MIT on cash flow from Lincoln? As manager of Lincoln Labs, MIT is responsible for ensuring that research results are reported accurately and honestly, whether publicly announced or privately transmitted to government agencies – just as we expect from our faculty. We cannot tolerate inaction toward even a hint of scientific fraud under the cover of government secrecy.

MIT's leadership must act decisively and with complete integrity with respect to this issue, even if taking a proactive public stand provokes negative responses at DOD. Following any other course poorly serves our colleagues, MIT, and the national interest.

Page 17 of this issue of the *Newsletter* contains a letter from Hugh Gusterson, an MIT faculty member, accompanied by an appended letter by three experts at other institutions illustrating how others are likely perceiving us. We are also publishing President Hockfield's response to the appended letter.

We encourage faculty commentary on these serious and timely issues.

The Retirement Game at MIT

OUR *POLICIES AND PROCEDURES* handbook offers a few administrative guideposts for negotiating retirement but says nothing much about the details. The devil is in the details!

MIT has never been able to create a truly graceful and uniformly equitable path to retirement for the majority of its now retired professors: For example, one distinguished retired professor is given a cubicle in a basement library as a retirement "office" while another keeps his longtime spacious office and a privileged parking space close to that office. Others are required to time-share offices in an office suite.

Why the large differences?

In the absence of an MIT-wide set of norms for allocation of space and administrative support to retired professors who wish to remain active and on campus, what each gets is determined by his or her ability to negotiate a "deal" with a department head or dean. In this setting the department's need for a potential retiree's slot, the retiree's negotiating style, and the personal chemistry between the professor and his administrative counterpart are determinants of the outcome. In addition, the outcome of the negotiation depends on available departmental space and departmental budgets for administrative services.

In the large, this is neither equitable nor collegial. The absence of a transparent policy on what post-retirement activities are allowed and what activities can be granted further muddies the waters. The lack of clear guidelines or principles from the administration on how and why these decisions are made renders the retirement negotiation dance awkward and unpleasant for all parties.

Over the coming year, the *Newsletter* intends to focus on these issues as faced by our faculty (nearly 25% of whom are 60 years old or over). In addition to addressing the process of retirement, we plan to invite retired faculty to report directly from the "horse's mouth" what they see as issues that need to be openly aired among faculty and administrators. We welcome any contributions on this important topic.

Join the Newsletter Editorial Board

THIS IS AN INVITATION to all our faculty colleagues to consider joining the *Newsletter* editorial board.

The *Faculty Newsletter* Editorial Board is composed of faculty from all schools within MIT. Membership is on a volunteer basis, and you can serve for as long (or short) as you like.

The duties of Board members include:

- Serving on Editorial Sub-Committees which decide the theme and content for individual issues of the *Newsletter*
- Soliciting and submitting articles
- Participating in e-mail discussions and *Newsletter* policy decisions
- Attending one Editorial Board meeting per year.

The more diverse the Editorial Board, the more representative of the entire Institute the *Newsletter* will be.

For more information, please contact any member of the current Editorial Board (listed on page 2) or contact the *Newsletter* office at *fnl@mit.edu*.

Editorial Sub-Committee

So, Just What Does an MIT Provost Do?
Reif, from page 1

a full set of priorities, but as you know, the President announced two major initiatives in her inaugural address: energy, and the convergence of the life sciences and engineering. These priorities were not created in the President's Office. They were identified by the faculty and embraced by the President as two areas in which MIT should lead.

For many years, MIT has attracted smart individuals from all over who want to study, learn, do research, and interact with some of the smartest people on earth. This should not change. MIT is an electric place (my apologies, I do have an EE background . . .), where excitement and passion for what people do here is palpable everywhere. In my opinion, MIT is the most exciting academic place on the planet. It is a treasure: a symbol of excellence and meritocracy not just for the country but also for the world. But how do we keep MIT at the forefront of education, of knowledge creation, of idea generation? You do it by relying on our faculty: by encouraging and stimulating them to dream of inventing the future, and by recognizing and supporting those dreams.

Beyond the energy initiative, and the convergence of life sciences and engineering, I expect many exciting and important opportunities to emerge from our discussions with faculty throughout the Institute. We will be doing a great deal of listening and learning over the next few months, but there are a few challenges (read "opportunities") that are already clear. First is the challenge of globalization. Today, our graduates compete not only with graduates from other U.S. institutions for jobs in this country, but also with graduates from foreign institutions for jobs in the global market. How should we best prepare our students for this changing landscape?

Second, there are exciting opportunities in innovation, whether in our curriculum and pedagogy, or in teaching our students how to use new fundamental knowledge to create technological innovation. And third, we need to maintain the unique culture of MIT, while making improvements and exercising leadership in areas that the society as a whole needs to address. For instance, building on the principle of meritocracy that is so much a part of the MIT fabric, we must increase the diversity of our faculty, students, and staff. There are other important issues, of course, but let's leave something for future *Newsletters*.

In short, MIT has been the place to be for many of us, and we want it to stay as the place to be for future generations of students and faculty who want to live and work among the best and brightest. It is part of the provost's job to make sure that our faculty and students are given the opportunities and support needed to invent the future. It is, after all, our faculty and students who make MIT the treasure that it is. ■

L. Rafael Reif is a Professor, Electrical Engineering and Computer Science; Provost. *(reif@mit.edu).*

L. Rafael Reif was born in Maracaibo, Venezuela. He received the degree of Ingeniero Electrico in 1973 from Universidad de Carabobo, Valencia, Venezuela, and the MS and PhD degrees in Electrical Engineering from Stanford University, Stanford, CA, in 1975 and 1979, respectively.

From 1973 to 1974 he was an Assistant Professor at Universidad Simon Bolivar, Caracas, Venezuela. In 1978 he became a Visiting Assistant Professor in the Department of Electrical Engineering, Stanford University. In 1980, Dr. Reif joined the faculty of the Massachusetts Institute of Technology, where he is currently the Maseeh Professor of Emerging Technology. He was the Director of MIT's Microsystems Technology Laboratories for the period 1990-1999, the Associate Department Head

for Electrical Engineering in the Department of Electrical Engineering and Computer Science for the period 1999-2004, and the Department Head of Electrical Engineering and Computer Science for the period 2004-2005. His present research is on three dimensional integrated circuit technologies, and on environmentally benign microelectronics fabrication.

Dr. Reif held the Analog Devices Career Development Professorship of MIT's Department of Electrical Engineering and Computer Science, and was awarded the IBM Faculty Fellowship of MIT's Center for Materials Science and Engineering from 1980 to 1982. He received a United States Presidential Young Investigator Award in 1984. Dr. Reif is a Fellow of the IEEE. His election carried the citation "For pioneering work in the low-temperature epitaxial growth of semiconductor thin films".

Dr. Reif is also a recipient of the Semiconductor Research Corporation's (SRC) 2000 Aristotle Award "in recognition for his commitment to the educational experience of SRC students and the profound and continuing impact he has had on their professional careers" (***http://www.src.org/member/about/aristotle2000.asp***). He is a member of Tau Beta Pi, the Electrochemical Society, and IEEE.

From The Faculty Chair

An Agenda for the Year Ahead

Lorna J. Gibson

OVER THE LAST YEAR, a number of colleagues have asked me "What does the Chair of the Faculty do?" I'd like to begin by describing some of the main duties of the position and what I plan to work on during my term.

The Chair of the Faculty represents the faculty in a wide variety of forums and provides leadership in faculty governance, both formally, through the committee structure and interacting with the administration, and informally, in meetings with various groups. Faculty governance at MIT works through the standing committees of the faculty (such as the Committee on the Undergraduate Program or the Committee on Curricula) and Institute faculty meetings. The Chair of the Faculty chairs the Faculty Policy Committee (FPC), which oversees and coordinates the work of the other committees, reviews proposals from committees for presentation at faculty meetings, and formulates policy on matters of concern to the faculty, for approval by the faculty [*Rules and Regulations of the Faculty*, Section 1.72]. The Officers of the Faculty (the Chair, the Associate Chair, and the Secretary) meet with the President and other senior officers of the Institute to set the agenda of faculty meetings. The Chair of the Faculty meets regularly with the chairs of the standing faculty committees as well as with various administrators.

The Chair also addresses faculty grievances and oversees adherence to the end-of-term regulations. The Chair sits on Academic Council, acting as a representative of the faculty to the administration, and attends monthly Department Head lunches as well as meetings of the MIT Corporation.

The Chair of the Faculty chairs the Faculty Policy Committee (FPC) . . . reviews proposals from committees for presentation at faculty meetings, and formulates policy on matters of concern to the faculty, for approval by the faculty.

The second question I am asked is "Why did you decide to do it?" For me, it is an opportunity to serve the faculty and the Institute, to interact with colleagues from across the Institute, and to learn more about the administrative side of MIT.

The agenda for FPC for the coming year will include a review of some of the standing committees of the faculty, following FPC's discussions of faculty governance last year (see the article in the *MIT Faculty Newsletter* by Rafael L. Bras, September/October 2004 issue and a response by Lotte Bailyn, Stephen Graves, and Kim Vandiver, November/December 2004 issue). In particular, the Committee on Outside Professional Activities and the Committee on Faculty-Administration have been relatively inactive in recent years and their roles and charges need to be reconsidered. The Committee on Graduate School Programs is large, with a representative from every department that recommends candidates for graduate degrees. As a result, it is less effective than it could be. One alternative would be to develop a committee structure at the graduate level that would parallel the roles of the Committee on Undergraduate Programs, the Committee on Curricula, and the Committee on Academic Performance at the undergraduate level. For instance, there could be a Committee on Graduate School Policy that would review proposed graduate programs, develop and disseminate best practices for graduate student recruitment, diversity, conflict resolution, advisor-advisee relationships, mentoring, etc., along with a Committee on Graduate Student Academic Performance.

Last year, FPC had extensive discussions on institutional-level international engagements and the principles that such engagements should satisfy (see the article by Rafael L. Bras, *MIT Faculty Newsletter*, November/December 2004). The Faculty Policy Committee recommended the formation of a new standing committee of the faculty to discuss the extent to which proposals for future institutional-level international engagements satisfy those principles, while acknowledging that the decision to commit MIT to such projects lies with the top administrative officers of MIT (the President, Provost, and Chancellor).

A second agenda item, arising from meeting with faculty from various departments over the last year and from discussions with the other Officers of the Faculty (Bruce Tidor, Associate Chair, and

continued on next page

An Agenda for the Year Ahead
Gibson, from preceding page

Diana Henderson, Secretary) is improving communication between the administration and the faculty so that the faculty are more engaged in decision-making processes. FPC will be discussing how this might be accomplished. One possibility is to make better use of existing opportunities for communication between the administration and the faculty through, for instance, the Committee on Faculty-Administration or the Department Head lunches. Another is to make more effective use of the Institute Faculty Meetings, such as introducing meetings to define issues and agenda items of concern to the faculty that may not arise through the formal faculty governance committee structure.

The Task Force on the Undergraduate Educational Commons, chaired by Dean Silbey, will be visiting FPC this fall prior to giving a progress report at a faculty meeting later on in the term. I urge you to attend the faculty meeting for what should be a very interesting presentation.

If you have suggestions for other issues for FPC to consider, please contact me (*ljgibson@mit.edu*), Bruce Tidor (*tidor@mit.edu*), Associate Chair of the Faculty, or Diana Henderson (*dianah@mit.edu*), Secretary of the Faculty.

Lorna J. Gibson is a Professor of Material Science and Engineering; Faculty Chair *(ljgibson@mit.edu).*

Teaching this fall? You should know …

the faculty regulates examinations and assignments for all subjects.

Check the Web at ***http://web.mit.edu/faculty/termregs***.
Questions: Contact Faculty Chair Lorna Gibson at x3-7107 or *ljgibson@mit.edu*.

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.

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 9 must be scheduled in the Finals Period.

Impact of Homeland Security Restrictions on U.S. Academic Institutions

Ernst G. Frankel

INCREASINGLY STRICT INTERPRETATIONS of so-called U.S. security requirements and subsequent imposition of barriers to entry of foreign nationals is affecting both the number of academically-qualified foreign candidates seeking admission to U.S. research institutions and institutions of higher learning, and the quality of those admitted. While there are no reliable statistics on the number of qualified graduate students and researchers who were either not admitted, given entry visas, or chose to abort their plans to go to the U.S. and went elsewhere instead, the numbers appear to be significant. Of equal, if not more importance, is that as a consequence, the quality of foreign graduate students and researchers at American institutions appears not only to have declined, but their commitments seem to be less focused as well.

Greater numbers of highly-qualified candidates now appear to prefer committing to institutions in other countries, which are not only more hospitable in their admission strategies and procedures, but also are more open and generous in terms of their research support. Stem cell research is a typical example where institutions in foreign countries are now doing advanced research that often leap frogs U.S. work. Similarly, the level of research support in which the U.S. has dominated for so long is becoming more equal in many areas of science and technology – with accessibility and size of support often better in other countries, where political correctness plays at most only a minor role in the awarding of research funding.

In the past, foreign graduate students provided a significant base of highly-qualified researchers, and often led important advances in science and technology. Many of them chose to remain in this country after completion of their academic research, providing important new blood to universities, research institutions, and industry. However now, as a result of the new U.S. security requirements, more of those admitted are sponsored by their respective government and their commitment to the interests of our country is greatly diminished. Indeed, their sponsorship is often based on explicit understandings or commitments for them to return to their native countries and transfer U.S.-developed technology or research advances. It is hard to understand why these foreign-government-sponsored candidates pose a lesser security risk.

This new environment affects not only competition within technologies, but also the ability of U.S. institutions to advance in their research. The new restrictions not only result in a lower number and quality of foreign academic graduate admissions and the progress of American university research, but also inhibit the effective transfer and use of research results to U.S. industry and, consequently, economic advances. ■

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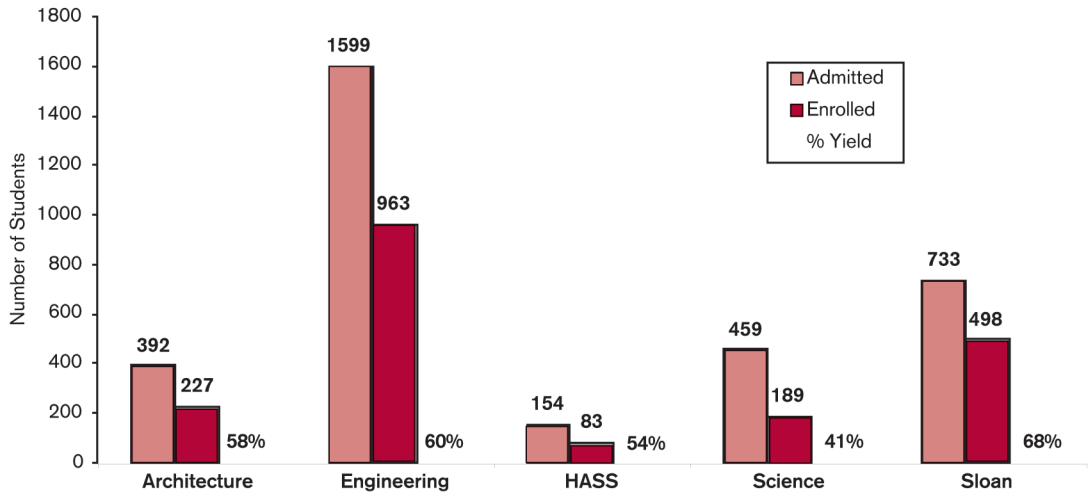
M.I.T. Numbers

2005 Graduate Admissions and Yield by School



Source: Office of the Provost/Institutional Research

Expedition to "Mars on Earth"

Matthew R. Silver
Olivier de Weck

THERE WILL ALWAYS BE some disagreement about the ideal place to summer. While many note that Cape Cod combines convenience and style, others insist that a more northern location, perhaps the coast of Maine, is preferable. A team of researchers from the MIT Department of Aeronautics and Astronautics and the Engineering Systems Division decided to take this argument further by conducting a field expedition to the remote Haughton Mars Project (HMP) research base, a few hundred miles from the magnetic North Pole.

The expedition was conducted as part of an Interplanetary Supply Chain Management project, funded by NASA and led by MIT Professors Olivier de Weck and David Simchi-Levi. The central goal for the arctic field season, which lasted from July 8 to August 6, 2005, was to investigate the similarities between logistics for remote terrestrial sites and supply chains for future planetary Moon and Mars exploration for modeling purposes. Another objective was to deploy and test technologies such as Radio Frequency Identification (RFID) for remote base operations.

The MIT team conducted this research in cooperation with the Haughton Mars Project (*www.marsonearth.org*), an international interdisciplinary field research project sponsored by NASA and the Canadian Space Agency (CSA) and managed by the Mars Institute. The site is focused on the scientific study of the 38-million-year-old Haughton impact crater and surrounding terrain on Devon Island.

At 75 degrees North latitude, Devon Island is a high arctic desert and the largest uninhabited island on Earth. The site was chosen both for its geological and scientific interest, and its similarity to Mars terrain. While no climate on Earth is exactly like Mars, the unique combination of rocky polar desert, permafrost, and analogous geological formations, afford comparisons to the possible evolution of Mars – in particular the history of water and of past climates, the effects of impacts on Earth and other planets, and the possibilities and limits for life in remote environments.

The High Canadian Arctic, with Resolute on Cornwallis Island and Devon Island indicated. Researchers stopped in Resolute on the way to the HMP base on Devon Island (75° N 90° W).

Beyond basic science, the remote Haughton Mars site functions as an analogue planetary base, supporting a diverse array of exploration technology and engineering test projects that also benefit from the Mars-analogue terrain, remoteness, and exploration-like activities undertaken by geologists and other scientists. For example, over the past several years, the Canadian Space Agency has supported the Arthur C. Clark Greenhouse project, to design, build, and test a greenhouse and autonomous plant-growth technologies in remote environments. Hamilton-Sundstrand, an aerospace engineering firm headquartered in Connecticut, uses the Haughton site to test advanced space suit designs. Also, this year the Drilling Automation for Mars Exploration (DAME) project, lead by the NASA Ames Research Center, tested autonomous fault diagnosis and artificial intelligence software on a prototype Mars drill. Many other exploration technologies and prototypes have been tested at the Haughton base since 1997.

The Haughton Mars project has its origins in a 1996 National Research Council grant awarded to Dr. Pascal Lee to investigate the potential for the High Arctic to serve as an analogue for Mars

Aerial view of the Haughton Mars Base and surrounding terrain. The six core structures, including the newly erected MIT tent, can be seen on the left. Researchers sleep in the individual tents on the right.

exploration. Having identified Devon Island as an excellent location, NASA formally established the Haughton Mars project in 1999, with Dr. Lee as principal investigator and Dr. Kelly Snook at NASA Ames Research Center as project manager. The project has grown over the years and now supports up to 60 researchers over the six-week field season, with a variety of projects from universities, government, and industry.

The base itself has also grown, and now includes a main mess tent, a communication-systems tent, a large office and laboratory tent for general work, a greenhouse test bed, and an octagonal core module that will eventually unite the buildings into a single base-like structure. There are also roughly 20 all-terrain vehicles (ATVs), a Humvee outfitted for longer traverses, and a small airstrip to support Twin Otter airplane flights in and out of base. This year, an MIT tent was erected for the space logistics project and also in preparation for future MIT involvement at the site. As a whole, the base can currently accommodate about 40 to 50 people at a given time, with researchers sleeping in individual tents near the main structures.

The MIT expedition to the Haughton Mars Site on Devon Island was part of the NASA-funded Human and Robotics Technology (HRT) project on "Interplanetary Supply Chain Management & Logistics Architectures." Originally, the plan was to analyze logistics for Antarctic exploration and offshore oil and gas exploration platforms. However, observing and managing the HMP logistics presented itself in early 2005 as an opportunity to deliver much more tangible and direct benefits to NASA. Not only will the project be able to closely observe and model both the micro- and macro-logistics of the base, it will influence the actual logistics of the site as advances made under the project are infused into base operations.

The team thus went to Devon Island to investigate the applicability of the site as an analogue for planetary base micro- and macro-logistics . . . . They also tested new technologies and procedures to enhance the ability of humans and robots to jointly explore remote environments on the Earth, the Moon, and Mars.

The team thus went to Devon Island to investigate the applicability of the site as an analogue for planetary base micro- and macro-logistics, to obtain lessons learned for Supply Chain Management (SCM) to remote environments, and to begin collecting data for modeling purposes. They also tested new technologies and procedures to enhance the ability of humans and robots to jointly explore remote environments on the Earth, the Moon, and Mars.

The MIT expedition had four main objectives for the summer field season:

First, a complete inventory of the base was compiled for future modeling and to create a "complete picture" of the current state of operations. The inventory was partitioned into a taxonomy developed by the project, and incorporated into an SQL relational database for retrieval using multiple "use cases."

The taxonomy contains 10 major classes of supply according to a high-level functional decomposition of research, habitation, and maintenance-related functions on base. It represents a significant advance over current practice for the international space station (ISS) and Antarctic logistics, where multiple fragmented inventories exist, leading to misunderstandings and expensive or dangerous under- or oversupply situations. As a whole, approximately 2300 items were inventoried at HMP, including items for base operations such as fuel and consumables, and items for specific

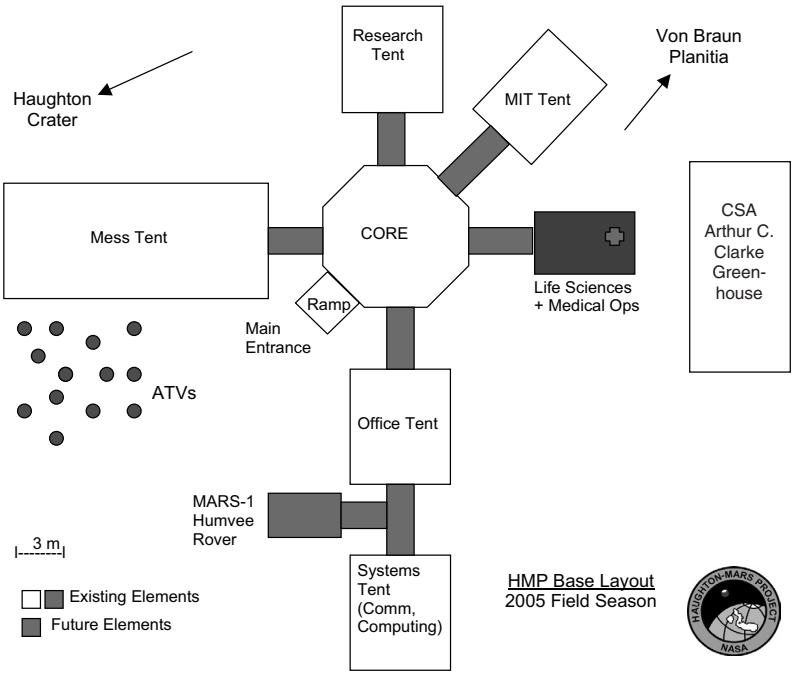
continued on next page

Expedition to "Mars on Earth"
Silver and de Weck, from preceding page

research projects such as the Mars Greenhouse, C-band satellite communications equipment, and CSA telemedicine kit. In a wider sense, this objective will help establish a benchmark model for how to efficiently operate a multinational, multi-organization research base in remote environments.

A second major field-season objective was to create and quantify an initial network model of the HMP supply chain. This network model will be used as a benchmark for a comprehensive interplanetary exploration logistics discrete event simulation. The simulation will have the ability to capture flights of vehicles in and out of base and to capture the associated forward and reverse cargo flows. Combined with powerful bin packing and network optimization algorithms, it will help base managers organize and plan Twin Otter flights (cargo missions) more efficiently than currently possible. Based on the difference between the planned and actual number of required flights (20 vs. 28) in this field season, the team estimated that the transportation optimization potential of HMP may be on the order of 30-40 percent.

Third, the MIT team experimented with RFID technology to ascertain both its potential benefits and limitations in the context of remote base operations. The basic ability to associate an object with information and then to autonomously track the location and state of assets, agents, and vehicles, has the potential to help many aspects of surface operations. Most obviously, it could save researchers precious time by accurately and effortlessly tracking objects as they move about base, and reporting exact levels of supply. It could also enable more exotic applications, such as the rapid "check-out" of vehicles for traverse using hand-held readers. Similarly, "smart shelves" that sense what items are on them could also save researchers time locating and analyzing rock and soil samples obtained during field excursions.



Current Layout of HMP Research Base on Devon Island.

While promising, many questions remain about the basic utility and limits of RFID technology for remote base operations. Testing at HMP therefore had two elements: formal scientific studies, and less formal experimentation with the basic technology as lessons were learned about base operations. Formal studies included an experiment to evaluate the benefits of RFID in terms of accuracy and timesavings compared to other technologies such as bar coding. A system was also developed to precisely monitor the flow of ATV traffic in and out of camp.

Preliminary results of these studies suggest, among other points, that while RFID technology will undoubtedly save time, basic improvements in accuracy and system design will be needed to justify their cost and mass. Most likely, special packaging would be needed to overcome basic problems of radio-wave reflection and attenuation. Further, it became clear that to avoid RF interference an RFID system needs to be designed together with the overall communications architecture of the base, rather than retrofitted as an afterthought.

These issues notwithstanding, observations of base operations have suggested potentially valuable niche applications for RFID technology beyond those conceived before the expedition. "Smart containers" that can precisely identify their contents while remaining RF opaque would be one helpful application. Further, a centralized information "kiosk" to distribute such information and monitor levels of critical consumables such as fuel and food would also be important. Future work will build on these findings to design and test more comprehensive RFID systems for remote base applications. HMP offers the potential to create a fully integrated, intelligent, and multidisciplinary research environment.

The fourth major goal for the MIT expedition was to establish logistics requirements for extra vehicular activities (EVAs) through observations of short ATV traverses and longer excursions with overnight stays. This goal links EVA planning to the micro-logistics modeling efforts. MIT researchers accompanied geologists on excursions

360° Panoramic view of the Haughton Mars Base on Devon Island.

into the Haughton crater and other areas on Devon Island, recording planning strategies – re-planning in the case of unexpected events or discoveries – supplies taken along, and caching possibilities (e.g., via air delivery). Further, an MIT-developed re-planning software tool was tested.

In addition to these research objectives, the MIT team prepared for more substantial involvement with the Haughton Mars Project starting in the 2006 field season. This will include human/robotic experiments (Prof. Jeff Hoffman), potential EVA suit work (Prof. Dava Newman), autonomous reconfigurable rovers (Prof. Brian Williams, Prof. David Miller), continued space logistics work (Prof. de Weck, Prof. Simchi-Levi), and the eventual testing of a pressurized lightweight planetary camper vehicle (Prof. de Weck).

This continued engagement, together with the availability of the MIT tent, provides the opportunity for other researchers in the MIT community to participate in the Haughton Mars Project. Given the multidisciplinary nature of work at Haughton, this possibility extends to any researchers with an interest in conducting research in the High Arctic. For example, in addition to the previously mentioned projects, the site has supported basic science in geology, glaciology, and microbiology, testing of scientific instruments and procedures such as weather balloons and monitoring equipment, and the testing of multiple prototype robotic technologies in the rocky desert. The MIT facility is open for participation by researchers in other departments and laboratories, such as Mechanical Engineering or Earth, Atmospheric and Planetary Sciences (please contact Prof. de Weck for details).

As their winter-like summer in the land of the midnight sun comes to an end, the MIT team has now returned to sort, analyze, and better understand the data collected and lessons learned from the HMP expedition. As advances are made toward their ultimate goal of efficiently and reliably supplying exploration bases on the Moon and Mars, we may one day be able to summer in even more unorthodox locations than Devon Island.

MIT professor and former astronaut Jeff Hoffman tests a Hamilton Sundstrand concept spacesuit during an EVA test run

Matthew Silver is a Research Scientist in the MIT Space Systems Laboratory and a 2005 MIT S.M. graduate in Aeronautics and Astronautics and Technology and Policy (TPP) *(mrsilver@mit.edu).* **Olivier de Weck** is an Assistant Professor of Aeronautics and Astronautics and Engineering Systems *(deweck@mit.edu).*

An Update from the Task Force on the Undergraduate Educational Commons

Robert J. Silbey

THE TASK FORCE ON THE Undergraduate Educational Commons has been working for over a year-and-a-half on its charge to review the General Institute Requirements (GIRs) and to suggest changes in the undergraduate curriculum. We hope to make all our recommendations known quite soon; we are scheduled to preview these recommendations at the November Institute faculty meeting.

Since the implementation of the basic structure of the GIRs about 40 years ago, reviews – both major and minor – have taken place fairly regularly. Committees have worked hard, releasing reports suggesting improvements to some aspect of the current GIRs; but then, more often than not, either the report was forgotten in someone's filing cabinet or only minor changes resulted from that hard work. A good example is the Laboratory requirement. Over the 40 years the requirement has existed, a number of committees have suggested that the requirement in its present form hardly lives up to its lofty goals, and should be overhauled – the recommended overhaul taking various forms, from a natural sciences laboratory requirement to a "phase one" add-on to the current requirement.

Other committees have suggested numerous improvements to the Science requirement, but except for the introduction of the Biology requirement (a major change, to be sure), little has happened that addresses the long-standing sentiment that the Science requirements may not be the right mix of subjects for the twenty-first century MIT student. In much the same vein, committees that have reviewed and made proposals for change to the Humanities, Arts, and Social Sciences (HASS) requirement have met with much the same resistance to major improvements.

Why has so little change occurred in the past 40 years? There are a number of reasons, including: a) most faculty think our undergraduate program is pretty good, so why change it; b) the department programs are designed assuming the current set of GIRs, so any change in those requirements would require rethinking and reworking of the departmental program; and c) there is a natural tendency to resist change. (I am reminded of the joke: "How many tenured faculty members does it take to change a light bulb?" The incredulous response: "Change??! Change??").

A final reason that many past reports and proposals met with resistance is because often faculty were taken by surprise when committee reports and recommendations were released. Hoping to avoid that particular result this time around, the Task Force has taken the tack of visiting every MIT department to talk to the faculty (and many others) about the GIRs and the first-year experience. We've heard from most everyone that improvements of various sorts need to be introduced. The faculty voices were not uniform, of course, but certain themes were clear; our Task Force deliberations have been based on what we heard. Those of you who attended any of our public forums last year heard what the Task Force considers to be some of the "forcing points" that we have heard repeatedly from faculty and students.

a. The first is universal: the desire for a more energizing and "flexible" first-year experience. As we heard time and time again in meetings with departmental faculty, "our students are beaten down," in ways that don't seem necessary. They need more exposure to the candy store that is MIT; they need to be offered more choice earlier on.
b. There is a larger role for Engineering in the first-year experience.
c. There should be no increase in requirements.
d. The four-year professional degree is essentially a thing of the past.
e. Students need more time: for exploration, for research, to study abroad.
f. The HASS requirement is too complicated; there are no clear goals (and from some quarters, eight HASS subjects are too many).
g. Project-based, active-learning experiences are a good thing for freshmen.
h. Double majors should replace double degrees.
i. There is real intellectual depth in the intersections of fields: multi-disciplinary work should be encouraged

All of these visits and conversations have taken a lot of time. The members of the Task Force have worked hard with no release time from other duties, and I am very grateful to be working with a group of colleagues who have given so generously to this effort. As I said, we plan to preview our recommendations at a faculty meeting later this term, but much of what we're thinking is revealed in the d'Arbeloff Call for Preliminary Proposals that was released in June and identifies three target areas of interest to the Task Force:

- First-year subjects that provide **broader coverage of the fundamental concepts and methods of modern science and engineering.** [We hope to introduce new subject matter into the technical core by offering freshmen more choice in what they are required to take.] Such subjects may be the result of cooperative initiatives between departments and schools.
- **A more common first-year experience for students as a component of the requirement in the Humanities, Arts, and Social Sciences**, which may take the form of coordinated subject offerings.
- Increasing the number of **"project-based" experiences for first-year students**, including curricular offerings across departments and schools.

There is a common theme in these different areas: the desire for more cooperative educational initiatives between and among faculty across departments and schools. This was a major theme of the 1998 report of the Task Force on Student Life and Learning. That report underscored the importance of the principle of the "unity of the MIT faculty" in taking responsibility for the undergraduate commons and in keeping it healthy and exciting.

The public discussions that will take place starting later this term will need faculty to keep an open mind about what is important for our students, even though the prospect of change may be uncomfortable for how it might affect the status quo. I look forward to thoughtful and objective reactions to our ideas and recommendations and to your help in designing the best educational opportunities for our students.

Robert J. Silbey is a Professor of Chemistry; Dean of the School of Science. He chairs the Task Force on the Undergraduate Educational Commons *(silbey@mit.edu).*

Computation for Design and Optimization: A New SM Program in the School of Engineering

Jaime Peraire
Robert Freund

JONATHAN BIRGE IS RUNNING a simulation of a femtosecond laser cavity on his computer in RLE's Ultrafast Optics and Quantum Electronics Laboratory. Birge, now in his third year of doctoral studies at MIT, came here from Boulder, Colorado with a solid foundation in optics and a Master's degree in optical electronics. Prior to MIT, he worked at a startup company developing algorithms for the optimization of optical systems.

This past spring, as Birge considered the classes in numerical methods that he would be taking for his Doctoral program, he discovered that these subjects comprised most of the core curriculum for MIT's new SM program in Computation for Design and Optimization (CDO). "In my optics job, I'd picked up optimization techniques ad hoc, with no formal training," Birge explained. "When I heard about the CDO program, I realized it would provide me with an excellent tool kit for doing optimization of any computer-simulated system." Jonathan Birge is now one of the 17 inaugural students in MIT's new SM program in CDO.

CDO: What and Why?

The CDO program is borne of the observation that intensive Computation for Design and Optimization has become an essential activity in the design and operation of many complex engineered systems. Such systems include micromachined devices, guidance control systems, imaging systems, distribution networks, telecommunications systems, and transportation systems. The Oden report [Oden J.T. (ed.) (2000), "Research Directions in Computational Mechanics,"

continued on next page

Computation for Design and Optimization
Peraire and Freund, from preceding page

National Research Council Report, National Academy of Sciences], commissioned by the National Academy of Sciences, has predicted that the next decade will bring explosive growth in the demand for accurate and reliable numerical simulation and optimization of engineered systems. Another recent report, issued by the President's Information Technology Advisory Committee, states categorically that "Computational science – the use of advanced computing capabilities to understand and solve complex problems – has become critical to scientific leadership, economic competitiveness, and national security." [President's Information Technology Advisory Committee (June 2005), Computational Science: Ensuring America's Competitiveness, National Coordination Office for Information Technology Research and Development, ***www.nitrd.gov/pitac/reports/20050609_computational/computational.pdf.***]

The critical role that computation now plays across all engineering and science disciplines, as well as the industry-based demand for engineers and scientists who are literate in computational sciences, has created a clear need to prepare tomorrow's engineers and scientists with appropriate knowledge and skills. The CDO interdepartmental Master's program is designed to address this need by educating students in the formulation, analysis, and critical application of computational approaches to designing, predicting, controlling, and optimizing engineering systems. As computation is a key interdisciplinary domain relevant across the spectrum of MIT engineering and science departments, CDO has been designed as an interdepartmental program.

As computation is a key interdisciplinary domain relevant across the spectrum of MIT engineering and science departments, CDO has been designed as an interdepartmental program.

CDO Students

The CDO program serves two student audiences:

- those who seek a terminal professional Master's degree before entering the technology workforce
- current or potential future doctoral students who, like Jonathan Birge, view the CDO curriculum as an important adjunct to their research

Prospective students will typically have a strong foundation in a core discipline such as engineering, materials science, physics, or mathematics.

The Program at a Glance

The CDO curriculum consists of core subjects that serve all engineering disciplines, as well as restricted electives from which students can choose to focus on particular application domains, and a 36-unit Master's thesis.

The core subjects cover numerical solution of partial differential equations, optimization methods, and numerical linear algebra. Says Birge, "The fact that CDO core subjects are general and not specific to certain disciplines will make the computational tools extremely useful for my work in optics."

The set of restricted electives currently consists of roughly 25 H-level courses that have computational themes and related educational components aligned with the themes of CDO. We aim for the Master's thesis to be a fairly serious research endeavor, and we hope that many CDO Master's theses will result in peer-reviewed publications.

We anticipate adding many more courses to the list of restricted electives as faculty awareness and interest in the program increases. Please visit ***mit.edu/cdo-program/curriculum.html*** to see the current list of CDO elective courses, and contact Professor Jaime Peraire at *peraire@mit.edu* to discuss adding your course to the list.

CDO expects that 15-25 students will be admitted per year, and that students will be able to complete the degree in 12-24 months.

CDO-Affiliated Faculty

CDO is quite relevant to a broad spectrum of the MIT faculty, and we encourage faculty to become affiliated with the program. As a CDO-affiliated professor, you would join a community with strong interests in computation. Affiliated faculty will be given the opportunity to suggest invited seminar speakers, supervise CDO Master's theses, participate in the admissions process, and collaborate in research grants and related activities.

Please contact either of the authors if you would like information about becoming affiliated with CDO. For the most up-to-date information about the CDO program, affiliated faculty, courses, and students, please visit the CDO Website: ***mit.edu/cdo-program/***.

Jaime Peraire is a Professor, Aeronautics and Astronautics *(peraire@mit.edu)*.
Robert Freund is a Professor, Sloan School of Managment *(rfreund@mit.edu)*. They are co-directors of the CDO program.

MIT Poetry

by Kim Vaeth

Why Didn't They Hear the Sea Calling?

I was there riding in my mother's
car with father who was
driving. We got lost
and my mother asks – Honey, why don't we
pull into a gas station and ask? My father refuses.
He says he'll find the right
street in just a minute.
He says he knows
right where it is.
Why didn't he hear
the sea calling to us, always
so close it was always living
so close.
Why weren't they drawn to it
like lovers swimming out and out?

Here

Eye to eye, three wild roses
bloom in a glass of water
on my table, as supple
and near as you were
three hours ago. The rose in the middle
opens so fully it pulls
the entire stem and the two
buds over in an arch
with its faint pink weight,
calling perhaps to the meadow
it was once a part of –
summer here now.
Just as your recent
cries reverberate
along my throat, this wild
rose creates a stirring
in me, a raw hope,
a hummingbird, unexpected
yet here, sacred. Rising
from nothing I know
about the past, rising
from a ripe blood orange.

The Searchlight Leaves Home

Where is my little daughter
who might save me

from the cupped hands of emptiness
the one thirsting for water

The Searchlight Burns

O. says, "she is like the light that travels
after the star burns up."

The sheep near the highway, burning with lambs.

S.'s light, after chemo, burning the cold sea.

All of us darkened, burning

within like coals
like straw
like…

The Searchlight Awakens

The pain of the Sisters of Mercy
who tied children to their chairs
is the pain of the world.

And Father Q. banished
for fondling, for plotting
to fondle.

All the orphans dance
All the orphans sing

In our own private City of Light
Blake reads "The Songs of Innocence."

Kim Vaeth is the author of *Her Yes* (Zoland Books). Her poetic texts for the orchestral works *Elegies* and *American Requiem* are recorded with Sony Classical and Refernce Records. She teaches at BU and tutors at MIT.

The Fund for the Graduate Community

Ike Colbert
Barrie Gleason

A BOLD NEW IDEA has evolved from exciting community-authored initiatives.

- Introducing reusable ceramic mugs changes the nature of social interaction in the EAPS departmental lounge, not to mention local conservation efforts.
- Graduate students manage a design competition for "un-useless things," attracting the attention of *The Boston Globe.*
- The Academics, Research, and Careers Committee of the Graduate Student Council analyzes their focus group research and presents their recommendations for improved advisor/advisee relationships at the May faculty meeting.
- The MIT Libraries establishes a seed collection of foreign language literature for recreational reading.

These are just a few of the current projects that received full or partial funding in round #4 of the Graduate Student Life Grants.

These grants were introduced in 2002, when the Dean for Graduate Students received a significant allocation of funds to be used for enhancing the quality of student life. Seeing this as one approach to understanding the role of community in graduate life, he decided to use the allocation to design and implement the innovative Graduate Student Life Grants process. The grants offered funding for creative initiatives for enhancing the graduate experience through a request-for-proposal process. Anyone in the MIT community was welcome to participate.

Between June 2002 and December 2004, the Dean and his selection panel have orchestrated four rounds of proposals; out of 112 proposals reviewed, they have funded 64 to date.

Initially, the student life fee funds provided an opportunity to experiment. Now a clearly successful proving ground, the grant process shows that there is a wellspring of fresh, creative ideas for enhancing graduate student life in the community. Successful programs point to the ways in which the Institute might support graduate life more broadly and on a permanent, sustained basis. While the Dean remained committed to shepherding the grant process, it was clear that a fund would offer resources to change the Institute landscape on a more permanent basis.

Successful programs point to the ways in which the Institute might support graduate life more broadly and on a permanent, sustained basis.

To that end, a small team representing the Alumni Association and the Graduate Students Office (GSO) developed the case for the Fund for Graduate Community and submitted a memorandum to the Treasurer, who approved a new expendable Fund. In March 2005, the Fund was announced in an appeal letter sent to all graduate alumni/ae over the Dean's signature This appeal described the opportunity to "ensure a vibrant community life for our graduate students," and explained that future Fund resources would be used for three main purposes. First, to generate and support more initiatives by institutionalizing the annual request-for-proposal process. Second, the Fund will support programs and activities serving targeted constituencies (ideas that surface through the grant process, or otherwise). For example, in the context of the Institute's priorities, such programs and activities might focus on international students, incoming women graduate students, students with families, or student parents. Finally, the Fund will offer the opportunity to sustain seminal ideas, those ideas that stand the test of time and should be integrated into the fabric of graduate student life at the Institute.

The team who developed the case for the Fund is currently at work on fundraising plans. The Fund for Graduate Community is featured as one of MIT's priorities for student life and learning on the Institute's "Giving to MIT" Website (***giving.mit.edu***), and the GSO will introduce special coverage on its own site early this fall. Even without a formal marketing strategy in place, the Dean's appeal letter has attracted 165 gifts totaling $24,000, to multiple designations; of that, 67 donors have contributed $10,400 directly to the Fund for Graduate Community.

The deadline for round #5 of the Graduate Student Life Grants is October 14, 2005. For more information about the Fund, or the Graduate Student Life Grant process, please contact Barrie Gleason in the Graduate Students Office at *bgleason @mit.edu.*

Ike Colbert is Dean for Graduate Students *(ikec@mit.edu)*. **Barrie Gleason** is Director of Communications for the Graduate Student Office *(bgleason@mit.edu).*

Newsletter to Unrestrict Website

THE EDITORIAL BOARD OF the *Faculty Newsletter* has decided to unrestrict the *Newsletter* Website (***web.mit.edu/fnl***), making it available to anyone with an Internet connection and a Web browser, worldwide.

Up until now, computer-specific MIT Web Certificates were necessary to view the *Newsletter* online. These Certificates were only available to people with an MIT ID number and an Athena account.

Editorial Board members felt that in the spirit of the Institute's continued openness and sharing of ideas and information, much along the lines of MIT's OpenCourseWare (***ocw.mit.edu***), unrestricting the Website was the proper thing to do. An extremely positive side effect of this action, will be the ability to add a "search" feature to the site, an activity technologically prohibited on restricted MIT Websites.

The necessary redesign and reconfiguration of the Website is planned to be completed by the November/December issue of the *Newsletter*.

MIT Response to Hurricane Katrina

The MIT community is reaching out to those affected by Hurricane Katrina, offering help for those directly affected, hospitality and support for displaced students, and expertise to the affected regions.

Visit the Website ***web.mit.edu/katrina*** to view upcoming and ongoing events, current news and photos, and to learn ways to help. The Website also contains key contact information and a message from President Hockfield.

letters

A reputation for integrity

To The Faculty Newsletter:

IN HIS RESPONSE TO Professor Ted Postol's allegations of scientific misconduct at Lincoln Laboratory, Provost Bob Brown writes (*MIT Faculty Newsletter* May/June 2005, p.7) that MIT has been unable to complete its investigation of Professor Postol's allegations because the Department of Defense "has classified the materials required in order to examine the allegations (including . . . our own inquiry report) and has denied our investigation committee access to those materials . . . . Without those materials, an investigation can neither identify the questions posed in the inquiry report nor answer them."

As contractor for the Lincoln Laboratory, one of MIT's primary responsibilities is to assure the scientific integrity of research conducted at the Laboratory. It is clear from the Provost's statement that MIT is unambiguously unable to fulfill that basic responsibility. If MIT cannot investigate allegations of fraud at a laboratory it manages – if its leaders cannot even have access to MIT's own preliminary report on the matter because that report has been classified – then MIT should withdraw from the management contract. When MIT is denied the right to audit the integrity of research at Lincoln Laboratory, then its managerial role has become an absurdity; we run the risk of seeing our great university's reputation tarnished by researchers for whom we bear responsibility but over whom we lack control.

In this respect the experience of the University of California as contractor for the Los Alamos National Laboratory is salutary. Every press account of missing secrets, inadequate security, embezzlement, and alleged spying at the Laboratory has dragged the University of California's name through the mud.

A reputation for integrity is a university's most important asset. If MIT cannot investigate and lay to rest the allegations of impropriety at Lincoln Laboratory, then it should protect its reputation for integrity by withdrawing from the contract.

At their request, I am appending a letter to President Hockfield from three distinguished independent physicists who share my concerns on this issue. [See next page, **ed.**]

Sincerely,

Hugh Gusterson
Associate Professor of Anthropology and Science and Technology Studies

Princeton University
Program on Science and Global Security 221 Nassau Street, 2nd floor
Princeton, New Jersey 08542-4601
Fax 609.258.3661
www.princeton.edu/-globsec

May 31, 2005

President Susan Hockfield
Massachusetts Institute of Technology
77 Massachusetts Ave
Cambridge, Massachusetts 02139

Dear President Hockfield,

We are senior members of the small community of independent physicists who work in the area of science and security. For the past two decades, we have read with appreciation the major analytical contributions that Professor Theodore Postol's research group has made to the U.S. debate over missile defense. This work has been path breaking and presented so lucidly that it has had a major impact on the debate. MIT should be proud of this group. Its contributions exemplify the impact that independent scientists protected by academic freedom can make to clarifying controversial public-policy issues.

We were distressed when Professor Postol became embroiled in a public debate with MIT's administration in 2001 and have been concerned by the toll that debate has taken in damaging both MIT's reputation and the health of Professor Postol's research group. However, we were pleased to learn a year ago that Provost Brown had decided that Prof. Postol's concerns did require investigation.

We were nonplussed in December, however, when President Vest announced that MIT has been blocked from conducting an investigation of the integrity of the work that is done at a laboratory that it runs. We understand that the Missile Defense Agency (MDA) has classified all the relevant documents, including the report of MIT's own initial inquiry. We understand further that MDA has informed MIT that even a committee with all the necessary clearances would not be allowed access to the documents because MDA has determined that there is no need for an investigation and therefore that the committee would have no "need to know" the classified information.

We are concerned that, despite former President Vest's statement that "we continue to seek the approval needed so that the investigation can proceed," MIT appears to have accepted MDA's edict as legitimate. In our view, MDA's position that MIT has no need to know whether fraud is occurring in the research that it manages for the federal government is unacceptable and flies in the face one of the fundamental rationales for having universities manage such research. We believe that MIT's position should simply be that it will not manage research whose integrity it is not allowed to verify.

In this connection it may be of interest to know that one of us (J. A.) currently chairs the University of California's National Security Panel, which reviews the weapons programs at the Los Alamos and Livermore nuclear weapons laboratories and the other two have served on its review panels. One of the University's requirements is that this committee -- or its specialized subcommittees -- be allowed to review all of the work done in these laboratories, including even special compartmented intelligence programs.

Finally, on a separate matter, we have difficulty understanding your recent suggestion to Prof. Postol that he gain access to the materials that MIT supplied to the DOD Inspector General in response to his complaint of retaliation by making a Freedom of Information request to the DOD. Why cannot MIT provide him with these materials in the spirit of our American tradition of fairness?

Sincerely yours,

John Ahearne, Director, Ethics Program Sigma Xi, The Scientific Research Society
P.O. Box 13975
Research Triangle Park, NC 27709

Richard Garwin, IBM Fellow Emeritus
IBM Thomas J. Watson Research Center
1101 Kitchawan Road, Route 134
Yorktown Heights, NY 10598

Frank von Hippel '59, Professor of Public and International Affairs
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Massachusetts Institute of Technology

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June 14, 2005

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Dear Professor von Hippel, Mr. Ahearne, and Mr. Garwin:

Thank you for your letter of May 31st, which arrived just as MIT began Commencement week.

I share your concern that a complete investigation of Professor Postol's allegations be allowed to proceed. I can assure you that MIT has consistently pursued, and continues to seek, an investigation of these allegations, including review of both the relevant classified and unclassified record.

On the subject of the Department of Defense Inspector General materials, MIT has been advised by a representative of the Inspector General that a Freedom of Information Act request is the appropriate way for Professor Postol to obtain the material considered in the Inspector General's process. There is no reason why Professor Postol cannot obtain these materials in this manner, or why MIT should disregard the position of the Inspector General on that question under the Inspector General's process.

Sincerely,

Susan Hockfield

Classroom Scheduling 101

Mary Callahan

FOR YEARS THE URBAN LEGEND at MIT regarding the assigning of classroom space has been that there is a secret algorithm that is applied. In this article I will attempt to dispel that myth, and highlight the complicated and often difficult task of assigning classrooms.

The Registrar's Office is responsible for the scheduling of about 2,400 subjects each term. While offerings such as thesis research or independent study don't require rooms, the majority of subjects do need to be assigned into one of the 159 classrooms managed by the Registrar's Office. These classrooms vary in size from a maximum of 566 to a minimum of 10, with technological capabilities ranging from distance learning to chalk and blackboards.

The most expedient way to schedule these subjects into classrooms is to determine what room a professor prefers and schedule the class into that room. According to the MIT Classroom Survey conducted by the Office of the Provost (***web.mit.edu/ir/surveys/***), three-quarters of faculty report getting their first-choice room. Although the Registrar's goal is to schedule each subject based on faculty preference while optimizing use of scarce classroom resources and minimizing student conflicts, there are many mitigating circumstances that prevent all subjects from being scheduled into the first choice of a room.

Days and Times

There is greater competition for rooms during certain days, such as Tuesdays and Thursdays. There are also preferred teaching times for both faculty and students. While the teaching day is 8 a.m. to 5 p.m., there are very few classes scheduled during the 8 a.m. hour, as neither faculty nor students prefer to hold class session that early in the day. Of the 226 subjects offered on Mondays during the fall 2005 term, 198 (87.6%) met between the hours of 10 a.m. and 4 p.m.

Scheduling Parameters

Although MIT does not have a rigid scheduling matrix, subjects that meet outside of a Monday/Wednesday/Friday or Tuesday/Thursday grid complicate the scheduling process, as they will likely cover more than one scheduling period. For example, a subject that meets from 10 am until 1 pm on Monday in effect takes up three time blocks (MWF 10; MWF 11; MWF12). The Registrar's Office tries to find other subjects that meet in the corresponding time blocks (W 10-1, F 10-1) to assure maximum utilization of space.

According to the MIT Classroom Survey conducted by the Office of the Provost , three-quarters of faculty report getting their first-choice room.

Subject Enrollment

Rooms are also allocated by space requirements of particular subjects. A major lecture, such as 3.091, will obviously be scheduled into a room that can accommodate the large enrollment. But each term there are less predictable situations that require switching rooms. A subject might be scheduled into a room with a capacity of 50 but only enroll 35 students. Another can have the opposite scenario; scheduled into a room with a capacity of 40 but 48 students enroll. It then becomes necessary to switch these two rooms, resulting in a situation where neither professor receives his/her first room choice.

Technological Requirements

Technological requirements of some subjects dictate that they be given scheduling priority in certain rooms. Subjects such as 8.01 and 8.02, using the Technology Enabled Active Learning (TEAL) format, need to be scheduled into classroom 26-152, as this room is specifically designed to support the pedagogical requirements of TEAL. Subjects conducted in the distance learning format, such as those offered through the Singapore-MIT Alliance, are scheduled in classrooms 32-123, 32-141, or 1-390, that have distance learning capabilities, as no other room will meet their unique needs. While other subjects can be scheduled into these particular rooms, the unique attributes of these classrooms require that subjects using these attributes be given preference in scheduling.

The nature of classes at MIT requires multi-purpose classrooms be located throughout the campus. Scheduling is such that a mathematics class can be followed by a literature class that can then be followed by a biology class, and the room has to be equipped to handle the needs of each subject. As 89% of faculty who use a

computer in the classroom report bringing their own laptops, there is a need for advanced video projection capability in every room with standardized audio/visual control systems.

Extenuating Circumstances

While all of the above complicate the scheduling process, an additional hurdle to creating a room schedule is the extenuating circumstances that are unavoidable but impact the scheduling of classrooms. The current Physics, DMSE, Spectroscopy, Infrastructure (PDSI) project provides a good example. The location of the construction between Buildings 4, 6, and 8 has necessitated the closing of 16 classrooms with a net loss of 848 seats within these buildings. This has resulted in the rescheduling of subjects that usually use this classroom space into different locations and has required renovations to some rooms to accommodate these classes.

There are also occasions where classrooms have to be forfeited to the benefit of the Institute. Competition for limited space can require the converting of an academic classroom into an office or lab facility, and while another space is usually traded for the room being annexed, the process results in a zero sum gain in academic classrooms.

Conclusion

As has been shown, the scheduling of rooms is an iterative process relying heavily on human decision-making in the allocation of somewhat scarce resources. The long-term goal is to continue to renovate classrooms on campus to provide the optimum teaching and learning environment for both faculty and students, with faculty and pedagogical needs as the driving force. Until that renovation is completed, the Registrar's Office will continue to try to best meet the needs of each subject when scheduling subjects into classrooms.

For more information about classroom scheduling, please visit our Website: *web.mit.edu/registrar/*.

Mary Callahan is the Registrar *(callahan@mit.edu)*.

MIT Professors Make Top 100 (Worst) List

WHAT DO PROFS. NOAM CHOMSKY and Nancy Hopkins have in common with talk show host Jerry Springer, professional basketball player Latrell Sprewell, rap music star Eminem, radio schlock jock Howard Stern, pop music star Michael Jackson, and druggie personality Courtney Love? They are all listed in Bernard Goldberg's book, *100 People Who Are Screwing Up America* [HarperCollins Publishers, 2005].

According to the book by the former CBS senior correspondent for *48 Hours*, Prof. Chomsky (who ranked 11th) ". . . in many ways, is the epitome of what, in a sane world, would be a complete contradiction in terms: the anti-American American intellectual." Stating that the reader might not have heard of Prof. Chomsky ". . . unless, of course, you hang out on college campuses in places like Berkeley or Palo Alto or Cambridge, Massachusetts, where Chomsky is as big as Elvis was in Las Vegas," Goldberg acknowledges that Prof. Chomsky "made his name long ago in academic circles for his work on linguistics at MIT." He then continues, "But he achieved true superstar status not for that, but his relentless, vicious attacks on all things American: American society, American values, American behavior in the world."

As for Prof. Hopkins, who came in 36th (one place ahead of comedian Al Franken), she was included because she "famously stalked out of a conference in early 2005 because she couldn't endure the indignity of Harvard President Lawrence Summers floating an idea she didn't like." After castigating the Harvard faculty for subsequently passing a resolution stating their lack of "confidence in the leadership of Lawrence H. Summers," Goldberg goes on to write, "But we shouldn't be too harsh on Harvard's faculty in general or on professor Hopkins in particular. They have an excuse: politically correct idiocy is a way of life on our most elite college campuses."

And you probably thought it was referred to as "liberal" media bias.

By the way, documentary filmmaker Michael Moore is ranked #1.

Academic Computing: An Equilibrium of Services for Education

M. S. Vijay Kumar

MIT FACULTY, WITH THEIR dedication to teaching, their desire to excel, and their willingness to be pioneers, have inspired, and often led educational technology innovation at the Institute. Academic Computing, and others involved in supporting the vibrant ed tech ecology at MIT, are working to attain a balance between providing a stable base of services to serve broad needs, and catalyzing and supporting the exploration of new technology applications for education. We will briefly review the projects that have grown into new services over the past year and look ahead to what will be coming.

Looking Back

Last year we witnessed significant advances in educational technology at MIT. Projects that were once exciting experiments are maturing into regular use. TEAL (Technology Enabled Active Learning) has become the mainstream instructional path for freshman physics. The stabilization of technology services such as Stellar, spatial data (GIS), and digital media has led to their increased adoption. Other examples include:

- Increased use of iLab, which allows students to control physical experiments through a browser from anywhere on the Internet
- OCW's remarkable growth
- Xtutor, a toolkit for creating online courses, which is being used in 6.001 and 6.034

There have also been advances in the production and delivery of educational video content. Academic Media Production Services (AMPS) has captured high-resolution video of classroom interaction for posting on the class Website within hours of the session. They have used rapid deployment systems to produce a series of videos of two popular undergraduate classes, Introduction to Biology (7.012) and Introduction to Solid State Chemistry (3.091) for the OCW Website: ***ocw.mit.edu***.

Virtual Office Hours could make it easier for students and faculty to make the personal mentoring and tutoring connections that are often hard to arrange.

Looking Ahead

Some key technologies and services that we will be working on with faculty in the next academic year are:

Evolving Course Management Platforms – New Stellar Tools

Stellar's toolkit will be expanded with pilots of modules created through MIT's collaboration with the Sakai Project (***www.sakaiproject.org/***), an effort among major universities to produce "community source" course management software. This fall we will reap the benefits of this work by offering trials of an online gradebook tool and a quizzing and testing tool.

Virtual Office Hours – An Integrated Communications Strategy

Assembling existing tools to enable virtual office hours for academic staff is just one example of how communications technologies such as voice over IP (VoIP), audio, video, document sharing, and instant messaging (IM) are converging to create more comprehensive and novel solutions. Virtual Office Hours could make it easier for students and faculty to make the personal mentoring and tutoring connections that are often hard to arrange. Working closely with an advisory group of faculty and researchers, the goal of the Integrated Communications Project (ICP, ***web.mit.edu/icp***) is to explore and inform the integration of the next generation of converged digital communications services for educational, research, and community activities of the Institute.

Bringing Technology into the Residence Halls – The ResTech Initiatives

Following last year's alteration of three existing computing clusters to better support collaborative work and accommodate the influx of students with laptops, Academic Computing will be exploring technologies that can be integrated into student residential living spaces to enhance the study and living experience. ResTech includes a variety of projects that range from straightforward applications of technology to more creative experiments such as:

- Helping Random Hall students manage and self-support a pool of loaner laptops for residents to use for class work

In an effort to coordinate and bring these efforts to a more sustainable state, Academic Computing is gathering requirements and developing tools to search, manage, and present image collections.

- Delivering student-captured cable programming of MIT sporting events into the dorms in High Definition TV (HDTV) format
- Providing wikis (Web-based collaborative work environments) to residential governance groups and housemasters to encourage participative involvement in residential life activities.
- Creating virtual residence halls to help convey to incoming freshmen the diverse values and cultures of individual dorms and living groups. In this Virtual MIT space, incoming students would have the ability to create their own rooms in a particular residence hall and interact with the current residents through their avatars.

Image Collections and Image Management Tools

Tools and repositories to manage and use image collections are generating considerable interest on the MIT campus and elsewhere, as illustrated by projects such as Metamedia from the School of Humanities, Arts, and Social Sciences, and StudioMIT, a system developed by the School of Architecture and Planning. These applications provide faculty with Web-based tools to integrate and present images in their teaching.

In an effort to coordinate and bring these efforts to a more sustainable state, Academic Computing is gathering requirements and developing tools to search, manage, and present image collections. One example is software called Narravision, which was built for Professors Shigeru Miyagawa and John Dower to support the graphical materials they compiled for their Visualizing Cultures class. These tools use software provided by the Open Knowledge Initiative (OKI) that allows access to several repositories simultaneously. In addition, AMPS developers have begun work to integrate a federated search tool into Stellar, to allow simultaneous searching through many repositories, such as DSpace. Overall this work will also be part of a larger institutional effort aimed at productively managing the lifecycle of educational image content.

Research Tools for Teaching

As an extension of our work in bringing High Performance Computing resources to teaching and learning, (***stellar.mit.edu/S/project/computationallyinten/***) we are working on porting software tools used by researchers in the disciplines into the teaching domain. Participating faculty see the value of this work in its potential to prepare our students to conduct research in their fields and to teach with the same tools used in research. An example of this is the use of a Broad Institute workflow control software package for creating reproducible research results.

The Next Step for Successful Projects

Many new educational technology applications for undergraduate education and student life have been developed through generous support from programs such as Microsoft Research's iCampus and the d'Arbeloff funds. IS&T Academic Computing is working with these initiatives to extend the value from these projects to other areas as appropriate, through integration with centrally-supported technology services. ShuttleTrack, for example, makes getting around the campus a little easier by tracking the MIT shuttle vans on a map in a browser window or a cell phone screen.

We will also direct our efforts towards linking systems such as Stellar and Sakai, OCW and Dspace to present the community with an efficient and coherent process for the entire lifecycle of course materials from content acquisition, to production, delivery and use, to preservation.

Understanding the role technology can play in realizing the plans for the undergraduate Common Core will be a critical element of planning the steps ahead. Taking stock of the current state and use of educational technology systems and services is an important prerequisite for planning to meet future needs. A joint undertaking by the MIT Libraries, OCW, and IS&T Academic Computing has been launched for this purpose.

A Collaborative Effort

In the year ahead we will continue exploring this equilibrium by working closely with faculty to better understand their needs and help them integrate technology into their teaching methods. Collaboration will ensure that the technologies provided answer real needs and inspire more effective ways of teaching and learning.

We welcome your interest in learning more about educational technology, and invite you to participate in discussions on ed tech topics and share your own experiences with colleagues. The Crosstalk Seminar Series (***web.mit.edu/acs/crosstalk***) and the *Ed Tech Times* online newsletter (***edtech.mit.edu/times***) provide useful forums. And, of course, please contact the Educational Technology Consultants at x3-0115, *et-consult@mit.edu* to find out more about Academic Computing services and projects offered, as well as to send us your ideas. ■

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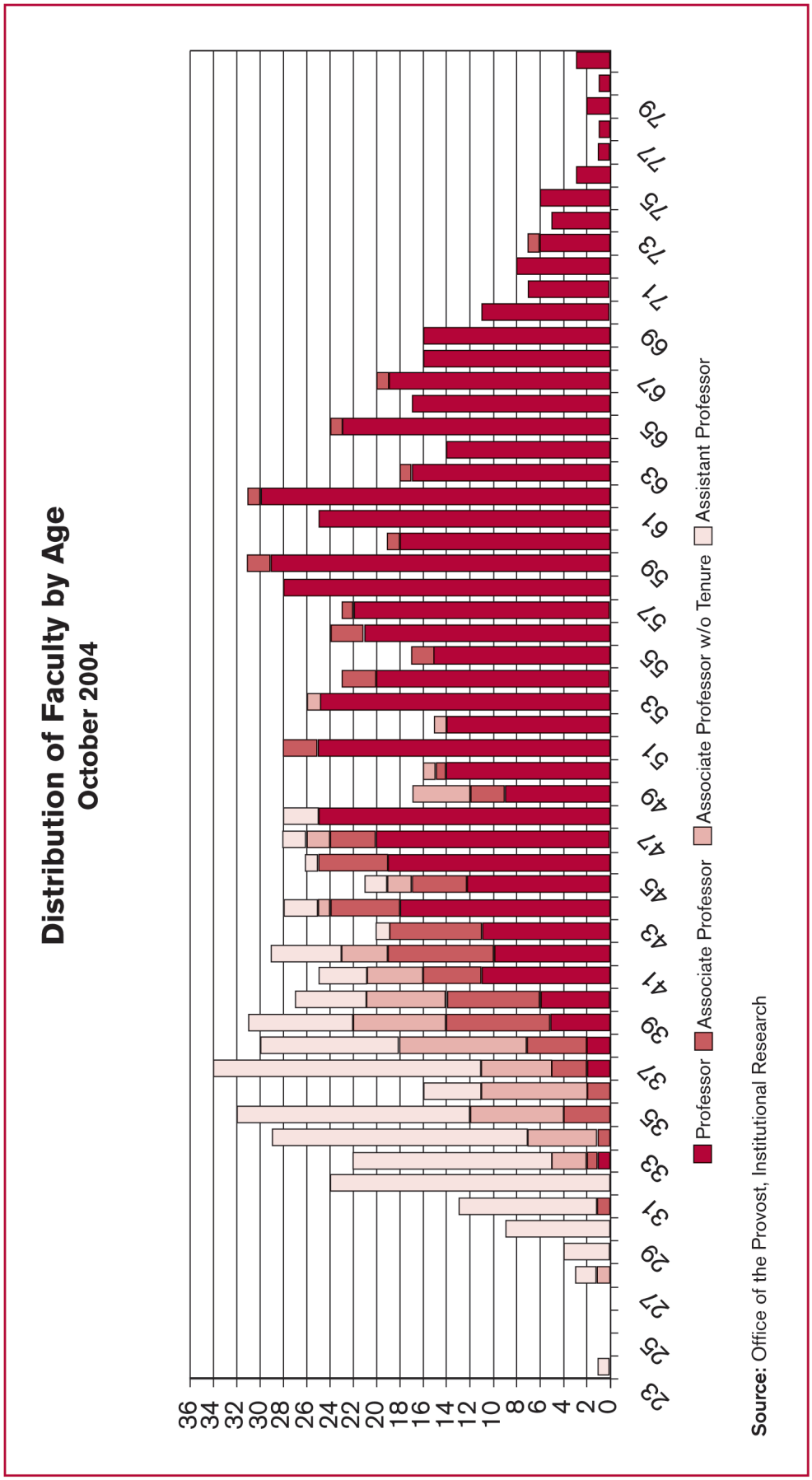
M.I.T. Numbers


Distribution of Faculty by Age
October 2004
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2
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Professor
Associate Professor
Associate Professor w/o Tenure
Assistant Professor
Source: Office of the Provost, Institutional Research