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MIT Faculty Newsletter

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in this issue we offer congratulations to the Class of 2017 (Editorial, below); the final From The Faculty Chair from outgoing Chair Krishna Rajagopal (page 4); announcement of the incoming Chair of the Faculty Susan Silbey (page 8); "Some Musings on Retirement After 40 Years at MIT" (page 9); and a report from MIT's Technology Licensing Office (page 21).

Boston March for Science

Highlights from MIT's Student Quality of Life Survey

Institutional Research

IN FEBRUARY 2017, Dean for Student Life Suzy Nelson invited all enrolled students to provide feedback on their MIT experience by responding to an on-line survey. Designed with input from students, faculty, and staff, the survey covered a wide range of topics, including satisfaction with academic and non-academic experiences; health and wellness; campus climate; and usage of student resources.

By consulting a diverse group of students, with differing perspectives and backgrounds, the MIT community has another source of information to better understand what is working well, what may need improvement, and how the MIT student experience could evolve in the future. In addition, the survey, which is administered every four years, provides the Institute another opportunity for periodic

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A Primer on Indirect Costs and Why They Are Important to MIT

Maria T. Zuber

DID YOU KNOW THAT MIT subsidizes every research grant that it receives, even when the grant includes full overhead costs? The reason isn't because MIT has a bloated administrative bureaucracy – as I will explain we're actually organizationally lean. It's because MIT is a research-intensive institution, and conducting research is expensive.

Recent discussions in Washington about cutting the federal science budget by reducing indirect cost recovery should be deeply worrisome to all of us. Given the seriousness of the threat, I thought it would be beneficial for me to explain not only why these costs are important to MIT, but more importantly, how they benefit every research program at the Institute, including yours.

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Editorial

A Letter to the Class of 2017; The March for Science

FELICITATIONS TO YOU THE GRADUATES – and to your families!

We join with the thousands of family members and friends gathered for Commencement, in sharing the excitement of your graduation. MIT's faculty value and take pride in your accomplishments as MIT's class of 2017. Teaching and mentoring you has been a source of deep satisfaction, as has the learning and research we have done with you. Now, as you take the next steps along career and life paths, your contributions to your communities and to society will be among the most gratifying rewards of our academic efforts.

We hope you will look back on your years at the Institute with the satisfaction that your presence and involvement contributed to enhancing the MIT environment and experience for the classes that

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The MIT Faculty Newsletter
Editorial Board

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A Letter to the Class of 2017
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followed. You can continue to have a positive impact on Institute life by remaining engaged and active as alumni.

You will be entering a world of considerable uncertainty and increased levels of social and political polarization. After the last presidential election, you rose to the challenges presented by the new administration, as it set about upending much that had been taken for granted. Many of you joined efforts to protect international members of our community from the threat of exclusion or deportation. Many of you also joined or supported the March for Science and the March for Climate in April, or participated in MIT's Day of Action that month. Issues such as immigration, climate change, nuclear disarmament, the reduction of global poverty, and the need to protect fundamental democratic rights have now become arenas for greater contention. The distant problems of far-away nations now emerge as problems that this nation – and the world – cannot ignore. Refocusing constructive attention on all these issues requires the urgent involvement of us all.

During your years with us, we on the faculty have watched the burgeoning of your many talents, your creative ambitions, your resilience in the face of setbacks, your thoughtful and quirky self-expression, your creative and entrepreneurial energy, and your myriad achievements. We hope that, as your various individual paths unfold, you will put your powers to work on solving some of the problems that confront us all, and on making our society more responsibly productive and more supportive of those in need. On behalf of the entire faculty, we wish you vision, strength, commitment, wisdom, success, and much happiness in addressing these challenges.

The Editorial Board
of the *MIT Faculty Newsletter*

The March for Science

ON SATURDAY APRIL 22, the thousands of people in the March for Science gathered on the Boston Common included several hundred MIT undergraduates, graduate students, postdocs, and staff. It was uplifting to see so many members of our community standing up for public investment in scientific research, and for the value of scientific approaches to the myriad problems our society is facing. The MIT group had rallied outside the Student Center, then marched over the Longfellow Bridge, joined by marchers from Harvard, and fusing with groups from Boston University, Harvard and Tufts Medical Schools, Brigham and Women's Hospital, and many other institutions, including biotechnology and pharmaceutical firms. This built on the earlier February 19 Copley Square Rally, coupled to the American Association for the Advancement of Science meeting.

Their creative signs expressed concern for the importance of scientific approaches to disease, to climate, to environmental protection, and to many other areas of concern. We had not witnessed such a public demonstration from the Boston area scientific community in many decades.

Unfortunately the speakers, though lauding scientific approaches to medical, social, and national problems, failed to bring a fully scientific analysis to the government policies we were rallying against. The sharp cuts in the NIH and EPA budgets that were a focus of the rallies derive from very specific policies of the Trump administration and the Republican Congress. The civilian scientific programs were not cut just to satisfy the call for reducing regulations on commerce and industry; they were cut in order to finance the enormous $54 billion increase in Pentagon spending, including nuclear weapons modernization.

As the *NY Times* (March 16, 2017) reported: "President Trump's 2018 budget blueprint released on Thursday proposes cuts in discretionary spending for most government agencies to pay for large increases in military spending." Budget Director Mulvaney was quite clear in speaking with Republican Governors: "By way of defending such extensive cuts, Mr. Mulvaney said simply that the White House's priority was military spending and that other reductions were necessary to advance that goal." (Alexander Burns, *NY Times*, March 22, 2017.) The deeply dangerous, unsound and expensive nuclear weapons escalation was one subject of the Conference "Reducing the Threat of Nuclear War," reported on page 14 of this issue.

Though the President proposes his budget, the actual spending of our income tax dollars is in the hands of House and Senate appropriations committees. The need to defend scientific research and scientific approaches to national problems cannot be separated from the need to have our elected representatives vote a national budget that responds to true national needs.

Jonathan King
Aron Bernstein
Max Tegmark

From The Faculty Chair

Some Developments, Advances, and Discussions from the Past Year

Krishna Rajagopal

AS THE ACADEMIC YEAR draws to a close, I will look back in this column on some of the many ways in which the Standing Committees of the Faculty have played their roles in the shared governance of MIT this year. Doing so will allow me to touch upon many important developments, advances, and discussions from the past year.

The **Committee on Academic Performance** (CAP) implemented new policies regarding the return of students who have been on leave, following a major review last year. For the **Committee on Discipline**, this was the second year (and the first full year) during which they have exercised MIT's new policies regarding incidents of alleged sexual misconduct; they have begun preparing for a major review of these policies next year. The **Committee on the Library System** is engaging with the Libraries as they respond to the report of the Task Force on the Future of Libraries. As we heard at the April Institute Faculty Meeting, the **Committee on Campus Planning**, our newest standing committee, has found its feet and is now playing its anticipated role as our eyes, ears, and voice as MIT develops Kendall Square and West Campus. The **Committee on Student Life** serves as a venue for constructive dialogue among its faculty and student members and the new leadership of the Division of Student Life, to whom it provides advice on various policies. A major topic this year has been consideration of the policy that allows smoking in some MIT dorms, consideration that has included respectful and thoughtful conversation with student leadership. The **Committee on Undergraduate Admissions and Financial Aid** played an effective advisory role as, for the second year in a row, MIT introduced substantial enhancements to undergraduate financial aid.

Interestingly, each of this year's new majors is being developed jointly by two departments and both of the new minors are interdisciplinary, continuing an ongoing trend of developing new educational pathways for our students that cross traditional departmental boundaries.

Over the course of the academic year, the **Committee on the Undergraduate Program** (CUP) and its **Subcommittee on the Communication Requirement** (SOCR), the **Committee on Curricula** (CoC), the **Committee on Graduate Programs** (CGP), and the **Faculty Policy Committee** (FPC) have reviewed, suggested improvements to, and approved two new undergraduate majors, two new undergraduate minors, and two new master's programs – resulting in the second-most active year for the development of innovative curricula for MIT's students by its faculty and departments in several decades, second only to last year. Interestingly, each of this year's new majors is being developed jointly by two departments and both of the new minors are interdisciplinary, continuing an ongoing trend of developing new educational pathways for our students that cross traditional departmental boundaries. It is also worth noting that in all these cases early engagement between the groups of colleagues developing new curricula and the relevant faculty committees was important, as it resulted in improvements to the new programs that are now being launched. The committees, each of which includes faculty from all five Schools as well as students, serve to accumulate and share perspectives and best practices over time.

The new **Chemistry and Biology major** (5-7) is a combination of the existing chemistry and biology programs at MIT aimed at students who are interested in working at their interface, which is itself a well-established field of study both in basic research and in applications such as pharmaceutical chemistry and biotechnology. The introduction of this new major was facilitated by a change to the rules defining our Laboratory Requirement that was introduced during Spring 2017 following an analysis by, and recommen-

dation from, the CUP. Students now have the flexibility to satisfy this requirement by combining designated modules. The design of the 5-7 major takes advantage of this flexibility.

The new **major in Computer Science, Economics, and Data Science (6-14)** is, as far as we know, the first of its type at any major research university. Contemporary electronically-mediated platforms for market-level and individual exchange combine complex human decisions with intensive computation and data processing, all operating within engineered economic environments. Examples include: online markets, crowdsourcing platforms, spectrum auctions, financial platforms, crypto-currencies, and large-scale matching/allocation systems such as kidney exchange and school choice systems. Some forms of exchange that were infeasible to coordinate (vehicle sharing, for example) are suddenly available and important. Other market activities that were previously thought to require centralization and oversight can now be decentralized and self-regulated (crypto-currency being the leading example), and the technology beneath that decentralization (so-called blockchain), will have many further applications. MIT is in a position to offer an innovative major that will provide students with foundational knowledge and hands-on experience relating to this emerging sphere of technological and economic activity because we have a considerable constellation of researchers working at the intersection of Economics and Electrical Engineering and Computer Science (EECS) as well as, according to surveys, considerable student interest.

The new **Environment and Sustainability Minor** is designed to address both people and the planet in an integrated manner, drawing upon content in four areas: earth systems and climate science; environmental governance; environmental histories and cultures; and engineering for sustainability. The minor combines a wide range of fields of inquiry to directly engage environmental and climate challenges facing ecosystems and populations around the globe. The minor has been developed by a large group of faculty from many departments working with MIT's new Environmental Solutions Initiative. The new **Polymers and Soft Matter Minor** will provide MIT undergraduates with a foundation in the science and engineering aspects of polymeric materials and soft matter. By virtue of its diverse applications, polymer science is interdisciplinary, requiring knowledge from chemistry, physics, and engineering. The new minor will allow undergraduates to engage with this field, and in particular with the community of faculty and graduate students cutting across several departments that constitutes MIT's long-established interdisciplinary doctoral Program in Polymers and Soft Matter.

The new major in Computer Science, Economics, and Data Science (6-14) is, as far as we know, the first of its type at any major research university. . . . MIT is in a position to offer an innovative major that will provide students with foundational knowledge and hands-on experience relating to this emerging sphere of technological and economic activity…

Both new majors and both new minors will be available to students in September 2017.

The two new master's programs approved by the Faculty this year are the first two instances of MIT's new **Master of Applied Science (MASc) degree**, an umbrella degree type introduced in Fall 2016 for one-year professional master's degrees that include a capstone project, not a thesis. Some students will complete both semesters of the **MASc in Supply Chain Management** (SCM) on campus. Others will begin by completing online courses and proctored exams that will earn them an MITx MicroMasters Credential in SCM. Some of these students whose performance is the strongest will be encouraged to apply for admission to MIT. Those who are selected and who enroll will receive Advanced Standing credit for one semester of their MASc subjects based upon their MicroMasters coursework; they will then proceed to do the second semester of their MASc and their capstone project on campus. The first MASc students selected in this new way will arrive on campus in January 2018; the comprehensive proctored exams that will conclude their MicroMasters are underway.

The **MASc in Data, Economics, and Development Policy** (DEDP) is being offered by the Economics Department with substantial support from the Abdul Latif Jameel Poverty Action Laboratory (a center within the department). MIT faculty have pioneered a shift in development economics toward more empirical research and impact evaluation methods that are controlled and quantitative, while at the same time the broader international development community has come to emphasize policies and development grounded in such analysis. The MASc in DEDP is aimed at development practitioners and policy-makers in governments, non-

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Some Advances, Developments, and Discussions from the Past Year
Rajagopal, from preceding page

governmental organizations, and international agencies around the world looking for opportunities to retool, to become fluent in modern techniques and skills. A few thousand students around the world have already completed some of the online courses toward the MITx MicroMasters Credential in DEDP, and the first proctored exams are happening within weeks. Twenty students selected from among the MicroMasters recipients for admission to the MASc program will arrive on campus in January 2019.

The **FPC Subcommittee on Sub-term Subjects,** chaired by Professor John Fernández (Architecture), released its report during Fall 2016. Prompted by an increase in the number of sub-term subjects, the FPC had asked this group to analyze and assess the current status and to make recommendations. Their recommendations include many that faculty and departments should already be heeding, such as clear and early communication of expectations by instructors in sub-term subjects, as well as a series of recommendations for departments and faculty regarding ongoing development of new sub-term subjects and assessment of those that are running. For the particular case of half-term subjects, the subcommittee also recommended changes to *Rules and Regulations of the Faculty* regarding start and end dates, add and drop dates, and end-of-half-term procedures, noting that lack of consistency in these regards among different half-term subjects was causing stress for both faculty and students. (The large majority of sub-term subjects are half-term in length. The subcommittee noted examples of pedagogically well-motivated sub-term subjects with other lengths, but recommended that the changes to *Rules and Regulations* should focus on the most common, namely half-term, case, which was where inconsistency in expectations was resulting in stress.) Over the course of Fall 2016 and IAP, the FPC worked together with the CAP, CoC, CGP, and CUP to arrive at proposed changes that would set consistent standards. Standardizing expectations for start/end and add/drop dates for half-term subjects will benefit all students and faculty, including those teaching/taking full-term subjects. The modifications to *Rules and Regulations* were approved by the Faculty in March and are now in effect.

Significant trends and changes in undergraduate major selection and enrollments have been observed by many of us. For example, these trends have come up many times in Random Faculty Dinner conversations. MIT's departments and Schools are feeling corresponding stresses and strains, and also opportunities, both in departments experiencing high enrollment and in those with significantly reduced enrollment. Earlier this semester, the CUP launched the **Study Group on Undergraduate Majors Selection**. The Study Group is charged with pursuing a process of discovery, analysis, and community discussion of data on trends in undergraduate major selection and enrollments at MIT; factors (both internal to MIT and external) contributing to these trends; effects and implications of these trends for students, faculty, and MIT; and responses by departments, Schools, programs, and offices at MIT, including existing best practices and initiatives underway as well as additional possible future responses. The group consists of seven faculty members from MIT's five Schools and two undergraduates, and is led by Professor Jeffrey Grossman (Materials Science and Engineering). The group would like to receive your input, and will be engaging broadly in the coming months. Input can be sent to *cup-sg-majors-input @mit.edu* at any time. The study group plans to update the CUP on preliminary analyses of trends, factors, effects, and responses in Fall 2017, as well as to update the community on plans to gather additional data and share observations and best practices.

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In the previous issue of the *Faculty Newsletter*, I described the report of the **Working Group on Computational Thinking and Algorithmic Reasoning for MIT Undergraduates** at length. As I mentioned there, proposals for course development are now in the hands of Dean Dennis Freeman, and the CUP has begun the analyses called for in the report. This important conversation is well set up for further progress next academic year. In that column, I also

described many **ways in which faculty members are responding to the impacts of the current U.S. administration on MIT**, grouping them into listening, learning and teaching, and outreach. These important conversations will also surely flow into the next academic year.

Let me also mention here that there are **two Working Groups** charged by the Provost that are engaging with important issues and that are both aiming to release draft reports before Fall 2017. One, led by Professor Steven Hall (AeroAstro), has been asked to provide an academic perspective to the planning process for the **Volpe** site, helping to identify opportunities to create a vibrant development that complements and strengthens the Kendall Square innovation ecosystem. The other, led by Professor Anantha Chandrakasan (EECS), has been asked to recommend policies and procedures related to **The Engine**; it includes subgroups focusing on facilities access, technology licensing, conflicts of interests, visas for MIT entrepreneurs, and MIT's innovation ecosystem. We can all appreciate the efforts of the many colleagues contributing to these Working Groups over the past semester. Their reports will surely provide key input to important ongoing MIT-wide conversations during next academic year and beyond. So too will Associate Provost Richard Lester's report, **A Global Strategy for MIT** (***web.mit.edu/globalstrategy***), in which he lays out goals and principles for global engagement and recommends how we can both bring MIT to the world and bring the world to MIT. The report was recently released for comment and discussed at the May Institute Faculty Meeting.

It has been an honor and a privilege to serve as the Chair of the Faculty for the past two years. I want to close this column with several **thank yous**.

First, to all the many colleagues, including faculty, students, and staff, who serve on the Standing Committees of the Faculty. I have given some examples above of the activities of these committees from the past year. I have worked closely with the chairs of all of the committees at different times. It is through their efforts and the efforts of all the more than one hundred committee members that the Faculty plays its many important roles in the governance of MIT.

Next, I want to thank the many hundreds of faculty who have come to the Random Faculty Dinners over the past two years. Perhaps the most enjoyable part of being the Chair of the Faculty has been attending these dinners once per month, including convening the after-dinner discussion.

Next, I want to thank the many hundreds of faculty who have come to the Random Faculty Dinners over the past two years. Perhaps the most enjoyable part of being the Chair of the Faculty has been attending these dinners once per month, including convening the after-dinner discussion. As Professor Jay Keyser did for almost 30 years, I began each after-dinner discussion simply by asking "What is on your mind?" The discussions that followed were varied and wide-ranging, always thoughtful, and exceptionally valuable for me and my fellow Faculty Officers as we have discharged our informal responsibility to represent the Faculty in many fora.

Next, Associate Chair of the Faculty Leslie Kolodziejski and Secretary of the Faculty Chris Capozzola. For two years we have been a team-of-three. We have met in one context or another multiple times per week, and in so many ways we have seen paths forward together that no one of us could have found alone. I cannot imagine how I could have done anything at all without their advice, counsel, and support. Heartfelt thanks. The three of us have valued the respectful, productive, and positive relationships that we have had with President Reif, Provost Schmidt, Chancellor Barnhart, and the administration over the past two years. We are fortunate that MIT's shared governance works as well as it does; not all universities are so lucky. Last and the opposite of least, our Faculty Governance Administrator, Tami Kaplan. She makes everything we the officers of the Faculty do happen, and furthermore provides both perspective and anticipation, as she is so often at least one step ahead.

Let me close by wishing the next officers of the Faculty – Professor Susan Silbey (Anthropology), Professor Rick Danheiser (Chemistry), and Professor Craig Carter (Materials Science and Engineering) – two years that are as productive, rich, full, and interesting as the past two have been. And, to all, a restorative and invigorating summer.

Krishna Rajagopal is a Professor of Physics, a MacVicar Faculty Fellow, and Chair of the Faculty *(krishna@mit.edu)*.

Susan Silbey New Faculty Chair

Newsletter Staff

PROFESSOR SUSAN S. SILBEY will succeed Krishna Rajagopal as Chair of the Faculty on July 1, 2017, after serving as Chair-elect during the current academic year. Susan is the Leon and Anne Goldberg Professor of Humanities, Sociology and Anthropology in the School of Humanities, Arts and Social Sciences, and Professor of Behavioral and Policy Sciences in the Economic Sociology group and Institute for Work and Employment Relations in Sloan. Professors Rick Danheiser (Chemistry) and Craig Carter (Materials Science and Engineering) will serve, respectively, as Associate Chair and Secretary of the Faculty.

Susan grew up in Brooklyn, New York, attending Erasmus Hall High School and spending entirely too much time hanging out on the street corners of Flatbush – but this turned out better than expected: it was there that she became buddies with her future husband, Bob Silbey, with whom she spent the next 51 years. After a BA from CUNY Brooklyn College and a PhD from the University of Chicago, both in political science, Susan spent 26 years as a sociology professor at Wellesley College, and for the last 17 years she has been in MIT's Anthropology department, eight of those as Head. Throughout this time, while studying and working in several disciplines, Susan has been doing the same thing: conducting empirical research on how law works. She is preoccupied with understanding what makes the law such a durable and powerful institution, more similar in its fundamental processes across its 4,000 years than any other social institution – including the family, the state, and the economy.

Susan grew up in Brooklyn, New York, attending Erasmus Hall High School and spending entirely too much time hanging out on the street corners of Flatbush . . . .

Susan is a sociologist of law and organizations. From her very first project – observing the Massachusetts Attorney General's Office of Consumer Protection – she has been explaining how legal processes do whatever it is that they do. She tracks formal legal doctrine in statutes, regulations, and judicial opinions from enactment through implementation, and ultimately to citizens' experiences and interpretations of those laws. The formally written doctrine taught in law schools represents but a small fraction, and thus an incomplete if not inaccurate account, of what happens on the ground in everyday life: in shops, offices, universities, homes, and street corners across the nation. Susan's most widely used work constructs a model of the cultural representations of law that circulate in popular consciousness and discourse. *The Common Place of Law: Stories from Everyday Life* documents how Americans experience and talk about law, simultaneously a game played by unruly lawyers and a solemn process that temporally and spatially transcends the actions of particular individuals, an ahistorical aspirational norm coupled to pragmatic, locally situated practices. Americans revere the law, but at the same time often resent and resist it. They seek the protection of the law and actively avoid it. Rather than weakening the institution, however, Susan and her co-authors show how these contradictory accounts constitute a matrix of reinforcing narratives that provide legitimation while creating the opportunities for critique, all contained within the same institution.

Susan has been developing a general model of the structure of institutional cultures across a variety of settings (e.g., alternatives to law in negotiation and mediation, children studying law in public schools, engineering education, the organization of scientific laboratories). Her most recent work concentrates on the ways in which environmental, health, and safety regulations have been infiltrating hospitals, laboratories, and other hazardous workplaces. With her

graduate students, she has been identifying examples of successful, pragmatic regulatory enforcement that keeps organizational practices within an acceptable range of variation close to regulatory specifications, but not necessarily perfectly compliant.

At MIT, Susan has been Secretary of the Faculty, and also served on more than a dozen committees including, among others, the Faculty Policy Committee, Committee on Academic Performance, Killian and Edgerton Award Committees, MITx Policy and Privacy Committees, SHASS Equal Employment Opportunity Committee, Budget Task Force, and the 2012 Presidential Search Committee. She is the recipient of numerous prizes and awards for her research, including several best article prizes from the American Sociological Association, a Doctor Honoris Causa from École Normale Supérieure de Cachan in France, a John Simon Guggenheim Foundation Fellowship, a Russell Sage Foundation Fellowship, the Harry Kalven Jr. Prize for advancing the sociology of law, and the Stanton Wheeler Prize, SHASS Levitan Prize, and Committed to Caring awards for mentoring graduate students. She is Past President of the Law & Society Association, and a fellow of the American Academy of Political and Social Science. She currently sits on two panels for the National Academies of Sciences, Medicine, and Engineering: Performance Based Regulation of Hazardous Materials and the Committee on Science, Technology, and Law.

Susan lives in the Back Bay and West Falmouth, where she maintains with her sister extensive organic vegetable and hydrangea gardens when not out sailing on Buzzards Bay. Susan's late husband, Bob (***web.mit.edu/robertsilbey/events/memorial.html***), joined the MIT Department of Chemistry in 1966. He served as Department Head from 1990-1995, and as Dean of Science from 2000-2007. The Silbeys' daughters, sons-in-law, and grandchildren live in Cambridge and Brookline.

Some Musings on Retirement After 40 Years at MIT

In the fair city of Cambridge
By Muddy Charles's stream
Scholars come from around the world
To join with academe

At a place quite special and unique
A place to build careers
A place that's changed in many ways
As we've counted off the years

We rode the subway for a dime
Lunched at the F+T
Got trimmed at the terminal barbershop
And parked our cars for free

Proposals sent to NSF
Were funded, one in three
Support came too from NIH
And also industry

The tenure process, though, caused stress
The productivity ramp was steep
But the goal was meritocracy
Not helping us get sleep

Teaching was rewarding
The students here are bright
Both graduates and undergrads
Will often work all night

But sometimes they drop pianos
And pumpkins from great height
And plant the field with weather balloons
To the Ivy Leaguers' fright

Our colleagues are impressive
Both brilliant and diverse
Some study things that are nano
Others probe the universe

Throughout the years our school evolved
With many buildings new
Old Kendall Square most disappeared
As our fair city grew

Though time has changed the campus
And maintenance is still unsure
And parking now costs us a grand
Our values still endure

In search for truth, and honoring facts
Our quest for knowledge stands
May our scholar's code of integrity
Persist throughout the land

The charge of our great Institute
And its mission in the world
Must ever pass to younger hands
As more years are unfurled

Retirees can shed some tasks
Like budgets and boilerplate
And grading piles of papers
And still getting grades in late

But some of us still hope to add
As we move to PPT
To the mission to humanity
Of the place called MIT

Harry Hemond
W. E. Leonhard Professor of Civil and Environmental Engineering
May 2017

A Primer on Indirect Costs
Zuber, from page 1

What are direct and indirect costs?

Research proposal budgets include direct and indirect costs. *Direct costs* are easily attributable to individual grants and include salary support for faculty, research staff, and postdocs working on the project, stipends for graduate students assigned to the grant, laboratory supplies, certain research equipment including computers, and travel and publication costs.

Indirect costs (IDC), aka the *F&A (facilities and administrative) rate or overhead*, represent genuine costs of performing research that are not easily attributable to individual grants. Think of these charges as applying to things that wouldn't need to exist or be used as extensively if MIT didn't conduct research. Examples include depreciation of research equipment and buildings, laboratory utilities (light, heat/cooling, power), hazardous chemical and biological agent management, libraries, internet, data transmission & storage, radiation safety, insurance, administrative services, and compliance with federal, state, and local regulations, e.g., Institutional Review Boards for human subject (COUHES) or animal research (CAC). Note that only resources utilized for research are counted. The federal government partially reimburses universities for these expenses.

Faculty salary support

In addition, since most faculty are paid in full by the Institute during the academic year, their participation in research during this time is supported by MIT.

How is MIT's indirect cost rate calculated?

MIT's current indirect cost rate is 54.7%. This rate is set through Uniform Guidance 2 CFR 200, whereby universities calculate their actual overhead expenditures based on previous years and apportion them to various activities – research, instruction, or other. MIT's rates are negotiated and audited each year and rates are applied only to those direct costs that are subject to overhead, which excludes tuition, equipment, major renovation, and repair and subcontract awards over $25K.

The easiest way to think about indirect costs, illustrated in Figure 1, is to understand how the average federal research dollar is spent at MIT. For a 54.7% overhead rate, 72 cents of every MIT research dollar goes to direct costs and 28 cents goes to indirect, or F&A costs. Figure 1 shows breakdowns within these categories and illustrates that *a 54.7% indirect cost rate does not mean that 54.7 cents of every research dollar goes to overhead.* It is 28 cents, because the rate is a fraction applied to the allowable direct costs added to the total direct costs.

Dating back to 1991, the government implemented a cap of 26% of the total negotiated F&A rate for administrative costs. MIT has historically been under this cap (currently 19%, justifying my opening statement that MIT is administratively lean). Figure 2 shows that since that time, federal regulations and agency-specific requirements have skyrocketed, including dozens of new regulations and expansion of others (***www.cogr.edu/sites/default/files/RegChangesSince1991_012417.pdf***).

In principle, it would be possible to calculate the exact share of F&A costs

Image: Hamsa Balakrishnan, associate professor of aeronautics and astronautics at MIT and a member of MIT's Institute for Data, Systems, and Society. She is working with the Federal Aviation Administration and major U.S. airports to upgrade air traffic control tools that can be integrated into the existing infrastructure.

MIT Photo / Bryce Vickmark

Figure 1. The MIT "Dollar Bill" that graphically explains how every dollar of an MIT federal research grant in FY16 is apportioned between direct and indirect (or overhead) costs.

required for each individual research grant, but it would be a logistical nightmare. Imagine tracking how much electricity was used for light, heat, and instrument operation on a project by project basis! UG 2 CFR 200 was designed to estimate these costs for all research projects over a year, limiting the need for complicated accounting.

would help sustain some areas of MIT's research. Figure 3 (next page) summarizes how MIT has increased UR support. This investment includes contributions from my office, the Deans, and DLCs. Figure 3 also shows the associated increase in research volume; clearly the increased investment has generated substantial funding. The slope of the funding curve is steeper than the investment because we

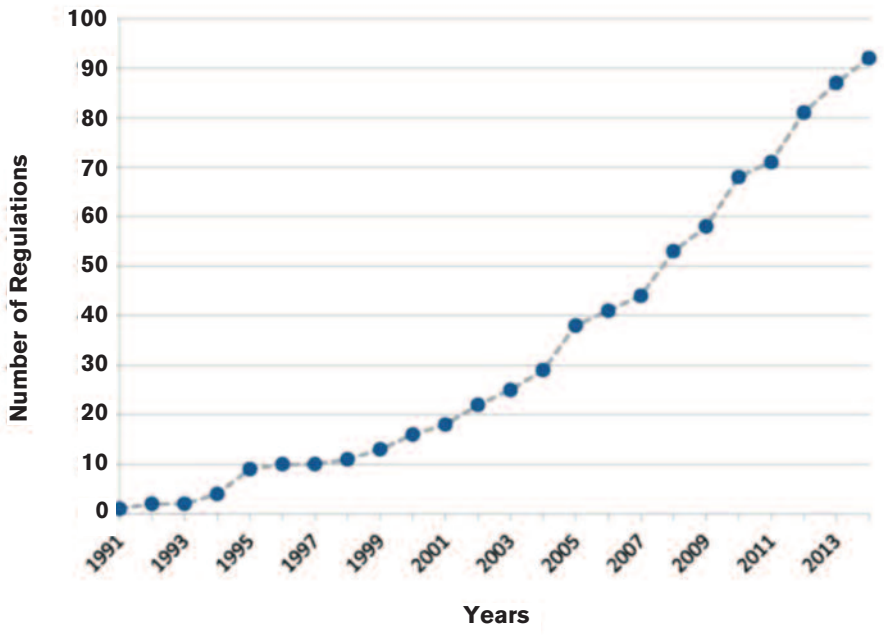

Figure 2. Cumulative number of regulatory changes applied to research institutions since 1991. Source: Federation of American Societies for Experimental Biology, 2015. Based upon data selected by the Council on Government Relations.

What is under-recovery?

Many foundations either decline to pay indirect costs or reimburse them at much lower (typically 10%-20%) than the negotiated federal rate. Whenever a sponsor pays less than full F&A, it generates *under-recovery (UR)*. Some institutions do not accept grants unless they carry full overhead, some write off the differential, and MIT, almost uniquely, identifies internal funds to cover the difference.

How has increasing investment in under-recovery helped our researchers?

With federal support declining for over a decade, it was apparent that increasing foundation support that incurred UR have successfully negotiated higher rates from foundations in some instances, and in others we have been able to convert some costs usually classified as indirect to direct (e.g., facility costs).

While increased UR investment has helped, the desire to obtain such grants is growing at a faster rate than our ability to provide support.

Why don't we just forget about UR?

Some faculty have asked me – why doesn't MIT just write UR off like some other organizations do? The reason is that *UR is a real cost representing an investment that MIT makes in research*. If we simply wrote it off, the benefit would fall to a limited cross-section of MIT researchers. Approximately 70% of foundation funding supports health-related research and the overwhelming majority is disease specific. By writing off these costs we would be helping researchers in those fields in an unbounded way, to the possible detriment of other areas in which research can't be supported by UR. It is my goal to understand all of the ways that MIT could invest in research to enable informed, strategic decisions about how to best drive discovery.

What would happen if the government reduced indirect cost recovery?

MIT supports the need to assure that taxpayer dollars are invested responsibly. Federal agencies have different regulations, and while Uniform Guidance has provided some regularization, the burdens on grantees continue to grow (cf. Figure 2). If the government made an accelerated effort to reduce burdens leading to a decrease in administrative compliance cost (the "A" part of F&A in Figure 1), this would be a welcome development.

But if the federal government cuts indirect cost recovery without reducing administrative burdens, then, friends, we've got a problem. All of the facilities and services that are needed to carry out research will still be with us, and MIT will have to find other ways to cover the costs. Research support in the form of UR, cost sharing, graduate tuition subsidies, lab renovations, etc. comes from internal funds. These funds also provide support for most other things that MIT does, from salaries, to benefits, to start up and retention packages, to student support and beyond. So, it should be apparent why IDC recovery is important to MIT and to you personally.

If IDC are cut, wouldn't all research universities be affected?

Yes, as would hospitals, laboratories, and research institutes. Those without sizable endowments would have a very limited capacity to make up the difference, but even institutions with larger endowments would have difficult choices to make.

continued on next page

A Primer on Indirect Costs
Zuber, from preceding page

What can we do to help?

MIT has been proactive in educating sectors, from government to industry to foundations to the public, on the importance of research and the role that indirect costs play. If you have contacts in states that don't have major research universities, outreach in those regions would be particularly helpful. Voices of support from outside universities, particularly industry, are especially effective.

Maria T. Zuber is Vice President for Research *(mtz@mit.edu).*

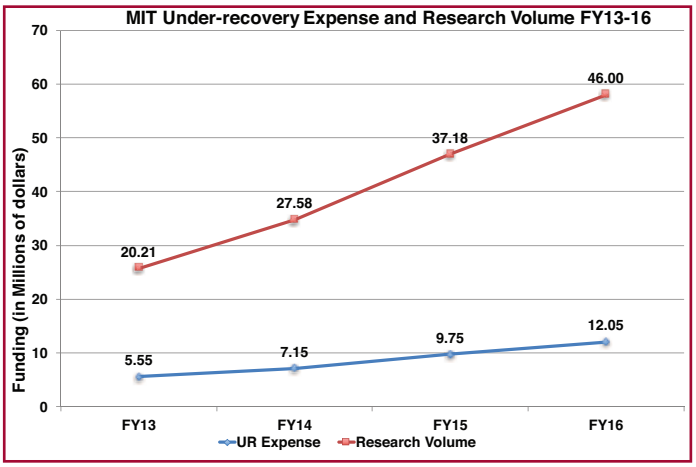

Figure 3. Recent history of MIT's investment in under-recovery (UR; in blue), and the research volume UR investment has generated (in red).

Day of Engagement, Day of Action

Newsletter Staff

THIS SEMESTER SAW OVER 1,000 members of MIT and the broader local community coming together in a large-scale, day-long civic engagement and action event, "MIT April 18: Day of Engagement, Day of Action." This grassroots effort was organized by a network of volunteers from all over campus, including faculty, students, postdocs, and staff, spanning all five Schools. There were over 70 different sessions and activities throughout the day devoted to open, respectful dialogue, discussion, and planning for action on the greatest political, social, and economic challenges facing us today. These sessions and activities addressed topics including the possibility of nuclear war; the ambiguous fate of truth in modern media; climate change; growing wealth disparity; racial justice; the polarization of political discourse; inequalities in education and economic opportunity; criminal justice reform; immigration; and many more. The event's center of gravity was the Stata Center – throughout the day the Stata Student Street was buzzing with energy and excitement – with additional sessions and activities in Buildings 26, 56, 66, and elsewhere on campus.

The tremendous quantity and variety of sessions and activities gave event participants many possible pathways through the day depending on their individual interests. Presenters and activity leaders included not only well-known faculty at MIT and other local universities, such as Daron Acemoglu, Abhijit Banerjee, Noam Chomsky, Junot Diaz, Jonathan Gruber, Saida Grundy, Joi Ito, Naomi Oreskes, Serena Parekh, and Lily Tsai (leading sessions on right-wing populism, health care, civil disobedience, refugees, public accountability, and the responsibility of intellectuals); but also students such as Wendy Salkin and Ronni Gura Sadovsky (leading a session on free speech and hate speech) and Kevin Richardson and Darien Pollock (leading a session on the

philosophy of racial justice), staff such as Libby Mahaffy (leading a session on bystander intervention) and Alena McNamara, Rhonda Kauffman, Sofia Leung, and Anna Boutin (leading an action zine-making activity), MIT Chief of Police John DiFava (participant in a panel on police-community relations), and student organizations such as Fossil Free MIT (leading a primer on climate change) and Sloan LGBTQI (leading a session on making start-ups LGBTQ-inclusive). Individuals from many Institute offices also presented or organized events, including Officer for Institute Community and Equity Ed Bertschinger; Office of Sustainability representative Paul Wolff; and former Director of the MIT Washington Office, William Bonvillian.

The range of content contributors also extended beyond academia to MIT's Leader to Leader (L2L) Alumni/ae Program (who organized an activity around questions of cultural curiosity) and into the local community, with participants including Cambridge City Councilor Nadeem Mazen (participant in a session on Securing a Progressive Agenda), General Counsel for the Massachusetts Department of Housing and Community Development Roberta Rubin (leader of a session on inequality in federal housing policy), and Oak Park, Illinois Regional Housing Center Executive Director Rob Breymeier (leader of a session on promoting neighborhood racial integration). The complete list of sessions and activities, along with more detailed descriptions, can be found at ***https://www.dayofaction.mit.edu/events***.

MIT's Day of Action was inspired by the Institute's historic leadership in the March 4 Movement of 1969 (***science.sciencemag.org/content/163/3872/1175***), and built on the highly successful Day of Action held by Princeton University on March 6, 2017 (***https://dayofaction.princeton.edu***).

MIT's event was organized extremely quickly. A public call to action was issued at the beginning of March and garnered signatures from hundreds of community members; content proposals were solicited starting in mid-March and led to the over 70 sessions and activities that took place over the course of the day, including lectures, panel discussions, workshops, film screenings, food offerings, music, and art-making. Additionally, a volunteer fair was held in the Stata Student Street in the afternoon, with over 20 on-campus and local community organizations setting up tables to help event participants learn about opportunities to channel their enthusiasm for civic action into ongoing initiatives. The event was open to all, representing the full diversity of the MIT community, and featured open, respectful dialogue and the exchange of ideas from the widest variety of intellectual, religious, class, cultural, and political perspectives.

The event was open to all, representing the full diversity of the MIT community, and featured open, respectful dialogue and the exchange of ideas from the widest variety of intellectual, religious, class, cultural, and political perspectives.

Feedback to Day of Action organizers has been extremely positive, with participants calling the event "a great success," "incredibly well organized," and "an amazing day," with it being "the first time I can recall that I've gone to a full day of talks and every single one was interesting." Day of Action co-organizer Roger Levy (faculty, Brain & Cognitive Sciences) considers the event extraordinarily meaningful, stating that "Now, more than at any time in my memory, people are asking, 'What can I do?' For so many MIT students, postdocs, staff, faculty, and local community members to devote a day of their lives to address the political, social, and economic challenges of today provides a visceral answer. It shows what we can do, together." Whatever the next steps for this grass-roots initiative may be, the success of MIT's Day of Action on April 18 demonstrates the energy and potential for a renewed norm of civic engagement as a fundamental part of campus life.

Prospects for Nuclear Disarmament in Uncertain Times

In conference on nuclear threat, former Energy Secretary Moniz and Rep. Lee call for diplomacy to diffuse risks

Jonathan Mingle, MIT News

May 9, 2017

FROM RISING TENSIONS ON the Korean Peninsula to questions about the future of the Iran nuclear agreement, the specter of nuclear conflict has returned as a concern for policymakers and citizens alike.

Two leading voices on nuclear issues, U.S. Rep. Barbara Lee and former Secretary of Energy Ernest Moniz, discussed the prospects for disarmament during a day-long conference on "Reducing the Threat of Nuclear War" held on MIT's campus on May 6.

"Frankly, the possibility of a nuclear bomb going off is higher today than 20 years ago," said Moniz, "in terms of the various regional conflicts we are facing."

Lee, a Democrat representing California's 13th District and a prominent advocate in Congress for nuclear disarmament efforts, recently returned from a trip to South Korea and Japan, where she met with security officials and visited the demilitarized zone (DMZ) between North and South Korea.

"I saw how volatile the region is," she said.

Lee is a co-sponsor of H.R. 669, a bill that would prevent the U.S. president from launching a first-use nuclear strike without authorization under a declaration of war by Congress.

"We must continue to put pressure on this president to give Congress a comprehensive strategy for deterring North Korea, that puts diplomacy and nonmilitary strategies at the forefront," she said.

"It is incumbent on us to show this administration the value of diplomacy," Lee said, calling on attendees to pressure their elected representatives to oppose the Trump administration's proposed sharp increases in defense spending and planned expansion of the U.S. nuclear arsenal. "His budget puts forth a $1.4 billion increase for the National Nuclear Security Administration (NNSA) to build more bombs, yet it doesn't make our planet any safer, nor does it advance NNSA's goal of nuclear nonproliferation," she said.

"After nearly a decade of persistence, the Obama administration, together with our allies, were able to negotiate a deal that put a lid on Iran's nuclear program and created the most extensive and intrusive nuclear verification regime ever negotiated," she said.

Moniz described the key features of that agreement, reached in 2015 among Iran, the U.S., and five other world powers, and shared his perspective on its prospects for survival under the Trump administration.

"This was an important example of diplomacy reaching critical security goals without a shot being fired," he said.

He reminded the audience of the long and difficult history of relations between the U.S. and Iran, stretching back to the U.S. role in a coup in 1953 and the hostage crisis of 1979. "The grounds of distrust are very, very deep," Moniz observed. "This makes it even more remarkable this agreement could be accomplished."

Moniz outlined how the agreement has successfully halted the Iranian weapons development program, which had been "expanding very dramatically, with 20,000 centrifuges and [was] close to [finishing a reactor that would produce] one or two bombs' worth of plutonium per year."

Moniz also pointed to "extraordinary transparency and verification measures," which give inspectors from the International Atomic Energy Agency (IAEA) access to suspicious sites.

"No other country has a fixed time in which to respond to inspector requests," he said. Iran, however, must respond within weeks to IAEA requests. "This is completely novel."

Commenting on Republican criticism of the deal, he noted that quarterly reports to Congress have confirmed that Iran is complying with its requirements.

"If the U.S. walks away from the agreement," he said, "we get the worst of both worlds. Then Iran has no formal constraints. And some may say, 'We'll put sanctions back on them.' It won't work. It worked before because we had the entire international community on the same page enforcing those sanctions."

He expressed doubt that other countries would support reimposing and enforcing sanctions on Iran. "There is no reason to think that if we walk away, we don't walk away alone. And the sanctions will not be effective."

Moniz said he is "reasonably optimistic" that all parties to the Iran agreement will continue their compliance — including the U.S. He cited the support of Senator Bob Corker, the Republican chair

U.S. Representative Barbara Lee and Former Secretary of Energy Ernest Moniz

of the Foreign Relations Committee, who recently called for the agreement's continued enforcement.

"I can't say that there's no doubt that this deal will stick going forward, but I can say the logic is completely clear and compelling," Moniz concluded. "And most people, including those who didn't agree with the deal, have come to that [conclusion]."

If there is continued compliance with the agreement, Moniz said, the international community should go even further, to improve transparency in nuclear programs beyond Iran. "We have got to think hard about what do we want to see in Iran and elsewhere in the region and beyond, in terms of nuclear fuel cycles."

In addition to returning to his role as a physics professor at MIT, Moniz was recently named the CEO of the Nuclear Threat Initiative (NTI), a nonpartisan organization founded by former Senator Sam Nunn and Ted Turner in 2001, dedicated to reducing the threat of attacks with weapons of mass destruction and disruption.

In that capacity, he said, he hopes to engage with members of both parties to work toward nuclear nonproliferation and increased support for the IAEA's work.

Lee and Moniz were introduced by John Tierney, former U.S. representative from Massachusetts and executive director of Council for a Livable World, which promotes policies to reduce and eliminate nuclear weapons.

During a question and answer session, Lee and Moniz addressed a range of other issues as well, including the risks of a cyber attack interfering with the U.S. nuclear command and control systems, and Lee's ongoing efforts to repeal the 2001 Authorization for Use of Military Force (AUMF) resolution passed by Congress.

The conference was jointly sponsored by MIT Radius, American Friends Service Committee, the Future of Life Institute and Massachusetts Peace Action, whose nuclear abolition working group is chaired by MIT professor of biology Jonathan King.

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Student Quality of Life Survey
continued from page 1

self-examination and reflection by hearing directly from the students who make MIT such a unique and dynamic place.

The survey closed in early March and was answered by 4,541 students, for an overall response rate of 42%. In general, students report being satisfied at MIT, work hard to succeed inside and outside the classroom, and sometimes find it difficult to manage all they have to do. In many areas, the 2017 results look similar or better than 2013, for both undergraduate and graduate students.

To view the entire survey instrument and to explore question-by-question results, please visit: ***web.mit.edu/ir/surveys/sql.html.***

Below are some of the broad-level survey findings, organized by topic area.

Satisfaction

It is difficult to measure every aspect of a student's quality of life, so as a simple measure, we directly ask students how satisfied they are being a student at MIT. According to the survey, 91% of students reported being somewhat or very satisfied (92% for undergraduates; 90% for graduate students). The 2017 results looked similar to the 2013 results. See Figure 1. When students were asked, "If you could decide all over again whether to be a student at MIT, what would you decide?" 3% responded that they would choose not to come to MIT, 81% said they would come to MIT, and the remaining 16% reported having second thoughts.

Just 20% of students expressed being very satisfied with their ability to balance academics and other aspects of life, 47% somewhat satisfied. Both undergraduate and graduate students tended to rate their overall academic experience higher than their overall student life experience. See Figure 2.

Workload

To further explore workload balance issues, the survey asked students to rate their current academic workload at MIT and how it compared to prior educational settings. Fifty-four percent of students said their current academic and research workload was "About right" (60% for graduate students and 47% for undergraduate students). Two percent said "Too light" or "Much too light." The 2013 and 2017 results looked similar. See Figure 3. Fifty-six percent of undergraduate students rated their workload as much heavier than high school, compared to 22% of graduate students who rated their workload much heavier than college.

Despite the demands that come with an MIT education, students noted that they felt self-driven and motivated to work through academic pressures. When asked the extent to which they agreed or disagreed with the statement, "Even if I feel overwhelmed by my academic workload, I can rise to the challenge," 83% somewhat or strongly agreed. A higher proportion of students strongly agreed with this statement in 2017 compared to 2013, for both graduate and undergraduate students. See Figure 4.

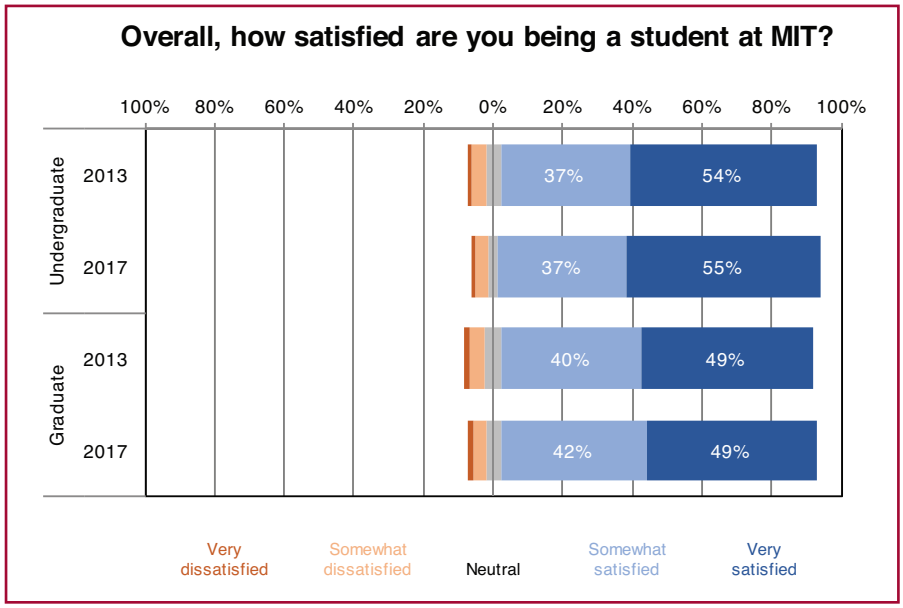

Figure 1

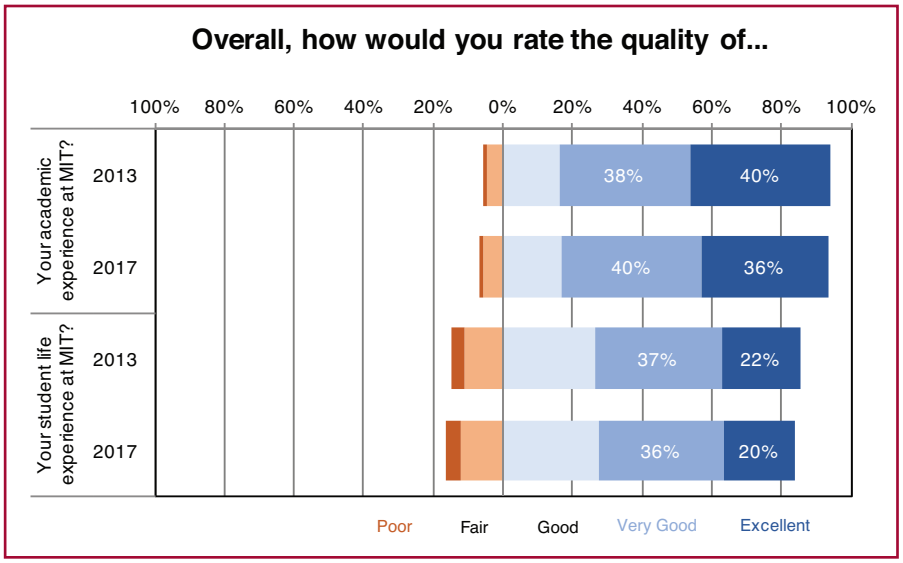

Figure 2

The survey asked two questions about the academic environment at MIT and how it relates to student well-being: has the academic environment negatively impacted the respondent's mental and emotional well-being, and has it negatively impacted the mental and emotional well-being of other students they know. Twenty-three percent of undergraduate students and 16% of graduate students strongly agreed that the academic environment negatively impacted the mental and emotional well-being of students they knew. A lower percentage (8-9%) strongly agreed that their own well-being was negatively impacted. See Figure 5 (next page).

Campus Climate & Support

Another goal of the survey was to gain student perspectives on campus climate and the support available to them. From a list of 10 different dimensions, students were asked to rate the general climate at MIT using a six-point scale. At one end of the scale was one word (e.g., Dangerous), and at the other end was another word (e.g., Safe). Figure 6 (next page) shows the mean score for each word pairing, separately for undergraduate students and graduate students. We observe that for the wording pairing **Stressful: Calm**, students were more likely to select "Stressful" than "Calm."

During the analysis of this particular section, we saw notable differences by student type. Graduate students were more likely than undergraduates to select "Competitive" for the word pair **Competitive: Non-competitive**. Similarly, undergraduates were more likely to select "Collaborative" for the word pair **Non-collaborative: Collaborative**.

Undergraduate students were more likely than graduate students to select "Harmful to mental health" for the word pair **Harmful to mental health: Beneficial to mental health**. Specifically, two-thirds of undergraduate students selected a point on the "harmful to mental health" side of the scale, compared to 52% of graduate students.

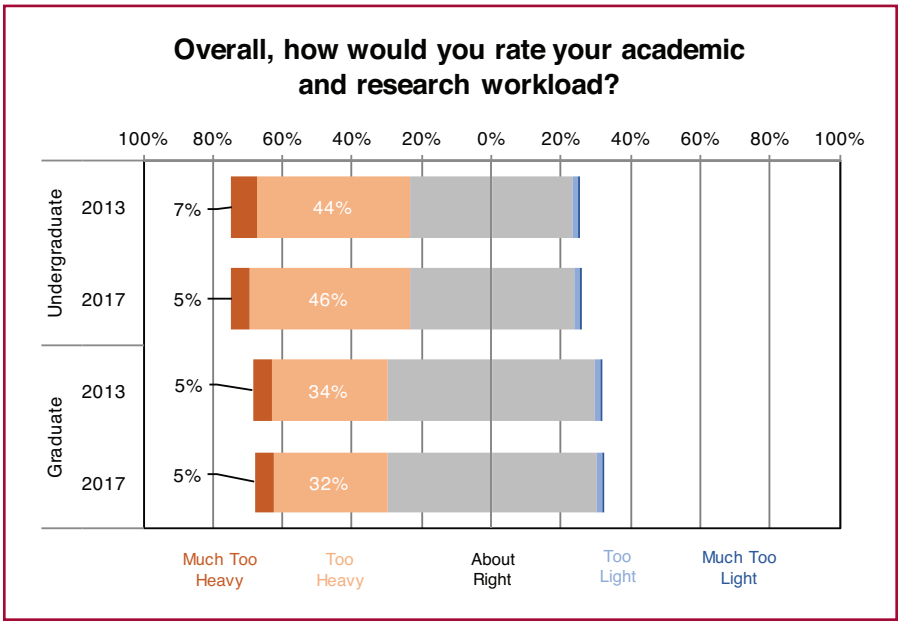

Figure 3

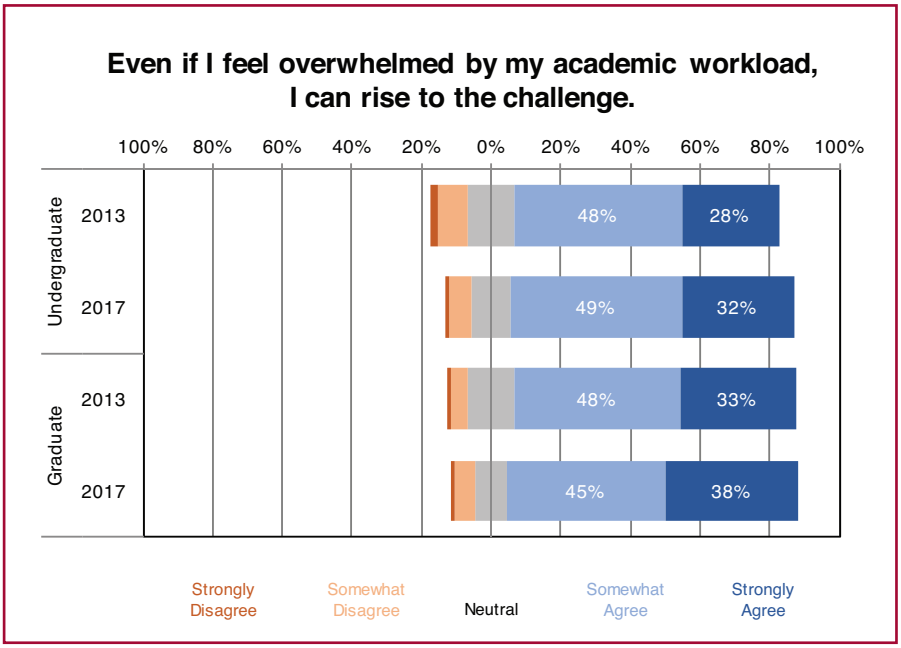

Figure 4

The survey also sought to gauge how supported students felt inside and outside of the classroom. For the statement, "Faculty members treat me fairly," 52% of students answered "strongly agree," up from 42% in 2013. A higher percentage of students agreed that MIT provided needed academic support, than support to succeed outside of academics (77% versus 55%). Both measures were up from 2013. The MIT administration's responsiveness to student concerns also fared better between the two survey years. See Figure 7 (page 19). In 2017, 23% of students strongly agreed with the statement, compared to 14% in 2013.

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Student Quality of Life Survey
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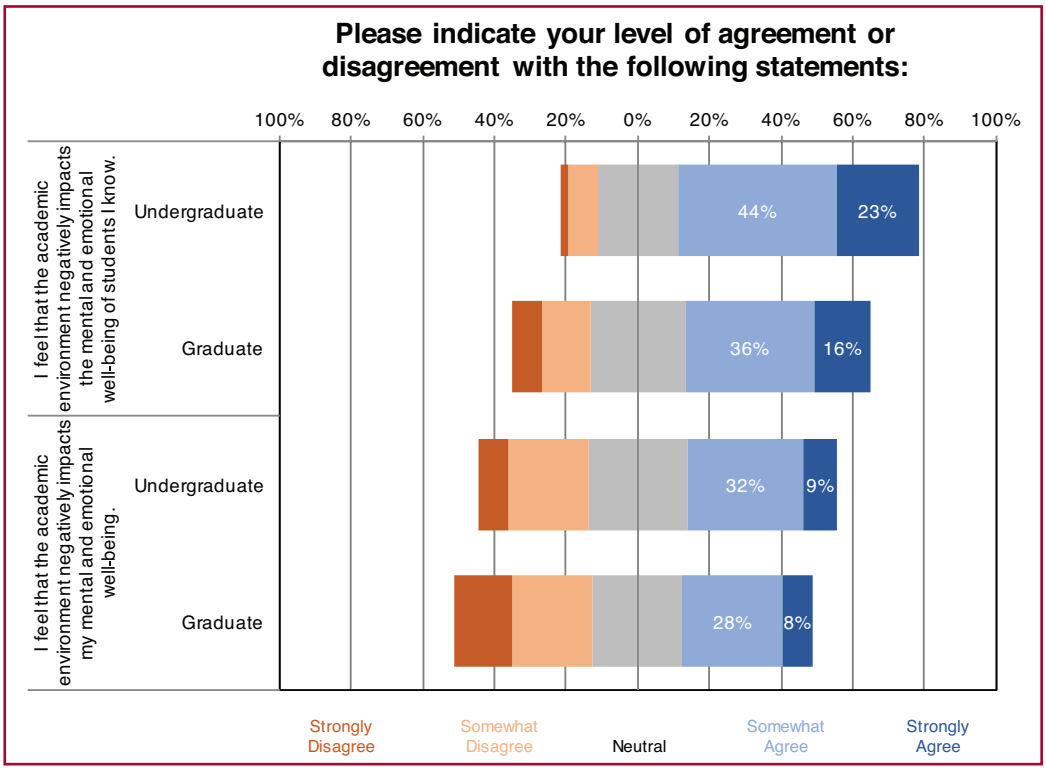

Figure 5

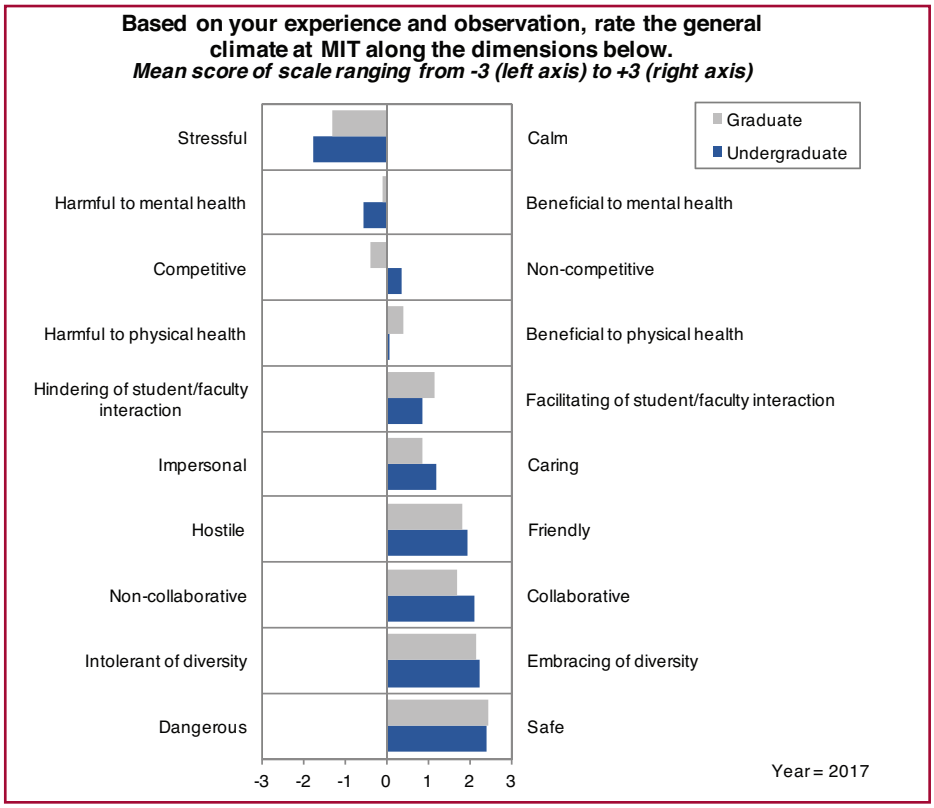

Figure 6

Feeling Overwhelmed, Isolated & Stressed

Another section of the survey revolved around sources of student stress, the ways students manage their stress, and their frequency of feeling overwhelmed and isolated. When asked how often they felt overwhelmed by all they had to do during the current school year, more than half said "Often" or "Very often," similar to findings in 2013. See Figure 8. On average, students were less likely to say they felt isolated than feeling overwhelmed. Eight percent said they felt isolated "Very often"; nearly a quarter said "Never."

The survey included a bank of questions asking students about potential sources of stress during the current academic year. For each of the 27 items in the bank, students rated the item on a four-point scale, ranging from "Not a source of stress" to "Very stressful." Interestingly, both undergraduate and graduate students expressed the same top stressors.

The top stressor was "Managing my workload," where 87% of undergraduates and 81% of graduate students rated it moderately or very stressful. This was followed by "Balancing multiple commitments" (84% undergraduate, 73% graduate), "Expectation to perform as well as my peers" (57% undergraduate, 61% graduate), and "Concerns about life after MIT" (56% undergraduate, 50% graduate).

Health & Well-Being

Another important component of the survey looked at health and well-being issues, asking students to respond to questions about their sleep habits, emotional health, and ability to find time to engage in fun activities. Seventy-three percent of students described their overall physical health as good or excellent, while 65% said the same about their overall mental and emotional health. Undergraduate and graduate student responses looked similar on these measures. See Figure 9 (next page).

When asked on how many of the past seven days students got enough sleep so that they felt rested when they woke up, 22% of students said fewer than three days per week (26% for undergraduate students and 18% for graduate students). This is much improved from 2013, where 37% of students said fewer than three days per week. See Figure 10 (next page).

Seventy-eight percent of students somewhat or strongly agreed with the statement, "I know where to get help when I am not feeling well," compared to 75% in 2013. In the hopes of learning if students are engaging in activities that are enjoyable, we asked how many days in the past week they did something fun; 70% of students responded three or more days.

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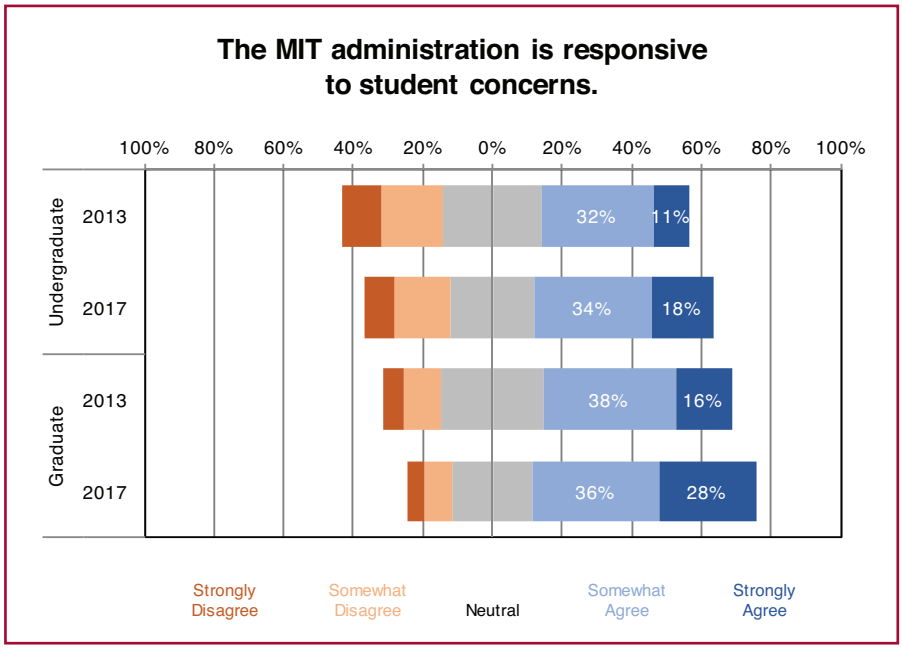

Figure 7

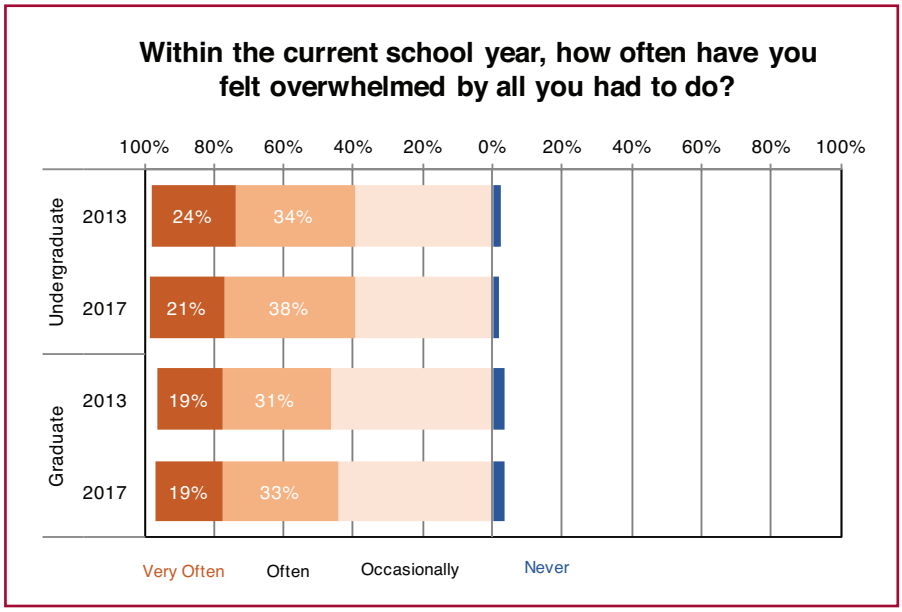

Figure 8

Student Quality of Life Survey
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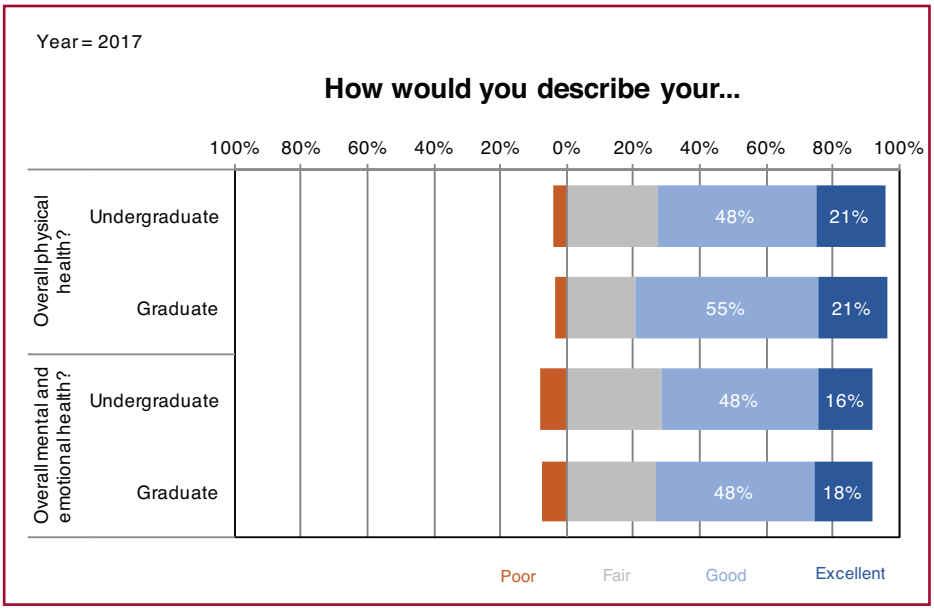


Figure 9

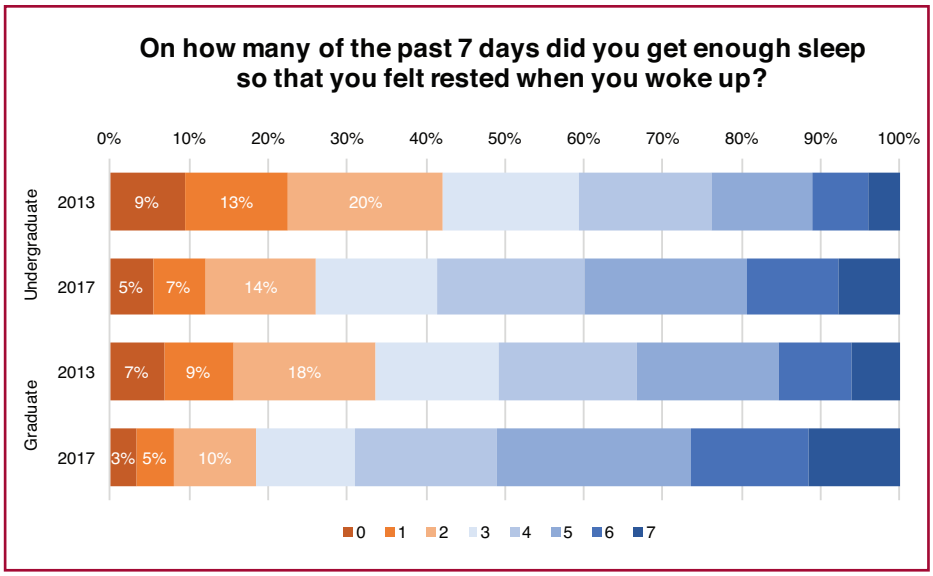


Figure 10

In the coming months, we will conduct a more thorough analysis of this survey, with particular focus on the open-ended questions asked on the survey. Questions about this survey or other surveys run at MIT can be directed to *mit-surveys@mit.edu*.

Technology Licensing Office and You

Lesley Millar-Nicholson

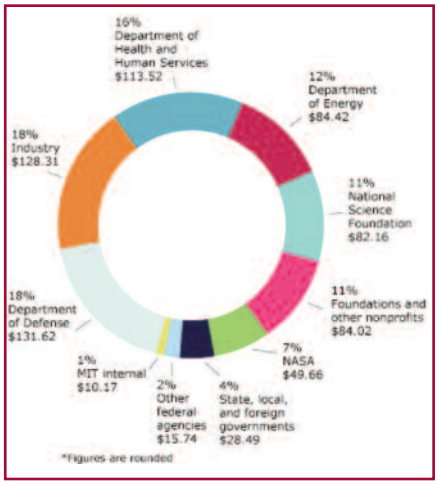
IT'S BEEN NEARLY A YEAR since I arrived at MIT from Urbana-Champaign, having spent a decade leading the technology transfer office at the University of Illinois' beautiful flagship campus. The opportunity to come to MIT to provide strategic leadership in the area of technology transfer and intellectual property (IP) management was ideal for me and my family. My wife, our nine-year-old daughter and I are now settled into the Sudbury countryside. I am also beginning to find my feet in the Kendall Square environment.

I thought it timely to share a little about myself and my vision of how the Technology Licensing Office (TLO) can support faculty and students alike in the work to amplify MIT's global impact through the transfer of innovation from the lab to the marketplace. The TLO's role in ensuring the efficient and effective transfer of MIT's scientific discoveries to startups and established firms has never been more important than now.

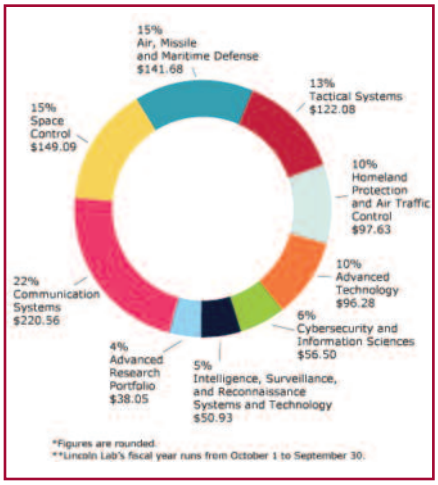
In my 16 years at the University of Illinois, I learned what it takes to create an ecosystem to serve entrepreneurial faculty and students when you don't have easy access to capital, mentoring, and the other resources necessary to build, sustain, and grow a vibrant innovation ecosystem. We did however, over the course of many years, manage to create a highly successful set of resources, facilities, and programs to support not only the University, but also the surrounding community. I was also fortunate to participate, on behalf of Illinois as IP lead, in some significant university/industry partnerships. With that backdrop in mind, I'd like to share with you my perspective on the MIT TLO, its responsibilities to the MIT community, and the ways that I envision we will shape technology transfer operations in the future to enhance our services to you.

In case you are not familiar with the work of the TLO, our purpose, in keeping with MIT's mission to advance knowledge, is to help identify, protect, market and license MIT's intellectual property and assist its transfer into society for the public good. The IP we manage may be patentable and/or copyrightable and may be jointly owned by other research or corporate entities. The TLO is also responsible for managing and licensing the MIT trademarks and use of MIT's name by third parties. We assist faculty in the transfer of materials and tangible property from other institutions into MIT labs, as well as from MIT to corporate and other research organizations. We also work with faculty in finding the most appropriate open source licenses for distribution of software. Administratively, the TLO reports to the Associate Provost with a dotted line relationship to the Vice President for Research for the purpose of signing licenses.

The TLO has IP compliance responsibilities stemming from MIT's and Lincoln Laboratory's use of federal, state, corporate, or other funding, and we must appropriately manage any IP flowing from that research. (See figures below which display funding from which IP may arise.) However, our work also involves many additional activities.



Research Expenditures By Primary Sponsor (in Millions)* Fiscal Year 2016 Total: $728.11



Lincoln Laboratory Program Funding By Mission Area (in Millions)* Fiscal Year 2016 Total: $973

We are proud to be part of the vibrant MIT innovation ecosystem and support many world renowned entrepreneurial programs such as the Deshpande Center for Technological Innovation, Sandbox Innovation Fund Program, and the

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Technology Licensing Office and You
Millar-Nicholson, from preceding page

Venture Mentoring Service. The TLO's goals also align closely with those of the MIT Innovation Initiative, as we work to move innovative ideas from conception to impact.

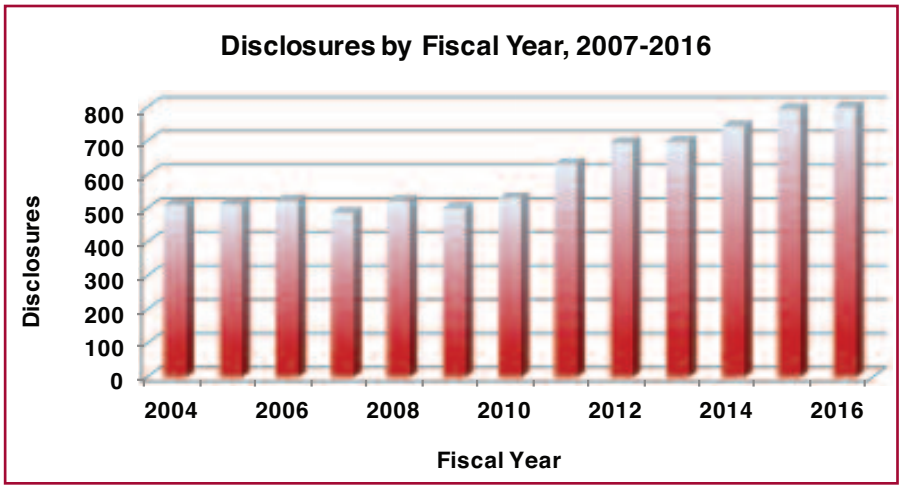
In addition, over 700 companies engage with faculty and students on projects at MIT, and licensing officers spend nearly half of their time working with the Office of Sponsored Programs (OSP) to negotiate IP terms and undertake the review of background IP for industry, and foundation sponsored contracts. We also work with the Industrial Liaison Program (ILP) to create and strengthen relationships between MIT and corporations. In recent months, the TLO, OSP, and ILP have been working closely together to identify more creative and flexible ways to engage with corporate sponsors. Our licensing officers also engage and provide IP related assistance to several Institute wide programs such as the MIT Energy Initiative, the Koch Institute, the Masdar Institute of Science and Technology Policy, and SMART (the Singapore-MIT Alliance for Research and Technology, that was MIT's first research center outside Cambridge). More recently, the TLO was involved in finessing a new IP portfolio approach created for the novel public-private consortium Advanced Functional Fabrics for America (AFFOA), which was led by MIT.

Most typically, faculty, researchers, or students will come to the TLO (located at 255 Main Street, Kendall Square) to submit a new technology for consideration and ultimately for licensing to a third party that will invest further funding toward the development of the technology, which then can be sold to customers. Our focus is impact, not income, and revenue derived from licensing is shared with inventors, research units, and MIT, after patent and other operational costs are recovered.

Evolution of the TLO

Since July 2016, I have been talking with many stakeholders in the MIT community and working with the TLO staff to identify ways in which we can improve the support we provide to the MIT community. Given the volume of research funding at MIT and the resulting thrilling scientific discoveries, it will be no surprise to you that the TLO has seen a 40% increase in technology disclosures received in the last 10 years (see the table). In that same period, we have had over 2,000 U.S. patents issued, and signed 1,000 licenses and options to companies, including licenses to over 190 startup companies. Some of our licensees are located within walking distance of the MIT campus. Many startups are embedded in local incubators, and we hope future startup licensees will also be part of the newly launched Engine. Of MIT's entire U.S. patent portfolio of 2,661 patents, over 50% are licensed, which is a very high proportion in comparison to our peers. (Both of these figures are of March 2017 and will change constantly based on new patents being issued each month and licenses executed.)

Such success takes significant effort, and building on such success takes candid reflection on what has been working and what needs to be improved. Behind the direct engagement with faculty and students sits a very capable but stretched TLO administrative infrastructure. With your help over the course of the next few years, I would like to make some adjustments to both our internal operations and our engagement with the community we serve in order to ensure that we not only stay relevant but also evolve as the entire innovation economy evolves. The following are a few of the areas that we have already identified for improvement. I welcome your feedback on these and other areas.



Technology Disclosures to the TLO

- Increased transparency in decision making, and in sharing the rationale for legal and financial deal terms
- Improved communication, both in consistency and provision of materials about IP management
- Improved TLO Website (due to launch in July 2017), including a future inventor portal
- Increased visibility of the TLO as a resource for the MIT community through more systematic and easy-to-access/use educational offerings on IP related topics, such as videos, Web-based seminars, and provision of data to faculty on their portfolios, market, and IP landscape analysis

- Lower transactional costs, through investment in infrastructure, including a new IP database and improved financial systems
- Improved invention disclosure process and patent management to ensure high quality patents to enable commercialization
- Improved access to our technologies for potential licensees, including a more user friendly technology database and expanded ready-to-sign licenses

We have already begun to take steps in some of these areas, but we also need the assistance of the MIT research community. For example, to improve our invention disclosure process and management of the patent portfolios we need to make some adjustments to our current procedures, such as reinforcing the need to have inventors submit their technologies *well before they make a public disclosure and provide sufficient information* for the licensing officer to ascertain, in consultation with the inventor, how and through whom the technology might be commercialized. To achieve this, we will be making some minor adjustments to our technology disclosure forms to gather additional information about the technology from inventors. We also need all MIT inventors to have completed an Invention and Proprietary Information Agreement. In addition, in the next six months, we will, following some improvements to the current beta system, be making a switch to an online-only technology disclosure process

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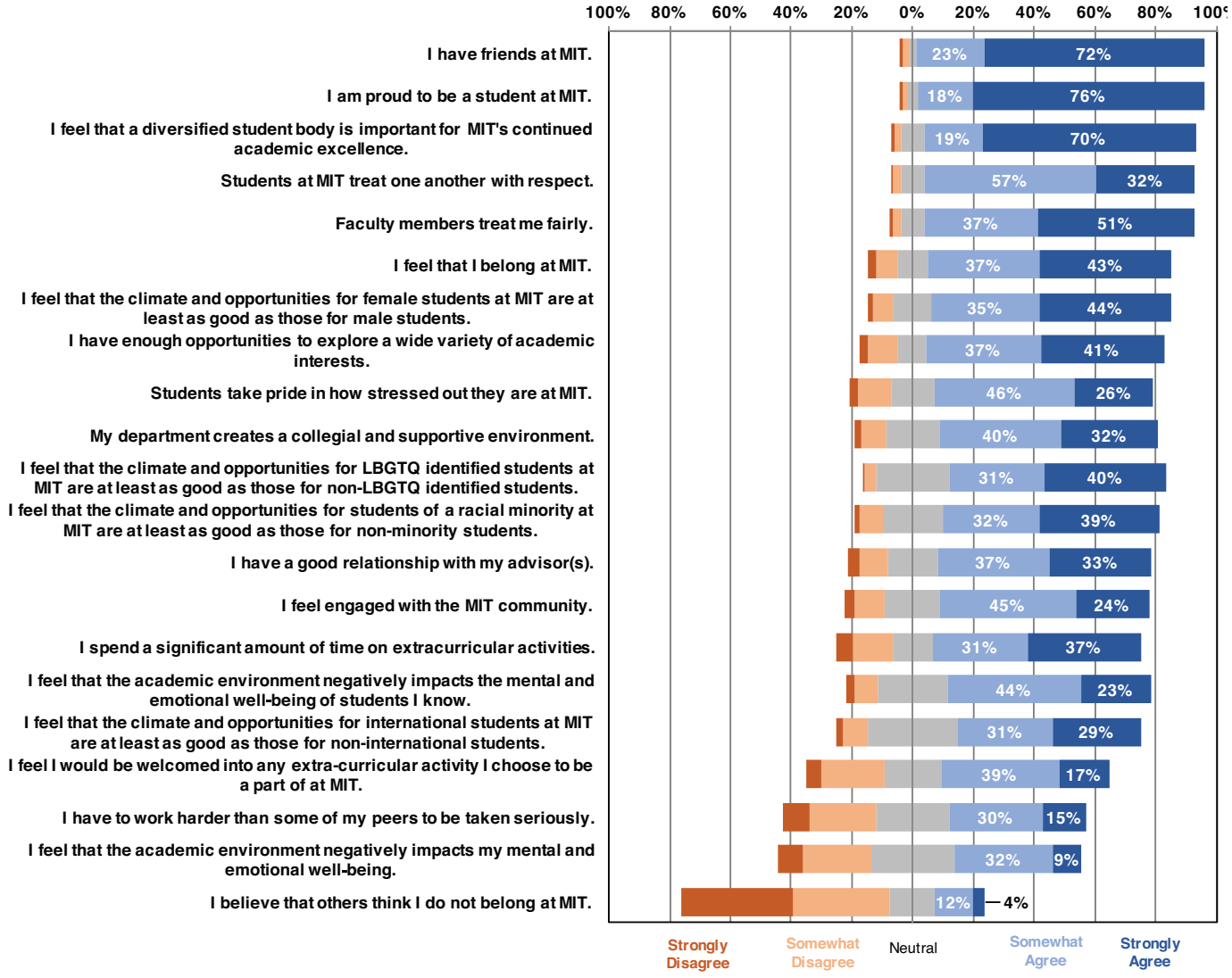
Whether through open source assistance, patenting and licensing work, copyright and trademark matters, transfer of materials, negotiation of IP terms in corporate sponsored research, or general guidance and information on IP matters (to name but a few), I hope that in the coming years the value that the TLO can add to the vibrant innovation environment at MIT will become even more apparent. I welcome your comments, not only about the efforts above, but also generally on your interactions with the TLO. Please feel free to contact me at *lesleymn@mit.edu*.

Lesley Millar-Nicholson is Director, MIT Technology Licensing Office *(lesleymn@mit.edu).*

M.I.T. Numbers
from the 2017 Student Quality of Life Survey

Please indicate your level of agreement or disagreement with the following statements:

Undergraduate responses sorted in descending order by somewhat + strongly agree



Source: Office of the Provost/Institutional Research