MIT Faculty Newsletter

in this issue we focus on education. Beginning with our editorial and the other two articles below, MIT faculty attempt to anticipate the upcoming national issues that are likely to threaten and change American education as it is currently comprised. We also offer the President of the MIT Graduate Student Council and the Dean for Graduate Education on graduate student involvement in international engagements (page 12); and "The Roadmap to the Future of MIT's Student Information System" (page 15).
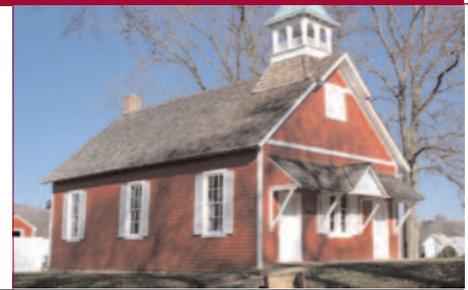
Little Red Schoolhouse

From The Faculty Chair
Reinventing and Sustaining the Faculty of the Future

Thomas A. Kochan

THE RECENTLY RELEASED REPORT on MIT Women in Science and Engineering celebrated the progress made since the original 1999 and 2002 reports, while cautioning that much work remains to be done. The progress is a tribute to the voice of faculty; in this case the MIT women faculty, who used data and personal experiences to call out inequities. It's also a tribute to the good sense of MIT's leaders who accepted responsibility for the problems and took actions to address them.

I open this column on this note not just to congratulate the community for its good work, but also to suggest that perhaps we should use this example to take a hard look at the future of our profession itself. I worry that some features of the faculty role are perhaps no longer well suited to recruiting and retaining the best

The Contributions of Institutions Such As MIT to a Knowledge-Based Economy

L. Rafael Reif

AN ARTICLE IN THE January/February 2011 *Faculty Newsletter* introduced MIT's approach to international engagement. The article pointed out, among other things, that it is important that all collaborating institutions benefit significantly from the engagement. It also recognized that much of the international interest in institutions such as MIT is driven by the desire to understand MIT's culture of innovation and of successfully transferring innovative research results to industry, since the latter benefits the national economy and, by extension, society at large.

The ongoing domestic debate regarding our national budget, in particular the debate about what constitutes a *cost* that potentially could be reduced, in contrast to an *investment* in the future that should be protected, provides us with an oppor-

Editorial
Protecting Education in America

THE DOMESTIC NEWS IS FILLED with accounts of the Tea Party efforts in Wisconsin, Ohio, Indiana, and Florida to cut public investment in public services, often with a focus on K-12 public education. In the U.S. Congress, the same political forces are proposing severe cuts in the budgets of the National Science Foundation, National Institutes of Health, Department of Energy, Department of Education, and other federal agencies.

These cuts will have significant negative effects not only on university-based research, but also on the fabric of higher education in the U.S. The initial impact will be borne by reduced support for graduate students and for junior faculty, including our own students and colleagues. This will, of course, lower innovation in many areas of science and technology, and slow economic recovery.

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Protecting Education in America
continued from page 1

Almost certainly the laying off of teachers and reducing investment in K-12 education in Wisconsin, Ohio, Florida, and other states will result in a reduction of high school graduates with a quality education. This will certainly be followed by efforts to reduce public investment in community colleges, state colleges, and state universities. One wing of the Tea Party forces will argue that since there are fewer high school graduates that can benefit from a college education, there is less need for institutions of higher education. The other wing will argue that a sector of higher education should be privatized and left to for-profit colleges who can provide education more "efficiently." Across the nation, the broader social impact of lowering the wages of public sector workers will be to lower the standard of living of a significant sector of the middle class in the U.S., and reduce the prospects of those living at the bottom to move up.

Though we may be temporarily insulated, it would be a deep error for MIT faculty to think of ourselves as outside of the struggles going on in Wisconsin and in Washington. If public higher education in the U.S. is pushed back, all of us in higher education are at increased risk. If we sit back and let our public school system be undermined, we undermine the foundation of higher education in the nation – whether public or private.

Since MIT has no school or department of education, we lack a regular forum for discussion of general aspects of education in the U.S. As one small step to increase our ability to assess the impact of these events, the *Faculty Newsletter* will be holding a series of forums in the fall on the general subjects of Higher Education in the U.S. and on K-12 STEM (Science, Technology, Engineering, and Mathematics) Education in the U.S.

In the meantime, we urge those of you who sit on Education or Public Policy Committees of your professional societies to press for an active response in defense

As a contribution to the MIT150 commemorations, the *MIT Faculty Newsletter*, the Technology and Culture Forum, the Program in Science, Technology, and Society, and the Department of Physics have organized a symposium [Wednesday, May 4, 4-6 pm] to honor and review this part of MIT history, and to focus on today's no less urgent need to prevent nuclear war – the ultimate disaster for the Earth.

of continuing public investment in higher education in general, in addition to the R&D component. One easy step is to make sure that forums on these issues are included in the programs of societies' national and regional conferences. Both the National Education Association and the American Federation of Teachers will provide speakers addressing the issues.

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Putting the Genie Back in the Bottle: MIT Faculty and Nuclear Arms Reduction

AFTER THE MANHATTAN PROJECT and the bombing of Hiroshima and Nagasaki, the Cold War resulted in an enormous proliferation and deployment of nuclear weapons by the U.S., the U.S.S.R., and their spread to other nations. In parallel, a robust movement against the development and testing of nuclear weapons also developed. Starting in 1945, many Manhattan Project alumni were active participants in the effort to make sure that these weapons would never be used again, and to warn the general public about their dangers. At MIT, this included Phil Morrison, Victor Weisskopf, Bernard Feld, Cyril Stanley Smith, and others. As the years went on and the problem only got larger, many

more joined in. At MIT there were Henry Kendall, Salvador Luria, Jerome Wiesner, Kosta Tsipis, George Rathjens, Vera Kistiakowski, Aron Bernstein, Jonathan King, and others among the faculty, as well as many staff, students, and postdocs.

On March 4, 1968 a day of protest about the development of multi-warhead missiles (MIRV) was held at the Institute. This event initiated a worldwide movement and led to the formation of the Union of Concerned Scientists, later led by Henry Kendall. [See *www.ucsusa.org/about/founding-document-1968.html* for the "Founding Document: 1968 MIT Faculty Statement."] The MIT campus aspects of this concern were aided by the Technology and Culture Forum.

As a contribution to the MIT150 commemorations, the *MIT Faculty Newsletter*, the Technology and Culture Forum, the Program in Science, Technology, and Society, and the Department of Physics have organized a symposium [Wednesday, May 4, 4-6 pm] to honor and review this part of MIT history, and to focus on today's no less urgent need to prevent nuclear war – the ultimate disaster for the Earth. The current urgent concerns include nuclear reactor accidents, nuclear weapons proliferation, and to continue and accelerate the global reduction and eventual elimination of nuclear arsenals. ∎

Editorial Subcommittee

and brightest talent needed to keep MIT and our peer institutions the beacons of innovation that the nation and the world need and will be willing to support.

The standard image of the faculty career is a lockstep sequence of movement from assistant to associate professor to tenure in eight or so years, followed by promotion to full professor several years later, and then a long sequence of teaching and research to retirement. That model no longer captures what most faculty do. Research careers are incubated or aborted earlier and end later in life than in the past. Interests change, knowledge grows, and disciplines evolve faster than many faculty can keep up with over the full course of their careers. Most faculty spouses or partners are highly educated and employed professionals, so career choices and patterns are dual not singular decisions. Teaching technologies are changing in ways that are altering who, when, and how we teach. Retirement at the "normal" age is becoming an oxymoron.

Moreover, I believe societal forces will pose increasing challenges to the business model that supports traditional lock-step careers. Witness the current attacks on pensions, benefits, and tenure of elementary and secondary schoolteachers. Do we really believe universities will be left unscathed? Universities that fail to adapt to both the changing labor market and to increased scrutiny from families and taxpayers that buy their services may find the best and the brightest choosing other careers, and parents and students turning to less costly educational alternatives.

An alternative conception would be to take a life cycle model to our careers, one that better integrates professional work, personal, family, and community activities and that is punctuated periodically with time taken to renew our knowledge, develop new skills, and reallocate use of our time. Consider the following stages in the life cycle model depicted in the figure on the next page.

Pipeline

Last year's report on Faculty Race and Diversity highlighted the need to reach out and expand the pipeline of young talented people motivated to pursue an academic career. This is essential to our efforts to attract more underrepresented minorities to MIT and to our peer institutions. MIT has a number of outreach programs on campus such as the Laureates and Leaders Program and many individual faculty members mentor undergraduates through UROPs and other research projects. Many of us have made appearances in local elementary and high schools to share our work and to motivate students to explore exciting issues in our fields. Some faculty have brought students who have surpassed what their high schools can offer into their labs, and served as mentors and showed these high potentials the excitement that comes from working on the frontiers of scientific discovery and problem solving. The wonders of online tools now make it more and more possible to bring university lectures and modular teaching into high school classes, thereby making for a smoother transition from high school to college.

All of these efforts need to become more integral parts of our professional responsibilities and careers. I will come back to this point when I discuss the renewal stage of the life cycle model below since it represents an opportunity to bring the university level expertise, mentoring, and teaching into our high schools, something that can only benefit our national education reform agenda as well as incubate the next generation faculty talent pool.

Early Career

We now lose too many talented young people, and especially talented young

women, to alternative careers, because academia has not adequately changed and invested to address the work and family challenges of young faculty. The updated Women in Science and Engineering reports both note the progress MIT has made on this front in the last decade with expanded day care facilities, tenure clock

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extensions, and time off for child care. But as the reports note, these are just first steps. More child care support, either on campus or through specialized high quality child care providers, remains a top priority for young faculty women and men and for those involved in recruiting them. I would venture a guess that in the next decade universities competing for the best talent will be in a race to the top to see which institutions can offer the best opportunities for starting a career and nurturing a family. MIT will need to continue to invest resources to address this labor market imperative.

Reducing the loss of talent in the early career stages will require taking a hard look at that limbo role we call post-docs. Post-doc time is lengthening in science and post-docs are beginning to become more common in engineering disciplines and departments. A naïve question might be: Are these really necessary developmental and screening opportunities or a source of relatively cheap apprentice labor? We ignore these trends at our own peril. Watch for increased unrest and/or pressures from post-docs to improve their lives and shorten their time in this role.

Mid Career

The need for lifelong learning is becoming more important for all occupations, including faculty. Faculty members need time and resources to retool their skills as knowledge advances in their chosen fields

of study and/or as their interests expand or their careers carry them into new or allied areas of research, teaching, and professional service. Sabbaticals are the traditional means for meeting this need but they too come in lockstep seven-year, semester-long increments. Many of our faculty already go well beyond standard sabbaticals by taking time off to start businesses or work in industry or government. Some faculty spend time at other research or teaching institutions to be with spouses and families spread across the globe. The growing number of international partnerships are taking faculty to sister institutions. As we expand our role in mid career or executive education, more varied forms of teaching will be expected of faculty. The growing power of online learning technologies will mean that the best of our faculty will be teaching not just traditional MIT students on campus but their "classrooms" will have a global reach. Another prediction: If we don't adapt our careers to reach out in these ways, our competitors (peers and other online teaching mills) will. Each of these departures from the standard career model illustrates the need for investment in mid-career retooling, and will continue to grow.

Renewal

Retirement is indeed becoming an oxymoron. Most of us are healthy enough and want to find ways to continue engaging in interesting and constructive professional activities and maintain a link to MIT well beyond the previously presumed retirement age. But we also want to make room to renew MIT with new recruits. The standard model of buying out faculty with small financial incentives wastes money and doesn't address the real interests of most faculty. We need to better fund and support a new model of faculty renewal in which faculty transition from full-time teaching and research to a phased process of doing professionally rewarding work, perhaps in part at MIT and in part by putting their talents, wisdom, and experience to work in our communities, schools, private enterprises, and non-profit institutions. Imagine, for example, the contributions our senior colleagues would make if we encouraged and supported them in teaching and mentoring the young people we want to bring into the academic pipeline! That is just one example of how we can put our human capital to work as we gradually wind down our roles at the Institute.

These days I spend a good portion of my waking hours encouraging teachers and school district leaders to not just defend themselves against their critics and attackers but to be proactive in renewing the way they educate students, govern their schools, and reinvent the teaching profession. We should do no less. Now is our moment to get ahead of the curve by investing the resources and implementing the innovations needed to keep our profession sufficiently strong, respected, and rewarding to attract and retain the best and brightest talent and to retain the support of those who pay for our services. ◼

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Creating, Sustaining, and Renewing the Faculty of the Future: A Full Life-Cycle Approach
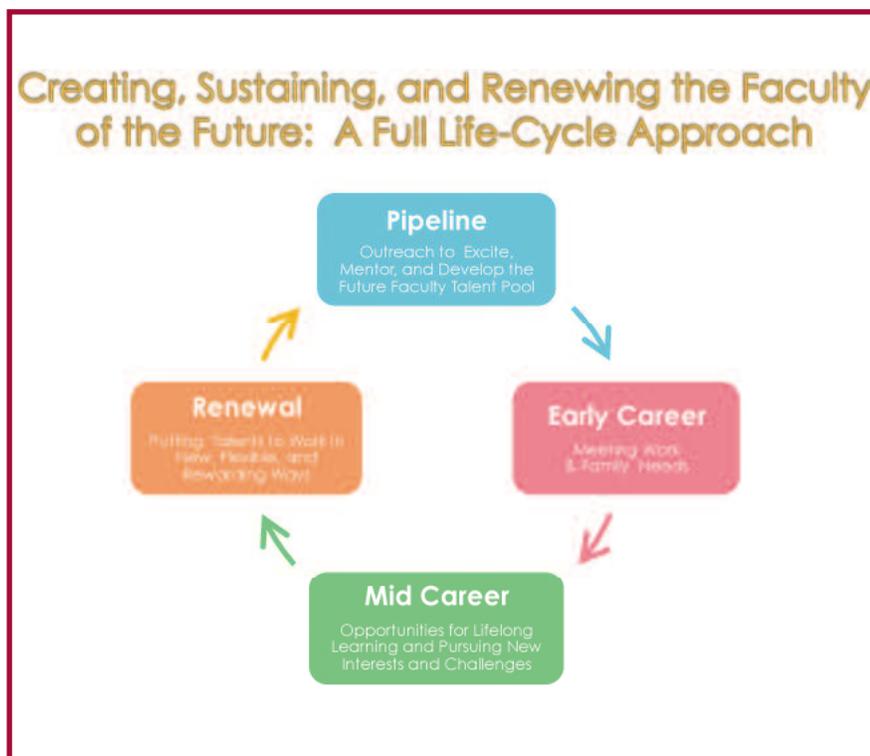
tunity to remind ourselves (and, hopefully, others in the U.S.) of the ways in which institutions such as MIT contribute to the well-being of our nation. In fact, MIT's mission statement refers to the advancement of knowledge and the education of students in ways that *"will best serve the nation"* as well as the world, and it is important to reflect periodically on how well we are living up to that part of our mission. International interest in MIT innovation can remind us of how our own nation is served by the advancement of knowledge and the education of students taking place at institutions such as MIT.

There are, of course, many ways in which an educational institution such as MIT contributes to the development of individuals and society. The purpose of this article is to focus on its value from the point of view of educating students – the human capital – who contribute to society through knowledge creation and applications and, more specifically still, on its value to a knowledge-based, domestic economy. Much of the content of this article aims to describe the MIT model for achieving these goals, and therefore will likely be familiar to our faculty, who live our mission statement in their daily activities, and hence are at the forefront of knowledge creation, dissemination, and application.

I. Premise
Nations that lead in innovation typically share at least the following three assets:

• *Human capital,*

• *Educational and research institutions where knowledge is taught, created, preserved, and used to solve important problems, and*

• *A society that develops its human capital and supports its educational and research institutions, that incentivizes the creation of knowledge and competitive products*

that benefit society, that embraces and practices meritocracy, that encourages the free flow of ideas and talents, and that protects intellectual property.

It is important to acknowledge that these assets are necessary, but not sufficient, for success in the knowledge economy. For example, a reliable infrastructure, the rule of law, and access to financial capital are absolutely essential as well. This article will focus only on the three noted above.

II. Human capital
In order to play a leading role in innovation, a nation needs a significant pool of well-educated and highly creative individuals within its population. This could be partially achieved by attracting talented individuals willing to cross national boundaries for better opportunities. However, in order to truly succeed and remain successful in the ever-changing knowledge economy, a nation needs to invest continuously in its human capital. It can do so by educating and preparing its youth to compete in the knowledge-based economy. It can do so by refreshing what they are taught, and innovating how they are taught. In the process, students develop the self-confidence that comes with learning, and they themselves learn to innovate, to create, to compete, to be entrepreneurial, to take risks, to persevere, to strive for excellence, and to be unafraid of failure. In this way, a nation's human capital is continuously renewed.

III. Educational and research institutions
The importance of educational and research institutions where knowledge is taught, created, preserved, and used to solve important problems may seem obvious. But to succeed in the innovation

economy, a nation needs institutions that deliberately prepare its young people to compete in the global marketplace of ideas, knowledge, and products – and to compete not only against local talent but

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against talent from all over the world. If a nation wants to succeed in the knowledge economy, its educational institutions need to provide their students with the skills and self-confidence to think in creative and innovative ways.

MIT is an example of an academic institution where knowledge is taught, created, preserved, and used to solve important problems. It does so by means of the following five interrelated principles and approaches that have evolved over the years and that are intrinsic to the fabric of the Institute.

First: Interdepartmental/interdisciplinary research units. MIT has approximately 30 academic departments, which hire virtually all of MIT faculty. These departments also organize and carry out undergraduate and graduate teaching programs, and award degrees in their disciplines. A defining aspect of MIT's approach is that we also have approximately 50 interdepartmental research units (e.g., laboratories, centers, institutes, initiatives). These units cut across departmental boundaries and focus on broad research themes (e.g., microsystems), or on a specific research mission (e.g., energy, cancer). Working across disciplinary boundaries, these interdepartmental research units make it possible for interested MIT faculty, students, and staff to work collaboratively on the solutions of difficult and important challenges by applying a variety of tools and perspectives.

Second: MIT integrates education and research. Research is in the DNA of MIT, and almost everyone at the Institute is involved in it. MIT believes that teaching and research must go hand in hand, and that they make each other stronger.

As with other private U.S. universities, at MIT the funding for the teaching and learning component of our academic enterprise comes mainly from tuition revenues, support from investments, and gifts. These funding sources represent a significant fraction of MIT's annual revenues.

On the other hand, funding for research is typically obtained by, and awarded to, an individual professor or groups of professors. This funding comes primarily from research sponsors such as the U.S. Federal Government, industry, private foundations, and foreign governments. Altogether, MIT received ~$600M in research funding last year (Fiscal Year 2010), an average of ~$600,000/year per faculty member. The quality of the education that MIT provides depends heavily on this research support. Without it, our ability to integrate research so closely with teaching and learning would not be possible.

Third: MIT pursues – and values – the most abstract, curiosity-driven, fundamental research, and the most applied, market-oriented innovations. At MIT, our faculty members pursue fundamental, curiosity-driven research and, at the same time, use knowledge to solve important problems. In fact, long-term fundamental research provides the foundations for knowledge advancement that in turn often finds application to real-world problems. MIT benefits immensely from the strengths and accomplishments in research and education of faculty, students, and staff from our five Schools. While the Schools and departments provide rigorous depth of knowledge in their fundamental and applied disciplines, the interdepartmental research units serve to interconnect the different disciplines. This interlocked education and research infrastructure sustains an academic institution that is simultaneously deep and broad, fundamental and applied.

Fourth: MIT interacts with industry. Of MIT's roughly $600M in annual research volume, about 70% comes from the U.S. Federal Government, about 15% comes

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from industry, and the remaining 15% comes from foundations and foreign governments. Research funded by the U.S. Federal Government typically supports the creation of knowledge and the solution of problems *regardless* of whether the research results might benefit an existing industry sector, or create a new market or industry sector. This fundamental and enabling support of our research activities greatly benefits society through the creation of knowledge *and* the education of students. In fact, long-term government funding of research is a great example of a nation's investment in its own future.

Industrial funding plays a different, yet extremely important, role. By and large, industry tends to sponsor research that creates new knowledge or solves important problems *in the industry sector of the sponsor*. The value to our research enterprise of interacting with industry extends far beyond the funding itself. Working with industry exposes us to real-world problems and allows us to work on realistic and practical, but still long-term, challenges. It has the added benefit of accelerating the transfer of knowledge gained at MIT into the marketplace.

Another way in which MIT interacts with industry is via our **Industrial Liaison Program** (**ILP**). The ILP works closely with nearly 200 member companies, matching their needs with the expertise of our faculty. A significant fraction of the ILP matchmaking efforts leads to either industrial research funding for faculty on campus, enrollment in executive or other educational offerings, and/or other forms

of mutually beneficial engagements. Yet another channel to industry is through our **Technology Licensing Office** (**TLO**), which manages the process of transferring

technology from MIT to the commercial sector. This office typically negotiates ~90 technology licenses every year, and helps create about 15-20 start-up companies annually. Research funding, ILP, and TLO are just a few examples of MIT's interactions with the industrial sector.

Technology transfer also occurs naturally when students graduate and join the marketplace. In fact, the largest form of technology and knowledge transfer has always been and will always be the education of students who carry new ideas with them into industry. For example, close to 26,000 currently active companies have been founded by MIT alumni, which together generate annual revenues of $2 trillion and employ about 3.3 million people (from *Entrepreneurial Impact: The Role of MIT*, E.B. Roberts and C. Eesley, Kauffman Foundation, February 2009). The continuous flow of international scholarly publications is also a major contributor to knowledge and technology transfer.

Fifth: MIT is an institution driven by a mission of service. MIT's history is rooted in a tradition of research efforts that result in practical benefits for society. MIT researchers address challenges with an underlying motivation to serve society by reaching solutions that improve our long-term quality of life.

Service includes, among many examples, additions to the pool of practical knowledge. For example, MIT is typically awarded over 160 patents annually, each

Contributions of Institutions Such as MIT
Reif, from preceding page

one representing an innovation produced by MIT faculty, staff, and/or students motivated to create the knowledge that will impact society. Patented technology licensed for development sometimes achieves financial success, contributing to general economic growth and job creation.

In summary, educational and research institutions educate and develop our human capital, create new knowledge and apply that knowledge to solve important societal problems. At their best, these vital institutions develop the innovators and the innovations that fuel a knowledge-based economy. Investing in them is investing in our future.

IV. A society that develops its human capital and supports its educational and research institutions, that incentivizes the creation of knowledge and competitive products that benefit society, that embraces and practices meritocracy, that encourages the free flow of ideas and talents, and that protects intellectual property.

How does an innovative society support and develop its human capital? First, by offering rigorous and accessible pre-college education. Second, by offering rigorous and accessible college education. Third, by offering a vibrant domestic technology job market that absorbs the flow of college graduates and that keeps them engaged and productive. And fourth, by embracing meritocracy, so that *fair competition based on merit* is encouraged, practiced, and respected. In such a society, an institution such as MIT is only one piece of a large, complex system of education and research that challenges students to do their best, to seek to be challenged, and to compete with other talented students. In a competitive society, many of the brightest minds end up pursuing college and advanced degrees at places such as MIT, where they are exposed to a rigorous and demanding education that actively

encourages them to innovate, to take risks, and to be unafraid of failure.

Like other U.S. universities, MIT practices meritocracy. Meritocracy, in its simplest definition, means competition based

on merit – that the best ideas prevail, no matter to whom they belong, and that the most talented and capable people succeed, regardless of their background. For example, for undergraduates, MIT practices need-blind admissions and need-based financial aid, which means that students are admitted to MIT based on merit, regardless of their ability to pay, and are offered financial aid packages according to individual need that allows them to attend MIT. Meritocracy also means that we want the best of the best at MIT, regardless of where they come from. Approximately 40 percent of MIT students pursuing graduate degrees were born outside the United States. Forty percent of our faculty members also were born outside the United States. In other words, even when there is significant and strong native human capital, it is vital to rely on broad *competition on the merits*, to yield the best talent. To practice meritocracy successfully, a society must accept and embrace merit and excellence as fundamental values, and as the primary criteria for individual advancement.

How does an innovative society support higher education and research that creates knowledge and solves important problems? Four forms of support are vital: First, a society must invest in its future through long-term, reliable, research funding. As mentioned earlier, MIT receives 70% of its research funding from the U.S. Federal Government via a competitive grant process. That continuous flow of funds over several decades has made institutions such as MIT powerful engines of innova-

tion and economic growth (see, for example, *Entrepreneurial Impact: The Role of MIT*, E.B. Roberts and C. Eesley). Second, funding must be earned through competitive mechanisms, such as peer

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reviews that let ideas compete for support, which is then given to the best ideas. Third, society must take a very long-term perspective, and support also fundamental, curiosity-driven, non-applied research, with the confidence that it will lead to unforeseeable technological innovations over the very long term. And fourth, a society needs a set of laws and policies that protect innovative ideas and encourage and reward the transition of ideas into products. In such a society, people in institutions such as MIT have the ability to think imaginatively, the confidence to think long term, the time to think deeply, and the encouragement to think practically.

What does "free flow of ideas and talents" mean? This means deliberately removing barriers that can exist within a given institution, between different institutions, between sectors like academia and industry, and even between nations. MIT collaborates regularly with industry, hospitals, government, and other universities, in the U.S. and abroad. Within MIT, talented people find or make their own connections and, if those are not within their academic discipline, they are able to connect through interdepartmental research units defined by common interests.

How does society protect intellectual property? It is not enough to grant patents and copyrights for inventions. An innovative society must have a reliable legal system so that patents and other intellectual property can be confidently transferred by contract from one party to another, and so that infringement can be prevented or compensated for.

V. Summary

As the United States faces increasing global competition for talent, ideas, and commerce, it is important to recognize some of the values that have contributed to make the United States a strong economic power:

1. Meritocracy. In people, ideas, inventions, and institutions – all competing on their merits: are they original, do they hold promise, do they change things for the better, and do they benefit society?

2. Openness and collaboration. Among and within institutions, disciplines, and sectors, so that people and ideas can flow to where they serve society best.

3. Long-term commitment. In funding, law, and policy; to talent, education, and research; so that innovators are encouraged to take risks, are rewarded if successful, and are not stigmatized if they fail.

These values, when embedded in a society rich in human capital, and embraced by institutions committed to excellence and to the creation, utilization, and dissemination of knowledge, fuel innovation, entrepreneurship, and progress. The United States and institutions such as MIT within the United States are great examples of what can be achieved by staying true to these values. ◼

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MIT 3rd in World University Rankings

MIT WAS RANKED THIRD in the recent World University Rankings 2010-2011 by the *Times Higher Education*. Harvard University was ranked first followed by the California Institute of Technology. The Institute was ranked second in the Engineering & Technology Universities category, again following CalTech.

Overall rankings were based on 13 separate performance indicators, combined in the following categories:

• Teaching – the learning environment (30% of overall score)
• Research – volume, income, and reputation (30%)
• Citations – research influence (32.5%)

• Industry Income – innovation (2.5%)
• International Mix – staff/students (5%)

This is the seventh year that the *Times* has provided these rankings, but they suggest a recent overhaul of the methodology "deliver[s] our most rigorous, transparent and reliable rankings tables ever." ◼

Top 10 World Universities 2010–2011

University	Score
1 Harvard University	96.1
2 California Institute of Technology	96.0
3 Massachusetts Institute of Technology	95.6
4 Stanford University	94.3
5 Princeton University	94.2
6 University of Oxford	91.2
6 University of Cambridge	91.2
8 University of California Berkeley	91.1
9 Imperial College of London	90.6
10 Yale University	89.5
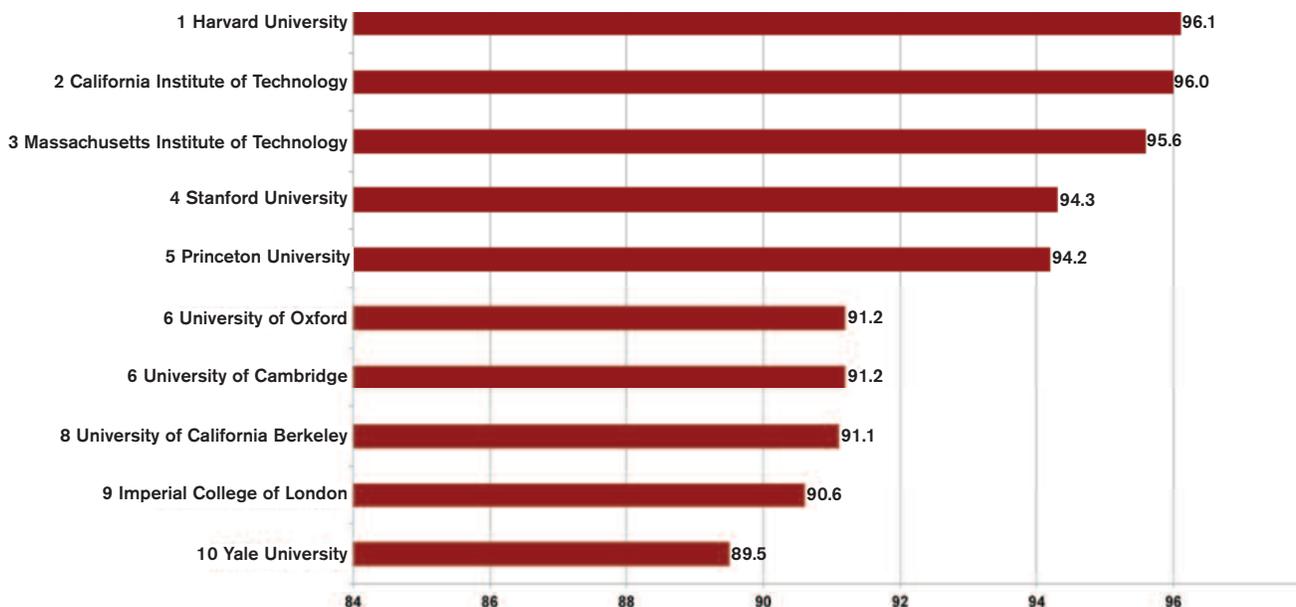
Departmental Discussions of Diversity and Inclusion

Edmund Bertschinger

THE MIT DEPARTMENT OF PHYSICS is committed to increasing the diversity of its faculty and student populations to improve our excellence and to better serve the society that supports our work. This mission statement appears on our departmental Website (*web.mit.edu/physics*); as Department Head, I promote it to the faculty. It is consistent with MIT's own mission statement, which refers to "a diverse campus community" and says, "We seek to develop in each member of the MIT community the ability and passion to work wisely, creatively, and effectively for the betterment of humankind." Mission statements encapsulate our institutional core values and provide a compass for navigating change. By themselves, however, such statements accomplish little. Accomplishing the mission requires a strategy and its implementation.

This article discusses one element of our strategy to improve diversity and inclusion at the department level: monthly facilitated discussions at a catered luncheon. Faculty, staff (administrative, support, and research scientists), postdocs, and graduate students are invited. Each month, between 15 and 25 people attend and many are repeat visitors. The model is easily copied and I encourage other departments, labs, centers, and institutes at MIT to do so.

I began this luncheon series one year ago with three purposes in mind: to build and support the community interested in improving diversity and inclusion in my department, to share with my colleagues information about diversity and inclusion that would help them in their work, and to recharge myself and others leading change. All three goals have been met. Attendees regularly tell me how much they enjoy and look forward to these lunchtime discussions.

As MIT faculty we are generally not trained in discussing topics like racial climate, gender inequity, implicit bias, and work-life balance, yet they surround us. How does one begin a luncheon series focusing on such issues? In our case, we did so with small group discussions of what diversity and inclusion means to each member of the community. This method takes advantage of the distributed intelligence at MIT and helps us see a more personal side of each other. At the first luncheon, after briefly welcoming attendees and discussing the purpose of the lunches, I encouraged respectful conversation within tables of six-to-eight people, during which time everyone had a chance to speak. Afterwards, faculty members told me it was the first time they had heard about the background and experiences of some graduate students whom they had taught, while staff members told me they appreciated hearing about the work-life balance concerns of some of our (mostly male) young faculty. The group – richly diverse and balanced by age, race, gender, student or employee status, and perceived power – wanted more.

At the outset I was unsure about how to select topics for discussion and how much of my role could be delegated. Both concerns evaporated quickly. In the following I will summarize several of the monthly topics of broad interest.

After leading two lunches, I had no difficulty getting volunteers to facilitate subsequent discussions and even to gather or prepare background materials for the group. I request each participant to do a small amount of reading or reflection before each luncheon. This preparation helps focus the discussions and gives the attendees resources they can share with others.

The luncheon that attracted the most faculty members to date was devoted to the *Report on the Initiative for Faculty Race and Diversity* that was released in January 2010. Faculty members were interested in learning about the report's conclusions and how the report's recommendations would be implemented by MIT. Parallel discussions were taking place at the level of the School deans, so this discussion was timely. Everyone was concerned that underrepresented minority faculty members were being promoted with lower probability overall than majority faculty, and there was discussion about the tension at MIT around the concepts of diversity and inclusion versus excellence.

> As MIT faculty we are generally not trained in discussing topics like racial climate, gender inequity, implicit bias, and work-life balance, yet they surround us. How does one begin a luncheon series focusing on such issues?

Not all faculty members agree that MIT has yet to achieve the ideal of a meritocracy and that further improvements are needed to achieve the excellence we proclaim. Senior faculty members sometimes forget how unforgiving and even cold the system can be for junior faculty, and sometimes they assume that because it worked for them, change is not needed. Listening to junior faculty – and to the staff and students who see their occasional distress – is a good way to broaden one's perspective.

At another luncheon we discussed implicit bias, a topic that most faculty members might understandably prefer to avoid. Fortunately, academic psychologists Tony Greenwald and Mahzarin Banaji have made it fun and easy to reveal hidden bias by creating an Implicit Association Test that is available online at *implicit.harvard.edu.* Play it like a short video game and you will discover how hard it is to prevent implicit bias – whether about obesity, wealth, politics, gender, or many other topics – from affecting your judgment. Having attendees take the test before coming to lunch prepared the group well for discussion and for understanding why implicit bias is a concern in faculty search procedures and letters of recommendation.

Two lunches so far have been devoted to the subject of work-life balance. This is one of the most important concerns at MIT, and those who attended the discussions were thoroughly engaged. In the first, staff members presented research on the challenges faced by working couples and told their own stories. The discussion that followed was animated and eye opening for graduate students. In the second luncheon, staff and junior faculty shared tips on how to balance time, which were distributed in a handout to attendees. One measure of change is that the majority of junior faculty members in my department now have children, something unthinkable in my day. In most cases both partners work. Family and parental leave, access to affordable quality day care, and family-friendly policies are essential for universities wanting to

recruit and advance the best faculty. However, we must not forget that the same concerns are held by staff, postdocs, and graduate students. I believe that MIT can and should do more, especially with regards to childcare.

For me, the most valuable luncheon was one that broached the topic of race relations by viewing and discussion of segments of the Intuitively Obvious videos produced in the 1990s by the Committee on Campus Race Relations. These videos are available at *diversity.mit.edu/videos.* I strongly encourage all faculty to view them, especially video 5. Although campus race rela-

(An ironic exception is the male faculty member who gives equal time to childcare.) This lunchtime discussion scratched the surface of MIT social dynamics enough to reveal some gleaming insights.

MIT faculty members are very busy and they rightly cherish and protect time for research and professional activities. Why then should they create and attend such discussions? My experience says that by doing so they will help themselves and their group members to be more effective and happier in their work. Understanding implicit bias and the damaging effects of stereotypes helps us to make wiser deci-

> For me, the most valuable luncheon was one that broached the topic of race relations by viewing and discussion of segments of the Intuitively Obvious videos produced in the 1990s by the Committee on Campus Race Relations.

tions are a little better now than they were 15 years ago, the concerns remain and may be even more visible given the much higher percentage of black and Hispanic undergraduate students now than in the past. Some faculty members participating in this discussion recognized for the first time that their own efforts to help students could be interpreted very differently by students who face discrimination. A sympathetic remark like "It's okay to get a B" can be interpreted as "You don't think I'm capable of earning an A because of my race." If this seems unwarranted, note that most MIT students – and many faculty members – have at least occasional doubts that they belong among such brilliant peers.

Lunchtime participants were also struck by the problems students and others faced by being stereotyped. Whether they are Asian students who are not offered help because they are members of the "model minority" or women faculty members who are expected to have soft and sweet personalities, we damage others with stereotypes.

sions that ultimately provide a leadership advantage – they help us recruit a stronger faculty and to have more successful students. Discussing work-life balance with postdocs helps prepare the next generation of faculty members. Even those with aggressive personalities benefit from learning techniques to help their students overcome impostor syndrome and achieve their full potential. As President Hockfield recently noted in her cover letter to the 2011 *Report on the Status of Women Faculty in the Schools of Science and Engineering at MIT*, we must "reinforce the importance of our efforts to strengthen MIT's culture of inclusion, so that everyone at MIT can do his or her best work."

Community-building discussions centered within department-sized units are an excellent way to strengthen the culture of inclusion. I would be glad to discuss implementation issues with any unit interested in starting their own series. ■

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Practical Considerations for the Involvement of Graduate Students in MIT's International Engagements

Ulric J. Ferner
Christine Ortiz

THE TOPIC OF INTERNATIONAL engagements has been one of recent conversation throughout the MIT community, with discussions taking place on the opportunities, risks, principles, funding, and strategy for involvement [L. Rafael Reif, "MIT's Approach to International Engagement," *MIT Faculty Newsletter*, Vol. XXIII, No. 3, Jan./Feb. 2011]. Graduate students are involved in a broad array of international programs (see the table, page 14), and MIT receives large numbers of proposals from abroad involving graduate education, including many for dual and joint degree programs.

MIT is not unique in this arena. In 2007, a survey of graduate deans found that 29% of responding U.S. universities had graduate-level collaborative programs with international institutions of higher education and 56% of both the largest 10 and the largest 50 universities had at least one collaborative program [*Council of Graduate Schools (CGS) International Graduate Admissions Survey Phase II: Final Application and Initial Offers of Admissions, August 2007*]. Online education, distance-learning, and communication tools are greatly facilitating the development of such initiatives. Discussions of benefits, challenges, and best practices for international engagements involving graduate education have begun to emerge ["Degrees of Success," *International Educator*, May-June 2008; "Joint Degrees, Dual Degrees, and International Research Collaborations," *Council for Graduate Schools Report 2010*]. The MIT Global Council, in their 2009 report *Mens et Manus et Mundus: New Directions for Global Education and Research at MIT,* urged the Institute to make international studies a core part of the MIT education, and also to pursue new avenues for engagement of graduate students in international initiatives. Recommendations included building targeted fellowship support for graduate students engaging in research on global challenges, creating an international graduate resident tutor program, and expanding department-based initiatives such as the Electrical Engineering and Computer Science Course VI-A International Masters of Engineering Thesis Program [*via.mit.edu/*]. Given the increasing interest in this topic, here we discuss a number of factors to take into account when considering international programs and engagements involving graduate education.

Educational aspects

A recent report by the Council for Graduate Schools articulates the many educational benefits to graduate students for involvement in international programs, such as: enhanced research skills, expanded research networks, access to specialized equipment and expertise, exposure to different academic, pedagogical, and scientific styles, and increased career prospects ["Joint Degrees, Dual Degrees, and International Research Collaborations," *Council for Graduate Schools Report 2010*]. Such experiences can train students to become "globally-cognizant" scholars; those who have an appreciation of their discipline in a broader cultural and socio-economic context, who build a meaningful understanding of different regions of the world, and who construct deep local relationships that constitute a basis for lifelong interactions with other institutions, countries, and cultures. In addition, the added value of immersion in another culture often significantly benefits the personal development of the student, in particular self-confidence, leadership skills, working in multinational teams, and communication. At MIT, there has been much thought about providing substantive intellectual and educationally enriched international programs, which are much more than "academic tourism."

One critical area to consider is academic advising. In particular, open communication is needed between the student and advisor on how travel abroad fits in and complements the student's educational program and the formulation of a plan to ensure that the student's academic milestones and goals are met, so as not to increase time-to-degree (e.g., qualifying examinations, thesis proposals, thesis committee meetings, etc.). Understanding mutual work expectations is a key component of any advising relationship; clear milestones, timelines, and timely and detailed feedback are highly beneficial [Graduate Student Council, "The advisor-advisee relationship: Where we are, and where we are going," 2010 Report]. The Singapore-MIT Alliance [*web.mit.edu/sma/*] explored the use of distance-learning in graduate education and was able to create trans-pacific advising, research collaborations, and classroom discussions between graduate students and faculty at MIT and in Singapore. Advisors should also consider a graduate student's willingness to participate in and travel as part of an

international program, in particular for graduate students with families.

For programs that involve research, it should also be ensured that graduate students have appropriate access to necessary facilities and instrumentation abroad, as well as a rich intellectual environment to ensure a high quality educational experience, while not extending the time-to-degree. Additional areas to bear in mind include: maintaining admissions standards and processes, research ethics and responsible conduct of research, synergy of educational curricula and activities, program quality assurance and assessment, accurate accounting of costs and resources needed (e.g., space, faculty time, administration, etc.), sustainability, differences in graduate student funding models, and strategies for enrollment consistent with the educational goals of the program.

Graduate policies

For MIT graduate students involved in international programs and collaborations, the length of travel varies greatly, from a few weeks to an entire calendar year or more abroad. If the length of contemplated travel is equal to an academic semester or more, programs should ensure that the student's residency requirement is maintained [*web.mit.edu/admissions/graduate/requirements/degree_req.html*]. Residency requirements are consistent with the philosophy that MIT will grant MIT degrees for those who carry out their education at MIT in Cambridge, MA (02139).

There are two types of student status under which thesis research may be carried out while not in formal residence at the Institute. "Thesis Research in Absentia" is applicable to all graduate degrees and intended primarily for students who are on location away from MIT but who maintain in every other respect full access to and contact with the academic life of the Institute. This status is appropriate for trips of shorter duration than one semester. "Nonresident Doctoral Thesis Research Status" is available only to doctoral students who have completed all requirements other than the thesis and is

granted one semester at a time to students with limited access to the campus and MIT resources [*web.mit.edu/odge/gpp/degrees/thesis.html*]. The visiting student category can be used for students pursuing a graduate degree at universitiesabroad who have been invited by faculty in an MIT department or laboratory/center to do research [*https://web.mit.edu/iso/iso/visiting/visitor.shtml*].

Risk management

It is advisable for graduate programs and administrators to be aware of the itineraries, passport, and health insurance information of their graduate students traveling abroad. The Global Education Office [*web.mit.edu/geo/*] maintains the database MIT-Horizons, which captures such information for GEO study abroad programs, the MIT International Science and Technology Initiatives (MISTI), and travel through the Public Service Center (PSC). Additionally, students should inform themselves about their destination. General MIT travel policies can be found through the Office of the Vice President for Research [*vpf.mit.edu/site/travel/policies_procedures/mit_policies_procedures/mit_travel_policy2*]. The MIT Risk Acknowledgement form [*web.mit.edu/studyabroad/forms/riskform.pdf*] is required for travel with MIT-sponsored programs. One should also be aware of MIT's Travel Risk Policy [*informit.mit.edu/epr/3.1travel_risk.html*] regarding countries with travel warnings. Travelers should also obtain a membership card for the International SOS program [*https://vpf.mit.edu/site/insurance/policies_procedures/international_sos*], which provides 24-hour emergency medical and security evacuation services to MIT travelers. It should be noted, however, that these services are not a substitute for personal health insurance.

Immigration

All students, both domestic and international, should secure an educational visa from the embassy or consulate of the country they will visit. Visa regulations vary dramatically depending upon the

host country and the student's country of origin; there are no generic visa requirements that apply to all nationalities. International students must also contend with getting their U.S. immigration papers and status in order so that they can return to the U.S. and MIT in a timely fashion. This will invariably involve strategic planning in consultation with the International Students Office advising staff before departure [*web.mit.edu/ISO/*].

Once again, with U.S. immigration regulations, the difficulty of getting a renewed student visa to return is dependent upon country of nationality and field of study. International students who contemplate studying abroad have to be concerned about extended visa security clearances, which are more likely if they have been abroad during their MIT degree program. In addition, their ability to take advantage of pre- and post-completion employment benefits associated with their F-1 or J-1 student visa status upon return may be impacted. If an MIT international is out of the U.S. for more than five months, they will likely need to accumulate another academic year of study in residence in the U.S. before they will be eligible to apply for employment-based benefits such as CPT, OPT, or Academic Training.

Cultural acclimation

International programs may want to consider formal cultural training for students traveling abroad prior to departure. MISTI [*web.mit.edu/MISTI/*] has been a leader in this regard and includes extensive country-specific preparation sessions for each of the countries to which they send students. Topics include: safety, political and socioeconomic background and history, language, practical aspects such as in-country travel and cultural differences. These sessions are available to all MIT students.

Personal support, professional development, cohort building, and community

Graduate students at MIT are given access to and utilize a wide variety of support

Involvement of Graduate Students
Ferner and Ortiz, from preceding page

services including, for example; advising and counseling on academics and graduate policies and procedures (e.g., Office of the Dean for Graduate Education, departmental graduate administrators and chairs), personal and professional development (e.g., Graduate Student Council, MIT Career Development Center, etc.), medical emergencies, wellness and stress reduction (MIT Medical), mental health services (MIT Mental Health and Counseling), conflict resolution (Ombuds), immigration and visa issues (International Students Office) and family support (Center for Work, Family & Personal Life). In addition to an administrative coordinator at MIT and abroad, equivalent support to those services available on the MIT campus should be identified for graduate students. Lastly, cohort-building and graduate student community aspects should be considered as well.

Graduate student initiatives

MIT has a large international graduate population: 2356 graduate students or 38% of all enrolled graduate students (fall 2010) representing 97 countries [Office of the Provost, Institutional Research], as well as a growing number of international exchange and visiting students. The graduate student community actively participates in bringing international companies and universities to MIT through numerous events, such as the MIT Energy Conference [T. Zeller Jr., "Energy Geeks Converge on M.I.T.," *green.blogs.nytimes.com/2011/03/05/energy-geeks-converge-at-m-i-t/, Mar. 5, 2011*], the MIT 100K competition [*www.mit100k.org*], the MIT European Career Fair [*www.euro-career.com*], and the MIT Career Fair, all organized by students [*career-fair.mit.edu*]. MIT can provide support to such graduate student-organized initiatives, as well as coordination with laboratory, department, School, and Institute-wide activities.

Selected MIT Initiatives and Programs that Involve International Components and Graduate Students

Programs	Weblink
Center for Clean Water and Clean Energy at MIT and KFUPM (MIT's Department of Mechanical Engineering and King Fahd University of Petroleum and Minerals, Saudi Arabia)	*ccwce.mit.edu*
Center for International Studies (CIS)	*web.mit.edu/cis/index.html*
Department of Chemical Engineering Practice School Program	*web.mit.edu/cheme/academics/grad/mscep.html* *web.mit.edu/cheme/academics/grad/phdcep.html*
Department of Electrical Engineering and Computer Science Course VI-A International Masters of Engineering Thesis Program	*via.mit.edu*
Department of Urban Planning and Studies International Studies and Practica and SENSEable City Lab	*senseable.mit.edu*
MIT Community Innovators Lab (Co-Lab)	*web.mit.edu/colab*
MIT International Science and Technology Initiatives (MISTI)	*web.mit.edu/MISTI*
MIT Public Service Center	*web.mit.edu/mitpsc*
MIT Sloan Action Labs	*actionlearning.mit.edu*
MIT Zaragoza Master of Engineering in Logistics and Supply Chain Management (ZLOG)	*mastersupplychain.edu.es*
Singapore-MIT Alliance	*web.mit.edu/sma*
The Singapore-MIT Alliance for Research and Technology (SMART)	*smart.mit.edu/home.html*
Singapore University of Technology and Design (SUTD) Dual Masters	*www.sutd.edu.sg*
Sloan Fellows Program in Innovation and Global Leadership	*mitsloan.mit.edu/fellows*
Sloan Masters of Science in Management Studies	*mitsloan.mit.edu/academic/msms*

The Office of the Dean for Graduate Education (*odge@mit.edu*) and the Graduate Student Council (*gsc-president@mit.edu*) welcome feedback and are happy to provide advice and support on this topic. ■

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The Roadmap to the Future of MIT's Student Information System

Mary Callahan
Eamon Kearns

IN EARLY FALL, INFORMATION Services and Technology (IS&T), in partnership with the Offices of the Dean for Undergraduate Education (DUE), Graduate Education (ODGE), and Student Life (DSL), finalized the MIT Education Systems Roadmap, 2011-2014 (*web.mit.edu/itgc/EducationSystemsRoadMap.pdf*). The three-year Roadmap focuses on implementing high-impact projects that increase efficiency and improve the user experience within applications that make up MIT's Student Information Systems (SIS). This includes projects that address long-standing requests from faculty and students to transform outmoded paper processes into streamlined electronic processes. Initial projects include both online grading and online registration.

Following the Roadmap

The Roadmap follows a multi-year process in which IS&T and its business partners analyzed the current Student Information Systems, gathered ongoing and new user requirements, and considered solutions for enhancement or replacement. Based on a review of the findings and an assessment of the proposed options, it was determined that the best way to move the systems forward was through incremental improvements and stabilization rather than a wholesale replacement.

Advantages to this incremental approach include:

- Increases MIT's ability to accommodate new and diverse business requirements

- Allows MIT to focus on high-impact, customer-facing functionality that enhances the user experience

- Enables incremental stabilization of the technical infrastructure

- Assures long-term sustainability

The Roadmap follows a multi-year process in which IS&T and its business partners analyzed the current Student Information Systems, gathered ongoing and new user requirements, and considered solutions for enhancement or replacement. Based on a review of the findings and an assessment of the proposed options, it was determined that the best way to move the systems forward was through incremental improvements and stabilization rather than a wholesale replacement.

The Education Systems Roadmap picks up on the incremental direction and moves aggressively towards our goals to modernize the systems. To enable this progress, MIT doubled our annual development investment amount in the student systems from FY10 to FY11.

The Education Systems Roadmap focuses on five equally important strategic priorities:

Digitization to create efficiencies in business process by replacing paper with online self service and workflow review. This will modernize and streamline business processes to meet community expectations.

Enrich Advising Support through meaningful communications, curriculum planning tools, and context sensitive help. This will allow advisors to spend better-focused time discussing academic, personal, and career issues with students; and provide timely information to students so they are better able to steward their academic and financial records.

Seamless User Experiences by providing a consistent, coherent, unified view between and among processes and to information. This will streamline work, provide system integration efficiencies, and support a consistent user experience.

Technical Stabilization by providing standard structure and components for new and replacement software being developed by Student Information Systems that will enable a foundation for system sustainability; developing roadmaps to incrementally replace obsolete system components to reduce technology risk and support sustainability; and providing ongoing operational support for SIS.

The Roadmap to the Future
Callahan and Kearns, from preceding page

Fulfill Mandated Changes by responding appropriately to address government or faculty mandated changes.

Current Projects
Based on the Roadmap timeline, development has begun on projects and applications that reflect these priorities. The core project team, with representation from the Registrar's Office and IS&T, is utilizing the expertise of the Faculty Working Group in developing these applications. Faculty members involved include Adam Albright, Bob Berwick, John Essigmann, Steve Graves, Eric Klopfer, Paul Lagace, Haynes Miller, and Bob Redwine. An update of current projects is outlined below.

Online Grading
This application will allow faculty to submit end-of-term grades, grade changes, completion of incomplete/outstanding grades, and other final grades via a Web interface. An initial pilot was launched in IAP '11, with an expanded pilot planned for spring '11.

Online Registration
The goal of the project is to improve registration for students and faculty by augmenting our current registration process (such as requiring face-to-face advising)

with intelligent messaging, digital signatures, and electronic submission. A team is currently developing a digitized version of the paper registration form. The digitized form is due to be piloted and implemented in the 2011-2012 academic year.

Enhanced Advising Tools
Subsequent to the Online Registration project, academic advising will be explored in greater depth to determine if/how technology can be utilized to enhance the current advising process.

Student and Classroom Scheduling System Replacement
MIT's current scheduling system is older and needs to be replaced. Planning for the new solution is currently underway with the implementation phase of the project targeted for FY12.

Oracle Forms Replacement
Oracle Forms is a product that is reaching end-of-life and needs to be removed from the student system. This is a major technical stabilization effort that will span over a number of years.

Online Registration
The goal of the project is to improve registration for students and faculty by augmenting our current registration process (such as requiring face-to-face advising) with intelligent messaging, digital signatures, and electronic submission.

The Education Systems Roadmap provides the foundation necessary to strategically enhance education systems that support faculty, students, alumni, and administrators throughout MIT.

Please see related article: "Student Systems – A Vision for the Future," *MIT Faculty Newsletter*, Vol. XX No. 1 [*web.mit.edu/fnl/volume/201/ssv.html*.] ■

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Eamon Kearns is Associate Director, Education Systems in Information Services & Technology *(ekearns@mit.edu).*

Free Market Apocalypse: Safeguarding the World from Large Disasters

Ernst G. Frankel

WHILE FREE MARKET ECONOMIES thrive and basic capitalism works well, it does require effective regulation to police or curtail corruption, self-serving, and harm to people and society. Recent major calamities such as the BP Gulf of Mexico oil spill, the northern Japan nuclear reactor problems, and others show that we must limit the role of private enterprise in managing major disasters that may harm society, public interests, and the world at large. Common interests and safety are too often in conflict with interests of private business.

Profit and asset value maximization are often in direct conflict with public interest and safety, as noted most recently in the BP Horizon oil spill and the northern Japan earthquake- and tsunami-triggered nuclear reactor disaster. In both cases, government agencies deferred to the owners to correct faults, assure safety, and – even after failure – left the owners with the responsibility to correct the problems and ameliorate the consequences. The respective governments apparently assumed that the owners/investors would want to do their best and have public safety and interest foremost in mind. Yet in both cases, the public was greatly disappointed as owners put their financial and liability interests first and dealt with the problems in a way that would minimize their own potential costs and exposure.

In these cases, as well as other similar accidents or disasters, potential threats were forewarned long before the respective accidents, yet little or no corrective actions were taken. These and other physical disasters follow a hierarchy of financial or economic disasters, such as the sub-prime mortgages, student loan fraud, and various other financial or financing schemes which not only brought the U.S. but much of the world's economies to their knees. Most were triggered by greed, lack of regulation and oversight, outright corruption or political self-interests, and self-serving objectives.

For example, BP refused to collect the bulk of the oil spilled out at the site and instead preferred to hide it by sinking it below the surface through use of millions of gallons of poisonous dispersants, though much of the spilled oil still ended up on beaches or in coastal power plant cooling systems. The surplus oil continues to exist as a huge oil and dispersant subsurface and poisonous cloud which is expected to kill and harm sea life for decades to come.

The owners of the Japanese nuclear power plants acted similarly, and instead of immediately taking dramatic affirmative action to seal off and insulate the damaged power plants by encapsulating them under a heap of sand and concrete and burying them for good under an insulating mound of dense material – which would have ameliorated the spread of radioactivity and let it cool over many years – they tried various halfway measures designed to reduce radiation and dangers of explosions, without developing a long-range plan or solution. So far all the work has consisted of stopgap measures, which generally only exposed other problems.

> Profit and asset value maximization are often in direct conflict with public interest and safety, as noted most recently in the BP Horizon oil spill and the northern Japan earthquake- and tsunami-triggered nuclear reactor disaster. In both cases, government agencies deferred to the owners to correct faults, assure safety, and − even after failure − left the owners with the responsibility to correct the problems and ameliorate the consequences.

In order to rectify these continuing unacceptable actions, there is an urgent need for the establishment of a super national disaster management agency with authority to take drastic measures to protect humankind and the planet, rather than narrow financial and nationalistic interests. Most importantly, unbiased academic experts should always be consulted, and perhaps even a global council of academic experts should be created to advise the disaster response authority in developing and imposing safeguards and solutions which are truly in the interests of humankind and the future of the world. Large-scale disasters (natural or manmade) increasingly negatively affect humankind and the world at large, and cannot be assigned to or managed by local, often biased, authorities. ■

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About DSpace@MIT

Ann Wolpert

DSPACE@MIT IS AN INNOVATION of the MIT Libraries that was launched in 2002 to address the growing challenge of collecting, preserving, and distributing MIT's scholarly content in various digital formats. The digital repository was created in the spirit of the Institute's mission – to disseminate and preserve the scholarly work of MIT's great minds so that it may be openly available and used to advance knowledge around the world.

Currently DSpace@MIT houses over 45,000 items from 62 depositing "communities" representing MIT faculty, researchers, departments, labs, and centers. Collections in DSpace@MIT continue to expand as new communities and important works are added – the growth of collections such as the MIT Open Access Articles collection, containing the scholarly articles that MIT faculty have chosen to make openly available through the Faculty Open Access Policy, is a recent example.

The MIT Libraries also maintains collections within DSpace@MIT, the largest of which is a collection of over 29,000 MIT theses and dissertations dating as far back as the mid-1800s. Since 2004, all new Masters and PhD theses are automatically submitted to the repository in digital format; theses completed prior to 2004 are added as they are digitized by the Libraries.

Since its creation, DSpace@MIT has been looked to as a model for digital repositories. It currently ranks twelfth in the world in a ranking of over 1,100 institutional Web repositories by the Cybermetrics Lab, a research group within the Consejo Superior de Investigaciones Científicas (CSIC). MIT's repository is ranked alongside other distinguished institutions in the top 20, such as CERN and the Smithsonian/NASA Astrophysics Data System.

Usage data show that the collections in DSpace@MIT are accessed from nearly

> The original DSpace software platform, on which DSpace@MIT operates, was developed jointly by the MIT Libraries and Hewlett-Packard (HP). Since its launch, the open source software has been widely adopted by numerous organizations facing similar digital archiving challenges. Today, the software that began as an idea at MIT, has been adopted by over 1,000 organizations worldwide. It continues to be the software of choice for academic, non-profit, government, and commercial organizations building digital open repositories.

In addition to scholarly articles, the repository includes a wide array of other digital material such as working papers, technical reports, preprints, images, and more that are vetted by each MIT community and submitted to the repository.

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every country in the world at an average rate of over 30,000 downloads a day. In 2010 alone there were 11.2 million total downloads. Users are finding items in DSpace@MIT in a number of ways, mostly by Web search through engines like Google and Google Scholar, but also through externally hosted portals, through the DSpace@MIT user interface itself, and from published literature references via persistent identifiers.

DSpace@MIT is a service of the MIT Libraries for the faculty and research community at MIT and is open to new contributors. The Libraries can provide assistance in establishing new collections in DSpace@MIT, as well as provide consultation and production services for metadata creation and digitization of legacy print collections. Contact *libraries.mit.edu/dspace-help* for more information. ■

Ann Wolpert is Director of Libraries *(awolpert@mit.edu)*.

DSpace@MIT Item Types
(45,867 Total Items as of 12/31/10)
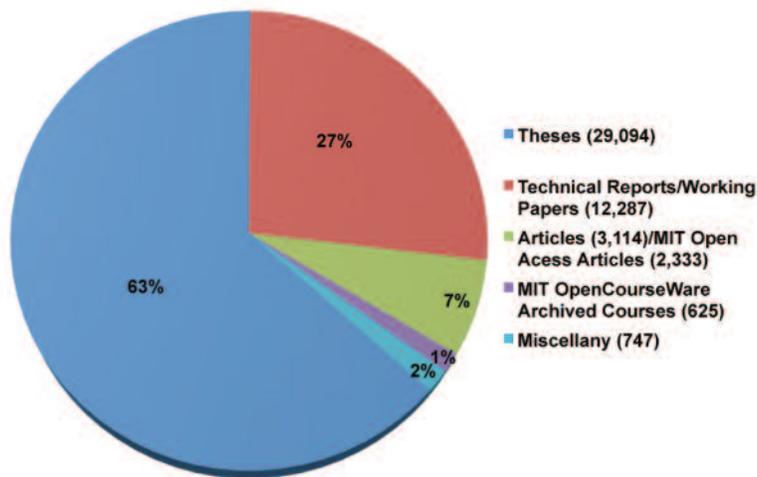
DSpace@MIT – MIT Open Access Articles Collection
(2010 Article Downloads by Country)
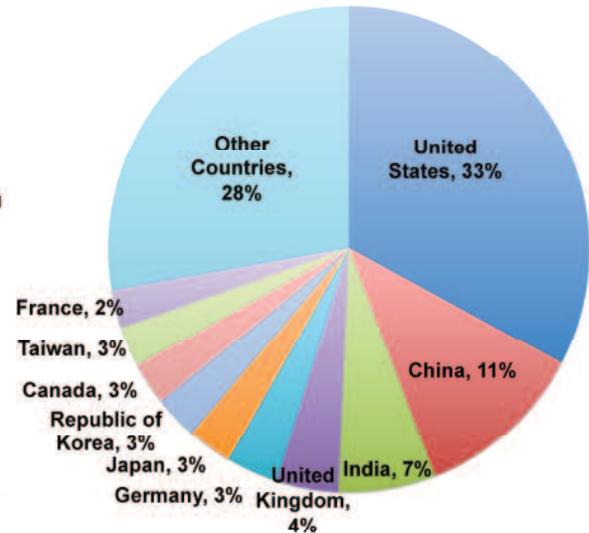
letters

To The Faculty Newsletter:

I WAS DISAPPOINTED to see the NRC rankings data given prominence in the recent *Faculty Newsletter* [Vol. XXIII No. 2, November/December 2010]. There is widespread agreement that the study was deeply flawed in many respects. I think that seeming to crow about the results is in poor taste. If MIT had looked bad, we would surely be complaining (appropriately) about the way the study was conducted.

John Guttag
Professor, Department of Electrical Engineering and Computer Science

Editor's Note: The following is from the NRC [National Research Council] Website: *sites.nationalacademies.org/ PGA/Resdoc/index.htm.*

Assessment of Research Doctorate Programs

Revised March 9, 2011

NRC Response to University Comments of Ranking Data will Appear Shortly

The NRC has been reviewing each of the 453 comments and suggestions that it received in response to the release of its doctoral programs in late September. Changes will be made in three principal areas:
1. Awards and honors. We discovered cases where these were undercounted. We have corrected these.
2. Citations. The NRC made an error in entering the 2002 citations. As a result, there will be slight changes in this measure for all programs except those in the humanities.

3. The academic placement measure. A few institutions had low response rates for this measure, which was derived from NSF data. To be fair to them, we have recalculated this measure so that the denominator is the number of respondents, not the total number of PhDs.

We will recalculate the ranges of rankings given these changes and a few other changes where the data sent to the NRC were incorrectly entered. These recalculations will result in some changes to the ranges of rankings. Other comments reflected disagreement with or misunderstanding of the NRC methodology. Our response to these comments will be to suggest that the programs refer users of the NRC worksheet to their program website, where they may present what they feel is the correct data and may present updated data. The recalculations will be posted by early April. ■

M.I.T. Numbers
U.S. News & World Report: Graduate School Rankings 2002 – 2011

Ranking the Top 10 Engineering Schools
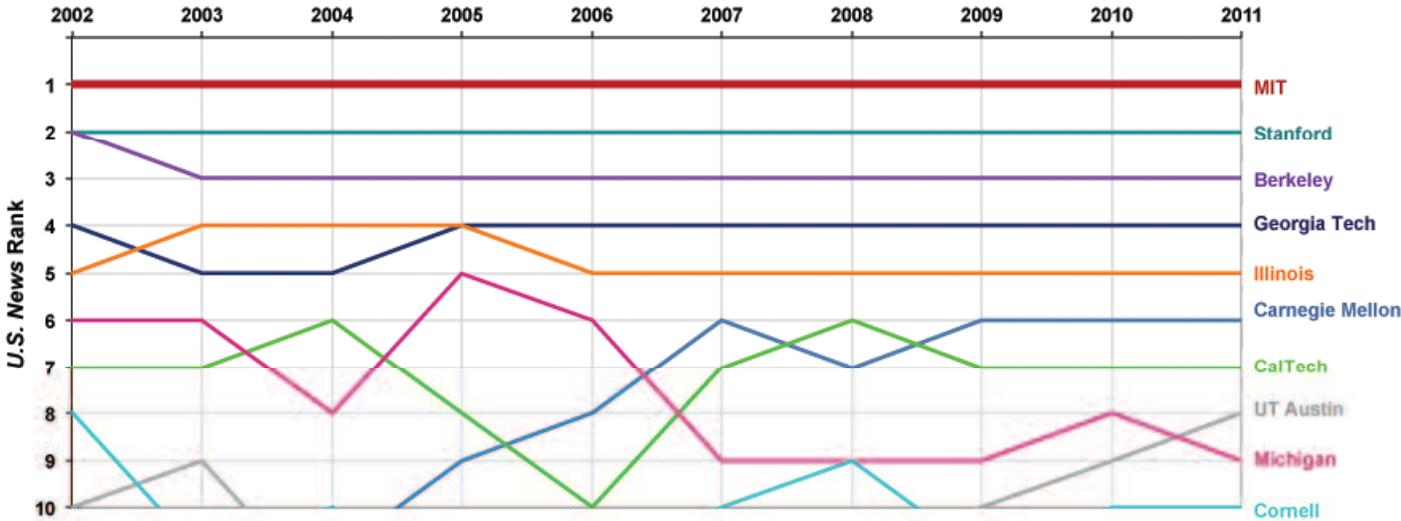
Ranking the Top 10 Business Schools