MIT Faculty Newsletter

in this issue we offer Provost Reif delineating the Institute's viewpoint on its international role (below); five current and past Undergraduate Association presidents on "Student Engagement at MIT" (page 12); "Education: America's Achilles Heel" (page 15); and facts and figures on faculty and student diversity at MIT (page 16).

The World Flag

MIT's Approach to International Engagement

L. Rafael Reif

THIS ARTICLE DESCRIBES MIT'S APPROACH to international engagement. It starts by explaining why MIT engages internationally, and then shows how – appropriately for our entrepreneurial community – MIT has many approaches to international engagement, not just a single, centrally coordinated "international strategy." It then explains our present approaches to these engagements, followed by a description of MIT's funding model, a few examples of today's many international activities, and a brief summary of some of the risks of engaging – or not engaging – internationally. The article ends with an evolving vision of MIT that connects many of our international activities to MIT's enduring global themes: bringing knowledge to bear on the world's great challenges and educating the global leaders of tomorrow. In our international activities, as in all we do, the overriding intent is to make MIT stronger and to reinforce MIT's position as one of the leading science and technology academic institutions in the world.

Many of the criteria discussed in this article are applicable to our domestic activities as well. The focus, however, is on MIT's present international activities and their benefits to MIT. Of course, we also want our partners, collaborators, and sponsors to benefit as well from their engagement with MIT.

It is important to recognize, at the start, two important realities:

MIT's talent composition is international. MIT, like other leading institutions of higher education in the U.S., has benefited tremendously from its ability to attract talented stu-

Editorial
Clarifying MIT's International Agenda

LAST SEPTEMBER THE Faculty Chair, Professor Tom Kochan, writing in the *Faculty Newsletter* (Vol. XXIII No. 1), noted that "One of the biggest strategic issues on the minds of many faculty is our international strategy. A number of faculty have asked: What is MIT's international strategy? Indeed does the Institute have one, and, if so, are we following it?"

Provost Rafael Reif, in this issue of the *Newsletter* (see page 1), describes his view of MIT's approach to international engagement. He rightly notes that much of this engagement is the result of entrepreneurial initiatives arising from the faculty at large, and that an attempt to impose coordination and cohesion on these richly diverse activities might be counterproductive. We feel there is nevertheless a need for faculty to learn from the experience of their colleagues who have

contents

Photo credit: *Page 1,* Wikimedia Commons

Clarifying MIT's International Agenda

been involved in significant international projects, and to obtain some guidance, calibration, feedback and support from them and from the MIT administration.

The International Advisory Committee (IAC) that the Provost constituted three years ago, with faculty drawn

> From the point of view of operational support for faculty initiatives in the international domain, there is more that can be done centrally. . . . Individual faculty members should not have to work from scratch when they put together an international initiative. What are the issues to be considered up front? What are the cautions? What might be the unintended consequences? What is the range of experience from similar efforts undertaken in the past?

from each of the Schools and with several members of the senior administration, seems to now be providing some measure of this guidance, calibration, and feedback. [Disclosure: One member of the Editorial Subcommittee serves on IAC.] The existence of such a committee, able to gather input on a wide range of international activities at the Institute – certainly all such activities of substantial size – and to use this perspective to provide guidance to various international initiatives, is very welcome. We are not aware of any predecessor to IAC that served as this kind of focal point at the Institute.

From the point of view of operational support for faculty initiatives in the international domain, there is more that can be done centrally. We recognize that it is harder, when dealing with the most diverse international partners, to provide faculty with the sorts of templates and procedures that they are used

to having when dealing with monolithic domestic agencies such as the NIH or NSF, or with US companies. Nevertheless, our sense is that more can be done than is presently being done. Individual faculty members should not have to work from scratch when they put together an international initiative. What are the issues to be considered up front? What are the cautions? What

might be the unintended consequences? What is the range of experience from similar efforts undertaken in the past?

The Provost's article goes on to note that the entrepreneurial efforts of individual faculty are complemented and supported by a coherent global strategy on the part of the central administration. It is presumably this strategic vision that underlies the bigger institutional commitments MIT ends up making. One assumes that this coherent global strategy reflects some measure of consensus among the faculty. Perhaps the IAC and the report it published in September 2009 (*web.mit.edu/provost/reports/IAC_Report_20090903.pdf*) have been helpful in this regard. (The original charge to the IAC included the task of contributing to the design of an international strategy for the Institute.) It is to be noted, however, that the major international involvements most commonly mentioned in faculty

conversations – Singapore, Abu Dhabi, and Portugal, for example – considerably predate IAC.

The Provost lists various desirable features of an institutional-level international commitment. On that list is "resources," and the article devotes a section to funding models for such commitments. We are encouraged to see recognition of the possibility that some projects in MIT's mix of desirable international engagements may not be in a position to cover all their costs, and may require seed funding from MIT and other partners in order to get off the ground. Do we have a specific example of a significant international initiative in a particular country or region that MIT felt was important enough to commit to up front, with a determined subsequent effort to team up with partners and line up the necessary resources? If so, this example would be well worth highlighting. The examples that faculty seem to pull out most readily are ones where – at least in the way the story is usually told in such discussions – the money showed up first and the program was put together subsequently.

MIT's sesquicentennial finds the Institute with a stellar and enviable international reputation, renewed and enhanced each year by new, or newly recognized, accomplishments of its students, alumni, and faculty. Our challenge is to carry this legacy forward in a creative and fruitful way, maintaining the core values that underlie MIT's excellence, but operating in a much more crowded world, and with unprecedented global challenges. ◼

Editorial Subcommittee

From The Faculty Chair
MIT's Sputnik Moment

Thomas A. Kochan

I AM PLEASED THAT a good portion of this *Newsletter* is devoted to discussion of MIT's growing international activities. As stated in this column in September, my hope was that this would be a year of extended dialogue to help clarify and communicate MIT's international vision and strategy. The Provost's thoughtful paper (see page 1) advances this dialogue, and the faculty forum we have organized for February 17 will provide an opportunity to discuss both the paper and a potential initiative in Russia. I hope you will join us at that session.

As we become more active on the global stage it is equally important to ask what MIT's contributions will be to addressing the enormous challenges we face here in the U.S.

The Great Recession that followed the collapse of the housing and financial sectors serves as a teachable moment for all of us. That was what President Obama implied in his State of the Union speech when he called this our "Sputnik Moment." That also was the theme in President Hockfield's December 7 letter to the community. The question is: Will we seize the moment by putting MIT's legendary problem-solving skills to work and lead other universities into an era in which the knowledge we create moves smoothly and swiftly from discovery and testing to application?

The first MIT150 symposium took up this issue with gusto. A cadre of Nobel Prize winners and their world class peers reviewed the lessons of the past few years for the economics and finance professions. The economists opened the first day with a sober assessment of the economy and called on each other and those now studying to enter the profession to broaden their models and methodologies, to more fully engage the evidence coming out of behavioral economics and related social sciences, to carefully design experiments focused on key social problems, and to avoid knee jerk positive or negative views of the role of government in the economy and instead promote smart and efficient government spending and regulations.

The finance experts echoed this sentiment on the second day by urging their colleagues to examine what went wrong with the risk management systems supposedly in place in both the private and public sector and to more carefully examine how finance theories and models are used or misused in practice. In introducing the first finance panel, Professor Andrew Lo challenged his profession to go a step further; to ask how its theories and models could be applied to the great economic and social problems of the day.

My hope is that we follow up this discussion and call to action by putting this good advice and forward thinking to work in our research and teaching, so that future Nobel Prizes go to individuals whose theories and research help to build a twenty-first century with a sustainable and broadly shared prosperity, and a healthy society.

As someone whose day job focuses on studying work and employment, I share the concerns expressed at the symposium over the inability of our economy as presently functioning to generate suffi-

> The question is: Will we seize the moment by putting MIT's legendary problem solving skills to work and lead other universities into an era in which the knowledge we create moves smoothly and swiftly from discovery and testing to application?

cient high quality jobs. The jobs crisis we face today is both one of quantity and quality. Unless something changes, it will take most of the rest of this decade to generate the jobs needed to replace the eight million lost in the recession and to keep up with labor force growth. Moreover, median worker wages have been stagnant for the past three decades for high school graduates and only the small proportion of college graduates with advanced degrees have seen their compensation levels keep up with productivity growth. Instead, as all sorts of economic studies have shown – including those by MIT faculty – too much of the nation's income growth has gone to the top one percent and even to the top 0.1 percent of the population, leaving more and more families stuck in neutral or falling further behind. The frustration, polarization, and anger felt by so many today should be a wakeup call that we need to redouble efforts to develop

This commitment to innovation is why a recent study led by Professor Ed Roberts and Charles Eesley estimated that MIT's living alumni alone have created over 25,000 companies, employing 3.3 million people, with $2 trillion in sales. . . .

ideas, policies, institutions, and organizational innovations capable of restoring trust and confidence in the future.

MIT has a leading role to play in this process, especially if, as we all believe, our best hope for the future is to build an innovation-led economy. Innovation, i.e., the process of generating scientific and technical breakthroughs and transforming them to new policies, products, and services, is part of our DNA. This commitment to innovation is why a recent

study led by Professor Ed Roberts and Charles Eesley estimated that MIT's living alumni alone have created over 25,000 companies, employing 3.3 million people, with $2 trillion in sales [*entrepreneurship.mit.edu/article/entrepreneurial-impact-role-mit*].

Attacking the big problems of our time will require a renewed commitment to interdisciplinary research and collaboration, again something that MIT is well suited to do. MIT researchers have shown

that the greatest returns to new production and information technologies are generated by the creative integration of technical and human, organizational, and social forces. We need to keep this principle in mind as we move forward in search of solutions to the major challenges in health care, manufacturing, poverty, energy, the environment, and other issues that rise to the top of our agendas.

So as we continue celebrating MIT's 150 birthday, let us look back not just with pride but with an eye to learning how our predecessors attacked and solved the big challenges and problems of their day, and then challenge ourselves to do the same today and in the future.

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

Teaching this spring? You should know …

the faculty regulates examinations and assignments for all subjects.

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

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

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

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

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

For subjects in which there is testing during the final examination period, no assignment may fall due after Friday, May 6.

For subjects in which there is no testing during the final examination period, at most one assignment may fall due between May 6 and the end of the last scheduled class period in the subject.

Collaboration Policy and Expectations for Academic Conduct
Due to varying faculty attitudes towards collaboration and diverse cultural values and priorities regarding academic honesty, students are often confused about expectations regarding permissible academic conduct. It is important to clarify, in writing, expectations regarding collaboration and academic conduct at the beginning of each semester. This could include a reference to the MIT Academic Integrity Handbook *web.mit.edu/academicintegrity/*.

dents, faculty, and staff who, for a variety of reasons, choose to leave their home countries to come to the U.S. MIT has been an institution open to international talent for a long time. At present, over 40% of our graduate students (see Figure 1), over 70% of our postdocs (see Figure 2), and about 40% of our faculty were born outside the U.S. This international profile has benefited, and continues to benefit, MIT and the U.S. enormously.

MIT's problem-solving ambitions are global and we cannot solve the most important world problems alone. MIT certainly focuses on problems important to the U.S. For example, MIT conducted the "Made in America" study in the 1980s, and has launched the recently announced initiative on Production in the Innovation Economy. But MIT has also focused on global problems, addressing concerns that go beyond the geographical boundaries of the U.S. (e.g., MIT's Energy Initiative). In order to do the latter, MIT has been collaborating with individuals and entities inside and outside the U.S. These collaborations benefit the U.S., MIT, and our partners.

I. Why does MIT engage internationally?
MIT faculty members have been engaging internationally for a long time. Why? Because they find collaborators they want to work with, and/or laboratory facilities they want access to, and/or research and education opportunities they find attractive (e.g., an appropriate region to test new ideas for greatest impact or to access data), and/or research sponsors they do not find in the U.S. In addition, MIT academic leaders – deans, department and program heads, center and lab directors – sometimes initiate international activities when it benefits their units and when the activities can be integrated into the larger intellectual context of the units. MIT academic leaders also want to provide educational opportunities to prepare their students to become global leaders. The
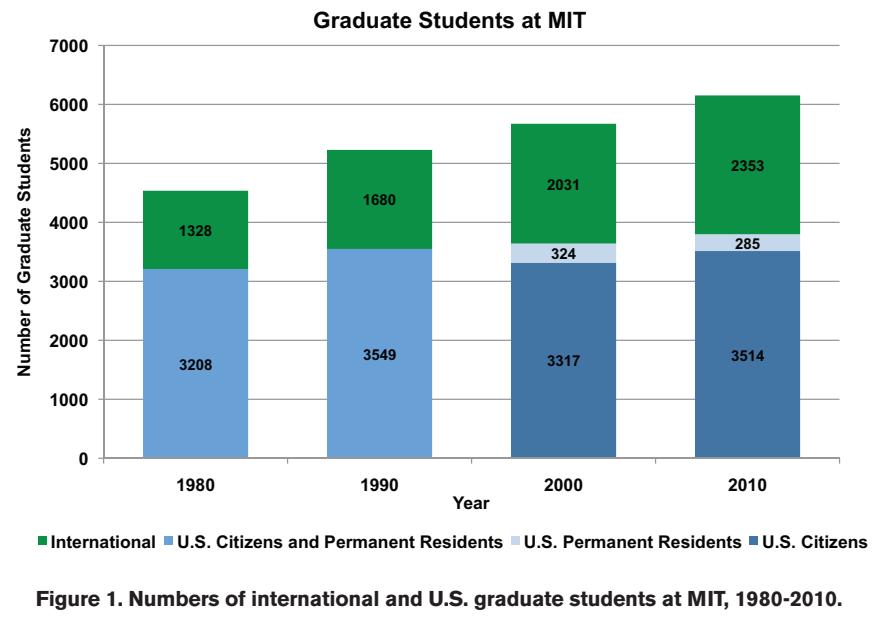

Figure 1. Numbers of international and U.S. graduate students at MIT, 1980-2010.
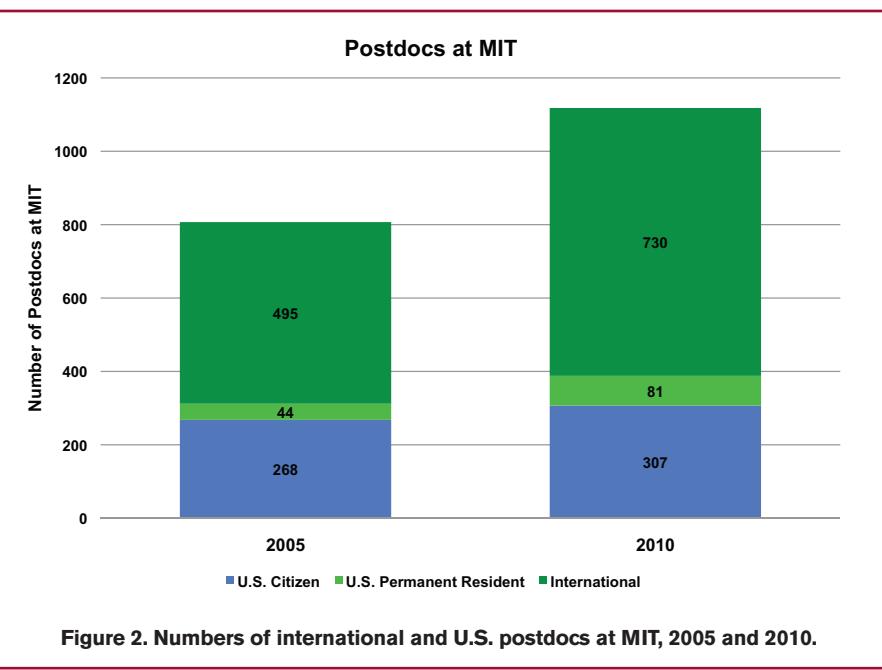

Figure 2. Numbers of international and U.S. postdocs at MIT, 2005 and 2010.

MIT central administration becomes involved in international activities when it is important to provide a larger, broader MIT context. Regardless of how an international activity is initiated, our faculty and students have benefited significantly from a variety of such interactions. In recent years, the opportunities and motivations for international engagement have expanded considerably, with several factors helping to explain this trend, including:

Relevance. There was a time when MIT and other U.S. academic institutions worked solely on problems of interest to the region and/or the nation. Of course, MIT faculty members still focus on such issues. But in general, our faculty want to work on the most important challenges of

the day, and many of these challenges extend beyond national interest to global importance. To quote from MIT's mission statement: "*The Institute is committed to generating, disseminating, and preserving knowledge, and to working with others to bring this knowledge to bear on the world's great challenges.*" The world's great challenges do not have national boundaries. By engaging internationally, we can (i) monitor progress of worldwide efforts, (ii) learn from others at the same time that we extend our own expertise, (iii) provide global network opportunities for MIT students and faculty, and (iv) enable our faculty and students to connect with MIT alumni, global companies, and our partners worldwide. Moreover, even though the U.S. will continue to be a source of inspiration for new ideas in research and education, many creative ideas will emerge or be implemented first elsewhere. Consequently, it is essential to MIT's continuing strength that our faculty and students remain closely engaged with the increasingly interconnected and expanding world of ideas and innovation.

Talent. At present, several nations are trying to emulate the U.S. academic system of education and research, and they are moving toward closing the gap by increasing their investments in these areas. American institutions, including MIT, have benefited significantly from being situated in the strongest economy in the world, and this has helped them attract some of the world's most talented scholars and researchers. As the economies of other nations strengthen, and as these nations invest in their local institutions, their ability to attract the best international talent will increase dramatically. We are already beginning to experience difficulties in retaining talent at MIT against competition from international institutions, reflecting an increase in competition for young talent globally. International activities make it possible for the Institute to stay connected and engaged with excellent talent worldwide, and increase our

opportunities to attract some of this talent to MIT.

Evolving educational vision. We need to educate our students to understand the world, in order to prepare them to compete globally and to become the global leaders of tomorrow. Our students' exposure to the international community that comprises MIT strengthens their understanding of the world as well as their education as future global leaders. It also is important to provide our students with opportunities for meaningful international experiences abroad, and close faculty involvement is necessary to ensure that international components of a course of study conform to MIT educational standards and expectations. In addition to educating our own students, it is important for MIT to contribute to the education of future global leaders who may not be able to attend MIT. The U.S. and the world benefit from the kind of education that MIT provides, and we should carefully consider opportunities to integrate our educational expertise into our international activities.

Funding. It is prudent and beneficial to diversify and expand MIT's funding sources. Not only is this a good policy, but it is also a natural evolution reflecting a more international and globally connected institution. As with talent, these funding sources are increasingly found overseas. For example, the Institute's sponsored research expenditures coming from international sources nearly quadrupled over the last 10 years to $96 million in FY2010 (see M.I.T. Numbers, back

page). This corresponds to an increase in the proportion of total campus sponsored research expenditures funded by interna-

> Consequently, even though many members of the MIT community, including our alumni, would like to see a greater degree of coherence in our international engagements, and would expect this coherence to flow from the central administration (i.e., from the President, Provost and/or Chancellor), the reality is that most of our engagements are neither initiated by, nor explored in coordination with, the central administration.

tional sources from approximately 7% in 2001 to about 15% in FY2010.

II. When referring to "MIT's International Strategy," who is MIT?
Only a handful of individuals can make a commitment or sign a formal document on behalf of MIT. Nevertheless, MIT has about 1,000 faculty members, including more than 30 heads of academic units and more than 50 directors of interdepartmental Labs/Centers/Institutes/Initiatives, five School Deans and three Deans for students and education. In addition, MIT has an office for Resource Development, including directors of Foundation and Corporate Relations. When any one of these individuals (or offices) speaks with an international entity or individual (whether public, private, government, commercial, or industrial), the international entity or individual often assumes the conversation is being conducted with "MIT." Consequently, even though many members of the MIT community, including our alumni, would like to see a greater degree of coherence in our international engagements, and would expect this coherence to flow from the central administration (i.e., from the President, Provost and/or Chancellor), the reality is that most of our engagements are neither initiated by, nor explored in coordination with, the central administration. Hence, in a dynamic and entrepreneurial community such as ours, it is not possible to speak of *the* "MIT International Strategy,"

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if that refers to a coherent set of activities taken up by MIT faculty, departments, and Schools in response to a cohesive, centrally coordinated strategy. On the contrary, marching in lockstep in this way would not be desirable, as the best ideas at MIT are those that originate with, and flow from, the students, faculty, and staff. On the other hand, the central administration does have a coherent global strategy and an approach to international engagement that is consistent with the exciting and entrepreneurial nature of our community.

III. MIT's approach to international engagement

MIT faculty and academic leaders are free to pursue engagements and seek access to collaborators, facilities, and sponsors that will benefit them and their partners, whether in the U.S. or abroad. In supporting these initiatives, MIT expects that the engagement be consistent with our policies regarding faculty commitment to MIT and with MIT's mission, principles, and values. When dealing with international activities on any level, it is particularly important to assess the reputational risk to MIT before starting an engagement, and to monitor this risk continuously during the engagement. Moreover, it is also important to recognize that regulatory issues applicable to international engagements add additional layers of compliance, complexity, and cost.

As mentioned earlier, in addition to faculty and academic leaders, the central administration occasionally pursues international initiatives that reflect a broader or more formal commitment on an institutional level, particularly those that offer our faculty and students access to (i) talent (i.e., students, postdocs, faculty, other researchers), (ii) ideas and collaborations, (iii) facilities and research infrastructure, (iv) research and educational funding, (v) opportunities to

educate future global leaders, and vi) opportunities to work on the world's great challenges. Usually such initiatives involve some level of partnership with a foreign university (or group of universities), foundation, or government agency, and come with a strong expectation of lasting benefits to MIT as well as to our partners. By and large, the central admin-

istration takes a proactive role in launching or shaping international activities when these are in support of a larger strategic goal for MIT.

How does the MIT central administration choose where to engage? Ideally, the potential international engagement ought to offer most of the following:

- Intellectual content of high interest to our faculty
- Talent, ideas, and resources
- Expectation of long-term commitment
- Potential for long-term impact
- Potential to integrate research and education
- A partner that values science and technology (S&T)
- A partner that values knowledge creation and applications
- A partner that recognizes the impact of S&T on the economy and society
- Scale of engagement that involves multiple disciplines
- Engagement in a current and/or future regional hub for innovation
- Engagement in a region with significant MIT alumni presence and the potential for involving them
- Engagement consistent with MIT's values and principles

Consistent with MIT's mission to *"work wisely, creatively, and effectively for the betterment of humankind,"* MIT should also support initiatives that pursue, where appropriate, activities that include a service dimension in underprivileged countries or regions that could greatly benefit from MIT's expertise, while at the same time providing MIT faculty

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and students with challenges to solve important problems.

The MIT central administration has practiced both a responsive and a proactive approach to international involvement. At this time, we are proactively exploring possible opportunities in China, India, Russia, and Brazil, complementing perceived faculty interest in these countries. We recognize, however, that there is limited capacity for such engagements of significant breadth, and that there are opportunity costs associated with these activities (e.g., participating in a large engagement in a given country may prevent us from participating in an important and desirable engagement in another country).

One way that we assess and monitor our international engagements is through MIT's International Advisory Committee (IAC), which is co-chaired by Associate Provost Philip S. Khoury and Vice President for Research and Associate Provost Claude R. Canizares. The IAC assesses international engagements by focusing on (i) consistency of the engagement with faculty's commitment to MIT, (ii) alignment of the engagement with MIT's mission, principles, and values, and (iii) reputational risk of the engagement

to MIT. The IAC also seeks to learn from past and ongoing activities in order to apply that experience to future activities.

The IAC sponsors faculty Working Groups engaged in designing possible strategies by countries and regions. A recent example is the "MIT-Greater China Strategy" Report (available at: *web.mit.edu/provost/reports/Final-GCSWG-Report-August-2010.pdf*). These IAC Working Groups advise the administration and provide regional guidance to faculty interested in working in specific regions.

In short, MIT's approach to international engagement can be summarized as follows: (i) activities that emerge from academic leaders, faculty, students, and staff take many forms but should be consistent with MIT's mission, principles, and values, and the MIT central administration plays an important role ensuring that this is the case, and (ii) activities initiated by the central administration are guided by a coherent strategic vision that strengthens MIT and is consistent with the entrepreneurial nature of our community.

IV. Funding model
With few exceptions, research and education sponsorships at MIT cover all (i.e., direct and indirect) project-related costs (exceptions include a few not-for-profit U.S. sponsors). Similarly, international sponsors also are expected to cover all direct and indirect research and education costs. However, larger-scale international sponsorships, particularly those initiated by the central administration, are typically asked to provide financial support beyond direct and indirect costs. Why is that?

International activities often require our faculty to travel away from MIT, creating an absence on campus that usually needs to be addressed. Moreover, due to their complexity, these activities typically require additional oversight, and in some instances governance commitments. Some large international engagements may require the active participation of members of MIT's central administration and ongoing support from MIT adminis-

trative offices such as finance, research administration, and technology licensing. As we engage in institution building overseas, we should seek resources to renew and strengthen MIT, i.e., to fund our own institutional renewal.

As a result, international sponsorships initiated by the central administration are typically asked to contribute to MIT's endowment in addition to covering all direct and indirect project costs. Some of

> As a result, international sponsorships initiated by the central administration are typically asked to contribute to MIT's endowment in addition to covering all direct and indirect project costs. Some of this endowment could be used, for example, to create new faculty lines to offset the additional call on faculty time.

this endowment could be used, for example, to create new faculty lines to offset the additional call on faculty time.

As indicated in Section III, some members of our community also work in regions of the world that significantly benefit from MIT expertise but which cannot afford to fund the engagement. MIT believes these activities are important as well, and is exploring ways to provide seed funds while the interested faculty members seek more stable support. There may also be cases where our strategy would be best served by MIT providing an initial investment of resources to help develop collaborations with particular countries, leading to possible longer-term engagements that would conform with the funding model for larger-scale projects described above.

V. MIT's international activities: a few current examples
As noted at the beginning, MIT has engaged internationally for a long time, whether participating in research collaborations or in institution building. An article by S.W. Leslie and R. Kargon ("Exporting MIT: Science, Technology and Nation-Building in India and Iran," The History of Science Society, pp. 110-

130, 2006) describes MIT's role in the establishment of the Indian Institute of Technology in Kanpur (IIT/Kanpur), and the Birla Institute of Technology and Science (BITS) in Pilani in the 1960s, as well as the Aryamehr University of Technology in Iran, in the 1970s. Why do MIT faculty engage with people and entities elsewhere, not just elsewhere in the U.S., but abroad as well? The answer is simple: because it benefits our faculty, it benefits our students, and it benefits society.

Our international involvement today comes in different forms, and its expanse is breathtaking. It covers a broad range of activities, from interactions with a partner/collaborator/sponsor, to faculty activities in regions where the necessary research infrastructure is available, to a variety of student internships. This section highlights *only a few current examples* of research and educational collaborations, student internships and exchange programs (of course, the classification used here is arbitrary and not thorough). The examples below are a mix of faculty-led initiatives and initiatives driven by the central administration.

Research collaborations. There are many individual MIT faculty collaborations with researchers in other institutions in the U.S. and abroad. There are also individuals and groups of MIT faculty engaging elsewhere in collaborations that provide access to research facilities we do not have at MIT. An example of the latter is the research our high-energy physicists have been conducting at CERN in Europe. In fact, numerous examples of spectacular research done by our Physics faculty at the

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facilities of SLAC National Accelerator Laboratory in California and of Brookhaven National Laboratory in New York underscore the point that our faculty go wherever necessary to access the facilities (and collaborators) they need for their research. In the case of CERN, those facilities are outside the U.S.

Just as MIT faculty helped establish new universities elsewhere in the 1960s, they continue to do so today. The Masdar Institute (MI) in Abu Dhabi, established through the Technology and Development Program in 2009, is a graduate-level institution dedicated to energy and environmental sustainability. The Singapore University of Technology and Design (SUTD) will matriculate its first students in April 2012. . . .

A new model for global engagement emerged with the establishment of the SMART (Singapore-MIT Alliance for Research and Technology) Center in 2007 in Singapore. The SMART Center offers our faculty, students, and postdocs the opportunity to collaborate with talented researchers in Singapore and elsewhere in Asia who have complementary expertise; it also provides access to Singapore's complementary facilities, and to research issues that benefit from study in the region (e.g., local infectious diseases).

Education collaborations. Just as MIT faculty helped establish new universities elsewhere in the 1960s, they continue to do so today. The Masdar Institute (MI) in Abu Dhabi, established through the Technology and Development Program in 2009, is a graduate-level institution dedicated to energy and environmental sustainability. The Singapore University of Technology and Design (SUTD) will matriculate its first students in April 2012 and will offer a multi-disciplinary curriculum focused on design. MIT faculty participate in these institution-building

activities partly driven by their sense of mission, but also partly to engage in activities they find intellectually stimulating, such as developing new curricula (which also benefit MIT) and integrating state-of-the-art research with the education of future global leaders unable to attend MIT. Moreover, MIT faculty benefit from opportunities and resources to carry out research in important fields (e.g., sustainability and design).

Student internships. An example of an international program with a focus on MIT students is MISTI (MIT International Science and Technology Initiatives), based in the Center for International Studies, which connects MIT students (and faculty) with research and innovation around the world. By working closely with premier international corporations, universities, and research institutes, MISTI matches hundreds of MIT students annually with internships and research opportunities abroad. In addition, MISTI provides funding for MIT faculty to jump-start international projects and encourages student involvement in faculty-led international research. Another example is D-Lab, which fosters the development of appropriate technologies and sustainable solutions within the framework of the International Development Initiative. Like MISTI, D-Lab seeks to give students deep and meaningful experiences and is committed to making a long-lasting impact in the communities where they work. To this end, D-Lab provides an opportunity for students to engage in

fieldwork and maintains strong relationships with partner organizations.

Student-exchange programs. An example of this kind of program is the Cambridge-MIT Exchange, which provides MIT and University of Cambridge undergraduate students the opportunity to study for one year at the partner institution.

An example of an activity that combines research, education, student exchanges, and internships is the Global SCALE (Supply Chain and Logistics Excellence) Network, established in 2008 in the Center for Transportation and Logistics. This network currently includes logistics centers in Spain (Zaragoza), Colombia (Bogota), and at MIT.

These are just a few examples of the tremendous breadth of engagements in which our dynamic and entrepreneurial faculty, students, and staff participate, as well as initiate.

Examples that MIT does not include in its portfolio at this time are satellite campuses and conferring MIT degrees elsewhere. We will come back to this in Section VII.

VI. Risks of action and of inaction
There are several risks of action, among them:

• Reputational. For example, as a result of MIT
  - Not fulfilling its obligations and/or commitments, and/or
  - Not meeting its collaborating partner's expectations, and/or
  - Not understanding or anticipating mismatched expectations

• Political or cultural. For example, as a result of
  - U.S. foreign policy, and/or
  - Host country shifts in political conditions, and/or
  - Host country cultural differences

In addition to these risks, there is the important issue of faculty workload. With increasing global engagements, the load

on our faculty may increase. A possible solution could be an increase in the size of our faculty.

There are, of course, several risks of inaction. Among them is the risk of jeop-

preparation of future global leaders who are unable to attend MIT. At present, MIT is neither establishing satellite campuses, nor is it conferring MIT degrees elsewhere. Instead, a possible alternative

these activities, when properly funded and administered, strengthen MIT. MIT's Sloan School of Management is already assisting partner schools to become leading institutions in their home countries, and exposing MIT faculty and students to collaborations with counterparts from those countries.

MIT could further expand its participation in the education of future global leaders by offering credentials for learning MIT-content on-line. MIT students could participate in this mode of education while attending the "MIT global network" of institutions, or when doing internships abroad. In other words, this would benefit not only students who cannot attend MIT, but also MIT students spending time elsewhere.

> At present, MIT is neither establishing satellite campuses, nor is it conferring MIT degrees elsewhere. Instead, a possible alternative model for extending MIT's international involvement is to establish a global network of research and educational institutions that focus on science and technology and that share MIT's values and principles.

ardizing MIT's position as the place (or one of the top places) "where the action is" in science and technology. It is clear that outstanding S&T international talent gravitates toward major centers of activity, i.e., where the future is being invented, and where the most creative, novel, and groundbreaking research is being carried out. MIT is one of those places in the world, attracting outstanding talent. MIT should continue to work on the most important problems our nation is facing, and it should continue to work on the world's great challenges. The latter suggests that MIT must engage globally to continue to attract some of the best international talent. Inaction not only risks our ability to continue to attract the best talent to MIT, but also risks the ability of our faculty and students to stay engaged with many of the most innovative ideas being generated worldwide. The risk of inaction is that, over time, MIT may lose the S&T preeminence it enjoys today.

VII. An evolving vision
As already stated, it is MIT's responsibility to prepare our students to understand the world and to engage and succeed in a globally competitive environment in order to become the global leaders of tomorrow. At the same time, it is important for MIT to consider expanding its educational reach and participating in the

model for extending MIT's international involvement is to establish a global network of research and educational institutions that focus on science and technology and that share MIT's values and principles.

These institutions would be located in present or future regional hubs of innovation. Examples might include MIT's SMART Center in Singapore, MI in Abu Dhabi, and SUTD in Singapore. These institutions, whether established as part of MIT (e.g., SMART) or in collaboration with MIT (e.g., MI, SUTD), could potentially become part of a network of institutions that will not only enable MIT students, faculty, and staff to engage globally, but will also enable MIT to contribute to the education of future global leaders attending those other institutions. Moreover, in the future, the education of an MIT student may combine time at MIT with time at one or more institutions that are part of this "MIT global network." This strategy allows MIT to (i) strengthen local institutions in geographically diverse regions, (ii) interact with, and participate in the education of, student talent in those institutions, (iii) provide unique opportunities to prepare our students to understand the world and to compete globally, and (iv) collaborate with complementary expertise and in complementary facilities to solve the world's great challenges. All

VIII. Summary
MIT faculty, academic leaders, and the central administration pursue mutually beneficial engagements in the U.S. and abroad. They do so because these engagements allow access to talent, collaborations, ideas, facilities, and/or funding. Furthermore, in line with MIT's mission, they allow us to work "*with others to bring this knowledge to bear on the world's great challenges.*" These engagements strengthen MIT's ability to continue to attract and retain some of the best international and domestic talent. They also allow MIT to better prepare our students to understand the world, to compete globally, and to become the global leaders of tomorrow. As part of our institutional strategy, we should consider expanding our role globally, such as participating in the education of future global leaders who are unable to attend MIT. MIT's global engagement will become more important with time, and will reinforce MIT's position as one of the leading science and technology academic institutions in the world.

L. Rafael Reif is Provost *(reif@mit.edu).*

Note: This article will be posted on the Provost's Office Website (*web.mit.edu/provost*) and is intended to reflect a "live" strategy, that is, it will be updated periodically as appropriate.

Student Engagement at MIT: A Path Forward

Vrajesh Y. Modi (2010-2011)
Michael A. Bennie (2009-2010)
Noah S. Jessop (2008-2009)
Martin F. Holmes (2007-2008)
Andrew T. Lukmann (2006-2007)

IN OUR CAPACITY AS current and former presidents of the MIT Undergraduate Association (UA), we are writing to bring attention to and express concern about the unresolved, longstanding issue of student engagement. Student engagement should be viewed not as an onerous task, but as a device to discover the most innovative solutions to the most complex problems. The handling of several recent situations has left many students feeling disenfranchised and has generated the perception that administrators disregard or are unwilling to solicit input. We believe that implementing the suggestions outlined below would demonstrate that the Institute senior leadership intends to follow through on its commitment to engage students in decision-making at MIT. Effective engagement of the entire community is the future of governance and would be a source of competitive advantage for MIT as an institution.

As primary stakeholders and future benefactors of this institution, students desire and deserve transparency, cooperation, and candor. We question the conclusion of the statement by the Chancellor and the Deans in a recent *Faculty Newsletter* (Vol. XXII No. 4): "Changes introduced over the past year have been successful in strengthening two-way communications – leading to a better understanding of how the administration works (on the part of students) and what students are looking for (on the part of administrators)." Students are still not being involved in decision-making at the Institute in a consistent, structured manner, resulting in ongoing controversy, ambiguity surrounding process, and a perceived lack of respect.

One can point to specific instances where the Institute reaped great benefit by successfully engaging members of the community: the Task Force on Student Life and Learning, the Institute-wide Planning Task Force, and the recent changes to Athena Printing, to name a few. Furthermore, involving students in evidence-based decision-making, a hallmark of MIT, contributes to the educational experience. "Learning by doing" is a founding principle of MIT; to produce the world's best decision-makers, we must involve students in decision-making. We believe that our concerns will resonate with members of the faculty, so we seek your involvement and support in addressing them. Our primary goal is to work with faculty and with Institute leadership to establish a coherent, comprehensive, and consistent philosophy and framework for when and how student input should be sought by Institute decision-makers.

Context

Three years ago, in a joint statement published in the *Faculty Newsletter* (Vol. XX

> Our primary goal is to work with faculty and with Institute leadership to establish a coherent, comprehensive, and consistent philosophy and framework for when and how student input should be sought by Institute decision-makers.

No. 4), the presidents of the Undergraduate Association and Graduate Student Council, the Chancellor, and the Vice President for Institute Affairs collectively wrote, "Student involvement strengthens community, provides a comprehensive perspective, and helps prepare a new generation of leaders." All parties committed to "strengthening the framework for students' role in decision-making," and "exploring channels for information sharing, maximizing transparency, and promoting the interface between students and administrators at the Institute." Accordingly, with the support of President Hockfield, in spring 2008 these groups created the Task Force on Student Engagement (TSE). Membership included the Chancellor, the Vice President for Institute Affairs, the Chair of the Faculty, the Dean for Student Life, the Dean for Undergraduate Education, the Dean for Graduate Education, four undergraduate student representatives, and four graduate student representatives.

The work of the Task Force was to be done with the "goal of renewing MIT's culture to more strongly promote and value student involvement in issues important to them." While it was clearly

the intent of the Task Force to act on this charge, a consensus was never reached on how to select and implement its recommendations. Circumstances surrounding the implementation of the varsity sports cuts, enrollment increase, and campus dining changes confirm the Task Force on Student Engagement has not achieved its objectives. While community involvement in the Institute-wide Planning Task Force was a step in the right direction, failures since then suggest this success was an outlier, not a turning point.

Varsity Sports Cuts (April 2009)
Approximately one year after the Task Force on Student Engagement was created, Department of Athletics, PE, & Recreation (DAPER) was asked to cut $1.45M from its budget over the following three years. Students were not involved in the decision on whether to cut particular varsity sports or to trim all programs. The Student Athletics Advisory Committee, which met monthly with DAPER leadership, was told about the decision to cut varsity programs one week before it was announced at a town hall meeting. At the meeting, students were told no decision had been made about the teams to be cut, or the way they would be selected. Two weeks later, eight sports were cut, but teams were told that a significant financial donation could help reinstate a sport that had been cut. Accordingly, the wrestling team raised $1.6M; but its varsity status was not reinstated, leaving the group feeling perplexed, frustrated, and betrayed. A joint statement from the Chancellor, Dean for Student Life, and Director of Athletics indicated the decision was also due to concerns about the team's viability, yet subsequently, in March 2010, the wrestling team won the National Collegiate Wrestling Association Division II National Championship. Still, the team's varsity status was not reinstated, leaving students with the perception that administrators had not been forthright in explaining the reasons for the cuts.

Enrollment Increase (September 2010)
After MIT alumnus Fariborz Maseeh generously donated $24M to complete the renovation of undergraduate dormitory W1, the MIT administration announced its decision to increase undergraduate enrollment. Once the decision had been made, student leaders were neither notified nor briefed, but rather learned of the donation and of the enrollment increase through the News Office's Website. Since then, student involvement has continued to be inadequate, and student leaders continue to be left in the dark about implementation details, despite repeated requests for information.

The Undergraduate Association is very concerned about the lack of student input into the decision. Our concern is process, especially the process moving forward. An enrollment increase impacts every aspect of the student experience, including academics, advising, student support services, UROP funding, etc., so it would have been appropriate to consult students during the decision-making process; and it is still appropriate to involve students in the process as it moves forward.

Campus Dining Changes (Spring 2010, Fall 2010)
This fall, students expressed considerable distress over the planned changes to the dining system, through written petitions in all four dining hall dorms and through an online petition with over 1800 signatures. Setting aside questions about the recommended plan itself, there were several issues of concern with the deci-

sion-making process. Last April, the Undergraduate Association President wrote, "While [the House Dining Advisory Group] is just beginning its work, it is clear that there are already several obstacles to credibly engaging students." Specific concerns raised included the one-and-a-half month timeline, the

Two weeks later, eight sports were cut, but teams were told that a significant financial donation could help reinstate a sport that had been cut. Accordingly, the wrestling team raised $1.6M; but its varsity status was not reinstated, leaving the group feeling perplexed, frustrated, and betrayed.

rigid set of assumptions governing potential meal plans, and the homogeneous nature of committee membership. Four days later, the Chancellor and the student Deans reassured, "No decision will be made without broad community input," and, "Next year, there will be continued opportunity to refine the plan."

Students and student leaders became increasingly concerned when the committee's recommendations were released during finals week, its final report was released during orientation, its meeting minutes were heavily redacted, and its redacted meeting minutes from September and October were not posted until December. This October, in response to an Undergraduate Association bill calling for the proposal to be reformed in light of the student response, the Division of Student Life spokesperson said, "The core structure of the plan, as defined by the HDAG recommendation, is not going to change." The discrepancy between this statement and the Chancellor's earlier one left students feeling deceived.

A Path Forward
Each of these issues occurred during the tenure of the Task Force on Student Engagement, which has failed to fulfill its

Student Engagement at MIT
Modi, et al., from preceding page

mandate of "developing a philosophy guiding student involvement, recommending opportunities for greater student participation, and proposing methods to ensure success." Instead, the

> To be clear, our intention is not to challenge the right of the administration to make the ultimate decision on any given issue, but rather to encourage them to put into place a clear and well-understood process that ensures that the student voice is heard.

TSE has scaled back meeting frequency from monthly to once per semester. Moreover, the Dean for Student Life did not even attend the most recent meeting. Three years of evidence suggest that the TSE will not be the solution to the recurring breakdown in communication.

To be clear, our intention is not to challenge the right of the administration to make the ultimate decision on any given issue, but rather to encourage them to put into place a clear and well-understood process that ensures that the student voice is heard. For the Institute to fully realize the benefits of engaging students, it must become part of our culture to consult with students on issues that matter to them. Based on the community engagement model used by the Institute-wide Planning Task Force, we propose the following steps to address the question of student engagement:

• That the presidents and vice presidents of the Undergraduate Association and the Graduate Student Council be made full voting members of Academic Council. Currently, the presidents of both groups are only invited annually to the meeting of Academic Council when tuition and financial aid are discussed. This systemic issue of student engagement has plagued good relations between students and administrators for years, and a bold solution such as this one is needed to resolve the problem.

• That all Institute Committees, standing and ad-hoc, of the Faculty, President, Provost, Chancellor, et al., provide for at least one undergraduate to be nominated through the Undergraduate Association Nominations Committee and one graduate student representative to be nominated through the Graduate Student Council Nominations Committee. Currently, students serve on many Institute committees, but have no representation on key committees such as EMG, CRSP, Global Council, Building Committee, etc.

• That when a major decision that will affect students is under consideration, all pertinent information, including historical context, decision-making criteria, relevant data, and preliminary recommendations, be made available to students for a period of 60 days to allow for input to be solicited and incorporated into the final recommendations. Last academic year, a similar motion was proposed in a faculty meeting. Currently, students are often surprised by major decisions and feel that they have not had input.

• That relevant administrators meet directly with students, rather than referring them to a department spokesperson.

• That when a new Institute committee is established, student members be nominated by the appropriate student governing body, not by the administration. Currently, this is sometimes, but not always, the case.

• That the MIT President meet with the UA president and with the GSC president on a monthly basis.

Comprehensive community engagement is vital to MIT's success as a diverse and forward-thinking institution, and we believe that students are not the only constituency that feels excluded from decision-making. We encourage administrators to engage members of our community regularly in decision-making and treat them as agents of change. We all have an interest in making the best possible decisions for MIT. We all seek to transform MIT into an institution that will thrive into the next century. We all seek to foster a community of greatness and strength. We all must work together. ■

Vrajesh Y. Modi is a Senior in Course 2 and Course 15; current UA President *(vrajesh@mit.edu)*;
Michael A. Bennie is a past UA President (2009-2010) *(mbennie@mit.edu)*;
Noah S. Jessop is a past UA President (2008-2009) *(njess@mit.edu)*;
Martin F. Holmes is a past UA President (2007-2008) *(goholmes@mit.edu)*;
Andrew T. Lukmann is a past UA President (2006-2007) *(lukymann@mit.edu)*.

Education: America's Achilles Heel

Ernst G. Frankel

IN RECENT DAYS, a lot has been said about the need to improve American Education, yet few specifics are ever mentioned. There is an urgent need to improve primary and secondary education, in terms of quality, accessibility, and focus.

It is not by chance that we have fallen so far behind education levels, as measured by standardized tests, in many other countries, including many poorer, developing nations. We have the problem of unequal access to and funding of education, largely as a result of school funding and control at the local level. Such significant local control virtually automatically assures that students in poor neighborhoods get lower quality teachers, facilities, and educational support. The so-called No Child Left Behind program – which I call the Most Children Left Behind program – never achieved any real improvements in primary education, and failed to provide funding to offset local inequalities. The shallow standardized tests used to measure performance, the lack of meaningful incentives for teachers, the dearth of greater involvement by parents as well as greater support for poor neighborhood children with after-school assistance such as properly supervised homework as well as other activities and facilities, are all major reasons for the failure of our schools.

Still, there is an even more invasive problem in tertiary education in America. We encourage a larger percentage of high school graduates to continue with tertiary education (what we call college) than any other country in the world. According to *The Economist* World Statistics, over 84% of U.S. high school graduates continue with tertiary education, mostly by attending some college, which in most cases amounts to nothing more than them spending another 3-4 years in a remedial high school – as most attend liberal arts colleges or programs that are not directed toward a career. The results not only affect our educational system, but also America's economy. Unpaid or uncollectible student loans now account for hundreds of billions of dollars and the total loss of uncollectible loans will soon equal the financial losses imposed by the Subprime Mortgage crises.

But there are broader implications. In addition to the potential loss in student loans there is the loss of working life and output by so many young Americans. The average working life of Americans starts two-four years later then in any other developed country. This not only means a loss of lifetime earnings of 8-10 %, but also loss of similar contributions to Social Security, Health Care, and other programs. For many years we were told that America is succeeding because it converted successfully into a service economy, and that for our economy to succeed we must maintain a high level of consumption, even if we have to borrow the money to pay for it. These misplaced policies are, in my opinion, a major reason for our economic troubles. We have to become a more productive and efficient society, which lives within its means, and educates its young for the jobs that are needed to be done.

I believe we will only be able to get out of this morass if we not only improve our primary and secondary education, but also assure that tertiary education is focused on the skills needed. The issue has grown significantly in recent years with the emergence of for-profit colleges, many of which offer programs that are neither recognized nor lead to a proper professional career. Their admission standards are often lax, and their marketing pervasive. Yet most of their graduates not only waste three to four years of their life and huge amounts of money, but also the opportunity to begin building a real career. Simple calculations show that if we had systems such as in Japan or Germany, where college is only accessible by a qualified few, well-prepared and focused students – while the rest undertake short 6-12 month trade or professional skill training usually organized and/or supervised by potential employers – we would have the skilled workforce needed by U.S. manufacturing and other firms. These firms are increasingly forced to outsource their work, not because of lower labor costs, but because of lack of adequate availability of well-trained and committed American workers.

If we would restructure our education system to focus on the needs of the American economy, and assure that only people who need and are qualified to undertake tertiary college education (with both programs and admission to these programs based on planned developments in our economy) we could not only increase our economic output significantly, but also improve the fiscal viability of Social Security, Health Care, and other entitlement programs. This education refocus, combined with a more rational consumption and tax strategy, could readily not only get us out of our current financial and economic mess, but also assure a brighter future for our country. ■

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

Faculty and Student Diversity at MIT: Facts and Figures

L. Rafael Reif

THIS ARTICLE SUMMARIZES THE present facts and figures associated with diversity at MIT.

Figure 1 shows percentages of under-represented minority (URM) under-graduate and graduate students, as well as faculty, going back to 1987 and 1991, respectively. As the graph indicates, the percentage of URM undergraduate (UG) students among the domestic (i.e., U.S. citizens and permanent residents) UG student body today is approximately 26%.

Similarly, the percentage of URM graduate (G) students among the domestic G student body today is approximately 12%. The percentage of URM faculty at MIT at this time is 7.3%. In the last five years, MIT's departments and Schools have been hiring URM faculty at a rate of 11% of the total hires (see the table, next page). All these percentages have been steadily increasing.

Figure 2 shows percentages of UG and G women students going back to 1901, and MIT women faculty as well as Science and Engineering MIT women faculty going back to the early 1980s.

As the graph indicates, the percentage of women UG students today is a little over 45%, and the percentage of women G students is close to 32%. The percentage of women faculty at MIT is 21%, and the percentage of women faculty in MIT's Schools of Science and Engineering is 17%, both increasing. As the table indicates, over the last five years MIT's departments and Schools have been hiring women faculty at a rate of 30% of the total hires.

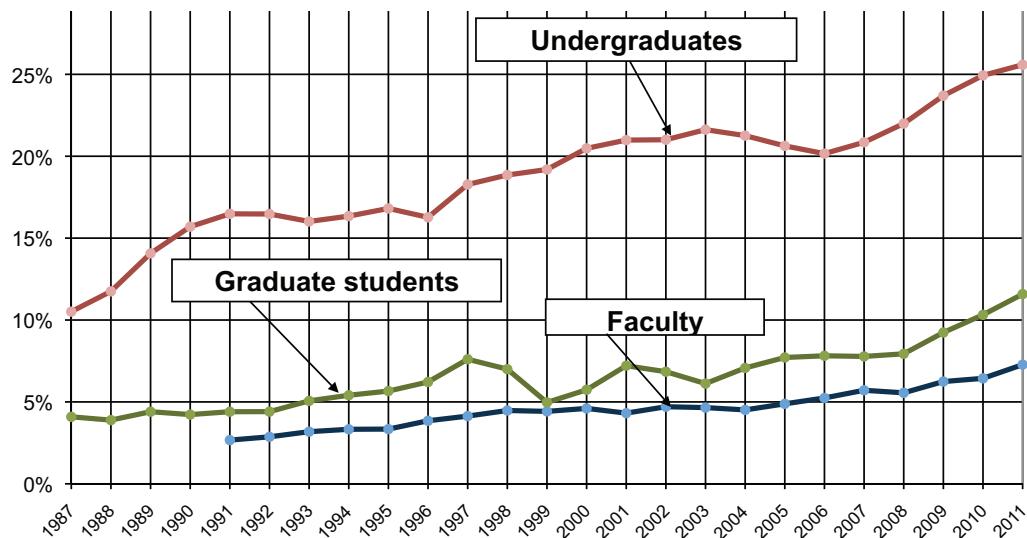Figure 3 shows the net change in the URM and non-URM faculty population at MIT over the last 10 years. In October 2001, MIT had 47 and 909 URM and non-URM faculty, respectively. In October 2010, MIT had 74 and 943 URM and non-URM faculty, respectively; i.e., 27 out of the net growth of 61 faculty members are URM faculty, representing 44% of the net faculty growth over the last 10 years.

Figure 4 shows the net change in the women and men faculty population at MIT in the last 10 years. In October 2001, MIT had 152 and 804 women and men faculty, respectively. In October 2010, MIT had 217 and 800 women and men faculty, respectively; i.e., 65 out of the net growth of 61 faculty members are women.

These facts and figures point towards an MIT whose community of UG and G students, as well as faculty, is becoming increasingly diverse. ■
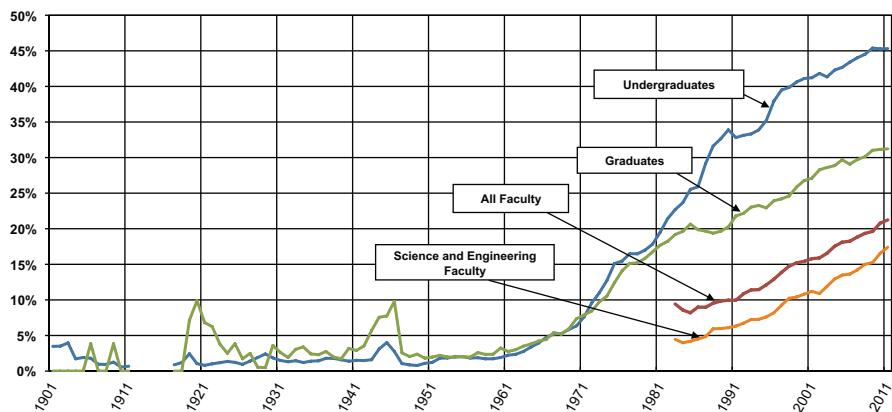
L. Rafael Reif is Provost *(reif@mit.edu).*

Figure 1. Under-Represented Minority Faculty and Students* at MIT
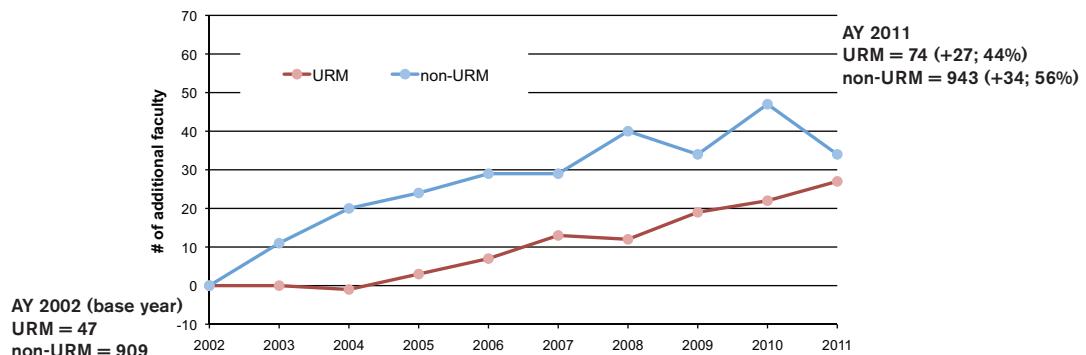

*Includes only domestic students (i.e., U.S. citizens and Permanent Residents)

Source all figures: Office of the Provost/Institutional Research
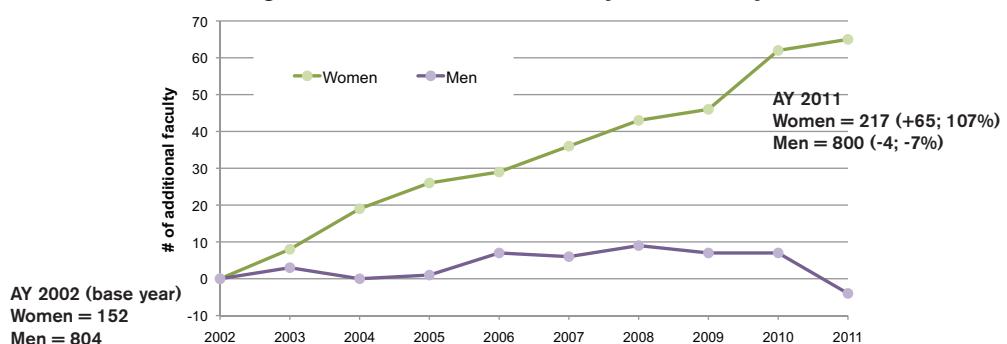
**Figure 2. Women as Percentage of Total Undergraduate,
Graduate Students, and Faculty: Academic Years 1901-2011**

Figure 3. Last 10 Years of MIT Faculty Net Growth by Race/Ethnicity

AY 2011
URM = 74 (+27; 44%)
non-URM = 943 (+34; 56%)

AY 2002 (base year)
URM = 47
non-URM = 909

Figure 4. Last 10 Years of MIT Faculty Net Growth by Gender

AY 2011
Women = 217 (+65; 107%)
Men = 800 (-4; -7%)

AY 2002 (base year)
Women = 152
Men = 804

Faculty Hires FY06 – FY10

School	URM	Women	Total Hires
Architecture	0	5	18
Engineering	10	19	66
SHASS	5	14	44
Sloan	7	13	38
Science	3	18	61
Institute Total	**25**	**69**	**227**
% of Total Hires	**11%**	**30%**	**––**

MIT Professional Education Short Programs: Linking Academia and Industry

MIT PROFESSIONAL EDUCATION Short Programs is the gateway to the Institute for industry professionals from around the world who want to gain knowledge about advances in technologies and bring it back to their workplaces. In turn, faculty who choose to teach short courses have the opportunity to augment their research and MIT courses with industry knowledge gained from participants in the classroom.

MIT Professional Education's recent international course delivery initiative is enabling the Institute's research priorities to connect to an industry audience worldwide. For instance, Professor Daniel Nocera brought his breakthrough work on solar energy to Tokyo in January 2009, when Professional Education offered his one-day course in conjunction with the MIT Industrial Liaison Program's Japan conference. In 2010, Professional Education offered a three-day course in India on air transportation infrastructure, led by Professor of Engineering Systems Richard de Neufville and Dr. Peter Belobaba of the International Center for Air Transportation. Leading players from the booming airports and airline development industry in India attended the course.

On campus, Short Programs offers some 45 courses, mostly in the summer. The programs cover a broad range of topics that span most of the science and engineering disciplines offered at MIT. This summer, the two-to-five day courses will include topics such as nanostructure fabrication, the future of vehicular transportation, network coding, and supply chain design.

Advantages for Faculty

Faculty who are considering teaching in the program might be interested in the experience of Charles Cooney, who has taught Short Programs for 40 years. Like many faculty, the Robert T. Haslam (1911) Professor of Chemical Engineering is certainly busy – he teaches in the rapidly evolving field of biochemical engineering with a focus on separation processes and drug development. His MIT posts include faculty director of the Deshpande Center for Technological Innovation and, outside MIT, he is actively involved with industry. Yet Cooney makes teaching industry professionals through Short Programs at MIT a priority year after year.

Prof. Cooney began teaching weeklong summer courses in 1970 – his first year as a faculty member. He wanted to teach at MIT, in part, because of the opportunity to work in an emerging field with Daniel Wang. After Cooney's first year teaching, he and Wang, now an Institute Professor, launched a new course, Fermentation Technology. Later, as the new knowledge about recombinant DNA techniques was emerging, Cooney launched a parallel course, Downstream Processing, which focused on recovering the biotechnology products created in fermentation and other techniques. Last summer, Cooney marked the twenty-fifth year of teaching his signature Downstream Processing course, which he updates every year, and he continues to join Wang in the fermentation course each summer because he still benefits from the exchange with students.

"We learn by questions we get and discussions in class," Cooney says. "We learn a lot by the conversations in the hallway when you are talking one-to-one or to small groups and they bring in their real-life problems. All of this relates to the content that you are giving in the classroom. I always say it keeps me honest in terms of what I present and how I describe it. I'm trying to address real solutions to real problems."

Translating Theory for a Broader Audience

Faculty who teach in Short Programs are active participants in realizing MIT's historic goal of supporting America's industry and business base. The Institute first offered summer courses to students in 1898 and refocused the courses on industry needs beginning in 1949.

In the past year, 47 MIT faculty members from 25 departments, centers, and labs taught Short Programs. They gained contacts with a wide range of professionals – the students came from 475 companies and organizations located in 50 countries.

"This thriving intellectual exchange furthers MIT's historic mission of bringing new knowledge to bear on the world's great challenges," says Bhaskar Pant, Executive Director of MIT Professional Education.

If you're interested in learning more about teaching for MIT Professional Education Short Programs, contact Anna Mahr, Associate Director for Short Programs, at *amahr@mit.edu* or 617-253-6161. ■

Editor's Note: This article was submitted by MIT Professional Education. For more information about them visit their Website: *web.mit.edu/professional*.

Sanyal, Schuh, Verghese, and Winston Named 2011 MacVicar Faculty Fellows

FOUR PROFESSORS HAVE BEEN named 2011 MacVicar Faculty Fellows as MIT celebrates the program's twentieth year recognizing outstanding undergraduate teaching. Bishwapriya (Bish) Sanyal (Department of Urban Studies and Planning), Christopher Schuh (Department of Materials Science and Engineering), George Verghese, and Patrick Winston (both in the Department of Electrical Engineering and Computer Science) join an elite group of just 38 current MacVicar Fellows.

The MacVicar Faculty Fellows Program was named to honor the life and contributions of the late Margaret L.A. MacVicar '64, ScD '67, Professor of Physical Science and Dean for Undergraduate Education at the time of her death in 1991. Professor MacVicar was a noted educator and scientist who founded MIT's Undergraduate Research Opportunities Program (UROP). She was nationally recognized for her leadership in shaping policies both for undergraduate education and for science education in public schools.

Selection of the Fellows is made by the Provost with guidance from an advisory committee chaired by Daniel Hastings, Dean for Undergraduate Education, and composed of undergraduate students and faculty. The committee also heavily considers student comments that express the positive and often profound impact these professors have made on their lives.

Bish Sanyal is Ford International Professor of Urban Development and Planning. He joined the faculty at MIT in 1984, after working for the World Bank, and served as the Head of the Department of Urban Studies and Planning from 1994 to 2002 and Chair of the faculty from 2007 to 2009. He is currently the Director of the SPURS/Hubert Humphrey program at MIT for mid career professionals. Despite such administrative responsibilities, Bish continues to teach popular courses on urban development planning and is involved in three research projects on planning theory, urban housing issues, and good performance in public sector in India. He is also the co-principal investigator for a Rockefeller Foundation funded project for curriculum development for a new private university soon to be started in Bangalore, India.

In addition to teaching DUSP's popular "Big Plans" class and D-Lab's development class, Bish has been instrumental in the creation of MIT's International House for Global Leadership (iHouse), an imaginative blending of undergraduate education, communal living, and public service goals.

Chris Schuh is the Danae and Vasilios Salapatas Associate Professor of Metallurgy. In July 2011, he will become a full Professor. After receiving his Ph.D. from Northwestern University, Chris joined the faculty as an Assistant Professor in 2002. His research uses experiments, analytical theory, and computer simulations to explore the processing-structure-property relationships in structural metals. He is particularly interested in the role of structural disorder and its effect on mechanical properties.

Since coming to MIT, Chris has taught five key subjects, all in the UG or G core areas of the Department of Materials Science and Engineering (DMSE). He has consistently received strong positive feedback from the students in these courses where they describe his lecture style as fun, engaging, energetic, and informative.

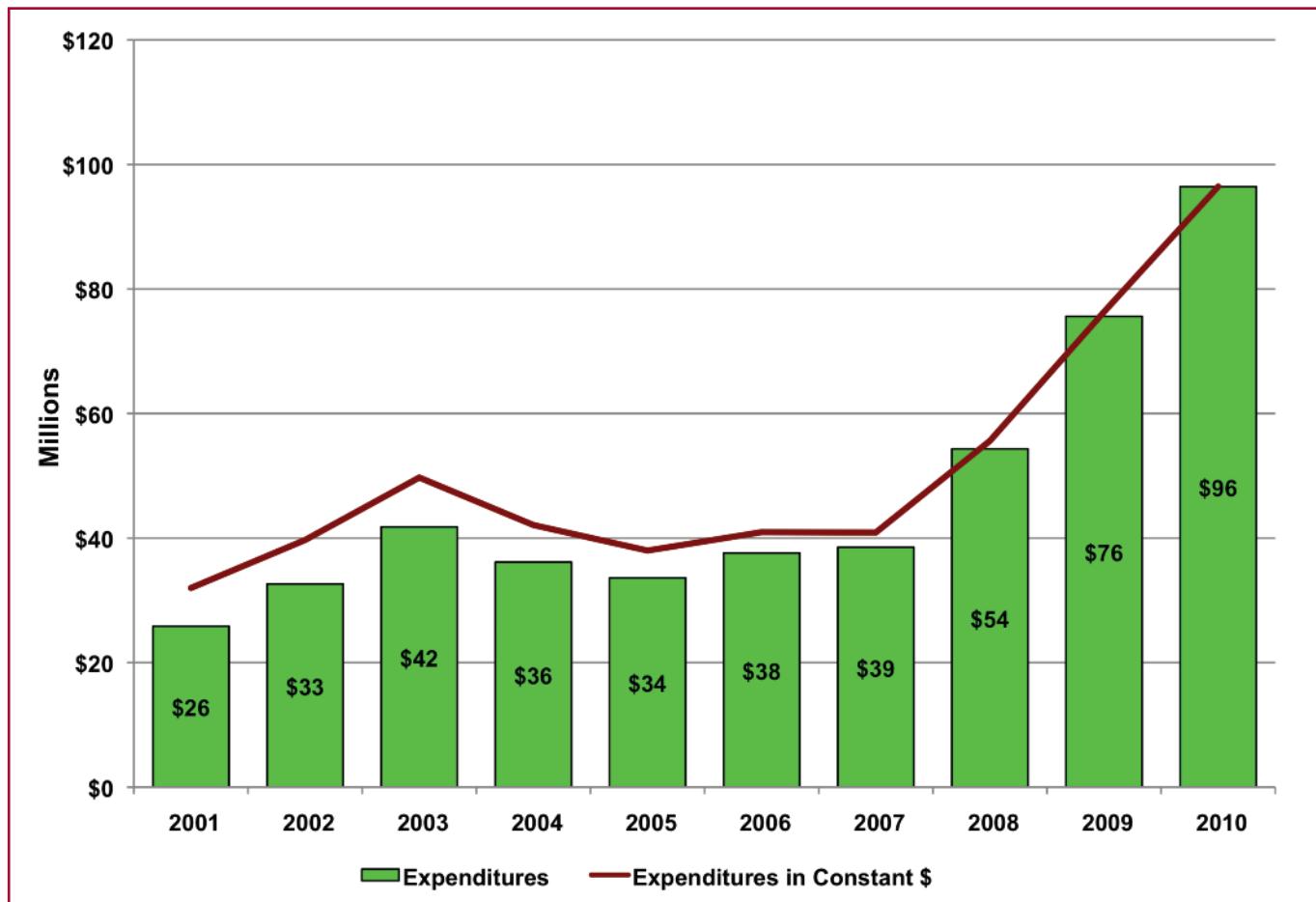**George Verghese**, Professor of Electrical Engineering, has been part of the MIT faculty since 1979. George's research in the Research Laboratory of Electronics (RLE) is currently focused on modeling and estimation in biomedicine, particularly for improved monitoring of patients in clinical settings.

George has had a broad educational impact in EECS through his role on the Curriculum Innovation Committee and as Education Officer for many years. He has taught a range of courses and in recent years he's been involved in the evolution of the "header" course in communication, control, and signal processing. He has been especially helpful in finding ways to explain complex and challenging material in a clear manner.

Patrick Winston is Ford Professor of Artificial Intelligence and Computer Science. After receiving his undergraduate and graduate degrees from MIT, he joined the faculty in 1970, and was the Director of the Artificial Intelligence Laboratory, which merged with the Laboratory for Computer Science to form CSAIL, from 1972 to 1997. Professor Winston focuses his research on developing computational accounts of aspects of human intelligence, with particular emphasis on the roles played by perception and language. He also works on applications of Artificial Intelligence enabled by learning, story understanding, and precedent-based reasoning.

Patrick's lectures frequently deal with both the important ideas that came out of a piece of work and the discussion of how those ideas arose. This comes from his approach to teaching students to think: it isn't enough to explain the great ideas to students, they also need to understand the process – the thought patterns – that lead to those ideas. It is what makes Winston's lectures far more than the advertised subject matter. He understands the power of conveying ideas clearly and tries to pass on his skill set.

M.I.T. Numbers
Campus International Sponsored Research*

*Excluding the Broad Institute

Source: Office of the Provost/Institutional Research