MIT Faculty Newsletter

this issue features an overview of the relationship between MIT and Singapore by Tom Magnanti (page 8); our MIT Profiles, highlighting Adèle Naudé Santos (page 16); Teach Talk, "First Response Education: New Orleans Comes to MIT" (page 20); and our new From The Archives, offering "The Implication of Mega-Partnerships for MIT Faculty" (page 22).

MIT Motorsports' 2006 Car

From The Faculty Chair
Undergraduate Education Reconsidered

Steven Lerman

AT THE SEPTEMBER FACULTY meeting, Dean Robert Silbey, the chair of the Task Force on the Undergraduate Educational Commons, formally presented their report to the faculty. This report was commissioned in 2003 by then-President Vest. Most of us had already been at one or more of the numerous departmental and open meetings that the Task Force organized, but the presentation of the final report to the faculty as a whole is an important transition point in our reconsideration of our students' educational experiences at MIT.

The Task Force's work engaged some of our colleagues who are most deeply committed to undergraduate education in a broad examination of almost every aspect of undergraduate education. As the report's authors noted, the last major change in our degree requirements was

Financial Foundation for MIT's Future

L. Rafael Reif

MIT's financial structure and recent history

MIT HAS SEEN SIGNIFICANT increases in its overall financial resources over the last decade. As a result of growth in financial markets and extensive fund raising campaigns, the Institute's net assets increased from $2.5B at the end of FY1996 to $10.1B in FY2006, representing a cumulative annual growth rate of 14.8%. At the same time, as a result of increases in instructional activity and sponsored research, MIT's annual operations have almost doubled during the same period, increasing from $1.2B in FY1996 to $2.2B in FY2006.

While net assets have grown roughly twice as much as operating expenses, the availability of financial resources has been asymmetrical across MIT's four operating categories: *General Institute Budget*

Editorial
Student-Driven Activities at MIT

THE SUPERB QUALITY OF our students, both graduate and undergraduate, is the number one reason given by our colleagues for choosing to teach or conduct research at MIT. Not only are MIT students in a class by themselves as scholars, they are also very energetic, ambitious, and enterprising beyond the classroom. The surprisingly large number of student-initiated and student-driven activities and teams on campus prove this (see table, page 4). Not primarily initiated by the administration or faculty, nor part of the regular curriculum, these activities are generated and sustained by the students themselves.

Many of these student projects operate without significant support from the Institute. The students' level of commitment is remarkable, but MIT can do much better in supporting them. In this

contents

Photo credits: *Page 1,* Alex Slocum, Jr.; *Page 11,* Deric Stucker; *Page 20,* Sebastian Bögershausen; *Page 23*, FSAE.

editorial, we review the range of student activities at MIT and point out where institutional support is inadequate. We then suggest four main areas of improvement that MIT should consider.

Students enter into extra-curricular activities for many reasons, but most do so primarily because they are interested in changing the world and in applying their theoretical knowledge to challenging real-world situations. In general, we can distinguish the following activities:

Competitions

A number of professional societies organize yearly competitions, in order to attract young talent to their field and also to give individual schools and groups an opportunity to measure themselves against their peers. Examples of such competitions are the yearly Formula-SAE competition and the AIAA design-build-fly competition. Another example is the autonomous underwater vehicle competition. Typically in these competitions, a rule set is established and teams compete by designing, building, and operating a machine that tries either to maximize a score or to compete directly against other machines.

Challenges

Challenges are more open-ended than competitions. They aim to push the technological boundaries and state-of-the-art in a certain field. Examples are DARPA's Grand Challenge, designed to develop new autonomous vehicle navigation technology, and the NASA Centennial Challenges for the development of new exploration technologies. Challenges also involve intricate rules, but often require the development of new technologies and techniques in order to meet a more or less utopian goal.

Community Outreach

These projects are designed to respond to some urgent and important societal need such as rebuilding after Hurricane Katrina

in 2005, or the teaching of school children in underserved rural areas in the developing world, among other activities. These activities are fundamentally different from competitions and challenges in that they emphasize altruistic human and social interactions rather than technology.

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Links

The following are selected links to externally-sponsored competitions and challenges in which MIT teams frequently participate.

- AIAA Design Competitions: *www.aiaa.org/content.cfm?pageid=210*
- Autonomous Underwater Vehicle Competition: *www.auvsi.org/competitions/*
- DARPA Grand Challenge: *www.darpa.mil/grandchallenge/index.asp*
- Formula SAE: *students.sae.org/competitions/formulaseries/*
- NASA Centennial Challenges: *exploration.nasa.gov/centennialchallenge*
- World Solar Challenge: *www.wsc.org.au/2007/*
- North American Solar Challenge: *americansolarchallenge.org/*

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How Are We Doing?

An informal survey (see table, next page) shows how active and engaged MIT's students are in many of these areas. The table shows a (probably incomplete) list of student-driven activities at MIT.

Student teams have moved surprisingly quickly to take up President Hockfield's energy challenge, in some cases outpacing the Institute's official initiatives. Emerging student groups focused on energy research include:

- Solar Decathlon team, which is building an entirely solar powered house
- Vehicle Design Summit
- NetImpact, based in the Sloan School of Management
- UA Committee on Sustainability.

We should be proud of our students for devoting their time and energy to these important activities. But after reviewing the results of past competitions and drawing as well on our own experience as faculty advisors to such projects, we feel there is a discrepancy between MIT's standing as the leading university for science and technology in the U.S. and our sometimes disappointing performance in some – but not all – of these events.

The Stanford Racing Team won the 2005 DARPA Grand Challenge in

6 hours, 53 minutes. MIT was eliminated before the final round. It is important to note, though, that the MIT student team raised about $100,000 for the competition, while the winning teams operated on multi-million dollar budgets.

The MIT Formula SAE team was formed in 2001 and competed for the first time in 2003, achieving the following rankings: 97th in 2003, 41st in 2004, 34th in 2005, and 63rd in 2006. On the design side, the students have been quite successful, creating many inventive engine designs; however, they have not yet been able to crack the top 25. This year, for example, extensive testing would have revealed a developing failure in a secondary system which eventually knocked them out of competition.

Our Solar Electric Vehicle Team finished third in the 2005 North American Solar Challenge and sixth in the 2005 World Solar Challenge.

Still more impressive, the ORCA team has a fantastic record since its first competition in 1998, including five first-place victories.

Current Level of Support

Student-driven projects offer an opportunity for our students to learn and practice skills that would be difficult, if not impossible, to acquire in the classroom. Currently the Edgerton Center is the centerpiece of MIT's support of student initiatives. The Center is currently the home for 23 clubs and teams, all of which receive administrative and advisor support through part-time efforts of three staff

Student-Driven Activities at MIT
continued from preceding page

members. The total effort is about 1.5 full-time equivalents. The Edgerton Center, with help from the Offices of the Provost and the President, provides roughly $100,000 in financial support, along with some limited laboratory space at two locations on campus. The teams also do some external fundraising on the order of $300k to $500k per year, which is an important part of their learning experience.

Steve Banzaert of the Edgerton Center insists that victory is secondary; what's important is that our students are learning. That is certainly a valid viewpoint. But there is another perspective, too. We set the highest standards for ourselves when it comes to university rankings. Shouldn't we aspire to the same level of achievement in our support of student-driven activities? The reality is that many of our student teams are operating with minimal support, in ramshackle facilities, and on shoestring budgets. The students' commitment is remarkable, but we must ask:

Can we do better?
How can MIT live up to its name, not just in terms of research and academics but also in terms of these intellectually challenging and very visible student activities?

We suggest four main areas of improvement to be considered:

1. Funding
Some limited funding for student activities is available at MIT, but mainly these are small grants on the order of $5-10k with little prospect of follow-on support. Most student teams depend on the generosity of private or corporate donors. MIT should establish a dedicated endowment for student-driven activities that would provide support at much higher levels, as much as $100k and $1 million per year for well thought-out proposals.

2. Infrastructure
This is probably the area requiring the most attention. While MIT has spent hundreds of millions of dollars on "trophy"

Student-Driven Activities at MIT (currently active teams)		
Team	**Website**	**Purpose**
MIT Motorsports	web.mit.edu/fsae/	To conduct formula SAE Racecar competition
MIT Solar Electric Vehicle Team	web.mit.edu/solar-cars/www/	To design and participate in various solar races, such as the WSC
MIT Autonomous Underwater Vehicle Team	web.mit.edu/orca/www/	To design, build and compete with an Autonomous Underwater Vehicle
MIT Space Elevator Team	mitset.mit.edu	To participate in NASA's centennial power beaming challenge
MIT Hurricane Katrina Student Initiatives	web.mit.edu/katrina/initiatives.html	To coordinate student organized relief efforts post Hurricane Katrina in 2005
MIT DARPA Grand Challenge Team	grandchallenge.mit.edu/	MIT's participation in the DARPA urban grand challenge
MIT Vehicle Design Summit	www.vehicledesignsummit.org/	To promote cooperative design of environmentally friendly vehicles with volunteer students
Biological Energy Interest Group (BEInG)	web.mit.edu/pweigele/www/being	To promote the design, deployment and dissemination of biological energy systems
MIT Competitive Robotics Club (CRC)	web.mit.edu/edgerton/battlebots	To inspire students and others through competitive robotic events
Easyrider Motorcycle Club	web.mit.edu/easyrider	To foster an interaction among motorcyclists at MIT
Floodsafe Honduras	web.mit.edu/lem/honduras	To design early warning systems for developing countries with an early focus on flooding
MIT FIRST Robotics Team	web.mit.edu/first/www/	MIT students work with high school students to build robots while learning about engineering
MIT Human Powered Vehicle Team (HPV)	lancet.mit.edu/decavitator/History.html	To build competitive, land- or water-based HPV's through multidisciplinary efforts
Mars Gravity Biosatellite	www.marsgravity.org	To develop, launch, and recover a biosatellite to study the effects of partial gravity on mammals
MITERS	web.mit.edu/miters/www/home.html	To encourage and assist student projects for electronic and mechanical construction
MIT Rocket Team	web.mit.edu/cats/www	To make tangible steps toward decreasing the cost of space access through rocket design
ROV	web.mit.edu/rov/www/OldSite/	To build a remotely operated vehicle for the Marine Advanced Technology Education Center
S.T.O.M.P. @ MIT Student Teacher Outreach Mentorship Program at MIT	www.stompnetwork.org/mit	To pool the talents and knowledge of K-8 educators and university engineering students
MIT UAV Team	aares.mit.edu	To build an unmanned aerial vehicle and to participate in AUVSI's UAV competition
The Tech Model Railroad Club of MIT	tmrc.mit.edu/	To promote the design and operations of model railroads for over 50 years
MIT Walking Robot Club	web.mit.edu/Edgerton/	To design and construct ambulatory robots for competition
MIT Wind Wise	sailbot.mit.edu/	To design and build an autonomous sailboat for competition
MIT Design that Matters	web.mit.edu/dfc/www/	To enable students and faculty to leverage their skills to serve developing nations worldwide
Africa Internet Technology Initiative	web.mit.edu/mit-africa/www	To provide opportunities through summer information technology education programs in Africa

buildings and highflying architecture in the last decade, many of our student teams are operating out of ramshackle facilities or are tolerated as temporary occupants in various departmental facilities.

To be sure some spaces, such as the Edgerton Center, are well organized and helpful to student teams. However, we think the Institute can and should do much better. MIT should have a large facility dedicated entirely to student projects, with built-in design studios, professional quality machine shops and test facilities. If we can afford one of the most expensive dorms ever built in per-square-foot costs, we can afford a facility such as this, which would contribute vastly more to our students. The NW quadrant of campus in particular offers potential opportunities for building such a facility or converting an idle space for such use. What would be most helpful is a flexible 24-hour facility with some common areas, but also some modular "bays" with easy access doors that would be assigned to teams for the duration of their projects. There, efficient design and building activity could take place, occupational safety standards could be monitored and enforced, and building materials and tools would be safe. The students have been trying to organize a "Do It Zone" (see: *diz.mit.edu*), and MIT is starting to take notice. But we need to do much more.

3. Services
Most student teams have extensive needs for building materials, machining, electronics, programming, and other services. Other requirements include counseling, communications, fundraising, and transportation. We believe these enterprising students deserve priority access to MIT's outstanding services.

4. Academic Credit and Faculty Support
We should reconsider the purely voluntary and unofficial system now in place. The Institute should consider a range of ways to link student-driven projects with capstone courses and design-build experiences. We might award academic credit for sustained and demonstrable perform-

ance on such activities. Other universities (for instance, Cornell's Formula SAE program) have developed courses and entire curricula around student activities and design competitions. But at MIT – for the most part – these activities are treated mainly with benign neglect. (But neglect is never really benign!)

The recently released report on the undergraduate commons places heavy emphasis on project activities; there could be a natural tie-in with the student-driven projects we've described here. Of course there is a danger: "institutionalizing" student activities might undermine their grass roots nature. A balance between spontaneity and professionalism has to be found.

On the other hand, we faculty must take care to offer advice, but not commandeer these projects or threaten the value to students in having ownership and responsibility for their activities.

Clearly, many student teams are desperately seeking faculty advice and support. So, when asked to mentor a student team, we urge you to step up to the plate and support our exceptional students in their independent projects. As an institute of technology, we should look at the great names engraved in Killian Court and recognize that many were inventors and engineers as well as scientists. How many faculty members today shy away from doing hands-on things with students because they are either too busy or believe it's not useful for the tenure path? We need to foster a more diverse idea of what an MIT education involves and how we as faculty can contribute to it.

The *Faculty Newsletter* solicits your comments and suggestions on student-driven activities. We would like to thank Prof. Alex Slocum, a number of student teams, as well as Sandra Lipnoski and Stephen Banzaert, for their extensive comments and suggestions for this editorial.

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Clarification

IN THE LAST *Faculty Newsletter* editorial ("The Need for Increased Faculty Involvement in Major Institute Initiatives," September/October 2006) we referred to the "failure" of several major relationships, and mistakenly cited the "ending of the Cambridge University/ MIT partnership." We were intending to refer to the MIT Cambridge University Student Exchange, not the Cambridge MIT Institute (CMI). "Failure" was intended to refer to what we understood at the time to be the discontinuation of the Exchange.

In fact, we have learned that the Exchange is continuing, with over 30 students from each institution in residence at the other this academic year. There is a formal intention by both institutions to continue the exchange in coming years. CMI, which was funded as a six-year project by the British Government, is wrapping up.

A more complete report on CMI, the Student Exchange, and its evolution will appear in the January/February issue of *Faculty Newsletter*.

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Special Edition Faculty Newsletter

A SPECIAL EDITION *Faculty Newsletter* will be published in mid-January, devoted entirely to commentary on the recently released Report of the Task Force on the Undergraduate Educational Commons. The Special Edition is being produced at the request of Faculty Chair Steve Lerman, who is responding to the suggestion by faculty members at the October 18th Institute faculty meeting.

Articles will be reviewed by a subset of both the *Newsletter* Editorial Board and members of the Task Force, to avoid redundancy and inaccurate information. Replies from members of the Task Force may accompany published articles.

Deadline for submission of articles is December 20th, and priority will be given to those that are succinct. Articles should not exceed 750 words. Please e-mail all submissions to the *Faculty Newsletter* at *fnl@mit.edu*.

Editorial Sub-Committee

Undergraduate Education Reconsidered
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made in 1965 in response to a report by a committee chaired by Professor Jerrold Zacharias. Since that time, we have made some smaller changes, including the introduction of a biology requirement into the science core curriculum, and the addition of the communications requirement, which changed the educational program of every undergraduate student and academic department.

The recommendations of the Task Force involve one of the central functions we have as a faculty. As I noted in my column in the last issue of the *Faculty Newsletter*, any changes in MIT's degree requirements must ultimately be voted on by the faculty. Through the work of the standing committees of the faculty, notably the Committee on the Undergraduate Program (including the CUP Subcommittee on the Communications Requirement), the Committee on Curricula, and the Committee on Academic Performance, we also are responsible for many of the policies that govern how our degree requirements are implemented and managed. I can think of nothing more important that we as a faculty will do over the coming years than discuss and act upon the recommendations made by the Task Force.

The discussion following the presentation of the report at the September faculty meeting was the start of our deliberative process. The breadth and depth of the initial comments and questions from the floor of the meeting reflect the extraordinary interest we all have in undergraduate education. Even at this early stage, it is clear that different parts of the Task Force report evoke strong positive and negative responses from many of us. We intend to continue this discussion at future faculty meetings, with the goal of informing any decision we ultimately make.

I should stress that an actual vote on a change in the degree requirements, assuming we choose to have such a vote, won't be taken for quite some time. Our plan is to discuss the Task Force report over several meetings and then ask a subcommittee of the Committee on the Undergraduate Program to consider the issues and concerns raised by the faculty and come back with a concrete proposal that we would discuss and ultimately vote on. This later stage may not happen until next academic year or later.

If history is any guide, these next few faculty meetings will be crucial in determining MIT's educational directions for the careers of most of us now on the faculty and at least an entire generation of students. Even if you have never come to a faculty meeting before, I urge you to attend the meetings in the coming months and participate in the discussion.

Not surprisingly, our first discussion of the Task Force report at the September meeting was relatively unstructured. In order to make our time at upcoming meetings as productive as possible, I'd like everyone to consider the following ideas about how we should proceed.

• Try to find time to read the Task Force's report before coming to the next meeting. It is online at *web.mit.edu/ committees/edcommons/documents/TF_ FullReport.pdf.* The report is superbly written and provides the best summary of the philosophy and history of MIT undergraduate degree requirements that has ever been produced. Even more importantly, the report provides not just the Task Force's recommendations, but a careful exposition of the factors that went into those recommendations. Almost all of the issues we'll debate at our upcoming faculty meetings were considered in great detail in the course of the Task Force's work, and their discussion about why they made each decision should guide our discussion.

• If you can't read the entire report, then please read the Task Force's summary of the recommendations. These can be found at *web.mit.edu/committees/ edcommons/documents/TF_SumRecs.pdf.* This summary gives a sense of the scope of the Task Force's work and presents their conclusions in a clear and concise form.

• As you think about the recommendations, try to keep in mind the difficult balance the Task Force is trying to strike. Any choices we make about degree requirements must balance the time students spend in courses that are part of the educational commons with time they spend in their majors and elective subjects. Every decision we make must balance the flexibility in our programs that allows different students to have different educational trajectories, against our responsibility to ensure that students have the breadth of knowledge every well-educated adult should.

As the report's authors make abundantly clear, fitting everything that we want every student to know into a four-year curriculum is a hopeless task. We must take seriously the idea that all our students must leave MIT with the passion to learn new things and the ability to do so over their entire lifetimes.

The recommendations of the Task Force should not be seen as a single, "take it or leave it" bundle. Clearly, there are important interdependencies among some of the recommendations that we should try to respect as we examine alternative proposals for educational change. However, there are also opportunities to intelligently disaggregate our choices in some areas. As the Task Force notes, earlier committees with similar charters made some recommendations that, for various reasons, we never chose to implement. Also, the Task Force report notes some recommendations about which their own membership was divided. The authors carefully articulate both the majority and minority views.

We should make sure that we consider all aspects of the Task Force's recommendations in depth. In particular, despite the fact that a majority of our faculty are in science and engineering, we should not focus entirely on the Science, Mathematics, and Engineering requirements. The Task Force makes important recommendations

about the structure and content of the Humanities, Arts, and Social Science requirements. The report devotes an entire chapter to how and why we should expand the opportunities for all our students to have educationally meaningful international experiences. It also provides guidance on important educational issues such as the coherence of the first-year experience, academic advising and mentoring, diversity, classroom quality and utilization, and educational innovation. While not all of these issues are directly governed by the regulations of the faculty, they have pro-

found effects on all our students and should be discussed and debated.

Be open to change. Part of the dynamism of MIT comes from our ability to innovate in our research and educational programs. We can never become so ossified in our thinking or decision-making processes that the only feasible outcome is the status quo. If we decide not to change our undergraduate degree programs, it should be because we have fully explored alternatives and decided that what we have now is the best we can do, not because it's what we have always done.

I should note that the upcoming faculty meetings will not be the only forum for discussion of the Task Force report. I am pleased to announce that the Editorial Board of the *Faculty Newsletter* has agreed to create a special issue devoted entirely to discussion of the undergraduate educational commons. Any of you who would like to write a short piece for this upcoming issue are invited to do so. ■

Steven Lerman is Professor of Civil and Environmental Engineering; Faculty Chair *(lerman@mit.edu).*

In Memoriam
Stephen J. Madden, Jr.

Newsletter Staff

STEPHEN J. MADDEN, JR., a retired professor who spent his entire 52-year professional career at MIT, died on October 7, 2006. He was 70.

Throughout his life, Madden was deeply fascinated by the sea and the sky. Much of his research involved celestial navigation, flight, fluid mechanics, and gravity. At the start of his career, as part of the Apollo missions, he was responsible for determining the precise location of the Moon throughout the mission, allowing the deployment and redocking of the lunar module to the mother ship.

In his later work, more detailed gravitational measurements were used to develop a better understanding of the shape of the Earth. His interests in geodesy and radar converged in early research on the GPS system, performed at Draper Laboratory. One of his last research projects was for the LIGO system, designed to detect gravity waves

from distant supernovas yielding clues to the fundamental structure of the universe.

Stephen was also a gifted teacher. He loved to encourage his students' curiosity. Throughout his career, he taught in the Departments of Mathematics, Aeronautics and Astronautics, and Earth and Planetary Sciences at MIT, supervising more than a dozen graduate theses. Even after retiring from Draper Laboratory in 1995, he continued to teach, and it provided him with great satisfaction to see his students take off with a problem.

Fond remembrances by colleague Leonard S. Wilk (SB, SM, MIT '52) include the following: "As a graduate student, Steve worked at the then Instrumentation Lab, most significantly on the Apollo Program – celestial and orbital mechanics. He also practiced his hobby of magic, giving stage performances with Bernie Whitman. He was very adept and was true to the profession in that he never revealed the secrets of the trade."

Wilk continues, "After retirement, Steve formed The Analemma Associates to consult with his expertise in computers and computer programming. This name came from his lifelong interest in sundials and the Equation of Time. Steve was a devotee of Chinese cooking and a long time patron of The Little Eating Place, Mary Chung's, and The Royal East. He would delight in ordering his favorite soup in Chinese."

Although his interests ranged far and wide, Madden always remained close to his roots, in Newton Lower Falls, at MIT, and on Cape Cod. His greatest love was his family, especially his five grandchildren. He was also a kind and gentle friend to many, and he was always eager to hear a story or share a joke. His sense of humor, his love of life, and his great passion for learning were freely shared and widely enjoyed. ■

MIT and Singapore

Tom Magnanti

Tom Magnanti, dean of the School of Engineering, has been actively involved in MIT's Singapore programs from the beginning of the Institute's large-scale institutional collaboration there in 1997. His own participation has been as a member of a broad faculty assessment team in 1997, as a faculty member in one of the initial Singapore-MIT Alliance (SMA) programs, as the Dean with primary responsibility for SMA and, most recently, as a member of a Steering Committee for the proposed Singapore-MIT Alliance for Research and Technology, or SMART, program.

AS THE INSTITUTE HAS been considering a major new research initiative in Singapore during the past several months, our community has been engaged in a lively dialogue that has raised a number of significant issues. Some faculty members have asked "Why Singapore?" "What are the benefits of MIT's engagement in Singapore?" "What are the required commitments of MIT's faculty and staff in Singapore?" As expressed in an editorial in the previous *Faculty Newsletter*, "Have faculty been sufficiently involved in the deliberations concerning our international activities?" And generally, "Would participation in international programs, and Singapore in particular, adversely affect education and research on our campus?" These are important questions.

MIT and International Engagements

First, from what I know, and from what has been reflected in various forums such as the recent report of the Task Force on the Undergraduate Educational Commons, there is considerable enthusi-asm on campus for international engagements. Indeed, many, if not most, would assert that MIT *must* be engaged internationally if it is to maintain its status as one of the world's great educational institutions. (Large engagements such as the recently announced program in Portugal, as well as programs like MISTI and many faculty engagements throughout the world, already provide considerable diversity in our international portfolio.) Other forums have reinforced the importance of MIT's international engagements, including a series of sessions held on internationalization by Academic Council this past spring, a subcommittee of Engineering Council convened two years ago to examine internationalization, and an open faculty forum on international programs held at MIT on May 17, 2006. As is evident from the feedback at these forums, the question is not *whether* we should be engaged internationally, but *how* and *with whom* we should engage. Rather than attempting to answer these questions in general, I will focus specifically on Singapore.

Why Singapore?

There are many reasons. Singapore has made a significant national commitment to education and research. It has

- excellent resources and physical infra-structure;
- a stable, corruption-free government;
- English as the official language;
- technically-savvy national leaders at the highest levels who embrace science and technology;
- a strategic location in a rapidly growing part of the world at the crossroads of Asia (especially China and India), having also emerged as one of India's largest trading partners;
- a stable, multi-ethnic society (Chinese, Malays, Indians, Australians, and Europeans/Americans);
- a world-renowned standing as a leader in math and science education at the K-12 level; and
- an established international focus as home to a number of American, European, and other academic institutions/partners (for example, INSEAD, Johns Hopkins, Georgia Tech, Duke, U. of Chicago), and it has become a key hub for major activities of a large fraction of the Fortune 500 American companies.

Of course, Singapore is also a young country without a rich research history; it is 12 times zones and 12,000 miles away. Its culture is different from that of the United States, and its government policies on some matters are not the same as those of this country. Participation by MIT in activities there could attract precious human and other resources away from our campus.

Any major initiative the Institute might undertake in Singapore, or anywhere else, will have associated risks and benefits to MIT. We need to be cognizant of these and prudently manage them.

How does MIT benefit from a relationship with Singapore?

Let me answer by indicating how the Institute has already benefited from the Singapore-MIT Alliance since its inception in 1999. Through SMA, we have:

- invested in and created new educational and research programs of considerable value to our faculty, departments, and to the School of Engineering, including new Master's degree programs in Computation for Design and Optimization, Manufacturing Systems and Technology, and Advanced Materials for Micro- and Nano-Systems.
- supported important emerging initiatives at the interface of molecular biology and chemical engineering and the Institute's new initiative in Computational and Systems Biology, as well as a traditional core area, computer science.
- been able to devote considerable resources to education. Many faculty have indicated that their teaching has improved as a result of their SMA experiences.
- brought together faculty from multiple departments in unusual ways to educate MIT students and foster interdisciplinary research and education.
- provided many of our faculty and some of our students with the opportunity to spend quality time, for the first time, in Asia.
- provided MIT opportunities to experiment with distance education and demonstrated that we can educate students effectively at a distance. For example, most of the SMA courses have been offered simultaneously to students at MIT and in Singapore. The classroom performance of these two student groups has been indistinguishable.
- not only been able to support current educational and research interests of our faculty and students, but also provide resources that support the long-term health of the Institute through investments in infrastructure (distance education-equipped classrooms and seminar rooms) and endowment to hire additional faculty and to create graduate student fellowships.

Has MIT attempted to address issues related to SMA and engage faculty in the SMA deliberations?

The SMA program has, of course, required faculty presence in Singapore. Moreover, it has provided considerable

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SMA Facts

- Over 65 faculty, drawn from all five Schools, but mostly from Engineering, have participated in SMA.

- Anchored in Singapore but with a broad regional reach, SMA has graduated nearly 700 students (with degrees in Singapore), drawn primarily from India, China, and other countries in the region.

- SMA has resulted in approximately 500 research publications.

- In SMA-2, unlike SMA-1, MIT gives degrees (Master's degrees) and Singapore independently gives degrees. Students are independently and separately admitted to MIT by the existing admissions committees of the appropriate departments and units, using the same rigorous standards employed to admit other MIT students to these programs.

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resources to some faculty and not to others. This raises legitimate concerns. We have tried to mitigate these concerns in part by ensuring that most courses have been taught to students both at MIT and Singapore, by providing considerable discretionary resources to the participating departments, and by having an open competition for the SMA-2 programs (within a broad set of problem areas jointly defined by MIT and Singapore). SMA-1 and SMA-2 both benefited considerably from faculty input. Before launching SMA, 25 faculty spent over six months to assess the strengths and weaknesses of the Singaporean universities. The assessment subsequently led to the definition of SMA-1's educational and research directions. Presentations at MIT faculty meetings, at FPC, CGSP, CoC, and CUP, at Engineering and Academic Councils, and in articles in this newsletter provided faculty with information and opportunities to offer input on SMA-2.

What deliberations have led to the proposed new Singapore-MIT Alliance for Research and Technology (SMART) Center?

Based upon the perceived success of SMA, the Singapore government invited MIT to consider being the first of several international universities to establish major research collaborations in Singapore through a new research complex that would contain a building devoted to MIT. (ETH, Zurich, has recently announced its intention to participate and an institution in Israel and research laboratories of American and overseas corporations could be other likely participants.) By leveraging eight years of MIT faculty experience and input with SMA, the proposed new SMART Center would be intended to offer similar benefits as SMA. It would expand our relationship to include a non-degree-granting, broader research engagement that would include collaborations with universities, industrial organizations, and research institutes in Singapore and the rest of Asia.

In January of this year, the Provost led a delegation with deans, department heads, and laboratory and program directors to explore this possibility. Subsequently, a Steering Committee was formed, composed of the Provost, the Vice President for Research, and the Deans of Engineering and Science and a former head of the Department of Materials Science and Engineering, and the heads of the Biology, Civil and Environmental Engineering, and Electrical Engineering and Computer Science departments, as research theme leaders. The committee began to develop a process for faculty engagement that included several direct communications from the Provost to the MIT faculty, presentations at Academic Council, at several School councils, the Faculty Policy Committee, and an MIT faculty meeting. Through 82 submissions of Concept Papers, 212 faculty from across all five Schools responded to a call for possible research collaborations – an expression of a strong grass-root interest in MIT's

MIT and Singapore
Magnanti, from preceeding page

expanded research engagement with Singapore and to the initially defined broad program themes of biomedical sciences, interactive digital media, and water resources and the environment.

After reviewing submissions, the Steering Committee clustered several concept papers and invited a number of faculty to submit research proposals. Singapore provided funds for MIT faculty to travel to and learn more about Singapore, and recently multiple delegations of research colleagues from Singapore traveled to MIT to meet with faculty and help design joint research projects for the proposed initial research activities.

What is SMART intended to be?

Broadly speaking, SMART aims to provide a unique opportunity for a major experiment in global research and to perform interdisciplinary experimental, computational, and translational research that presently could not be conducted at MIT. SMART also provides MIT an opportunity to be a pioneer in an international research campus of distinguished institutions in a strategic location within a rapidly-growing region of the world that is predicted to dominate technological growth in the twenty-first century.

The program activities are still under development, but would include a major research program with approximately 10 focus areas, each envisioned to involve a team of MIT faculty, PhD students, post docs, and collaborators from universities, research institutes, and companies in Singapore and from countries throughout Asia, including India and China, as well as potential collaboration with other universities elsewhere in the world (including those establishing similar programs in Singapore). Research would be conducted both at MIT and in the new building in Singapore dedicated to SMART. The research themes would be targeted for topics providing unique opportunities for MIT to conduct

research on problems of significance to society, such as infectious disease. The program would also create new opportunities for MIT to facilitate technology transfer in the region through the creation of a technology innovation center similar, and perhaps linked, to the Deshpande Center for Technological Innovation at MIT. The SMART building in Singapore is also expected to have staffed wet lab facilities with capabilities not available on the MIT campus and a world-class supercomputing facility accessible through special Internet access to faculty and students at MIT. Opportunities for appropriate undergraduate student participation, such as UROP projects in Singapore, summer internships, and MISTI internships, are also possibilities.

Faculty participation in SMART

Of course, having a building in Singapore devoted to MIT research carries expectations of residency in Singapore for participating MIT faculty. It also carries an expectation that more research funding will be spent in support of the MIT-directed research of SMART@Singapore than of SMART@MIT. As currently envisioned, about 10 faculty would be expected to conduct research in the MIT center in Singapore at any given time, taking turns through periodic faculty visits within a well-coordinated research theme. A number of meetings held with faculty members preparing the first round of proposals are helping to design models for faculty presence and research expenditures in SMART. The provision of resources to endow up to 10 new faculty positions at MIT would offset, to some degree, the reduction in faculty time on our campus because of time spent at the SMART Center.

SMART is intended to provide new and unique research opportunities and technologies that would be very attractive to our faculty. No faculty member would be required to participate.

> As currently envisioned, about 10 faculty would be expected to conduct research in the MIT center in Singapore at any given time, taking turns through periodic faculty visits within a well-coordinated research theme.

Next steps in developing SMART

Throughout the process to date, discussions have continued with Singapore concerning the structuring of the new relationship. Faculty input, most obtained through meetings with the cluster leaders and groups of faculty members with prior involvement in Singapore through SMA and/or with a strong interest in participating in the future activities of SMART, has been essential in shaping these deliberations.

If all goes well, the current plan would be to launch a small number of research themes (three or four) next summer and use these as opportunities to gradually learn about, and better frame, the SMART Center and research program. Over the next three years, we would solicit additional proposals from a broad cross-section of MIT faculty and expand to the 10 envisioned research thrust areas (one of which is likely to be a cluster of small projects). The areas of research would be broad, beyond the initial areas identified already, and would be formulated based upon input from MIT faculty.

Several issues remain to be resolved, including residency requirements in Singapore for participating MIT faculty, allocation of funding between Singapore and the MIT campus, resources and accommodations to be provided to faculty and families while in Singapore, and the relationship between SMA and SMART, as well as the implications and management of the impact of the SMART program on the MIT campus. We are currently working on these issues with several MIT faculty groups and with colleagues in Singapore.

Dean Tom Magnanti and SMA Students from Singapore, China, India, Indonesia, and Malaysia at a Welcome Reception in Singapore, July 6, 2006

Would large-scale research funding in SMART present too much risk for MIT?
Although the funding details are still under discussion with the Singapore National Research Foundation, the combined funding for SMART@MIT and SMART@Singapore is likely to be at a level comparable to some of the largest research centers at MIT.

Some faculty have asked if we are devoting too much of our resources to programs in a single country and if research in some areas might become too dependent on a single source of funding through SMART. These are judgment calls but I believe that, for reasons I have already stated, Singapore represents an unusual opportunity that, although requiring careful oversight, is worth pursuing. The Institute certainly needs to closely monitor situations when it receives a large amount of funding from any single source as it does with sponsors that provide core support to large labs and centers and those that provide large fractions of the research funding across campus. Concerns about large-scale concentrated funding are partially mitigated by the fact that SMART would be organized around several diversified research themes, introduced gradually over three years, and would be supporting a spectrum of MIT faculty and research domains. In each of these domains SMART would provide only part of the Institute's research. Nevertheless, we need careful oversight and management as we introduce any approved SMART programs with the benefit of input from a wide cross-section of researchers from MIT and Singapore.

Other faculty ask if we are responding too much to availability of resources. We have many other opportunities, some potentially very well funded, that we do not pursue. Funding is an issue, but more important are the intellectual, strategic, geographical, and programmatic opportunities Singapore offers, such as those I have suggested previously.

Concluding Comments
I hope that this communication has provided some insight concerning our relationships in Singapore, about the processes we have and are using, and about some of the possible benefits and costs to MIT.

If SMART is to be successful, it must provide clear benefits for both MIT and Singapore. The process must strike a balance between centralized institutional planning that is essential to any long-term and large-scale program like SMART on one hand and bottom-up faculty governance and input on the other. I strongly believe that the program holds enormous potential and exciting new opportunities for MIT, for Singapore, and for science and technology worldwide. ■

Tom Magnanti is Dean of the School of Engineering and an Institute Professor *(magnanti@mit.edu)*.
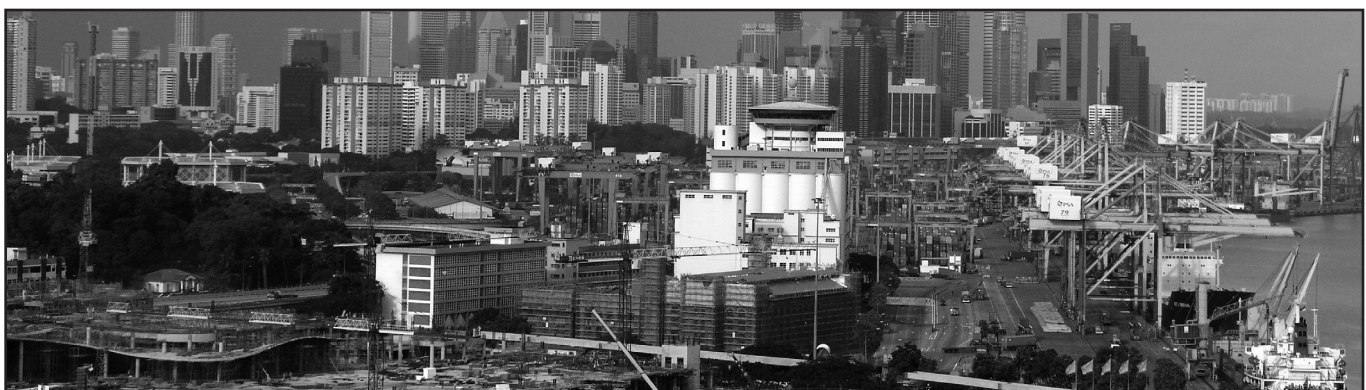
Singapore Harbor and Skyline

Financial Foundation for MIT's Future
Reif, continued from page 1

(GIB), *Sponsored Research*, *Auxiliary*, and *Designated* (see Figure 1). The GIB funds the bulk of the academic MIT enterprise, and includes unrestricted funds that can be used for any Institute purpose. Its largest sources are tuition, unrestricted endowment income (e.g., payout to unrestricted accounts invested in Pool

Executive Committee of the Corporation votes these distributions annually, and they are typically referred to as "*voted endowment distribution*."

MIT has generally viewed *Sponsored Research* and *Auxiliary* activities as self-funded. Since these budget categories do not fundamentally affect the Institute's financial flexibility, the remainder of this article will focus on the GIB and the *Designated* funds.

endowment distribution" of up to $500 million for the 2001-2010 period to finance strategic investments – that is, it authorized support from the endowment beyond that of the *voted endowment distribution* described above to close the budget gap resulting from these strategic investments and growing operating needs.

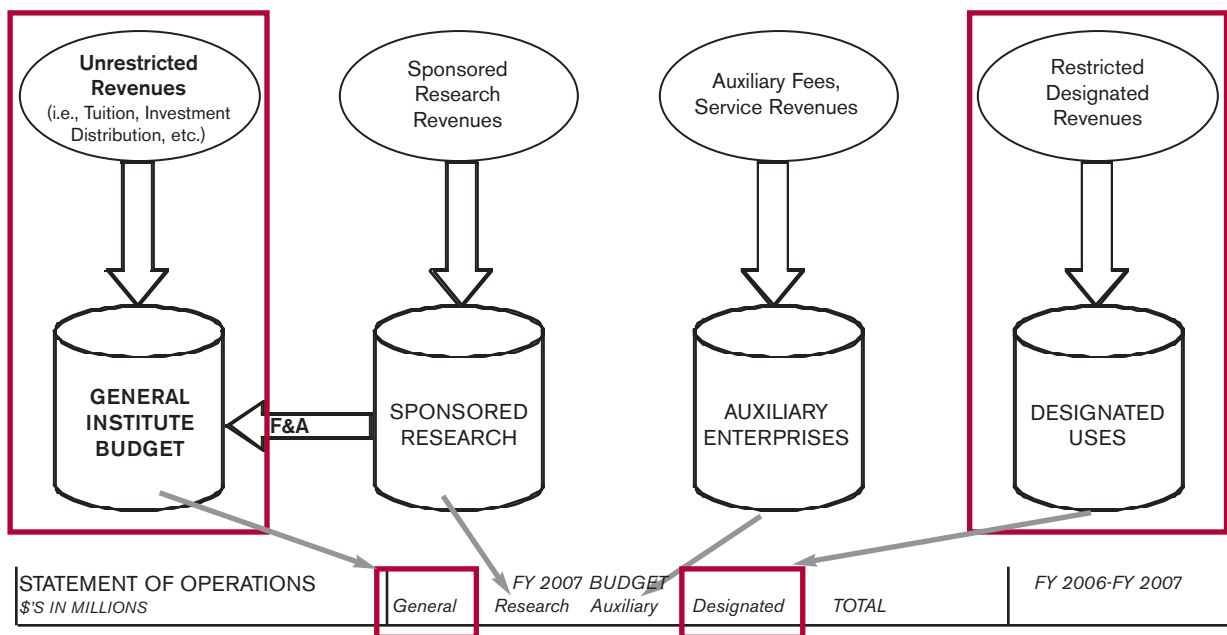The *additional endowment distribution* has been provided by selling unrestricted

Figure 1. MIT's Operating Categories

A), and facilities and administrative cost recovery. *Sponsored Research* represents the direct component of grants and contracts, typically controlled by individual principal investigators. *Auxiliary* includes proceeds and expenses from Housing, Dining, MIT Press, Endicott House, and Technology Review. Finally, *Designated* corresponds to restricted expendable gifts and endowment income paid to the holders of restricted Pool A accounts such as Professorships or Scholarships. Both the restricted and unrestricted endowment incomes come from annual distributions from restricted and unrestricted accounts, respectively, invested in Pool A. The

Designated funds cover expenses that are within the scope of restrictions imposed by their donor or custodial academic unit. As a result of the limitations on their use, as well as conservative spending and the desire to save for a rainy day, *Designated* resources available for spending are rarely exhausted and their aggregate balances have accumulated with time.

MIT's continued need to maintain its competitiveness has put pressure on the GIB. As a result, the GIB expenses have been higher than the GIB revenues for the last several years, creating a structural budget gap within the GIB. In April 2000, the Executive Committee of the MIT Corporation authorized an "*additional*

endowment units in Pool A, normally referred to as the "quasi endowment" (see Figure 2). These financial plans formalized a longer-term trend that can be traced as far back as the early 1970s and well into the 1990s. Since then, MIT has closed annual budget gaps with unrestricted funds.

Protecting MIT's Financial Flexibility
A significant fraction of the income from the *voted endowment distribution* is not available to help balance the GIB, as it is either held primarily by Departments, Labs, and Centers (DLCs), or is restricted by donors to specific uses. Moreover, in FY06, less than 10% of the endowment
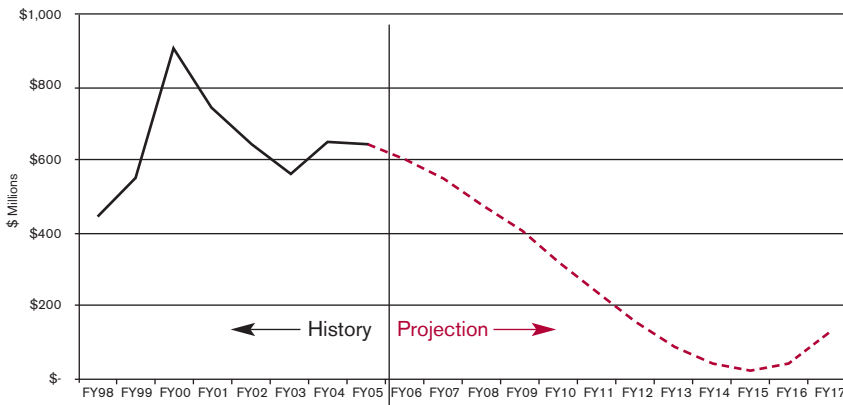
Figure 2. General Unrestricted Expendable Assets (Quasi Endowment)

increasing the voted Pool A distribution, and then utilizing the lion's share of the increased distribution to offset an equivalent reduction in support from the GIB. Let me contrast the new model with the current model: If we were to follow our current financial model of "voted" and "additional" endowment distributions, the *voted distribution* for FY08 would be ~$43 per unit, and a projected FY08 operating gap of about $77M would require an *additional distribution* derived from selling unrestricted Pool A shares (see Figure 3). However, by increasing the *voted distribution* to $53 per unit, the

was sufficiently unrestricted to be considered quasi endowment and used to support the *additional endowment distribution.* Given projected levels of fundraising and anticipated operating needs, our current financial practice is unsustainable in the long run. In fact, based on current projections, the Institute would have exhausted its unrestricted endowment funds by Fiscal Year 2015 (see Figure 2).

FY08: Laying a New Financial Foundation for the Future
Strategy Description
Starting with Fiscal Year 2008, we plan to lay a new foundation for MIT's financial future, increasing the Institute's long-term financial flexibility by allocating funds more effectively between the GIB and the *Designated* operating categories.

The proposed strategy is essentially a "zero-sum game." The plan will eliminate the *additional endowment distribution* by increasing the *voted endowment distribution* by an equivalent amount (see Figures 3 and 4). Whenever possible and allowable, the additional funds that academic units receive from the increased *voted distribution* payout (see Figure 4) will be exchanged with GIB funds. As a result, the aggregate GIB and endowment revenue to each DLC will be at least the same as before. In fact, as discussed below, the revenue to some DLCs will actually increase. Importantly, the
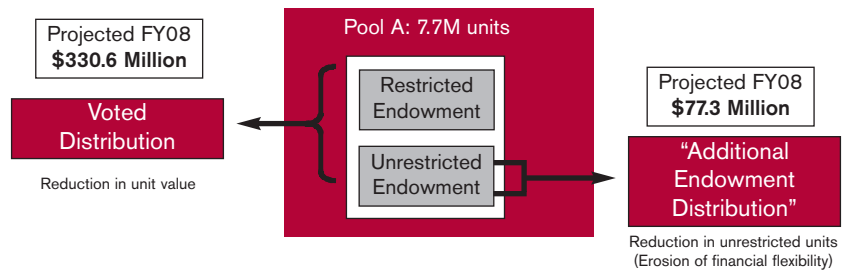

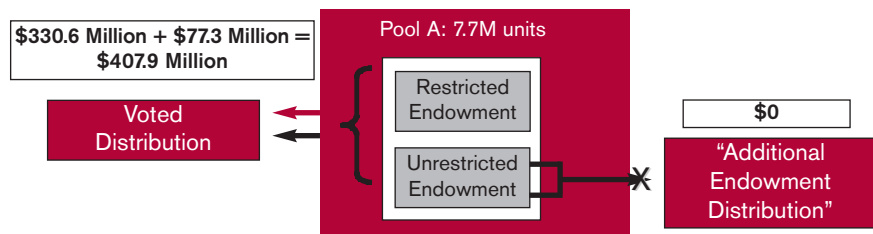Figure 3. FY2008 Endowment Support of Operations – Current Approach

Figure 4. FY2008 Endowment Support of Operations – Proposed Approach

proposed strategy does not increase MIT's overall reliance on the endowment. It simply wraps the additional endowment need into the voted distribution, keeping the aggregate distribution from endowment funds at the same level as projected using the current model.

This new strategy will support the projected operating costs for FY2008 by first

operating gap is reduced to a nominal amount (see Figure 4). We plan to eliminate the use of the *additional distribution* entirely by FY09.

In sum, this strategy would eliminate MIT's reliance on unrestricted endowment assets to balance the operating budget – a use that is unsustainable in the long term – while maintaining the same level of projected funding for academic units.

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Of course, donor restrictions appropriately constrain the application of this rebalancing mechanism, and distributions from restricted funds can be exchanged for equivalent GIB funds only when such use lies within the restrictions of the funds.

While this and other limitations make a 100% exchange unattainable, discussions with the top 20 academic department holders of Pool A accounts indicated that a large portion of the increased voted distribution can substitute for today's GIB funds.

The Strategy in Action
Endowment holdings are projected to include 7.7M Pool A shares in FY2008. Of these, 4.2M shares are in unrestricted and Scholarship & Fellowship accounts, which fund the GIB; 3.5M shares are in other restricted accounts that fund the DLCs. Increased voted distribution from the 4.2M shares will directly offset the need for additional distribution to the GIB. Increased voted distribution from the 3.5M of DLC-targeted funds will be used to offset a reduction in GIB allocation to the DLCs.

As an illustration, consider Undergraduate Scholarships. MIT accepts students on a "need-blind" basis and commits to meeting the full financial need of all students. In FY2006, total undergraduate financial aid expenditures amounted to $54M. Endowment income paid to Scholarship Funds covered only $36M, which left a gap of $18M that was covered by unrestricted GIB monies. Scholarship funds hold 1M Pool A shares, and implementing the new policy would have increased the endowed financial aid funding by $10M, therefore reducing the need for GIB subsidy from unrestricted funds to only $8M.

The Strategy's Impact
MIT's Pool A Distribution Rate
The main purpose of MIT's endowment is to provide a level of revenue stability for current and future generations of MIT faculty, staff, and students. To ensure that

the purchasing power of the endowment is maintained for future generations, MIT has used as its target for the voted endowment distribution a spending range of 4.75-5.5% of a 36-month average of the

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The main purpose of MIT's endowment is to provide a level of revenue stability for current and future generations of MIT faculty, staff, and students.

</div>

Pool A Unit Market Value (UMV). Over the years, MIT has kept the "voted" distribution rate within the target range. However, our "all-in" or effective distribution rate, which includes the *additional endowment distribution* as well as the *voted endowment distribution*, has been in the neighborhood of 5.5% since FY1999 (see Figure 5). The "Financial Foundation for the Future" strategy will drop the total, "all-in" distribution rate to 5.1% in FY2008, a rate that is consistent with the preservation of our assets for future generations (see Figure 5). It is important to emphasize that this does not reduce the funds that a DLC or faculty member will receive now or in the future.

Beyond FY08: Assessing the Future
The goal of this new financial strategy is to balance MIT's operations and increase our financial flexibility for MIT's future. Implementation of this strategy will require a great deal of commitment, collaboration, and hard work from faculty and administrative leaders across the academic units receiving GIB funds and holding endowed funds. By working together, we will lay a sound and sustainable financial foundation for MIT's continued academic excellence. ■
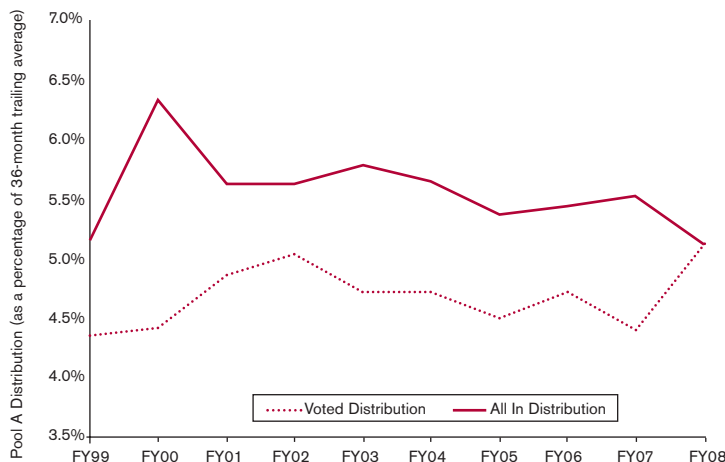
L. Rafael Reif is Provost *(reif@mit.edu).*

Figure 5. MIT's Endowment Distribution (FY1999 - 2008)

Teaching and Challenging Engineers . . . to Engineer

Ernst G. Frankel

ENGINEERING EDUCATION HAS undergone radical changes in content, objectives, and delivery during the last 20-30 years. The approach has increasingly been to emulate science teaching and train engineering scientists, researchers, and technology developers to the detriment of developing skills required to engineer, design, and manage increasingly complex and often large engineering systems and infrastructures. Some schools, such as MIT, are filling the resulting gaps by introducing "Systems Engineering" or "Engineering Systems" offerings, often taught by instructors who have extensive experience in real engineering projects.

While the U.S. has made tremendous progress in advancing so-called high technology and remains at the forefront of information technology, control imaging, and other technologies, it seems to increasingly lag behind or even fail to maintain capabilities in engineered systems or projects, and even in manufacturing engineering. This is becoming more and more evident considering the condition of our electricity transmission networks, highways, railways, ports, electricity generation, water supply, and other public infrastructure systems in America, as well as public services such as wireless telephony and others.

Few other, if any, developed countries distribute electricity and land-line telephone service by wires hanging from forests of wooden poles. Their maintenance and failure costs could easily pay for placing these services underground. Our highway and rail systems are not only outdated and in many parts of the country decrepit, but are mostly incapable of accommodating or serving advancing transport technology, traffic, and service demands. Our ports are at least 20-30 years behind modern Asian and European ports and are incapable of accommodating large modern ships, many of which must transship their cargoes at foreign transshipment ports to feed US ports at added costs of billions, if not tens of billions of dollars per year. None of our airports are among the top of the world's terminals in terms of efficiency, operations management, or architecture. Similarly, many of our water, sewage, and other distributed systems are not only antiquated, but in serious disrepair. Even our wireless telephone systems technology in use is probably 10 years behind that in place in much of Europe and Eastern Asia.

Probably most importantly, is our real or perceived inability to effectively plan, engineer, design, and even manage engineering projects. While the Big Dig may be an extreme example, there are unfortunately many other examples of inexcusable budget and schedule overruns, failures of quality management, and quite often inadequate supervision, engineering, or design.

Serious schedule overruns are of particular concern, as they not only dramatically increase financing costs, but also introduce inherent technological obsolescence. In the not too distant past, American engineering firms and contractors were considered world leaders and played important roles in many of the world's most important large engineering projects. This is no longer so, and most large engineering projects in the world are now planned, designed, and managed by foreign, mainly Asian, engineering firms. For example, China built the world's first high-speed Maglev train system in Pudong on schedule and budget, and its Three Gorges dam project, the world's largest, is both on budget and schedule. There are similar examples in large tunnel and costal construction projects in Japan and Europe.

During a recent MIT Brunel lecture, President Emeritus Charles Vest laid out his vision of Engineering Education for 2020, and among other objectives emphasized social responsibility of engineering. Brunel, who over a hundred years ago advanced tunnel and coastal construction, shipbuilding, and large infrastructure engineering, all the while making engineering a true renaissance profession, would probably be disappointed at the increasingly narrow focus of today's engineering educational and inadequate social concern. This was also shown in my recent involvement with the Katrina disaster, where we uncovered disregard for engineering quality and a resulting failure of public safety in the design, construction, supervision, inspection, and ultimately maintenance of the levee system protecting the city of New Orleans. And this is not an isolated example, but often represents the norm in this country.

While there are many factors contributing to these increasingly common failures in American engineering projects, the need to implement some basic steps seems clear. Among them are a reintroduction of more professional engineering education with mandatory life-long professional training in advanced engineering technological and project/risk management subjects, and establishment of more effective certification/licensing and inspection requirements. These may go a long way toward reestablishing American engineering and giving it the global status it once proudly held. This may require a cultural change and assignment of more responsibility, prestige, and rewards to engineers, but unless we start to redirect our approach toward engineering and engineers and give it the proper prestige, before long we may find America in the condition of India, a country with a highly-educated professional elite, a decrepit infrastructure, and a largely defunct social system. ■

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MIT Profiles
Adèle Naudé Santos

Adèle Naudé Santos, FAIA, is an architect and urban designer whose career combines professional practice, research, and teaching. She is currently Dean of the School of Architecture and Planning at MIT, as well as principal architect in the San Francisco-based firm, Santos Prescott and Associates. Her academic career includes professorships within the graduate programs of UC Berkeley, Harvard, Rice University, and the University of Pennsylvania, where she also served as Chairman of the Department of Architecture. She was also the founding Dean of the new School of Architecture at the University of California, San Diego, and has had numerous visiting appointments throughout the United States and the world, including Italy and in her native South Africa.

The following interview of Prof. Santos (**ANS**) by the *Faculty Newsletter* (**FNL**) took place on October 27.

FNL: *What brought you to MIT to serve as the first woman dean of the MIT School of Architecture and Planning?*

ANS: MIT is such an interesting place! There's all this unique stuff going on that makes Architecture and Urban Planning completely different from our neighbor up the street! When I was approached about the deanship here, I had been on the faculty at Harvard, the Chair of Architecture at UPenn, the Dean at UCSD, was a professor at UC Berkeley – and was heading back to private practice. I thought at the very least I should check it out. I didn't know if they would go for a woman or even consider a third dean from the southern hemisphere – but here we are.

FNL: *Those are pretty large programs, aren't they?*

ANS: Well, they are. SA+P may be a tiny school, but you know what? It's a pretty damn good program. As good or better than our peers. And in league with our siblings here at the Institute. In fact, when compared to the other Schools at MIT, we must work harder and smarter with fewer resources, yet we do not compromise our high standards of excellence, and continue to make impressive contributions to our disciplines and to improving the overall quality of human life and the health of our communities.

FNL: *What makes the MIT School of Architecture and Planning so special?*

ANS: It's the company we keep! There is an incredibly diverse array of disciplines and pursuits under the roof of this School that draw on and experience cross-fertilization with many, many of the incredible and diverse activities happening everywhere else at MIT. We have Center for Real Estate faculty assembling and analyzing data into the first index for commercial real estate who work side by side in the same department where the Teacher Education Program educates undergraduates from all over MIT how to be science and math teachers in secondary high schools. We educate mid-career professionals from developing countries in SPURS (Special Program for Urban and Regional Studies) as well as working with Massachusetts community activists and local institutions in the Center for Reflective Community Practice. SA+P is home to faculty who study whether computers can learn and respond to emotion in the Media Lab, who are looking at rapid fabrication techniques for housing, or studying how sensing networks developed by engineers and all the data we can now gather and manage from these networks – can be embedded in the infrastructure of cities to help us better understand how we use and can improve these environments.

FNL: *And all of this occurs within the School of Architecture?*

ANS: Ahem. The School of Architecture and Planning!

FNL: *Yes, of course!*

ANS: It's a common shorthand, but our faculty are architects and planners and artists, computer scientists, building technologists, experts in environmental policy and sustainability, musicians, urban economists, community activists, historical preservationists, and teachers of teachers. And that's just a start! We have a world-class program in Urban Studies and Planning with in-depth, decades long, urban partnerships both in Massachusetts and around the world. We started the first Center for Real Estate in this country 20 years ago with an innovative approach to real estate that goes beyond investment and profit but approaches real estate development as a physical product in the

built environment. The Media Lab is the first research center of its kind to investigate the boundaries and interactions between people and technology. We have a tradition of artistic innovation in our

ism/city design and development are in the process of establishing a research entity called the China Urbanization Lab – the Urb Lab – with Tsinghua to deal with rapid urbanization. Why? Because

– like the future of community building and campus development right here in Cambridge. The way I see it, if the real estate industry, which includes residential, commercial, construction, etc., is the largest consumer of energy in this country, if over half the world will be living in urban areas by the year 2030, if utility costs in our campus buildings are a driving cost factor of our budget, MIT needs this School and our faculty at the table, in the studio, and at the lab bench to develop the best solutions possible.

> This year we will introduce a new undergraduate course called Cityscope. Modeled on Terrascope, we will bring all the focus of the disciplines in our School to examine one city each year from multiple points of view.

Visual Arts Program and the Center for Advanced Visual Studies that attracts world-renowned artists and has earned international recognition – yet few people at MIT know these are even part of the Department of Architecture. And, we have the oldest architecture program in the country. Our alumni in Architecture include notables like I.M. Pei and Charles Correa, and graduates who formed the architectural foundations for some of the most successful firms in the country – firms like Skidmore, Owings and Merrill (SOM) in Chicago, Bull, Stockwell and Allen (BSA) in San Francisco, Gruzen Samton in New York City.

FNL: *I think a great deal of work being done in the School of Architecture and Planning is really unknown by other parts of the MIT community.*

ANS: It's true. The alumni and faculty of this School have had an enormous influence on the shape, architecture, art, development, and infrastructure of many of the major cities and communities in this country, and in cities and communities around the world. Yet, as a relative new comer to MIT, I can easily see that the contributions of this School are more widely known and understood outside the doors of 77 Mass. Ave., than on the opposite side of this threshold! For instance, not many people here at MIT know that for 20 years we've been taking a team of students every other year to Beijing where we partner with Tsinghua University to tackle some intractable problem in the city of Beijing. Based on our two decades of collaboration, our faculty in urban-

there is massive migration of rural people to the cities of China where cookie cutter solutions are going up faster than you can speak because nobody sat down and said, "Well, what is the quintessential answer to urbanism here?" The Urb Lab gives us a chance to look at how to build in a manner that is more durable, more sustainable, more beautiful, and culturally relevant. When we were there in January and again in June, we were heralded by the Beijing Press! Back home, I found myself often explaining in great detail the history and significance of being the first MIT faculty in China 20 years ago and what it means today.

FNL: *What plans do you have for the School?*

ANS: To take this rich and marvelous tradition of excellence and make it even better! We need to build on what we do best in each area and create stronger collaborations across the School and across the Institute. We need to play a stronger game at the undergraduate level and grow our learning community at the graduate level. And we need people to know what we do! We need to raise our visibility and profile both within MIT and across the greater alumni community. The disciplines and faculty of this School have enormous experience and expertise they can bring to larger Institute initiatives such as energy, international education, and institutional partnerships. Improving the content and quality of our undergraduate curriculum is as important as is preparing the next generation of leaders to tackle the types of problems facing MIT

FNL: *Do you feel like you have been able to make some inroads?*

ANS: Most definitely so. We have the benefit of having fresh leadership in the Department of Architecture, the Media Lab, the Center for Real Estate, and the Visual Arts Program, while being able to draw on the experience, counsel, and expertise of those faculty who have served the School so well in the past.

This year we will introduce a new undergraduate course called Cityscope. Modeled on Terrascope, we will bring all the focus of the disciplines in our School to examine one city each year from multiple points of view. Everything from: How do you conduct policy and land surveys? What do you see? What policy issues are involved? What are the challenges? What happens to one part of the city infrastructure if you alter a different part? What are the environmental issues? What about energy efficiency? How do both these issues affect economic viability? I think it could be a very exciting first dip into the built world for the undergraduate student, and provide important exposure to issues that affect all of us – because we all live in communities. On the graduate level, we have finally been able to double the size of the incoming class in the Master's of Architecture program from 12 to 24 students. This is very exciting and will truly invigorate the quality of debate and discussion by building a vibrant community of learners in this program.

We have begun to develop new cross-School initiatives. I already mentioned the Urbanization Laboratory – which will

Adèle Naudé Santos
continued from preceding page

have its first demonstration project in Shenzhen under the direction of Architecture Department Head Yung Ho Chang. Emeritus Dean Bill Mitchell is working to bring form and coherence to

the Space Committee have worked with us on two important projects – making it possible for us to move into Building 9 and restarting construction of the building designed by Maki for the Media Lab. Building 9 is the heart of the School and home to Urban Studies and Planning, and Architecture. It will be a fundraising chal-

MIT. I believe the Dean can and should play a role in forming policy, choosing architects, and helping to critique what goes on – because critique and peer-review are an essential part of quality architecture and planning – just as they are in the sciences. I believe that our peer review process should come from inside and outside the campus. The School has extremely talented faculty who have extensive experience in campus development at other universities in this country and around the world who can provide important and useful feedback to our own plans in campus development. And we can use what we have learned in our design studios that have studied, for example, the provision of faculty and student housing adjacent to campus.

We have had many exciting ideas on how to re-energize our boring Infinite Corridor and how to deal with the negative impact of Massachusetts Avenue on our institutional image.

The Design Lab, a collection of multidisciplinary research and project teams pursuing innovative design solutions to social, economic, and cultural problems. And I am very excited about two new cross-School advisory groups: an SA+P Energy Council to develop a cross-School initiative on the energy efficient city, and an SA+P Housing Task Force to review our curriculum and research initiatives to address renewed interest in housing. And, we have a working group of faculty from across the School that is developing an initiative called the Responsive City. It's really a very fascinating inquiry – with all the sensor networks being developed by the engineers, and all the data being collected – how can the planners and architects embed this data architecture into the physical infrastructures of our communities to understand how they can work better?

FNL: *What's the biggest challenge to creating such cross-disciplinary activity in SA+P?*

ANS: Quite honestly, it's been our space. Our programs, students, and faculty are widely scattered across the campus, and up and down Mass. Ave., and some of the facilities are in dangerous disrepair and unsafe for students at night. And, we desperately need exhibition space for our studios and course work to be effective teaching tools. Exhibition space for us is like lab space for the School of Science!

This is why I am so pleased that the Provost, the President, and members of

lenge for sure, but we are looking forward to finally bringing the Center for Real Estate from across Mass. Ave. into its home department of DUSP, right off Lobby 7 and the Dome. When the extension to the Media Lab is completed, we look forward to bringing the Visual Arts Program, the photography labs, and the Center for Advanced Visual Studies down from the MIT Museum area and giving them a home in the Wiesner Building. Think of it! If I could get the whole School playing together from the visual artists with the architecture faculty all the way through the Media Lab where there are faculty musicians and artists and designers, and put them all next to the art at the List Center, imagine what could happen!

FNL: *When is the extension to the Media Lab building supposed to happen?*

ANS: Actually, it will get underway next year. We expect to break ground in the spring and are planning for completion a couple years after that. It will be exciting to better integrate the Media Lab physically into the activities of the School. Most people don't even know the Media Lab is part of the School.

FNL: *The Media Lab building is only one capital project in an ambitious program of campus development. How is MIT drawing on your expertise and the expertise of the School?*

ANS: I think there is an important role the Dean of the MIT School of Architecture and Planning can play in developing and implementing the long-term vision of campus development for

We are invited from around the world to do studios and workshops on real problems in places like Seoul, Kiev, Sao Paolo, Zaragosa, and so on. Our proposals for the Seoul Digital Media City are being implemented. We have just shipped a prototype interactive bus shelter to Paris from The Design Lab. We have had many exciting ideas on how to re-energize our boring Infinite Corridor and how to deal with the negative impact of Massachusetts Avenue on our institutional image. We have the know-how to transform our public environment into a digitally interactive place that is focused on the future. It seems silly that the students and faculty have not been included in the process of thinking through our own environment.

FNL: *Is there anything else you would like to add?*

ANS: MIT is a place where people take a practical, pragmatic approach to solving problems. This hands-on approach to very real problems is exactly what we do across the School of Architecture and Planning. Our problem sets are design studios, our laboratories are physical spaces, our peer-reviewed journals are exhibits and juried competitions. But at the end of the day, we proudly share with our colleagues across MIT a common orientation to Mens et Manus, mind and hand. Who would want an architect or planner who didn't come with both? ∎

MIT Poetry

by William Corbett

Written in Pencil

The lake under rain
Wind streams in water
A day full of words,
Most unspoken, lightning,
The bowl filled with peonies
Long enough ago to know better
Marni you were here when
My mother, your grandmother, died,
Lay dying, not so far away
I couldn't go. I didn't,
Had reasons that today I can't
Remember. No wonder we lie
To ourselves, to others, selfish,
Easier than facing who we are.
If that's the thunder tell me
Something I don't know or say
It in a way I've never heard before.

February Lunch

So cold schools close
On the train reading Snyder
Forty years down the road
Rare, job-worthy poems
Of hard outdoor work
Ear for the way we talk
Plain surface, action below
A fine ride to the whited
Cambridge streets
And lunch with old friend Simic
Down from New Hampshire.
Dean? Not for him.
Clark, whose Belgrade bombing
Killed his uncle or Kerry
Will get his primary vote.
He's just back from Germany,
Liked it there because people
Admit they once did terrible things.

William Corbett, who teaches in the Program in Writing and Humanistic Studies, has published three volumes of poetry as well as memoirs and literary essays. His most recent publication is *Just the Thing: The Selected Letters of James Schuyler*.

Teach Talk

**First Response Education:
New Orleans Comes to MIT**

Holly Sweet

History of the development of the NOLA study group

LIKE MANY AMERICANS, I was stunned to follow the progress of the impact of Hurricane Katrina on the Gulf Coast last August, particularly the devastation of New Orleans caused by flooding from the storm due to levee failure. At a dinner gathering of friends shortly after the hurricane, I asked everyone what they were going to do to help. "Nothing" was the most common answer, citing various reasons ("it's too big a problem, I don't know what to do, my dollars will just get swallowed up in bureaucracy," etc.).

The passivity of their responses got to me. I realized that the most important thing I could do was to get others involved in New Orleans through some kind of educational effort. I wanted to bring the devastation of New Orleans home to MIT students. It is one thing to watch pictures on TV, it's quite another to study what is actually going on. I wanted students to gain experience doing research on their own about an event that was happening at the same time they were studying it, and to present a specific topic in class. I also wanted them to imagine concrete solutions to real-life problems. I wanted to have them work together, alongside me, in teaching and learning about a subject that was new to all of us.

I knew that credit drew students so I conferred with the director of ESG (Professor Alex Slocum) about using our special topics credit (SP.233) for the group. He agreed that it was important to use this credit in "first response" education, that is, an educational experience investigating important current events in

depth. I sent out an e-mail to the ESG community the next day about a study group on the subject and had a planning meeting with interested ESG students right after Registration Day. I also sent out the following announcement to all undergraduate administrators at MIT:

SP.233 New Orleans: Rising or Sinking City? (3-6 units pass/fail credit)
This study group will spend time looking at what made New Orleans great, why Katrina was so devastating, and what can be done to rebuild the city. Guest speakers and documentary films will supplement discussion and readings. Participants will take turns presenting information on topics and will put together a resource book.

Finally, I contacted the administrator of the MIT home page to put something up about the study group. By September 16th, I had 10 students from a variety of backgrounds enrolled in the subject.

Structure of the study group
We started with introductions, overview of the group, people's special interests, and discussion of final projects, spent a week on the history of the city, two weeks on the culture of New Orleans, two weeks on Katrina (focusing on why the levees failed, why Katrina was such a powerful storm, and why the evaluation plan failed so dramatically), two weeks on the political and psychological aspects of the storm (in particular, for the people who were displaced from their homes), and three weeks on the rebuilding of New Orleans (including a look at other cities that experienced natural disasters). Our guest

speakers included an MIT alumnus who lives in New Orleans, an ESG alumnus who went down to Houston to help in the recovery efforts, and Professor Lawrence Vale, who discussed his book on *Resilient*

Destruction rendered by Hurricane Katrina

Cities and implications for New Orleans based on his research. Readings were largely drawn from Wikipedia and from current newspapers and journals (including *Time*, *Newsweek*, *The New York Times*, *The Boston Globe*, and the local paper of New Orleans – *The Times Picayune*). I paid attention to what was on TV and taped a number of shows that were of relevance to our class, including those on levee construction, global warming, and coastal erosion.

Each week a student took notes about what happened during the class and e-mailed me the information, which we collected and stored on the ESG Website. I created a listserve for the students in the study group and students were encouraged to send relevant information which they found online to the class. Students were responsible for presenting material for one topic (such as levee failure or the

politics of FEMA) during the term. For the last week, I asked students to consider one thing which they felt would be crucial to the rebuilding of the city and to present an argument in class about why this was so important and what could be done to help this occur within the next two years.

Along the way, some interesting events occurred because we were one of the few academic classes studying the impact of Katrina on New Orleans. I began receiving e-mails from a variety of educators around the country asking permission to use my syllabus to help them develop classes on New Orleans and Katrina for the coming spring term. One of my students, a freshman, received an e-mail from an NPR staff member addressed to "Professor X" asking him "as an expert in the field" about his opinion on levee failure. An MIT alumnus who lived in New Orleans read about our class on the Internet and started corresponding with us about his experiences trying to help out with the disaster. He sent us a set of weekly pictures which gave us a "real life" view of what was actually going on in New Orleans.

Impact on students and lessons learned

The students in the group had a variety of reactions to this experience. One student ended up majoring in Course 11 (Urban Studies and Planning) after studying New Orleans and talking at length with the department head (Professor Lawrence Vale) who spoke about resilient cities at one of our sessions. Another student decided to visit New Orleans for a help week during spring break and was able to see in person what she had studied in the fall. Several students mentioned that the ability to study what was happening to New Orleans helped fend off the feelings of hopelessness and despair which afflicted so many. All of them said they enjoyed the immediacy of the study group and that fact that they were co-creating the group along with me. They were involved in something that went beyond MIT, beyond their problem sets and tests, and brought them into the real world in a substantive way.

Putting together and running this study group stretched me intellectually. I "taught" a class in which I had no formal training. I took a more positive view on the value of laptops in the classroom and reliance on the Internet for information. I became involved with a city that had previously meant very little to me. I collaborated with students in studying a subject which was highly topical, changing daily, and had immediate relevance in a number of fields, including psychology, earth science, urban studies, political science, civil engineering, and sociology. I met graduate students, alumni, and faculty at MIT that I would not normally have met in the course of my work here. I encourage faculty and staff to consider doing something similar in the future: the rewards are tremendous. ◼

Holly Sweet is Associate Director of the Experimental Study Group *(hbsweet@mit.edu).*

Do MIT Students Ever Sleep?

When MIT Answered the Transportation Survey
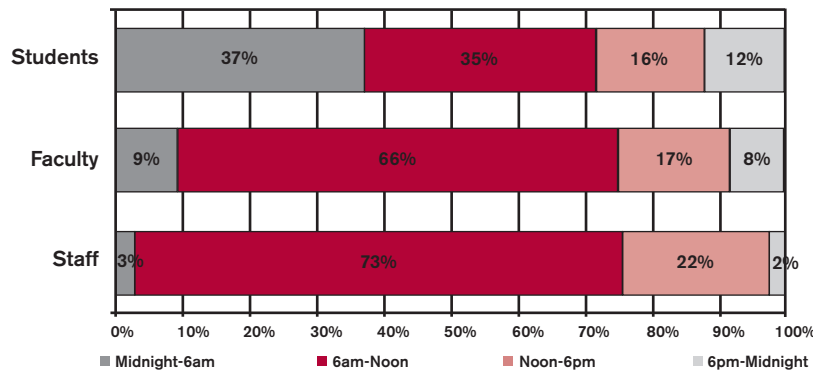
Source: Office of the Provost, Institutional Research

ANALYSIS OF THE RECENT MIT Transportation Survey found a familiar phenomenon: many members of the MIT community are awake late at night, and still checking e-mail. In fact, more than 35% of student respondents answered the survey between midnight and 6 am.

The good news? Most of the freshmen who answered a sleep question on a recent survey indicated they get a moderate amount of sleep:

- 69% reported getting between 6-7 hours of sleep per night on average
- 17% reported getting 8 or more hours of sleep
- 14% reported getting 5 or fewer hours of sleep. ◼

From The Archives

The Implication of Mega-Partnerships for MIT Faculty

Robert B. McKersie

With this article we introduce a new feature, "From The Archives," reprints of past *Newsletter* articles that speak to current topics of interest. Both the editorial in the September/October 2006 *Newsletter*, "The Need for Increased Faculty Involvement in Major Institute Initiatives," and Tom Magnanti's piece in the current issue, "MIT and Singapore" (page 8), reflect concerns addressed in this article.

The following is a reprint from the September, 2000 *MIT Faculty Newsletter* (Vol. XIII, No. 1)

* * * * * *

THIS PIECE DEALS WITH the "sacred" territory of faculty workload norms and how we relate to our employer, the Institute. Hence, some of the items in this piece will be seen as quite controversial.

Currently, most of us, as faculty members at MIT, work under an explicit understanding that specifies our teaching requirements each year. Alongside this is an implicit contract that, in varying degrees, suggests that we will step forward to involve ourselves in a variety of service or outreach activities.

My proposal is that we need to make many aspects of what is the implicit side of our relationship to MIT much more explicit, in order to deal with some very big developments.

So, what is the challenge at hand? Over the past several years, various leaders at MIT (including the central administration, deans, research directors) have negotiated major partnerships with a variety of companies, governments, and even other

universities. The list is growing longer by the month and includes partnerships with Microsoft, Merrill Lynch, the Government of Singapore, the sponsoring companies of Leaders for Manufacturing, Ford Motor Company, and Cambridge University. I have only focused on those arrangements that deal with the development and transfer of knowledge, in distinction to programs that are primarily educational (such as the new SDM Master's program).

Most parts of MIT have celebrated with enthusiasm the announcement of these large undertakings. But a growing number of voices from the faculty have been saying something to the effect: "My arm is being twisted to get involved in a particular partnership." Clearly, the workload is not evenly distributed across the faculty.

In a number of the partnerships it is the case that a high percentage of the work is done by people who are hired exclusively for the partnerships, in other words, the "bench" work is not being done by our regular faculty. This is true of first generation projects such as IMVP, Lean Aerospace Initiative (LAI), and Lean Sustainment. To be sure, faculty are in charge of these projects, but the extent of faculty involvement is not as large as originally envisioned.

A further difficulty that has developed in some instances (and I saw this first hand from my vantage point as Deputy Dean for Research at the Sloan School – a position that helped foster a number of these partnerships) is that given the difficulty in recruiting faculty to "come on board," sponsors feel short-changed. Further, the deliverables that were prom-

ised as part of the negotiations to establish the partnership are not always forthcoming in full measure.

Another problem can occur when these partnerships approach faculty as free agents and are successful at securing their participation, but do so without consideration of the consequences to the faculty's home department. For instance, the partnership buys out some of the faculty teaching load, leaving the department with a void. This inevitably results in conflict between the program and the department, and can make it even harder for the two to cooperate and coordinate plans. This is further exacerbated when the program, like the Singapore initiative, is a School-wide or Institute-wide activity that must draw upon faculty from multiple departments and Schools.

So, what is the solution(s)? Actually, my main purpose in this piece is to raise the subject and to provoke discussion. But I cannot duck that easily. One thought would be to move toward an understanding between the faculty and the administration at MIT where a service or extension function is seen as a regular part of the explicit employment contract. I use the word "extension" in the historic sense, wherein land grant universities (and MIT for a while was one of these) assume a responsibility to extend knowledge beyond the clients who are in residence on the campus.

Before going any further, I'm sure someone is raising the question: Why do we have to have these partnerships if we are experiencing difficulty in staffing the programs and delivering the "goods?" Well, we are in a new era, and aside from

the dollars that these partnerships provide, they connect us to interesting problems in industry and in a variety of organizations, and for a place like MIT, which is very much on the applied side as well as fostering basic research, they are a welcome development.

Returning to some of the practical questions as to how such a revision of our work norms would be defined, I would recommend that this part of our portfolio only apply to tenured faculty. It might work as follows:

In discussions between an individual faculty member and a department head/dean, an understanding would be reached as to what percentage of the workload would be charged to these extension-type projects over, say, a five-year period of time. It might be desirable, in some cases, to reduce the classroom teaching load so as to leave ample room in each faculty member's schedule for research and activities of his/her own choosing. And it would be desirable that these discussions be complemented with concurrent discussions with the leads for the partnership programs, so as to coordinate on how faculty are engaged in these activities and to assure that the same signals are sent on what is expected and encouraged.

Now, what are some of the advantages of moving in this direction, aside from the practical result that all tenured faculty would play their part in helping implement these partnerships? First, if faculty see these partnerships as part of their regular workload, then I am sure that faculty will insist on being involved at the conception and birth of these partnerships, and we will not be in a situation where faculty feel that somebody "at the top" is out prospecting for deals and then bringing them back with gusto to present to the various labs and faculty for execution. It is possible that we might engage in fewer of these partnerships, and that would not be all that lamentable. For sure, where we do sign on to deliver certain research programs and to generate new knowledge for a particular client, since we would do it only with faculty involvement, we would do it well, and the project would become part of the faculty's social contract at MIT.

Right now, the partnerships are not embedded in our culture, and unfortunately too often junior faculty (who find it more difficult to say "no" than tenured faculty) sign on, only to find at tenure review time that their activities on some of these projects are not given high value. This is a very serious disconnect – we either need to cut back on partnerships or bring them into a tight embrace with senior faculty. ■

Robert B. McKersie is a Professor Emeritus in the MIT Sloan School of Management (rmckersi@mit.edu).

The MIT Motorsports Formula SAE Team after the 2006 Formula SAE competition at the Ford Proving Grounds in Pontiac, MI
[See Editorial, page 1]

FitFaculty@MIT
## Making time for exercise leads to greater camaraderie, productivity, "svelteness"

Kim Schive

"CHALLENGING," "COMPETITIVE," and "way cool" are some of the adjectives Prof. Dick Larson uses to describe getfit@mit, MIT's annual fitness challenge. Larson, director of the Center for Engineering Systems Fundamentals and a member of the "Civil Unrest" getfit team for the last two years, credits the 12-week, team-oriented program for helping him form exercise habits that stuck with him after the program's end. "No one has ever called me svelte," he admits, "[but] without getfit@mit, this pre-baby-boom faculty member might be quite un-svelte!"

Free tee-shirts, prizes, fun

"The getfit@mit challenge is intended to encourage exercise during a time of year when the cold weather and short days make it more difficult to stay active," explains Maryanne Kirkbride, MIT's clinical director for campus life. "We want participants to challenge themselves, but it is not a competition." The grand prize winner is chosen at random from all teams that meet a minimum average number of minutes for at least 10 of the 12 weeks. Everyone who registers gets a free tee-shirt, and all participants will have opportunities to win weekly team and individual prizes, including gift certificates to sporting goods stores and restaurants and fitness-related prizes such as pedometers, dance lessons, and passes to ski areas and skating rinks.

The third annual challenge, presented by MIT Medical, the MIT Health Plans, and MIT Medical's Center for Health Promotion and Wellness, begins on January 22, 2007. Registration opens at the end of December and continues
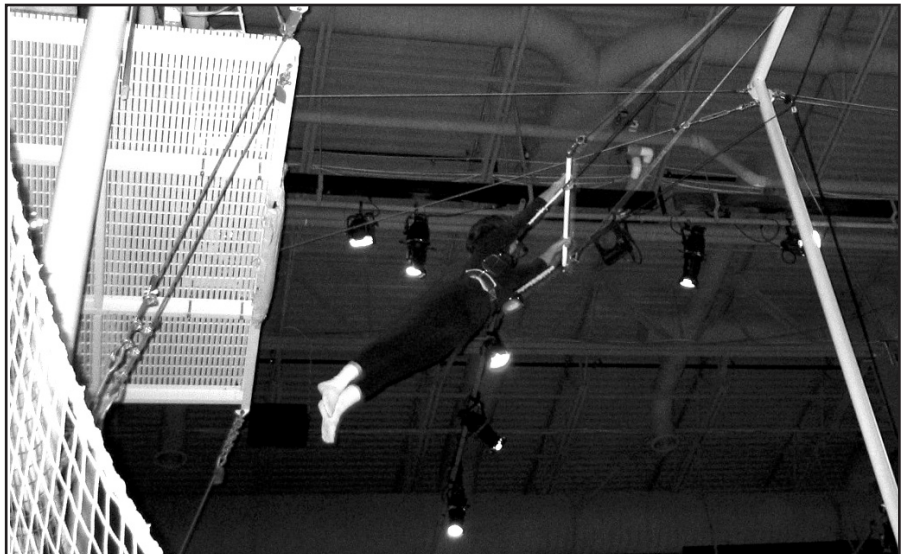
A "Creative Exercise" getfit@mit prizewinner at the Trapeze School New York in Reading

through January 17. Participants will form teams of five to eight members and keep track of their exercise minutes for each week of the challenge. Individual participants will choose passwords that allow them to log on and enter their weekly exercise minutes at the getfit@mit Website: *getfit.mit.edu*. Team and individual results will be tracked online, but participants will have to be logged on to view their individual results and those of their teammates identified by name. "The rest of your team will know how much you exercise, but it's not like everyone at the National Academy of Engineering annual meeting will know that you only managed to eke out 20 minutes during the seventh week of the challenge," Kirkbride quips.

Team spirit

A team-based challenge might seem a bit of a hard sell in the bastion of individual- ity that is MIT, but faculty participants say that being part of a team is one of the best aspects of the program. Larson cites the benefits of faculty members having an opportunity "to interact with MIT staff members in a way quite different from normal day-to-day business." Prof. Merton Flemings, MIT-Lemelson Program director, and "Buff Stuff" team member, says getfit@mit is "a great way to build camaraderie in a research or administrative group."

Prof. Richard Locke, the Alvin J. Siteman Professor of Entrepreneurship and Political Science, agrees. "My team consisted of both faculty and staff at Sloan," he explains. "Although we knew each other professionally before, our sense of camaraderie grew because of our collaboration on the getfit challenge. It's a really fun thing to do!" Locke's Sloan colleagues, Prof. Deborah Ancona and Prof.

John VanMaanen, add that the encouragement of teammates and the need to report one's exercise minutes each week serve as real motivators to keep going. "At the 300-minute mark [at the end of the challenge], it pushed me to hit the numbers and not let down the team," VanMaanen notes.

Lower cholesterol, higher productivity

Prof. Larry Vale, head of the Department of Urban Studies and Planning, says that joining a getfit team initially felt like "yet another thing I didn't have time to do." But now he says, "It became just the excuse I needed to start, and keep up, a regular exercise routine – one that quickly led to weight loss, coupled with clear improvements in cholesterol levels and blood pressure. I feel more energized than ever now. Far from a time sink, the time devoted to exercise has increased the productivity of my day."

Other getfit@mit participants also cite real and lasting benefits of the program. Of the 70 percent of getfit participants who began exercising more as a result of the 2005 challenge, almost half continued exercising at this increased level throughout the rest of the year. Additionally, about a quarter of participants report losing weight, reducing stress levels, and sleeping better. About 40 percent report improvements in general mood.

Get ready, get set, get fit!

To learn more about the upcoming getfit@mit challenge, visit: *getfit.mit.edu*. Enter your e-mail address to receive a reminder when registration opens. Or get a jump on organizing a team by downloading a team sign-up sheet now. "Some of us need just a bit of encouragement or team spirit to get to the gym," says Prof. Steven Eppinger, deputy dean of MIT's Sloan School of Management. "If this is what it takes to get you moving, then getfit@mit is for you!" ■

Kim Schive is the Communications Coordinator in the Medical Department *(schk@med.mit.edu).*

Helping Students Become Better Writers

Rebecca Blevins Faery

I HEAR THE LAMENT from faculty all the time: "Why don't MIT students write better?" And I hear one from students as well: "How can I learn to be a better writer?" Happily, there is an answer: faculty can encourage students to enroll in an introductory writing subject – 21W.730, Expository Writing; 21W.731, Writing and Experience; 21W.732, Introduction to Technical Communication.

Most importantly, the CI-HW subjects are a gateway to critical and analytical thinking across the disciplines, a preparation for the thinking-through-writing that students will be asked to do in many of their courses throughout their years at MIT. In all CI-HW sections they are asked to read carefully and critically, to evaluate and challenge ideas, to develop ideas of their own for writing, to craft shapely arguments supported by appropriate evidence.

Some of our students are required to take one of these courses (CI-HW) during their first year because of their performance on the Freshman Essay Evaluation (FEE). But those of us who teach in the first-year writing program, and many other faculty as well, believe that more students should elect to take a CI-HW class (about 30 freshmen currently elect to take a CI-HW subject each semester, along with about 40 upperclass students).

Contrary to prevailing opinion, there is nothing at all remedial about these subjects. They are rigorous, intellectually rich, and interesting, and they offer students a great deal of practice in critical thinking, writing, and revising. While each section has a thematic focus for reading and writing, the underlying principle of every subject and section is that students learn to write by writing frequently, getting generous feedback, and revising every major assignment. The real subject of CI-HW classes, in other words, is writing. In that way they differ from other CI-H subjects in which students have opportunities to write, but typically do not receive a great deal of explicit instruction in writing as part of the process of the course.

We clearly can't promise to make everyone who takes a CI-HW class into an accomplished writer in a single semester, but we can promise that the students are firmly placed on the right path to becoming competent writers, able to take advantage of the opportunities for ongoing development of their writing abilities that the Communication Requirement is designed to offer them. A number of CI-HW sections have been published on OpenCourseWare; reviewing them on the OCW site is an excellent way for interested students and faculty to get a thorough sense of how those courses work. Descriptions of the CI-HW sections offered each semester can be found at the Writing and Humanistic Studies Website: *web.mit.edu/humanistic/www/classes.shtml*. And if you have questions, please e-mail me. ■

Rebecca Blevins Faery is Director of First-Year Writing in the Program in Writing and Humanistic Studies *(faery@mit.edu).*

A Century of MIT at a Glance

Number of faculty reaches 20-year high

THERE ARE 998 FACULTY members at MIT, a 20-year high, according to the official tally taken on October 31st of each year. There were 1003 faculty members in the fall of 1983 (AY1984), the all-time high. [Faculty members are defined as Professors, Associate Professors, and Assistant Professors.] (See M.I.T. Numbers, back page.) The total number of students (10,253) is slightly below the all-time high of 10,340, which was reached in the fall of 2003 (AY2004).

There is currently an all-time high number of women students at the Institute (3,638) split almost evenly between undergraduates (1817) and graduate students (1821). These numbers have risen virtually every year since the early '60s (see chart below).

The number of international students (not including permanent residents) at MIT is 2,480, as of October 31 (AY2006), down from the all-time high figure of 2,629 in 2002 (AY2003). (See chart, next page.) Asian students comprise the largest population of international students, with 1208 members.

**Number of Women Students at MIT
1900-2007**

☐ Graduate Students
■ Undergraduates
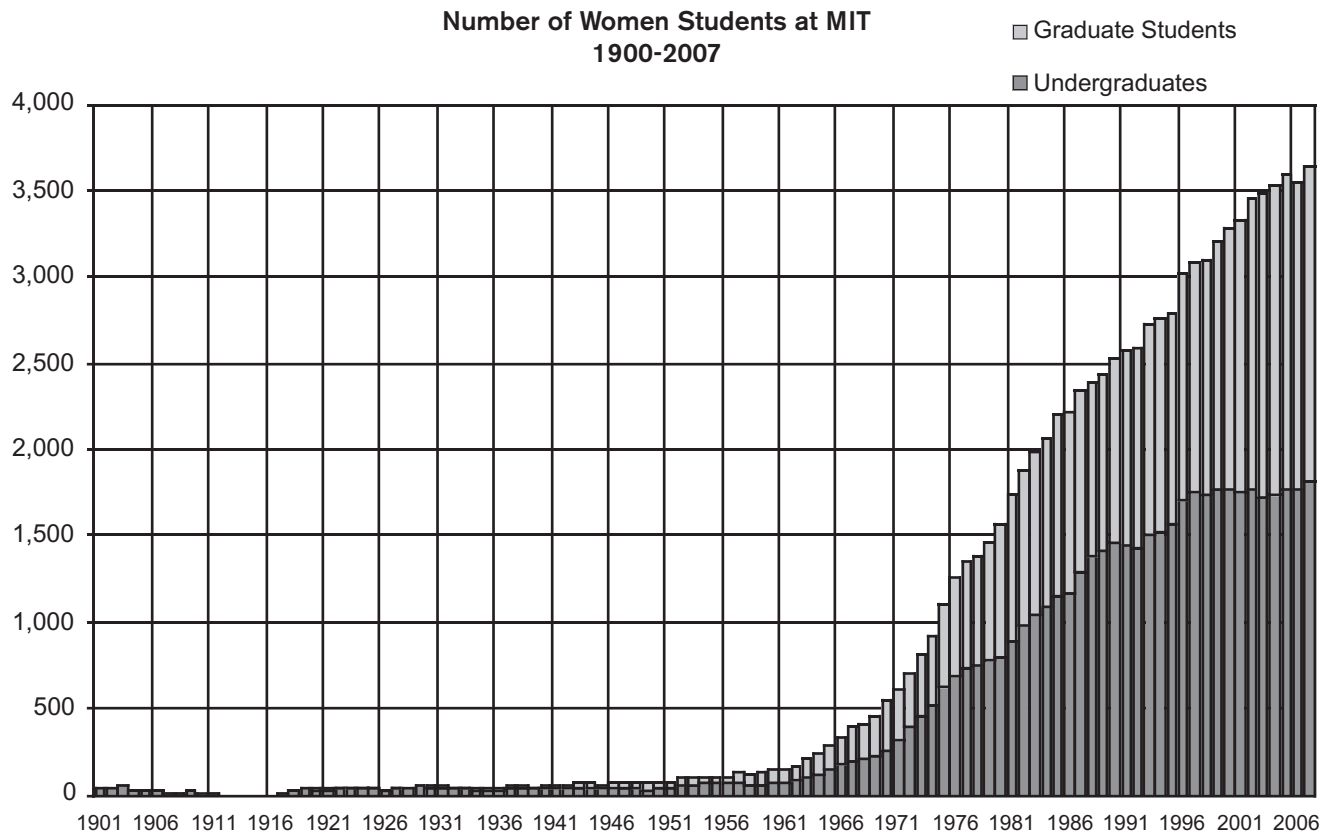
Since 1900, the ratio of students to faculty has fallen from 49 to 1, to about 10 to 1 in the current academic year. This ratio was the lowest during World War II, when it fell to less than 4 to 1 in AY1944. Since World War II this ratio has hovered around 10 to 1, although it increased to 11 to 1 in the fall of 1996, as a result of the early retirement program. The number of faculty dropped that year to 896, from the previous year total of 960.

The number of undergraduate students reached its peek at MIT in the early 1980s. The current number of 4,127 is approximately 10% lower than it was in the fall of 1982. The number of graduate students reached its current high in the fall of 2003, with 6,228 registered students. In the fall of 1979 (AY1980) the number of students studying for advanced degrees surpassed the number of undergraduate students for the first time. This fall (AY2007), the ratio of graduate students to undergraduate students was 6 to 4.

Prior to 1960, MIT had a number of "other" students in its official counts. These individuals were not officially study-ing for undergraduate or advanced degrees. However, as the category of graduate students grew, the number of individuals in the classification "other" declined and finally disappeared in the late 1950s.

The current MIT counts of students does not include those cross-registered from other universities, including Harvard, Wellesley, and Tufts. ■
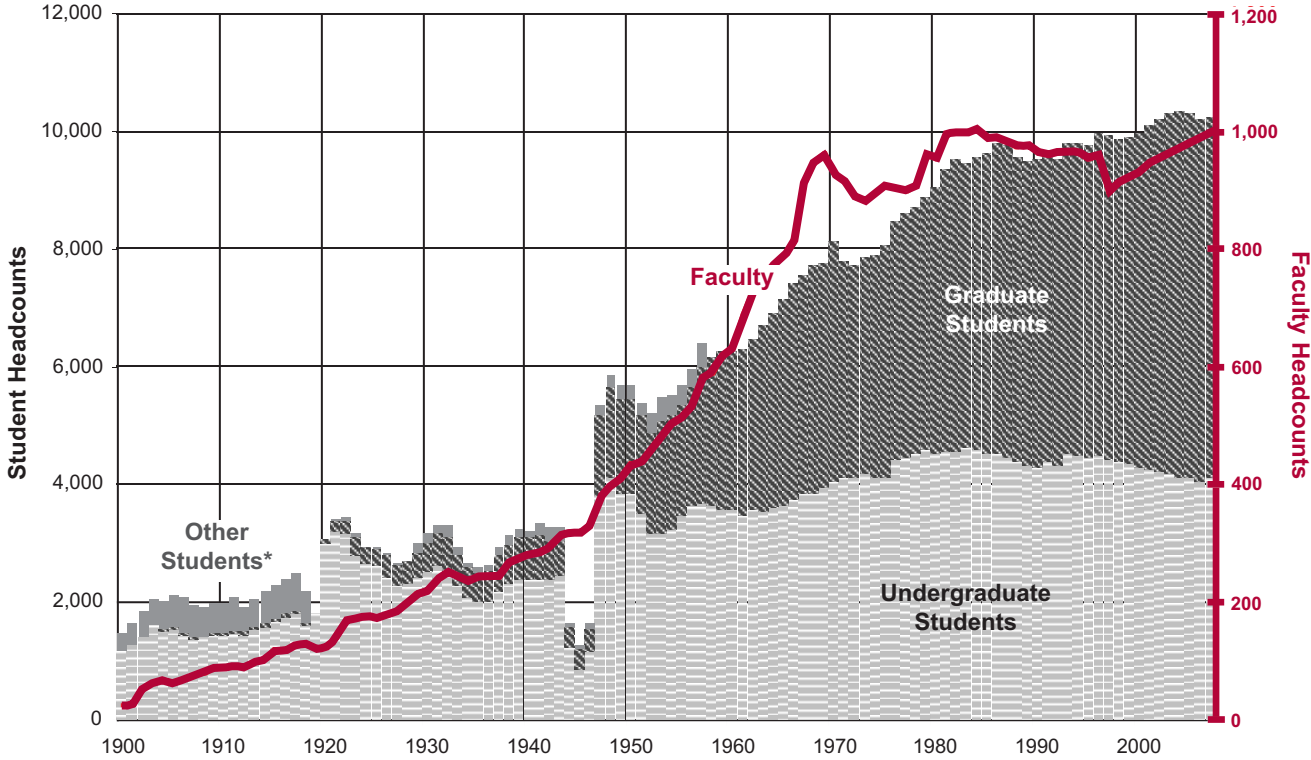
Number of International Students at MIT 1900-2007
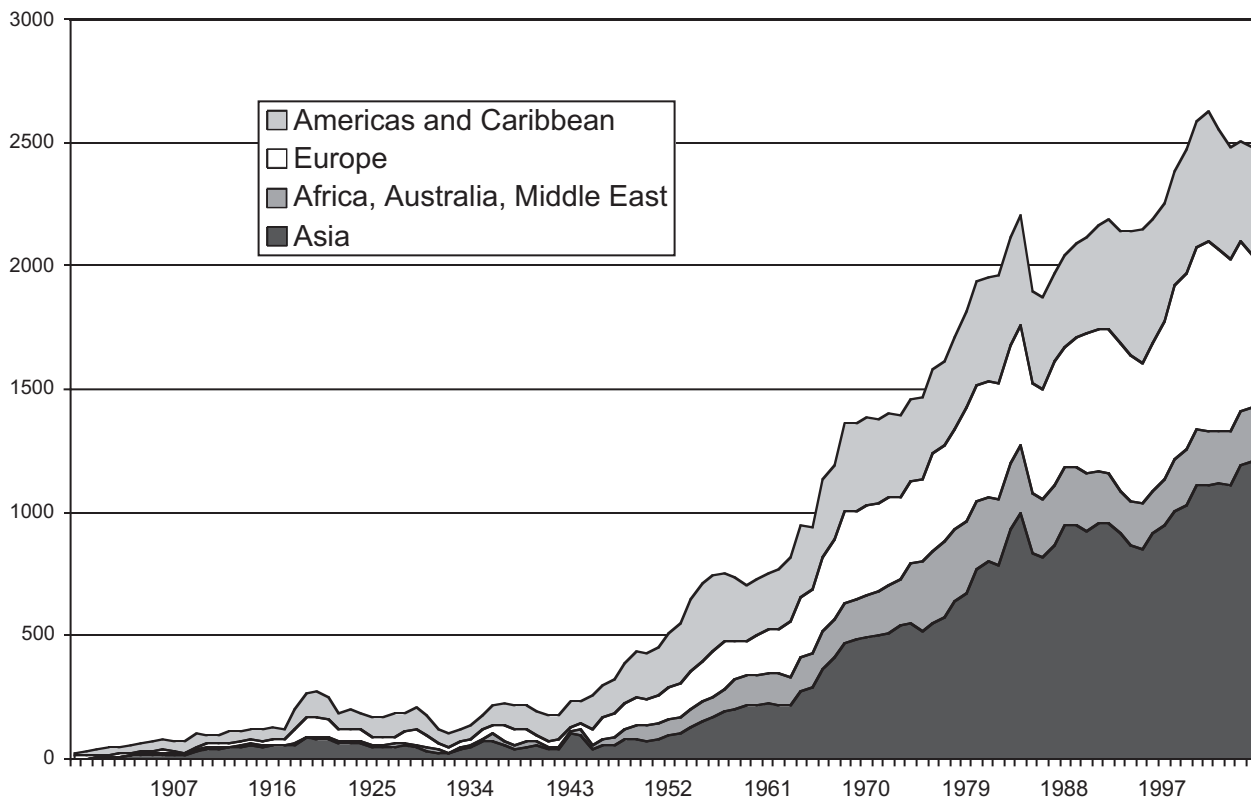
M.I.T. Numbers
MIT Faculty and Students (1900-2007)

*Other Students are those not accepted into a degree program.

Source: Office of the Provost, Institutional Research