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MIT Faculty Newsletter

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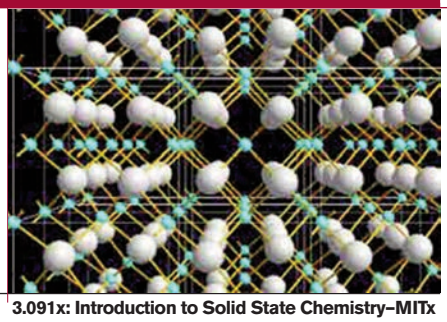
in this issue we offer a diversity of subject matter. Former Massachusetts Secretary of Transportation Fred Salvucci addresses MIT 2030 concerns (below); both our editorial and Faculty Chair Sam Allen explore MITx issues (below, page 4); John Belcher shares his experience with depression (page 6); chair of the CUP Tim Grove and others make the case for additional freshman advising (page 10).



3.091x: Introduction to Solid State Chemistry–MITx

Should MIT Create a School of Education?

Nelson Yuan-sheng Kiang and Leon Trilling

Is This the Time?

WITH EVERY CHANGE IN LEADERSHIP, opportunities arise to discuss major changes in policies, organization, and purpose. MIT is now presented with just such a moment. During the two-day celebration (September 20 and 21, 2012) of President Rafael Reif's inauguration, the theme of education was highlighted. President Reif has a record of being actively interested in education, not only for philosophical reasons, but also as a practical means for improving the lives of people. Thus, this well may be an opportune time for MIT, as a leading research university known for its teaching, to establish a School of Education that will examine every aspect of teaching and learning, with a special emphasis on the role of technology yet to come.

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MIT 2030 and the Kendall Zoning Issue

Fred Salvucci

MIT, THROUGH ITS REAL ESTATE entity MITIMCo (MIT Investment Management Company), has proposed to the City of Cambridge a significant increase in permitted density in Kendall Square. Major questions about that proposed plan were raised by many community residents and by some MIT faculty members, particularly highlighting concerns about potential adverse social impacts of gentrification, lack of affordable graduate student housing on and near campus, inadequate transportation capacity, and whether narrow real estate evaluation provides adequate recognition of the long-range interests of MIT as an institution whose primary mission is education and research.

New president Rafael Reif asked Professor Tom Kochan of the Sloan School to chair a task force to review this

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Editorial

What's Next With MITx

PRESIDENT REIF, THEN PROVOST Reif, announced MITx on 19 December 2011. Many are getting on board, while others remain skeptical, but one happy consequence is unquestionable: we discuss how we teach more now than ever before.

Perhaps everything that needs to be said has been said in one conversation or another, but not everyone has said everything accessibly, not everyone has heard everything, and new things will need to be said, so we anticipate that the faculty will have a lot more to contribute to the discussion and debate in future volumes of the *Faculty Newsletter* as we work our way through a turbulent decade full of big thoughts. Meanwhile, what is said has begun to exhibit nuanced tones:

Maybe the big benefit is a great chain of teaching. Instead of faculty and TAs,

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The MIT Faculty Newsletter
Editorial Board

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What's Next with MITx
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everyone is a TA, helping, at the low end, to teach a subject just learned, and at the high end, to provide the big picture and access to what is new and exciting.

It is tempting to rail against crowd teaching, horrified by the idea of evaluation by someone not on the faculty, but maybe we are forgetting the educational benefit provided to the evaluators. Many say they learn a subject best when they teach it, so why not have everyone solidify their learning by teaching.

Electronically facilitated, every MIT student could spend time teaching material just learned to those just learning, deepening understanding on both sides.

Maybe the big benefit is the inverted classroom. Instead of live lectures, students watch the material presented, in a way that exploits the medium, in 12-minute chunks, separated by gating questions that test understanding. Then, class time becomes discussion time.

There are points of irony here. One is that textbooks have been around for a long time, and textbooks abound in established subjects, so why haven't we inverted the classroom using books? Part of the answer may be that we humans prefer, and perhaps learn better, when knowledge comes in through spoken language. It is said that Abraham Lincoln read law books to himself out loud, driving his law partner nuts. Lincoln said he thought he understood it better that way.

Another point of irony is that our humanists may be ahead of MITx, rather than left out. After all, they have always had what looks like an inverted classroom centered on discussion. Their MOOCs are BOOKs, authored by the likes of, say, Homer, Thucydides, Sophocles, and Plato, and a little more recently, by Dante, Voltaire, and Shakespeare, with many of their works augmented these days by clips from theater and film.

Maybe we should focus exclusively on projects. Projects are empowering because they leave students feeling they have learned something.

We do have to be careful here, however. Learning bits and pieces of a subject is not the same as mastering a subject. Bits and pieces are enough for some of what we do, but mastery of the material in our line of work, and understanding what mastery means, is important too.

Maybe you can educate, as well as train, with a MOOC. It is easy to say you cannot teach people how to think with a MOOC, but you cannot defend the point convincingly until you explain what it means to learn how to think. Some say it is a matter of guided experience, typically working as a kind of apprentice, and it is hard to imagine how experience can be acquired through a wire.

Hard to imagine does not mean forever impossible, however. Many of us remember when the idea of carrying around a computer was hard to imagine, therefore seemingly impossible. If learning to think involves guided exposure to real and surrogate experience, and if that experience produces a repertoire of story fragments and the means to exploit them to solve new problems, then it is interesting to note that computer-based story telling, guided by student models, is a long-term research interest of some of our participants in the Intelligence Initiative.

Maybe we are not being bold enough. Most of our discussion centers on improving what we are doing now. So maybe we are exploring only those parts of the space closest to where we are. What about doubling the size of the undergraduate student body, enabled by more efficient, MOOC-based teaching? What about outsourcing the freshman year, enabled by MOOC-based teaching? Maybe UROP is all that is of value outside the humanities. If so, why not offload all the undergraduates? Let us just bring students in every third term (treating the summer as a third term) for intensified UROP experiences, thus tripling undergraduate MIT exposure.

There may be many stable points in the larger space of possibilities. If we do not think about the whole space, we may end up stable on a hillock instead of a mountain.

Maybe we are asking the wrong question. We ask: Can we adapt everything we teach to the age of MOOCs and MOOC it out to the hundreds of thousands?

That is the kind of question that leads to caricature: "Ok, you have just read Act 3 Scene 1. Before you go on, when Hamlet says `To be or not to be, that is the question...', he is referring to (1) the threat of bad weather in the strait of Oresund; (2) the possibility of invasion by avenging Norwegians; (3) a potential consequence of family stress."

Are we missing an opportunity if we do not turn the question over, and ask instead: "What are the 50 or 100 skills, concepts, and experiences every MIT graduate should know, understand, and have?" We have asked before, but perhaps this time we should ask without constraining ourselves to what can be gotten through a faculty GIR vote or how long it would take to get through it all.

With a list of 50 or 100 in hand, we can ask, with current and foreseeable technology, how can we best equip our students with the right skills, concepts, and experience in four plus forever. Then, we can situate ourselves to seize online opportunity, and as President Reif said, solve the unsolvable, shape the future, and serve the nation and the world.

Editorial Subcommittee

From The Faculty Chair

Faculty Roles After MITx Subjects Are Widely Deployed

Samuel M. Allen

LIKE MOST PEOPLE IN higher education, I have been thinking a lot about the effects of online learning tools on residential education at MIT. A lot has been written already about this topic, and it will undoubtedly come into sharper focus as the Institute-wide Task Force on the Future of MIT Education gets underway.

My initial focus of concern, as the idea of MOOCs took hold, was for the viability of colleges and universities when low-cost, high quality, online subjects become widely available. With the cost of higher education of increasing concern both on campus and in Washington, low-cost alternatives to a four-year residential Bachelors degree experience are likely to become very attractive. Should we be concerned about the long-term viability of MIT and other residential educational institutions? I'm not sure, but strengthening the on-campus student experience will always be an important goal.

In what ways do students gain added value by being campus residents during their undergraduate years? The report of the Task Force on Student Life and Learning, commissioned by President Vest in 1996 and completed in 1998, considers the foundation of an MIT education to rest on the "educational triad" of academics, research, and community (see ***web.mit.edu/committees/sll/tf.html***). The report covers the Institute's mission, presents 11 shared principles that "define MIT," discusses the components of the educational triad, and concludes with recommendations. In many ways, the report illuminates the potential "value added" by an MIT education. Here are some excerpts:

"If the goal of an MIT education is to develop the elements of reason, knowledge, and wisdom that characterize the educated individual, MIT cannot rely on structured learning alone." (p.33).

…"community" refers to students, faculty, staff, and alumni who have come together on campus for the common purpose of developing the qualities that define the educated individual. Establishing a critical mass of intelligent people dedicated to excellence in everything they do is central to MIT's mission." (p.33)

"… informal learning-by-doing through peer interaction at the community level can properly develop in students many qualities of the educated individual. Community interaction is an excellent preparation for life: paired with MIT's formal curriculum, it is a means to develop communication skills and the ability to think critically about societal issues, and it provides experience with cultural and intellectual diversity. Second, the accelerating changes of the information revolution are eroding the boundaries of place and organization. To add value to a technical education available elsewhere, MIT will increasingly have to rely on the value it can deliver by combining informal, community-based learning with structured, curriculum-based learning." (p.34)

From the earliest discussions at which I was present, MIT's engagement with MITx was described as being driven primarily by the aim to improve the on-campus educational experience for our own students. I believe that MITx offerings have the capability of doing this by making some types of learning more efficient, and possibly providing both students and faculty with more time to interact.

Extrapolating from the report of the Task Force, an online-only education will always be incomplete because it won't engage learners in two of the three components of the educational triad.

The Task Force report contains many other gems that we need to keep in mind as MITx grows and matures. While a number of the report's recommendations have been implemented, there is much left to inspire and inform discussion and debate as MIT and MITx move forward.

From the earliest discussions at which I was present, MIT's engagement with MITx was described as being driven primarily by the aim to improve the on-campus educational experience for our own students. I believe that MITx offerings have the capability of doing this by making some types of learning more efficient, and possibly providing both students and faculty with more time to interact. We clearly need data on where those efficiencies will arise, and I know that is one aim of analysis of the early MITx offerings.

Will the added value be sufficient to provide a continuing flow of exceptional applicants to our campus as online instruction is available for a broad array of disciplines? To gain insight to these questions we need to examine some specific aspects of the MIT educational experience that are either very difficult or essentially impossible to reproduce online. Many in the MIT community are actively discussing these issues. Some of the features of on-campus life that can't be replaced online include:

- Living apart from their families and developing self-reliance
- Forming deep friendships with on-campus peers
- Learning from their peers
- Having access to a broad suite of student support services
- Being in regular contact with faculty who can serve as mentors and advisors
- Engaging in research with graduate students and faculty
- Taking advantage of myriad extracurricular opportunities, including athletics, the arts, and student government

I believe that the extent to which these sorts of activities are offered and delivered on campus, and the quality of the students' experience, will determine whether or not we will continue to have a high-quality diverse applicant pool. And success at having a vibrant on-campus community hinges on the commitment of faculty and student life professionals to fostering and facilitating both professional and interpersonal development of our students.

What changes in faculty roles might be needed to provide the value-added I discussed above? Existing roles include classroom instruction, mentoring and advising, and providing our students with research experiences. Are faculty already doing enough? We are certainly *busy* enough already! But will incorporating more MITx subjects into the undergraduate curriculum lead to significant changes in the mix of faculty contributions to the "value added" activities?

In December 2011, when we first began to discuss MITx, some of us thought that if lectures to groups of students were to be replaced by MITx courseware, faculty time would be "freed up" for redeployment to working more intimately with small groups of students. I am less enamored with that view than I used to be, but I expect it will happen to some degree. Getting an MITx subject launched is a full-time job, not only for the faculty instructor(s), but also for a team of people working behind the scenes. No doubt we are still on the very steep part of the learning curve for putting MITx subjects together, and with additional experience and platform development doing so will become more efficient. But I now doubt that faculty will find significant blocks of time opening up. Faculty will need to be more engaged with students, and in some different ways, as our on-campus students make regular use of MITx resources.

Our faculty is very diverse and currently not all of its 1,000+ members is engaged in delivering formal lectures. In SHASS, many faculty already teach small groups of students as the norm for subject delivery and student engagement with the class material. But in SoE and SoS it is very likely that some of the hours our students currently spend in lecture will be replaced by incorporating MITx content into the time they spend studying outside of the classroom. What changes should we make in how we account for the "units" assigned to each MIT subject? Does it make sense for the total units to include the number of hours per week of online instruction? Should the unit breakdown for each subject explicitly count hours of "face-time" with instructional staff?

I know I've raised more questions than I've answered. Working out just what MIT faculty will do in the age of MITx and off-campus MOOCs will happen as such offerings become more numerous. But consideration of the likely roles needs to shape our thinking and planning.

In December 2011, when we first began to discuss MITx, some of us thought that if lectures to groups of students were to be replaced by MITx courseware, faculty time would be "freed up" for redeployment to working more intimately with small groups of students. I am less enamored with that view than I used to be . . .

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In Good Company: Professional Help Can Alleviate the Weight of Depression

John Belcher

THE APRIL 10, 2012 ISSUE of *The Tech* carried an article by Grace Taylor that I greatly admired [***tech.mit.edu/V132/N17/depression.html***]. It was about her depression and how she dealt with it.

At the time I thought I should write a similar article on the same topic, but from a faculty point of view, not a student point of view. Why? Because there is a stigma attached to having been clinically depressed and being on anti-depressants (as I am). That stigma is undeserved, and many people who should embrace such treatment instead avoid it. The more open people like Grace and I are about our experiences in dealing with depression, the more acceptance of those treatments there will be.

Near the end of the '80s, I was doing well. I had a stable marriage and two wonderful children, 8 and 11. I was a tenured Physics Professor, and Principal Investigator on an instrument on the Voyager Outer Planets mission to explore Jupiter, Saturn, Uranus, and Neptune, with a Neptune encounter coming up. Then I was diagnosed with a malignant melanoma. Its thickness was such that the chances it would metastasize were about 1 in 4. At that time, metastasized melanoma was a death sentence. I became hyper-vigilant about my health. A bit later, my then-wife and I started a major renovation project on our home, which did not go well. Because of the stress of that situation, and my own preoccupation with my health, our marriage collapsed. At the beginning of the summer of 1989, I was trying to figure out how to get divorced, what the custody arrangement for my

The past year has seen an increased focus on issues of student support and wellness at MIT. One outcome of this focus has been more open discussion on campus about the mental health obstacles that students may face here. Such discussion is beneficial because it reduces the isolation students feel when confronting mental health problems. It can seem that we are expected to overcome stress, anxiety, depression, and other such challenges all by ourselves. Few people are born equipped to do so, however, and for all people, the process is faster and more pleasant if they feel comfortable using support networks, whether informal or professional.

While any and all open conversations about mental health are valuable, of particular note are public accounts that shed light on experiences that are more common than they appear. Last spring, Grace Taylor published a series of articles in The Tech about her experiences with depression and professional mental health treatments. This fall, a blog post by Lydia K. on the MIT Admissions Website (***mitadmissions.org/blogs/entry/meltdown***) confronted the common but overwhelming, and sometimes debilitating, levels of stress that students here experience. As Chair of the Undergraduate Association Student Support Committee, I was inspired by these accounts. They sparked conversations about topics typically forbidden and resulted in a sense of camaraderie among students. It occurred to me that their impact could be matched, if not exceeded, by similar accounts from faculty, who hold positions of great revere in the MIT community.

As a result, I approached Professor Belcher about sharing his story, which we published in the March 19 issue of The Tech. I think that additional faculty accounts like Professor Belcher's regarding the many flavors of mental health obstacles will be inspiring and helpful for students. Because of the invisible nature of mental health afflictions, however, it is difficult to identify faculty who might be willing to share their stories unless they are already open about them. My hope is that by publishing a solicitation in the Faculty Newsletter I might reach a broader audience of faculty with wellness-related accounts to share with students. If you are interested in adding your story to a more open discussion about mental health at MIT, please contact me at *rileyb@mit.edu* or *ua-wellness-chairs@mit.edu* – anything you can offer is much appreciated. Note that for at least this semester, there are also opportunities to publish through one of our partner organizations, ActiveMinds (see ***web.mit.edu/activeminds/speakyourmind.html***).

Thank you.

Betsy Riley '14
UA Student Support Committee, Chair

It was the perfect storm. My physical coordination went. My thought processes became disordered. I had a hard time, for example, simply reciting the Pledge of Allegiance. I became lethargic, and had a hard time getting out of bed in the morning.

children would be, how to prepare for the upcoming Neptune encounter in August, and because of the melanoma, still panicked about my mortality.

It was the perfect storm. My physical coordination went. My thought processes became disordered. I had a hard time, for example, simply reciting the Pledge of Allegiance. I became lethargic, and had a hard time getting out of bed in the morning. Sleeping all the time seemed like a good option. I retained a certain detachment as I was sinking into depression. "So this is what it feels like to become clinically depressed" I would say to myself. You cannot imagine what it is like unless you have been there. I have always had hyperactive thought processes – juggling a million things at once in my head. For the first time in my life I could no longer do that. I soon realized what "living in the day" meant. The best I could do each morning was make a sort of ranked list of the things I had to do to get out of the situation I was in, and then just forget everything except the one on the top of the list. Considering the full list for even a second was just overwhelming.

I started seeing a psychiatrist, who immediately diagnosed depression and recommended an anti-depressant. I was reluctant. I was raised in Texas and had a macho attitude. Real Texans don't take Prozac. But I sank further into depression and became less and less functional, and I realized that I had no choice. I had to do something. The well-being of my children depended in part on my being a reasonably functioning adult, and I was far from that state. So I started taking Prozac.

I know that there is a lot of popular press these days about anti-depressants not always being effective. Maybe that is true for some people, but nothing could be further from the truth for me. I could immediately see the difference in my mental processes two days after I started taking Prozac. I would describe it as like being in a room full of a huge amount of static background noise that makes it impossible to think, and then someone walks into the room and turns the volume way down. I could think logically again. I could recite the Pledge of Allegiance. My physical coordination returned. Life became tolerable. Not great, but tolerable. That made it possible to slowly start dealing with the situation I was in.

These events took place more than 20 years ago. I am now happily remarried. My children are now 34 and 37. I am permanently on Prozac, as a prophylactic.

These events took place more than 20 years ago. I am now happily remarried. My children are now 34 and 37. I am permanently on Prozac, as a prophylactic. Since I am a Texan and by definition should be able to whip depression all by myself, I have on two different occasions in the last 20 years gone off of Prozac. In both cases after about six months I lapsed back into clinical depression. I think once having been depressed, your body chemistry is such that you are more susceptible to a recurrence. Watching my descent into depression again those two times was really enlightening. I would do fine with a certain level of stress, but if one additional, not so big, stressor was added, I went from flying high above the waves to being right at sea level, and then even the slightest additional thing could cause me to go down. And it could be really fast, like stepping off a cliff. My body chemistry could change in a few days from more or less normal to clinical depression, with all the symptoms I mentioned above. So I just stay on Prozac. Luckily for me, it has always remained as efficacious as the first time I used it.

This term I am teaching in and co-administering 8.02 along with Peter Dourmashkin, with 830 students. We both know from long experience that it is statistically inevitable that a handful of our 8.02 students will get into trouble this term, with their own perfect storm, and that clinical depression is one of the possible outcomes. I am no doctor, but I do recognize the symptoms of depression. If a student comes to me with troubles of any kind, I always tell them to go to S^3 or Mental Health. In case depression is the cause of the trouble, I also share with them that I have been clinically depressed and am on Prozac, and that there is no shame in that.

We should all be thankful that we live in this day and age, when these medications and treatments are available. We should not avoid them. In the words of Grace Taylor, "It's not you, it's a disease." ■

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Teach Talk

Dialog on Right-Now Talks

Patrick H. Winston

THROUGH AN ACCIDENT OF NATURE, no recitation instructors were available this past term for 6.034, Introduction to Artificial Intelligence. My TAs and I wondered how we could make up for the enrichment function normally provided in weekly recitations. We decided to add "right-now" talks. On eight Fridays, we had inspirational MIT faculty and staff talk about what they were doing in their research right now. We aimed to schedule the right-now talks so that they demonstrated that the skills and concepts I was teaching are relevant to current research and practice.

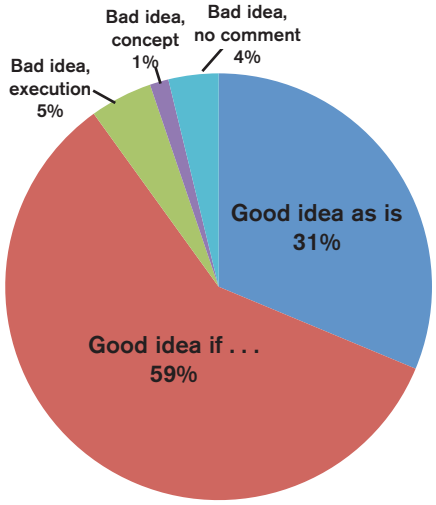
To get feedback, we asked a few questions on the cover page of our final. The results seemed to invite discussion at the Galileo Society. Segredo represented the staff.

Simplicio: I've heard about Winston's experiment. Wasn't this just making a subject out of a set of guest lectures?

Segredo: Winston still gave his usual lectures on Mondays and Wednesdays, so there were still distinct syllabus-grounded lectures. The right-now talks were condiments.

Simplicio: How did the students react to the right-now talks?

Segredo: Well, we ran a survey, asking the students to choose among (1) Good idea as is, (2) Would be a good idea if..., and (3) Bad idea. We think 95% fell on the spectrum from not completely against the concept to wildly enthusiastic.



Salviati: What? It looks like 90% to me.

Segredo: You have to squint. Of 288 registered students, 223 chose to try to improve their grades by taking the final. Of the 223, 96% answered the question. Of these, 31% indicated they like the right-now idea as is. Another 59% suggested improvements. That brings us to 90%.

Salviati: OK, so how did you get beyond that?

Segredo: We looked carefully at the volunteered comments of the students who checked Bad idea. Nine wrote that they vigorously disliked the execution, but said nothing about disliking the concept. Three others didn't like the concept: one wrote that he didn't get anything out of the talks; another wrote that he didn't have the right background; and a third wrote he had trouble with the English. So of those 12 who checked Bad idea and said why, three-fourths complained about execution rather than concept, with comments much like those who checked Would be a good idea if.... Taking the nine as not completely against the concept gets us to 95%.

Salviati: You can't say 95%!

Segredo: Right, we only think it. But 90% is still an impressive number.

Simplicio: What were the suggestions?

Segredo: There were 132; 42% wanted changes in the way we asked questions about the right-now content in our exams.

We just wanted to encourage students to attend and pay attention, so we asked multiple choice questions that we thought would be exceedingly easy for those who attended and paid attention. Here is an example:

Sussman's propagator architecture is motivated, in part, by his interest in problems such as:

- *Harnessing the power of cloud computing.*
- *Harnessing the power of crowd sourcing.*
- *Calculating the distances to galaxies.*
- *Modeling the propagation of rumors spreading through social media.*
- *All of the above.*
- *None of the above.*

Sussman talked for 20 minutes about

galaxies and said nothing at all about cloud computing, crowd sourcing, or rumors.

Salviati: So everyone got those kinds of questions right?

Segredo: No, many found them difficult and complained. We soon got rid of the All of the above and None of the above options, which everyone hated, but still, some said they attended faithfully and tried hard, but still bombed. The fact is, there is a lot of fogging out in lectures of any kind. Next time, we will teach some techniques for increasing absorption and retention.

Salviati: Like what?

Segredo: Taking structured notes and telling someone about the talk right afterward.

Simplicio: Why bother? MIT is moving to lecture-free MITx, after all.

Segredo: We don't think research talks and business pitches will move toward 12-minute chunks with gating questions in between.

Simplicio: Why didn't you ask open-ended questions?

Segredo: It would have taken forever to grade them. Besides, our quizzes are chocked full with our regular material, so we had to have rapidly-answerable questions.

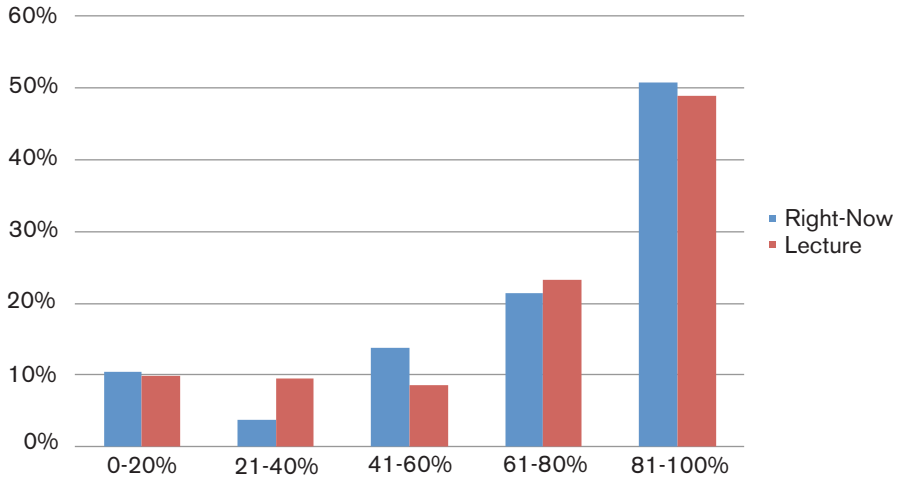
Salviati: What other suggestions were there?

Segredo: 22% wanted fewer points allocated to the material. We allocated 2/7 of each student's total score to questions covering the eight right-now lectures and another eight given by me that had an enrichment flavor. We might go a little lower, but we think we would soon get low enough that no one would show up. We are competing with other subjects for our students' time, after all.

Simplicio: So how many showed up?

Segredo: Have a look at how the students responded to an attendance question in our survey. About 50% of the students claimed they went to at least 80% of the regular lectures and the right-now talks; more than 70% went to most of them.

Simplicio: Why didn't you just take attendance?



Segredo: The look and feel of attendance taking seems wrong. Besides, you can attend and not pay attention.

Simplicio: Why are you so sure attendance would have dropped without testing?

Segredo: Well, we offered a totally optional Friday afternoon one-hour session focused on discussing the material covered by that day's right-now speaker. Typically, about 10 students came.

Salviati: What else did the students say they wanted?

Segredo: 12% wanted notes. Another 4% wanted the talks to be available online. But notes and recordings would discourage showing up.

Simplicio: So what?

Segredo: No inspiration. No practice in getting something out of a research talk. Speaker recruiting would become impossible.

Simplicio: What about the rest of the suggestions?

Segredo: In the miscellaneous category, perhaps the most interesting suggestion was that we threaten to ask questions about the right-now talks, but not actually do it.

Others suggested that we provide previews before the right-now talks, discuss them in tutorials afterward, and supply food during.

Salviati: Any big surprises?

Segredo: Not a big surprise, but although there were lots of complaints about our testing, no one volunteered that our testing uncovered a personal absorption and retention problem.

Salviati: Will you do it again, with adjustments?

Segredo: Definitely. The idea emerged from an accident, but the right-now idea plays on the question of where the value-added will be when much of skill teaching moves to MITx and its analogs. At least part of the value-added will be inspiration from inspiring live speakers and a sense of being at a place where interesting and important things are happening. We have to find all sorts of ways to amplify that part of the experience.

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MIT Freshman Mentoring and Advising: The Role of the Faculty

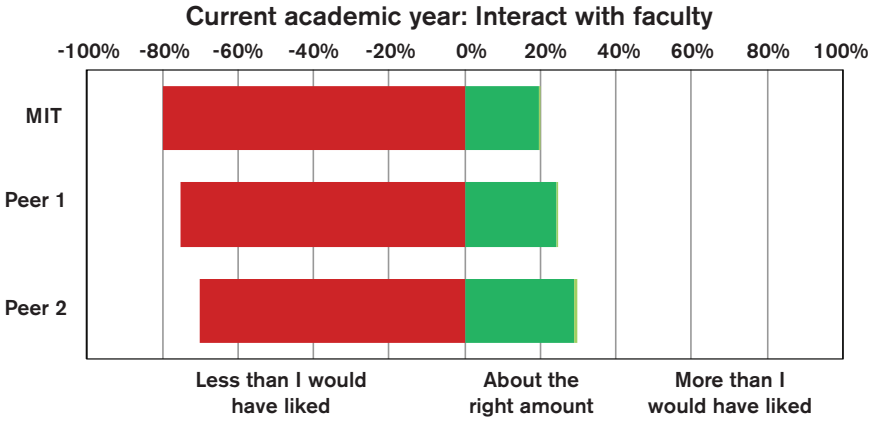
Timothy L. Grove
Samuel M. Allen
Daniel Hastings
William E. Grimson

AS A MENTOR, A FACULTY MEMBER becomes an essential part of the network that supports freshmen during their transition from high school to university life. Faculty mentors provide excellent support for the development of individuals who will become lifelong learners and leaders. Faculty mentors also provide counsel on the intellectual and disciplinary paths to follow while enrolled at MIT and on directions to pursue after graduation. Faculty mentors facilitate future opportunities by providing letters of recommendation for summer jobs, internships or graduate school applications. Faculty involvement and interaction with freshmen leads to better teaching and learning and is a natural mechanism for improving the quality of residence-based undergraduate education.

Freshman advising at MIT has been a topic of concern over the past decade because of the decline in the number of faculty members serving as freshman advisors. The number has decreased from a high of ~120 faculty in 1996 to only 83 in the current academic year. Consideration of how MIT might reverse this decline in faculty involvement led the Committee on the Undergraduate Program (CUP) to evaluate the key principles underlying the current freshman advising model. In the course of this exercise the CUP developed a set of desired characteristics for MIT's freshman advising program. An important finding of CUP's study was that faculty are only one part of an advising and mentoring network, but they are an essential part. The CUP believes that this knowledge and recent developments in support for freshmen at MIT, described below, provide new opportunities for more faculty members to become involved in freshman mentoring.

Reassessing Residence-Based Education

This is a critical time for MIT's faculty to reassess its vision of residence-based education. Part of that re-evaluation must consider the role of faculty/student mentoring. The CUP believes that intellectual interactions between faculty and students should be a core value and defining characteristic of an MIT undergraduate education. The 2011 Enrolled Student Survey found that MIT undergraduates were significantly less satisfied with the amount of faculty interaction than students at the institutions represented in two cohorts of peers: Peer 1, a small group of private, highly-selective research universities with whom we most closely identify; and Peer 2, a larger group of other private, highly-selective research universities. (See chart, below.)

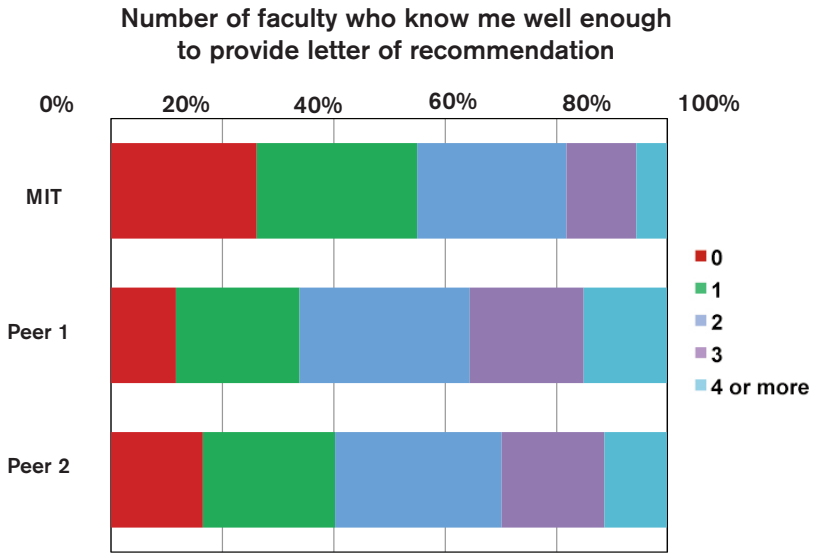


Source: 2011 Enrolled Student Survey

Furthermore, the same survey also revealed that MIT seniors are much less likely than students at those peer institutions to know three or more faculty members who would write letters of recommendation. This finding has serious implications for our students' post-baccalaureate planning. (See chart, next page.)

MIT students want more interaction with faculty members and one important way to meet this desire is to provide faculty mentoring during the freshman year, and to continue it through a student's time at MIT. The CUP believes that the current model for faculty engagement in freshman advising can be improved upon. It should be possible to structure the program so that the faculty advisor's efforts are focused on mentoring more than on subject selection and other administrative activities.

In the past, freshman advising has required faculty advisors to know "everything" about MIT's freshman year – or at least that is what many faculty members have assumed. In reality, there has been a significant shift from that time-consuming and sometimes emotionally demanding role to one in which the faculty member is part of a freshman's network of support. This network includes knowledgeable staff with expertise in degree requirements, professional development, and support of the physical and mental well-being of our students. Many members of the academic community, in addition to faculty members, already contribute to this suite of resources.



Source: 2011 Enrolled Student Survey

Academic Resources
- Advisor
- Student Associate Advisor
- Office of Undergraduate Advising and Academic Programming (UAAP)
- Academic program offices (e.g., Communication and HASS Requirements)
- ROTC officers
- Learning communities – Concourse, Experimental Studies Group (ESG), Media Arts and Sciences (MAS), and Terrascope
- Office of Minority Education (OME)
- UROP supervisors

Residential Resources
- Housemasters
- Graduate Resident Tutors (GRT)
- Residential Life staff

Other Professional Resources
- Coaches
- Office of Global Education and Career Development
- Student Support Services

The specific roles and responsibilities for each group within the advising and mentoring network have been discussed by the CUP, DUE, and staff in the UAAP, the office that coordinates freshman advising. These groups worked together to define a matrix of the interconnected and interrelated roles for the members of the network. For some types of advice, the faculty mentor plays a key role; while for other types of advice the student associate advisor or a housemaster plays the primary role.

Although existing resources available to freshmen are diverse, this network of support would benefit greatly from increased faculty involvement. The CUP's goal is to turn the existing advising/mentoring network into a system that encourages faculty commitment to freshman advising while shifting the faculty advisor's primary role from one that is often largely administrative to one that is primarily focused on mentoring. The key to this is structuring a system that takes advantage of the complementary skills and knowledge available from other teaching staff and administrators. Our proposal would initially build on the two existing avenues available now for faculty participation in freshman advising: offering a Freshman Advising Seminar (FAS) or participating in a traditional advising relationship. Every advisor will be matched with an upper class student, the Associate Advisor, who is well informed in the GIRs and is knowledgeable about MIT support resources.

Accomplishing Our Objectives

To accomplish our objective of ensuring that every first-year MIT undergraduate is advised or mentored by a faculty member, we need about 145 faculty mentors. That is about 12.5% of the number of full-time MIT faculty. Mentoring could be provided through Freshman Advising Seminars, traditional advising, and by faculty pairing up with staff advising experts in UAAP, ESG, Concourse and OME. And we should think about new ways of mentoring students. Meeting regularly with a small group of students for lunch or dinner could be a very effective and enjoyable way of interacting. Yale University does this in their system of residential colleges. Faculty members have an open invitation to dine with undergraduates. If you have visited Yale and experienced the intense and vibrant exchanges that go on at almost every dining table, you probably thought "Why don't we do this at MIT?"

Why haven't we met this goal of freshman mentoring before now? In the past two decades, a number of faculty-led committees have looked at freshman advising and made suggestions on how we could enhance faculty participation. The CUP spent the past year developing a set of Freshman Advising Principles. A review of the "Report of the Task Force on the Undergraduate Educational Commons" also provided some sound and thoughtful advice on this subject.

One reason that things have not changed relates to the fact that some faculty in departments with large undergraduate enrollments are already advising sizeable groups of upper-class undergraduates, which can consume a great deal of faculty time and energy. There is a feeling that there is not enough time for faculty to do freshman advising as well. However, not every department has a large number of majors, and we could distribute mentoring activities in a way that shares the load among us all. Also, we don't need to have every faculty member in the Institute participating in freshman advising. As outlined above, this problem could be solved if

continued on next page

MIT Freshman Mentoring
Grove et al., from preceding page

we increase the number serving as freshman advisors from 70 to 145. An additional 75 faculty advisors should be sufficient.

Can we not find a way to do this? Perhaps it is time to provide some incentives or look at the advising load of departments and balance these loads by distributing responsibilities for freshmen to faculty in departments with smaller undergraduate enrollments. Perhaps we can identify and provide meaningful incentives. In any case, it will require that all of us at MIT – faculty members, department heads, deans and the MIT administration – work together to create a new system to mentor first-year students. We will need to identify resources and develop mechanisms that support faculty mentoring and advising. To begin this process of reinventing freshman advising at MIT, the CUP offers the following resolution:

Proposed Faculty Resolution

It is the sense of the MIT faculty that every freshman should have a faculty member serving as a mentor or advisor. We ask that the leaders in MIT's administration partner with the CUP, the Deans of the five Schools, and DUE and DSL to develop and implement an advising program that moves us towards this end.

We would value your input, advice, and feedback on this proposed faculty resolution.

Timothy L. Grove is Chair of the Committee on the Undergraduate Program and a Professor of Geology *(tlgrove@mit.edu);*
Samuel M. Allen is Chair of the MIT Faculty and a Professor of Metallurgy *(smallen@mit.edu);*
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Undergraduates Support Faculty Mentorship of Every MIT Freshman

Naren Tallapragada
Ravi Charan
Jonté Craighead

INTELLECTUAL LIFE AT MIT thrives on vibrant exchanges between students and faculty. We have all seen the results of successful student-faculty relationships, from spirited class discussions to productive research collaborations. Moreover, the relationship between a faculty advisor and an undergraduate advisee can teach students the value of seeking out good mentors throughout their lives. We are writing on behalf of the MIT Undergraduate Association to endorse CUP's call in this *Faculty Newsletter* (Vol. XXV, No. 4) for every freshman to be mentored by a member of the faculty. We believe that these efforts will catalyze more meaningful engagement between undergraduates and the MIT faculty.

Currently, the freshman advising system caters to the immediate needs of freshmen when they arrive on campus, with, for example, appropriate focus on choosing classes in which to enroll. Here, MIT staff and students play an invaluable role in helping freshmen adjust to college life. Their guidance on "how to get around MIT" is important – but so is the unique perspective of faculty members on how to get involved with academic life at the Institute. This perspective can broaden a freshman's intellectual horizons in ways that the perspective of other advisors – staff and students – cannot.

To be clear, the current system serves some students well. Some faculty already advise freshmen and do a wonderful job of it. Many students are capable of seeking out mentorship proactively, and others are highly independent and do fine without it. Yet some students remain underserved by the current system. These students – many of whom spend their freshman year in lecture classes with hundreds of students – often find the faculty and their position of authority to be intimidating.

You know these students – or, rather, you don't. They're the ones who don't come to your office hours and don't raise their hands in class. As students ourselves, we can tell you that they're not uninterested in classes or in forming relationships with faculty. Rather, they lack confidence – these same students have no difficulty approaching their peers with insightful questions. Pairing freshmen with faculty mentors will show these students the value and process of engaging with their professors and can help to humanize the faculty as well.

Faculty mentorship can transcend the purely administrative relationship that too many undergraduates associate with the word "advising." Advising should be more than signing forms, ensuring progress through a degree checklist, or occasionally helping with class selection.

Indeed, students' attitudes towards freshman and upperclassman advising are decidedly intertwined: many undergraduates have been conditioned by their freshman advising experience to think of subsequent advisors as functionaries rather than as mentors. Some of our fellow students see their departmental advisors no more than once per semester, and, even then, merely to obtain a (now digital) signature.

Faculty mentorship of all freshmen will teach students to value and cultivate relationships both with major advisors and with faculty in general. Such a mentorship system would also send a strong signal – to students, parents, and the world – that, even in the era of MOOCs, MIT cares deeply about the quality of the residential educational experience that it offers to undergraduates.

On behalf of the MIT Undergraduate Association, we endorse the proposed resolution on freshman advising and urge you to do the same. After all, we were all college freshmen once.

Naren Tallapragada is a Senior and Chair of the Undergraduate Association (UA) Committee on Education *(ntallapr@mit.edu);*
Ravi Charan is a Junior and the UA Chief of Staff *(rcharan@mit.edu);*
Jonté Craighead is a Senior and the UA President *(jontec@mit.edu).*

MIT 2030 and the Kendall Zoning Issue
Salvucci, from page 1

issue and make a recommendation. Professor Kochan made a Solomonic recommendation – that the increase in zoning density, which provides a significant increase in opportunity for MIT, should be supported, but that the question of what to do with this expanded opportunity needs much deeper consideration by the MIT community. Given the significance of these strategic decisions at this important moment in the history of the Institute, what principles should inform this discussion? What moral obligation does MIT have to the Cambridge community? To the State and region? To the MIT community? These are questions that the MIT faculty, staff, and student body should be discussing, and engaging the administration and MIT Corporation.

A Little History

Over 40 years ago physical issues of even larger magnitude faced Cambridge and MIT when the state was proposing to build 8-lane highways (the "Inner Belt" and the extension of Route 2) through Cambridge neighborhoods of Cambridgeport, Central Square, and Porter Square, as well as Union Square in Somerville, with the destruction of thousands of homes and businesses and inflicting substantial disruption on neighborhood fabric and transportation systems. The debate over the Inner Belt was polarizing, with significant divisions of opinion about the relative role of public transportation and the automobile, the sustainability of suburban sprawl, the environmental impacts of increasing petroleum consumption and air pollution, and especially the socioeconomic injustice of disrupting inner-city, largely poor and working-class multiracial neighborhoods, for the convenience of higher income, largely white and suburban automobile commuters. The divisions and debate occurred at the national, state, and local levels, with the conventional wisdom of "business as usual" planning elites arguing that the continuation of the 1950s paradigm was essential for economic growth, and environmental justice advocates arguing that this definition of economic progress is unsustainable, and that a transit oriented strategy could lead to more economic growth, improved environmental outcomes, and improved socioeconomic justice. This debate split the MIT community, with the MIT administration pursuing strategies to benefit from the disruption of Cambridgeport and Central Square to expand MIT ownership of neighborhood real estate, while many faculty voices challenged the injustice inherent in that strategy, and demanded that MIT behave as a cooperative member of the Cambridge community.

Kevin Lynch of the MIT Urban Design and Planning faculty actually proposed relocating the highway route to a high viaduct along the Grand Junction railroad, which would have substantially avoided the low- and moderate-income neighborhoods. When President Killian of MIT publicly opposed any roadway construction near MIT, junior faculty such as Robert Goodman, Chester Hartman, and Lisa Peattie organized a signature drive attracting over 500 members of the MIT and Harvard academic community who courageously demanded that MIT behave as a good neighbor within the Cambridge community, and either welcome the road in its neighborhood, or oppose the construction of the highways anywhere in Cambridge. Neighborhood opposition skillfully organized by Father Paul McManus of St. Mary of the Annunciation Parish secured the support of Cambridge Mayor Dan Hayes, Congressman Tip O'Neill, Senators Ed Brooke and Ted Kennedy, Boston mayor Kevin White, and state representative (later governor) Mike Dukakis, and built a regional coalition stretching from Cambridge and Somerville to East Boston, and Roxbury to Milton and Needham, demanding a halt to the destruction of the neighborhoods for highways.

In 1970, Governor Sargent asked Professor Alan Altshuler of MIT's Political Science Department to chair a task force to review the Commonwealth transportation plans, and accepted the task force recommendation of a highway construction moratorium and fundamental transportation policy review. Altshuler designed and implemented the first transportation study to embrace the principles of the newly-enacted (1970) National Environmental Policy Act. Based on that review, Governor Sargent canceled the Inner Belt Highway and Route 2 Extension, secured changes in federal legislation to allow an equal amount of federal funding to be available for public transportation, set in motion the expansion of the Red Line to Porter Square, Davis Square, Alewife, and Braintree, reformed the MBTA, imposed parking limits in Cambridge and downtown Boston, and made gasoline tax money available for transit. The following governor, Dukakis, consolidated and extended the transit-oriented policies, expanding the capacity of the Red and Orange Lines by 50%, and acquired and recapitalized the bankrupt commuter rail networks. These changes in transportation strategy made possible the dramatic growth and economic development in the Kendall Square area, with practically no increase in traffic, and the redeployment of Cambridge street space to more pedestrian- and bicycle-friendly uses. The proposed doubling of density in the Kendall Square area could not be contemplated today except for the changes in transportation strategy unleashed by the anti-highway fight. But what about environmental justice? How are the lower-income residents organized by Father McManus faring?

Back to Today

The good news is that the Cambridge neighborhoods were spared the physical destruction that had been planned through Central Square, Porter Square, and Union Square. But Cambridge has increasingly become unaffordable for low- and moderate-income people. The Cambridge Residents Alliance and other residents have challenged the idea that the increased density now proposed can be pursued without worsening the housing affordability problem. Adding high-density, high-income housing to Central Square with only token amounts of

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MIT 2030 and the Kendall Zoning Issue
Salvucci, from preceding page

affordable housing is likely to spur more gentrification. Many academics and planners say that the continuing increase in rents, especially of transit-accessible housing, is stunting economic growth (see Kaufman "heat" map below). Some MIT faculty and graduate students have argued persuasively that the shortage of affordable graduate housing on or near campus is also undermining the viability of the MIT graduate student research program that is fundamental to the success of MIT.

But doing nothing will only ensure the continuation of gentrification and lack of adequate graduate housing. Densification of Kendall Square can help to change the dynamic. There is a targeted and potentially effective response that MIT can initiate. The number of graduate students and postdocs for whom MIT does not provide on- or near-campus housing has grown to approximately 4,000 graduate students and 1,000 postdocs, who are displacing low- and moderate-income residents from more affordable housing than the cancelled highways would have destroyed. It is clear that lack of MIT graduate student housing is having a severe adverse impact on housing affordability, probably much more significant than the successful economy. With reasonable public transportation access, employees of Novartis are much less likely than MIT graduate students to be competing with long-term residents for housing near Central Square, or in Somerville. By committing to a policy of building 100% affordable housing for graduate students either on campus or nearby, and implementing it quickly, MIT could simultaneously ease gentrification pressure on the neighborhoods and deal definitively with the need for affordable graduate student housing. If, in addition, MIT were to provide affordable on- or near-campus housing to junior faculty and staff, MIT could further reduce gentrification pressures, and improve its competitiveness in recruiting junior faculty.

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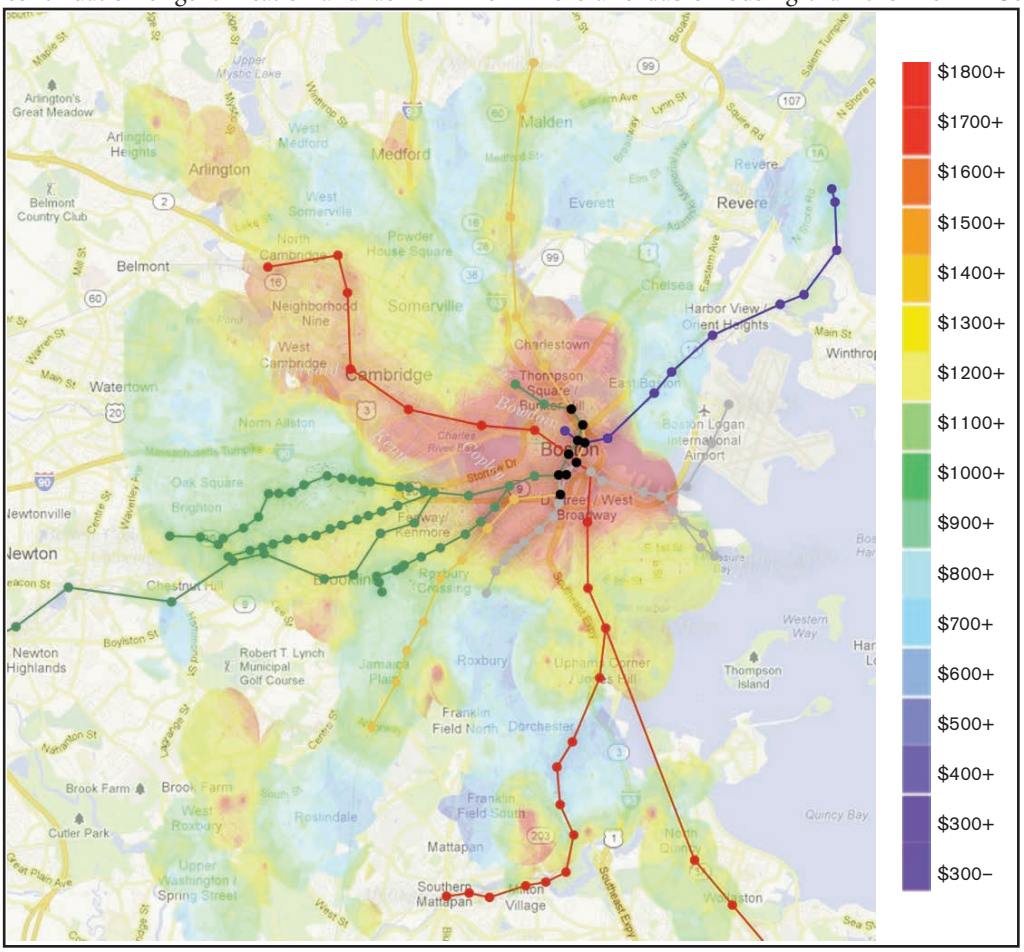

Kaufman Heat Map. Prices per bedroom as of January 2013.

If MIT or Kendall Square developers were allowed to "buy" additional development rights from Central Square, and transfer them to Kendall Square, moderate height, low- and moderate-income housing could be added near Central Square, financed by the purchase of development rights, helping the City to stabilize the density and affordability of Central Square. In Kendall Square, increased high-rise development would be further from traditional neighborhoods.

In terms of transportation access, doubling the density of economic activity in

Kendall Square risks attracting more traffic to a street network that is already congested. MIT can take three significant actions to offset this risk. First, MIT could substantially expand its transit benefit program to provide (at least) as much subsidy to transit commuting as it provides in below-market parking prices for auto commuters. Nearby Novartis provides free transit passes to all its employees. Imagine the "green" message if MIT were to provide all of its students, staff, and faculty free transit passes! Second, MIT could go on a "parking diet," reducing the amount of on–campus parking as well as that proposed to meet the expanded density envisioned at Kendall Square, thereby reducing the traffic generation that would otherwise occur. Third, by supporting changing signalization at the intersections of Ames Street and Wadsworth Street with Memorial Drive, MIT can help to provide better automobile access to Kendall Square from Memorial Drive, reducing pressure on Massachusetts Avenue, Broadway, and Third Street, and strengthening the symbolic connection of Kendall Square to the magnificent amenity that is the Charles River Reservation with high-quality pedestrian connections.

The challenge of providing adequate levels of new public transportation capacity to supplement the crowded Red Line requires MIT to join a coalition arguing that the State quickly implement "Urban Ring" bus service, Green Line or DMU rail service in the Grand Junction Corridor, modernize the Red Line signal system, and purchase more Red Line railcars. If the higher building density proposed near Kendall Square is accompanied by a parking cap at current levels, new development will require transit improvements, and the developers and MIT will have to lobby the State to deliver more and better transit service. The State will have to make significant improvements in public transportation to convince the public, as well as developers, that it is reasonable to pursue higher density.

It is true that MIT is better than most local universities both in its provision of on-campus housing for graduate students, and its transit subsidies. However, being better than others is not enough. If MIT wants to be a world leader in sustainability, it needs to do more. MIT is asking for permission to double the development density of its land. If MIT argues (correctly, in my view) that higher density at Kendall is good for economic, environmental, and equitable sustainability, then MIT needs to take the lead by building at least 5,000 units of affordable graduate student housing, and reducing the automobile dependency of its existing campus, as well as in its Kendall Square proposals.

If the City of Cambridge permits the doubling of density in the Kendall Square area, they are providing a very large financial benefit to MIT and other landowners in the area, a benefit that creates a huge moral obligation for MIT and others to reciprocate. I agree with the recommendation of Professor Kochan's committee that the MIT community should support the increase in zoning density, but reconsider in a much more open discussion with faculty, staff, students, and the broader community how MIT should use this opportunity. Provost Chris Kaiser has now designated Professor Phil Clay as chair of a graduate student housing working group, which can serve as a forum for this discussion. To be meaningful, the task force should not waste time deciding if there is a shortage of affordable graduate student housing. It is clear that MIT has an urgent responsibility to construct 5,000 to 6,000 housing units for graduate students and postdocs, married students, and junior faculty. The task force should focus on where and how to add this housing in timely fashion to be included in the Kendall Square redevelopment prior to final City approval.

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The rest is up to us. Over 40 years ago MIT faculty such as Professors Kevin Lynch, Robert Goodman, Lisa Peattie, Tunney Lee, and Alan Altshuler "thought globally, and acted locally," courageously challenged the business-as-usual attitudes of the MIT administration, and substantially improved the trajectory of urban development in the Boston metropolitan area, and the nation. The discussion of how best to use the opportunity of Kendall densification is this generation's opportunity for leadership by the MIT community.

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Survey of Graduate Alumni: Career Trajectories, Entrepreneurship, and Professional Skills

Christine Ortiz

MIT ALUMNI WITH GRADUATE degrees currently total 79,885 and now constitute over 50% of all MIT alumni. Their accomplishments are diverse, numerous, and bring great prestige to MIT. Examples include 20 Nobel Prize winners (among them George Smoot PhD '71, Physics; Kofi Annan SM '72, Peace; and Paul Krugman PhD '77, Economics) and 23 astronauts (including Col. Edwin E. "Buzz" Aldrin, Jr., ScD '63, and Ronald E. McNair, PhD '76). MIT has graduated leaders in fields as diverse as government (such as Benjamin Netanyahu SM '76, Prime Minister of Israel, and Sheila Widnall SM'61, ScD '64, former Secretary of the Air Force 1993-1997, MIT Institute Professor of Aeronautics and Astronautics and Engineering Systems Division), online education (Salman Khan, MEng '98, founder of the Khan Academy), music technology (Amar Bose SM '52, ScD '56, founder of Bose), computers (Radia Perlman SM '76, PhD '88, "Mother of the Internet", and Steve Kirsch SM '80, inventor of the optical mouse), business (Robin Chase SM '86, founder of Zipcar, and Cecil H. Green SM '24, founder, Texas Instruments), invention (Bernard Gordon SM '49, inventor of Doppler Radar and holder of over 200 patents), and academia (Shirley A. Jackson, PhD '73, President of Rensselaer Polytechnic Institute and nuclear physicist). Graduate alumni represent a rich source of information about the knowledge and skills gained during their education at MIT and its persistence throughout their career.

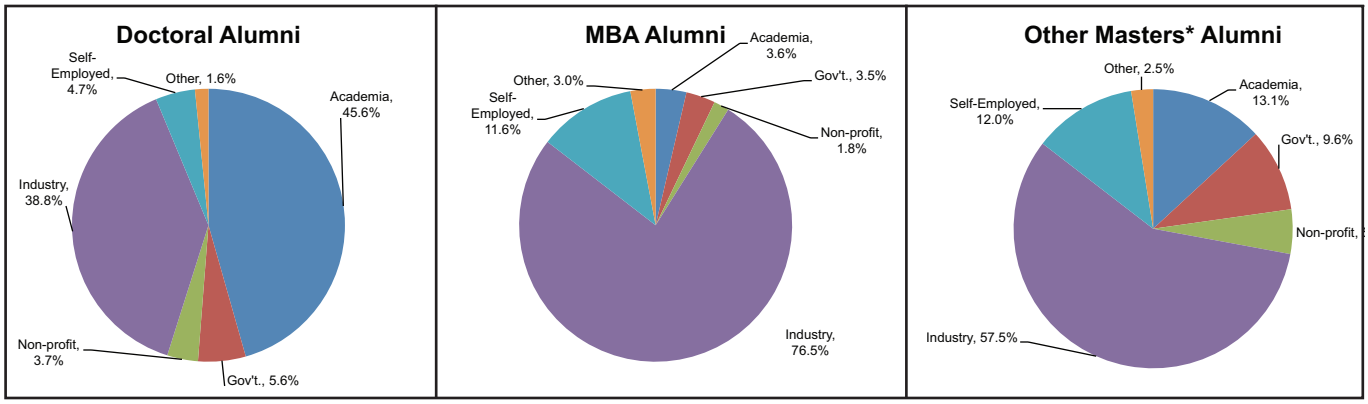
During the fall semester of 2012, the Office of the Dean for Graduate Education (ODGE) sponsored a survey of graduate alumni whose degrees were awarded approximately 5, 10, 15, 20, and 25 years prior. The purpose of the survey was to elucidate post-graduate trends in employment and career trajectories, entrepreneurship activities, professional activities and accomplishments, and the necessary knowledge and skillsets for various career paths. We expect this information will be useful in the development of graduate curricula, co-curricular professional development activities, and strengthening engagement with graduate alumni. The graduate alumni survey yielded 3,692 valid responses, corresponding to an overall response rate of 23%. The distribution of respondents, both by cohort and by general field of study, is similar to that of the invited population. Doctoral students responded at a higher rate than other degree categories, but the majority of the conclusions we draw are within degree type. The proportion of female graduate alumni respondents increases by cohort year, from 18% of those 25 years out to 37% of those five years out. Similarly, the proportion of non-U.S. citizens increases by cohort year, with 16% of those 25 years out saying they are not a U.S. citizen to 40% of those five years out. The full survey results may be accessed at ***web.mit.edu/ir/surveys/grad_alum.html***.

The dataset provides a wealth of information and is currently being analyzed. Of note, 94% of graduate alumni respondents were "generally satisfied" or "very satisfied" with their time being a graduate student at MIT. In what follows, we describe some salient Institute-level trends in the areas of career trajectories, entrepreneurship, and professional skills.

Career Trajectories

93% of our graduate alumni are employed, with just 2% currently seeking employment (others are engaged in such activities as travel and caring for family). The average annual salary of graduate alumni was reported to be $156,793; the median was $137,500. Graduate alumni, overall, were most likely to report working in a private for-profit organization (54%), in a U.S. four-year college or university (13%), or to be self-employed (9%). Figure 1 disaggregates these data by degree type and shows significant and interesting differences. Though the doctoral degree has traditionally been considered as a main pathway to academia, 54% of doctoral alumni reported that their employer was a governmental, industry, not-for-profit, or other organization, or were self-employed. This is somewhat higher than the 45% of PhD recipients who report a non-academic employer at graduation. Alumni were also asked to describe the course of their career so far with regard to their field; over half of doctoral alumni reported that they remained in the same field while two-thirds of MBA alumni and 58% of other Masters alumni have changed fields at least once. A Task Force on Graduate Student Professional Development ("TFPRO") that I have assembled is currently considering various necessary skillsets (discussed later on in this article), both discipline-specific and transferable, and will provide recommendations for formulating a coherent set of graduate co-curricular professional

Figure 1: Employment sector distributions by graduate degree type (recipients of degrees in 1987, 1988, 1992, 1993, 1997, 1998, 2002, 2003, 2007, and 2008).



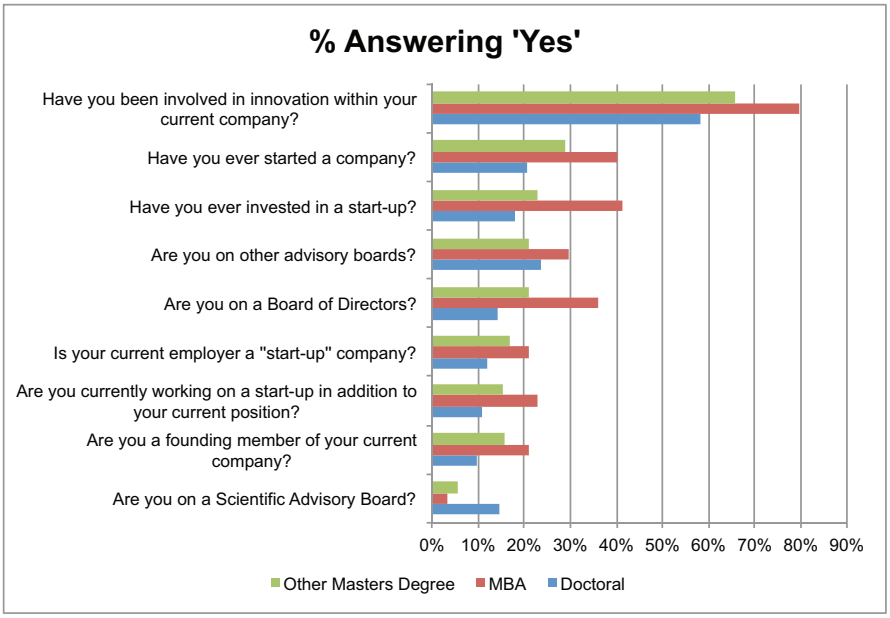
***"Other Masters" includes: Master of Architecture (MArch), Master in City Planning (MCP), Master of Engineering (MEng), Master of Finance (MFin), Master of Science (SM), Engineer (each degree designates the field in which it is awarded).**

development offerings that will better prepare our graduate students for the employment trends observed in these data.

Entrepreneurship

With MIT situated in a dense external ecosystem of start-ups, entrepreneurship among our faculty and students has flourished on MIT's campus, rising sharply over the last 10 to 15 years. Institute-wide, 28% of graduate alumni have started a company, 25% have invested in a start-up, and 15% indicate they are working on a start-up currently (see Figure 2 for data disaggregated by degree type). In Figure 2, we can see that even 21% of Doctoral alumni, and 29% of other Masters alumni, have also started a company; of those respondents, 24% of Doctorates and 19% of Masters say the company was based on their research at MIT. 28% of the Doctorates and 33% of the Masters (both MBA and other) had started their first company within five years of their MIT degree. Moreover, 41% of Doctoral alumni have at least one patent or invention, as do 12% of MBA alumni and 27% of other Masters alumni.

Figure 2: Entrepreneurial activity by graduate degree type (recipients of degrees in 1987, 1988, 1992, 1993, 1997, 1998, 2002, 2003, 2007, and 2008).



***"Other Masters" includes: Master of Architecture (MArch), Master in City Planning (MCP), Master of Engineering (MEng), Master of Finance (MFin), Master of Science (SM), Engineer (each degree designates the field in which it is awarded).**

Professional Skills

All graduate alumni survey respondents were asked to rate the importance of a variety of professional skills to their current work on a scale from Not Important to Essential. The most highly ranked skill for all three groups (Doctoral, MBA, and other Masters alumni) was communicating effectively one-on-one. All three groups also ranked prioritization very highly, but the other three skills in the top five varied somewhat by group: Doctoral alumni valued critical thinking, time management, and taking initiative; MBA alumni highly ranked being flexible and adaptable/responsive to change, taking initiative, and resourcefulness; and other Masters alumni emphasized being flexible and adaptable/responsive to change, resourcefulness, and critical

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Survey of Graduate Alumni
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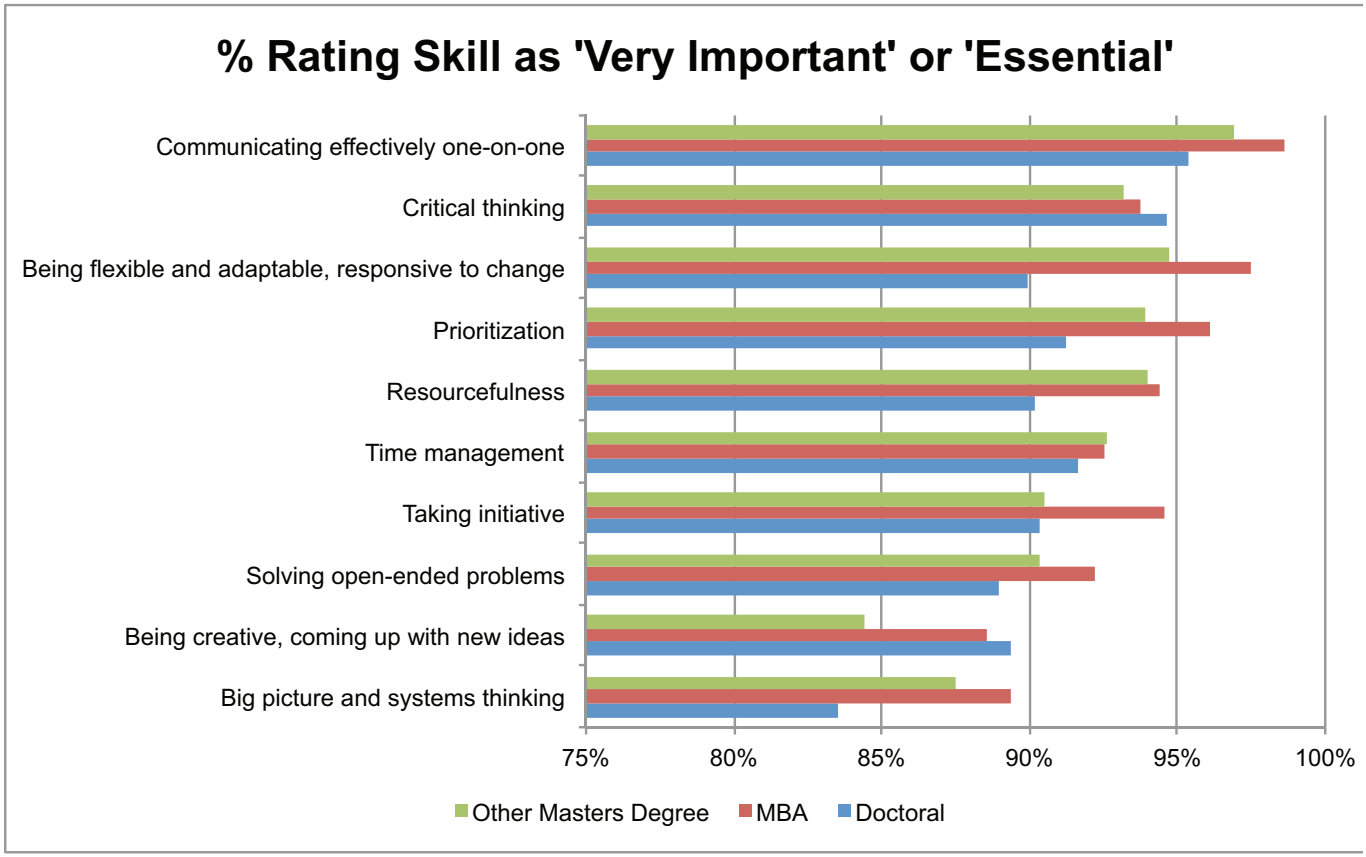
Figure 3: Ten skills rated most important by graduate degree type (data includes graduate alumni years) (recipients of degrees in 1987, 1988, 1992, 1993, 1997, 1998, 2002, 2003, 2007, and 2008).



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thinking. As mentioned above, the TFPRO will draw on these data from the survey to further inform its recommendations for formulating a coherent set of ideal professional development offerings for MIT graduate students.

The key results elucidated by the graduate alumni survey are important as we consider the future of residential graduate education. Our graduates are pursuing a diverse set of career paths and experiencing dynamic career trajectories. They are extensively engaged in innovation and entrepreneurship. And they have identified transferable skills, including one-on-one communication, prioritization, critical thinking, flexibility, and resourcefulness, as critical to their success. MIT must think carefully about how to evolve graduate education in response to the picture that emerges from these findings, and in response to the external forces of globalization, the rapid development of online education, financial strain, and the generational changes of our students. I believe the most effective path forward in addressing these changes is a graduate education experience that integrates residential, virtual, and global experiences. Linking discipline-specific academic rigor with innovative and enriching non-traditional learning activities that develop transferable skills, context, and character will enable our students to generate and apply new knowledge to effect positive and transformative change in the nation and world in the twenty-first century.

Acknowledgements
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Should MIT Create a School of Education?
Kiang and Trilling, from page 1

In recent years charter schools have developed at an unprecedented pace largely because many parents have lost confidence in the K-12 public schools. The "No Child Left Behind" initiative, with its emphasis on standardized testing, has been controversial, to say the least. Its effects are still unclear and the role of government in education needs a thorough debate involving all segments of the population.

An MIT School of Education with a unique point of view would bring added energy and expertise to the national educational scene. It might help to invigorate private and governmental support for educational reform, which by all accounts is a top priority for parents worldwide. A truly effective "National Institute for Education Research" modeled after the National Institutes of Health could provide sustained federal funding for improving our public and private educational systems. An MIT School of Education could be the spark that ignites such new initiatives.

What Might a New School Be Like?

One of the problems with almost all public educational systems is that they are based on a faulty premise: that all people are alike in their potential. This idea leads to an industrial model for education in which students (as raw materials) are fed into an educational machine, emerging as products usable by society for its various needs. Such an approach leads to a push toward "standardization" when we all know from personal experience that people differ in capabilities, talents, energy levels, interests, and developmental pace. Perhaps it is time to consider individualized education as an alternative underlying philosophy. In health care, the hottest idea today is personalized medicine that takes account of variations in genomic, epigenetic, and cultural factors. A similar vision in which opportunities for learning can be adjusted to the proclivities of individuals through technological changes already here is now thinkable. Social media, online learning, edX, "Great Courses," etc. are all emerging signs of a revolution in how and what we learn. MIT can take a leading role in shaping the coming changes. Entities such as the Broad Institute, the Brain and Cognitive Sciences Department, and the Media Lab are only a few of the possible participants that would naturally help to set agendas for a School of Education.

One of the problems with almost all public educational systems is that they are based on a faulty premise: that all people are alike in their potential. . . Perhaps it is time to consider individualized education as an alternative underlying philosophy.

What Steps Can Be Taken Now?

There are many steps that can be taken right now for MIT to start scrutinizing future paths for educational institutions. For example, each department could identify at least two people (preferably one senior and one junior faculty member) who are especially committed to improving teaching. Such volunteers could meet to discuss how they teach their respective subjects now and how they could teach them if the "drill" and "problem set" aspects were done online. Accordingly, we would then almost have the beginnings of a "virtual" School of Education already. Being entirely voluntary, such an initiative would at least identify passionate participants willing to invest time and energy to thinking about how to proceed. We could then propose a step-by-step plan to create a real School of Education with many departments that would investigate better ways to teach all levels of students so as to achieve true diversity in education. Such a beginning would require few resources (such as salaries, space or staff) at the outset that are not already available. The idea would be to cross-link a faculty of educators brought up with traditional methods of teaching but willing to explore different ways with new tools.

There are pockets of underused "people assets" at MIT that might also be able to help. One obvious such group is the MIT retirees who might like to have a focus for applying their wisdom, knowledge, and connections. Another group might be the alumni, some of whom are well aware of the need for change. Yet another would be staff who do not now teach, but would like to participate. In fact, suggestions on how to drastically improve education at MIT have been proposed at various times in the past by faculty, students, and alumni, but the Institute was not ready.

Possible Space and Funding in the Future

There have been many discussions about how to develop the space that is available to MIT in Kendall Square. One daunting problem is that any significant development would require considerable funding. A major new initiative that could attract the interest of large donors might resolve the current uncertainty. Starting a special School of Education may well stir the imagination of wealthy philanthropists. (Naming possibilities can be very attractive.)

We believe that the time is ripe for MIT to examine the need for real changes in educational practice and to act to improve the ways that knowledge can be distributed more effectively for the benefit of all of society.

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30th Anniversary of Writing and Communication Center

Steven Strang

THIS YEAR MARKS THE 30TH anniversary of MIT's Writing and Communication Center (WCC) as a professional teaching institution. Started by the Program in Writing and Humanistic Studies, which is now Comparative Media Studies/Writing (CMS/W), the WCC is firmly based on research in composition studies, rhetorical theory, and writing center pedagogy.

Our name says it all – we provide advice on all aspects of writing, oral presentation, and communication in general.

Those teaching in the WCC are all lecturers in CMS/W. They all have advanced degrees (e.g., three have degrees in Teaching English as a Second Language), all are published writers, all have years of experience as college classroom teachers, and all have many years' experience working with MIT students and faculty. For example, our newest hire joined us in 2006, our longest serving lecturer has been with us since the fall of 1983, and I began the Center back in 1982. Several of our lecturers split their time between the WCC and the Writing Across the Curriculum (WAC) program, thus gaining even more up-close-and-personal insight into the genres and needs of every department.

Table 1. Unique clients organized by status and School, Fall 2012

School	1st Year	Sophomore	Junior	Senior	Graduate Students	Postdocs	Others*	Totals
Engineering	7	23	31	40	106	56	32	**295**
Science	3	12	18	19	21	14	26	**113**
Arch/Urban	1	1	3	5	55	3	16	**84**
Management	0	1	5	3	28	2	19	**58**
SHASS	1	3	9	0	6	0	19	**38**
Undeclared Majors	45	0	0	0	0	0	0	**45**
Totals	**57**	**40**	**66**	**67**	**216**	**75**	**112**	**633**

*Others refer to lecturers, faculty, staff members, spouses, special students, affiliates, fellows, and alums. Work with "others" has been sporadically funded.

Table 2. Number of visits made by status of client and School, Fall 2012

School	1st Year	Sophomore	Junior	Senior	Graduate Students	Postdocs	Others*	Totals
Engineering	15	34	78	59	270	187	89	**732**
Science	11	32	46	46	37	45	76	**293**
Arch/Urban	3	2	9	11	206	28	33	**292**
Management	0	4	20	12	74	7	39	**156**
SHASS	1	6	16	0	15	0	10	**48**
Undeclared Majors	74	0	0	0	0	0	9	**83**
Totals	**104**	**78**	**169**	**128**	**602**	**267**	**256**	**1604**

*Others refer to lecturers, faculty, staff members, spouses, special students, affiliates, fellows, and alums. Work with "others" has been sporadically funded.

Who uses the WCC?

Throughout the WCC's 30 years, we have worked with people from literally every MIT department and School.

Unlike many writing centers which work only with undergraduate students, MIT's WCC also works with graduate students and postdocs. We work with writers at all skill levels. In fact, some faculty members send us their best writers and speakers in order to make them even better communicators. On average, each year we see about 1300 unique clients who make between 3000-3300 visits. The figures from fall 2012 are typical, with 633 unique clients consulting us (see Table 1).

How much is the WCC used?

Nationally, a 50% usage rate in writing centers is considered good (usage rate is the number of clients seen divided by the number of available appointments). The usage rate for MIT's WCC has ranged from 83-90% over the last two-and-a-half decades. When we receive funding for summer hours, the summer usage rate is between 95-100%. In fall 2012, for example, there were 1604 visits made, and our usage rate was 90.1% (see Table 2).

As Tables 1 and 2 clearly show, MIT's WCC is much more than just an undergraduate resource; it is a major resource for graduate students and postdocs as well.

Why do people consult the WCC?

Reasons for consulting the WCC are as varied as the types of communication that occur both on campus and in the professional world (see Table 3).

During fall 2012, we dealt with 249 papers for Communication Intensive (CI) courses (171 for CI-Humanities courses and 78 for CI-Major courses).

As Table 3 suggests, we work not only with course papers and theses, but also with professional tasks (conference

Table 3. Reasons for consulting the WCC, Fall 2012

School	Paper	Thesis	Professional	Applications	CVs	Research Statement	Oral Present	Other Tasks*	Totals
Engineering	49	57	170	272	43	82	24	25	**722**
Science	28	20	94	176	40	16	8	14	**396**
Arch/Urban	85	61	89	48	3	10	7	2	**305**
Management	88	38	52	20	26	2	0	1	**227**
SHASS	208	9	24	21	7	2	2	2	**275**
Undeclared Majors	1	0	16	17	1	0	0	1	**36**
Totals**	**459**	**185**	**445**	**554**	**120**	**112**	**41**	**45**	**1961**

******Other Tasks* include interview practice, pronunciation practice, overcoming writer's block, creative writing, writing practice and process, etc.

****The discrepancy between the number of visits (1604) and the reason for visits (1961) occurs because many clients use one visit to deal with two or more separate reasons (e.g., a CV and a class paper).

papers, book and grant proposals, articles and books for publication), with applications, letters, CVs and resumes, research and teaching statements.

Over the years, literally hundreds of theses and books have contained acknowledgements thanking the Center and its individual lecturers for help in making their projects successful.

In addition to documents, we help with oral presentations – developing both the content of the presentations and the accompanying slides. We offer practice for oral presentations, pronunciation, and interviews. We help clients overcome writer's block and anxiety about speaking in class (or in front of an audience).

Although the WCC's major mission is one-on-one consultations, we do other things as well.

During IAP, we sponsor events such as "How to Write a Great Abstract," "Writing Effective Proposals," and the "Dissertation Support Group."

We work with the Graduate Student Council's Dissertation Boot Camp.

In 2002, I started and have sponsored ever since the MIT Writers' Group. Its members have included undergraduate and graduate students, faculty, and staff members – anyone interested in writing fiction, personal essays and memoirs, other types of non-fiction, poetry, and drama. Several of our members have published pieces they worked on in Writers' Group, and two of our undergraduate members have won Ilona Karmel Writing Prizes.

What is the WCC's role?

The WCC is a teaching institution. We do not edit, proofread, or re-write documents. Instead, we teach our clients how to be better writers and better speakers. When clients visit the WCC, they agree to the following statement: "I understand that the Writing and Communication Center's goal is to teach me how to be a better writer and that the Center does not edit or proofread documents. I also understand that the goal of any session is to teach something rather than to get all the way through any document."

Of course, the documents improve as a by-product of the teaching, but, more importantly, so do the writers.

How do clients feel about sessions in the WCC?

After each session, a client fills out a survey and deposits it in a locked "ballot box," thus guaranteeing anonymity. This practice gives us good insight into how we are doing. We ask questions using a 7-point Likert scale (where a 7 means "agree strongly" and a 1 means "disagree strongly" – i.e., the same approach used for classroom evaluations).

For the statement "I learned something new about writing or oral presentation during this session," 80% of clients circled 7, strongly agreeing, and another 13% circled 6. Given the fact that many of our clients make repeat visits to the WCC, that 93% is a strong testimony to the amount and quality of teaching that occurs.

For the survey statement "I found this session very helpful," 88% of clients agreed strongly by circling 7, and another 8% circled 6. In other words, 96% of sessions were deemed helpful or very helpful.

In short, the WCC's lecturers are very effective teachers.

What is taught in a typical session?

Over 95% of our teaching deals with higher order issues such as analyzing and addressing particular audiences, developing and refining ideas, exploring the implications of ideas, organizing large amounts of material effectively, translating a visual concept into written form, shaping material into effective communication, adjusting tone, polishing style, and turning turgid language into concise, reader-friendly prose. The rest of our teaching involves grammar, word choice, shades of meaning, and the like.

What lies ahead?

As we begin our next decade, the WCC stands firmly planted in the Program of Comparative Media Studies/Writing, drawing upon and adding to CMS/W's expertise in all aspects of communication. We will continue to work with clients from across the Institute, helping with everything from applications to audience analysis, from evidence to exposition, from grammar to graphs, from papers to proposals, from resumes to research statements, from style to speeches and slides.

You may recommend or require visits to the Center for individual students or for your whole class, for advisees, and for those writing dissertations under your direction. On our homepage (***writing.mit.edu/wcc***), simply click "Recommended/Required Consultation at the Writing Center" in the left navigation bar, or go directly to ***writing.mit.edu/node/214*** and fill out the form. We will notify you when your student(s) have consulted with us.

continued on next page

30th Anniversary of WCC
Strang, continued from preceding page

One way that you can help us to help your students is by alerting or reminding your students about the WCC. If possible, please post the following on your syllabi and Websites:

The Writing and Communication Center (12-132) offers free one-on-one professional advice from lecturers (who are published writers) about all types of academic, creative, and professional writing and about all aspects of oral presentations. Go to ***writing.mit.edu/wcc/ appointments*** *and register to make appointments online. The Center's core hours are Monday-Friday, 9:00 a.m.-6:00 p.m.; evening hours vary by semester. Please check the online scheduler for up-to-date hours.*

If you have any questions, suggestions, or requests, please contact me directly: *smstrang@mit.edu* or call 617-253-4459.

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Beyond the Classroom

Why I Live With Students . . . .

Anne McCants

MIT, LIKE ALL INSTITUTIONS of higher education, has a basic mandate to teach our students how to engage in critical thinking, to communicate clearly, to conduct research, to master different modes of analysis, and to incorporate the most accurate information known to us about the workings of both the physical universe and the social world we inhabit within it. This program of study takes place in classrooms large and small, in laboratories, between the pages of books, and increasingly, in the digital environment and on a global scale. If every student who passed over our threshold were to master these skills we would be very pleased indeed.

Nonetheless, as a residential institution we have an opportunity to cultivate yet another quality that may well be of equal

Nonetheless, as a residential institution we have an opportunity to cultivate yet another quality that may well be of equal or even greater importance for the lives of our students than just the skills promoted by an education as conventionally understood: the ability to make good decisions in matters of everyday life . . .

or even greater importance for the lives of our students than just the skills promoted by an education as conventionally understood: the ability to make good decisions in matters of everyday life, especially in cases where information is incomplete, or competing goods are clearly at stake. This quality is sometimes dignified as discernment, at other times trivialized as common sense, as if it were easy to come by. But in all cases it represents the ability to take what we know and/or know how to do, and to apply that information to the hundreds of decisions, big and small, that we must make every day; and to do so in a way that promotes the values to which we collectively subscribe, whether fairness, loyalty, honor, kindness, empathy, effi-

ciency, honesty, or courage, among others, and in varying degrees of importance for different people, of course.

Yet wisdom – for that is the essence of what I have in mind here – is not easy to teach. The claims of countless self-help gurus notwithstanding, there are not "five easy steps to a new and wiser you" that can be codified for dissemination on the page or in a lecture. Moreover, we know from our experience working with the incredibly smart students it is our privilege to teach at MIT, that being smart is not by itself enough to make one wise. Moreover, to be smart but not wise can actually be a dangerous thing, as our capacity to harm is so often inextricably linked with the capaciousness of our intellect.

Wisdom, then, is much in demand and not easily come by. Most fruitfully it is born of experience, either our own (the so-called "school of hard knocks") or that of others made accessible to us. We only get better at making difficult decisions if we watch other people make them (preferably well) and then practice making our own. The study of history or literature can offer us entrée into this quest, since our most enduring stories almost always feature the struggle to make wise decisions in the face of ambiguity, uncertainty, and miscommunication. But it can be even more powerful when we can consult directly with those more experienced than ourselves, especially if the choice we face will have real consequences and be responded to by people with discordant interests and alternative points of view to our own.

All this is to suggest then that if we want to cultivate wisdom in our students – and surely we do – we have to employ a broader teaching model than our usual one centered on the classroom. We have to situate ourselves into those places where students enjoy the agency prerequisite to decision-making. While this does sometimes happen in the classroom or perhaps the project laboratory, my experience as a housemaster suggests to me that it occurs most frequently for students in their co-curricular groups, their living environments, and in the context of their personal pursuits. These are the places where their most challenging "case studies" are likely to arise. If the faculty is not ever present in these places, we will not be the ones who are turned to for advice, or whose example will be consulted for emulation. If they do not see us struggle (and sometimes fail) to make difficult judgments of our own, they may not even appreciate how daunting the task they face might be. If they only meet us in the classroom, usually a highly orchestrated and certainly a time-limited context for social interaction, they are unlikely to ever see us engaged in the fraught work of value-laden decision-making.

All this is to suggest then that if we want to cultivate wisdom in our students – and surely we do – we have to employ a broader teaching model than our usual one centered on the classroom. We have to situate ourselves into those places where students enjoy the agency prerequisite to decision-making.

If, on the other hand, we live amongst our students, and participate in their activities and projects, we will inevitably find ourselves together at moments that really matter to students on an interpersonal and sometimes profoundly private level, when the right thing to do is not necessarily obvious, and the facts do not speak for themselves. We will be confronted together by ethical conundrums, by values in conflict with each other, by persons that require an empathy that is not easily forthcoming. We will struggle together to know when it is best to hang tough in a difficult situation, and when to move on for what look like greener pastures, but of course might not be. Side-by-side we will have to discern when to complain (self-righteously or not) and when to forebear; when it is appropriately compassionate to help clean up someone else's mess, and when we ought to let them feel the full brunt of their behavior; when to promote the needs of the community over those of the individual and vice versa; when to celebrate difference and when to cultivate social norms; how to distinguish love that is exuberant and uplifting from an obsession that is smothering or even frightening; and how to make rules that protect the vulnerable without stifling those with strength, talent, and passion. Already in the fall semester of this academic year, every one of those questions has pressed itself upon a student with enough urgency to send them to my doorstep, and most more than once. It is in the conversations triggered by those moments that I can most significantly contribute to the store of experience that they will need to draw upon as they take the many skills they acquire in their MIT education out into a complex world, a world that needs them to be as smart as they can be, but also desperately needs them to be wise.

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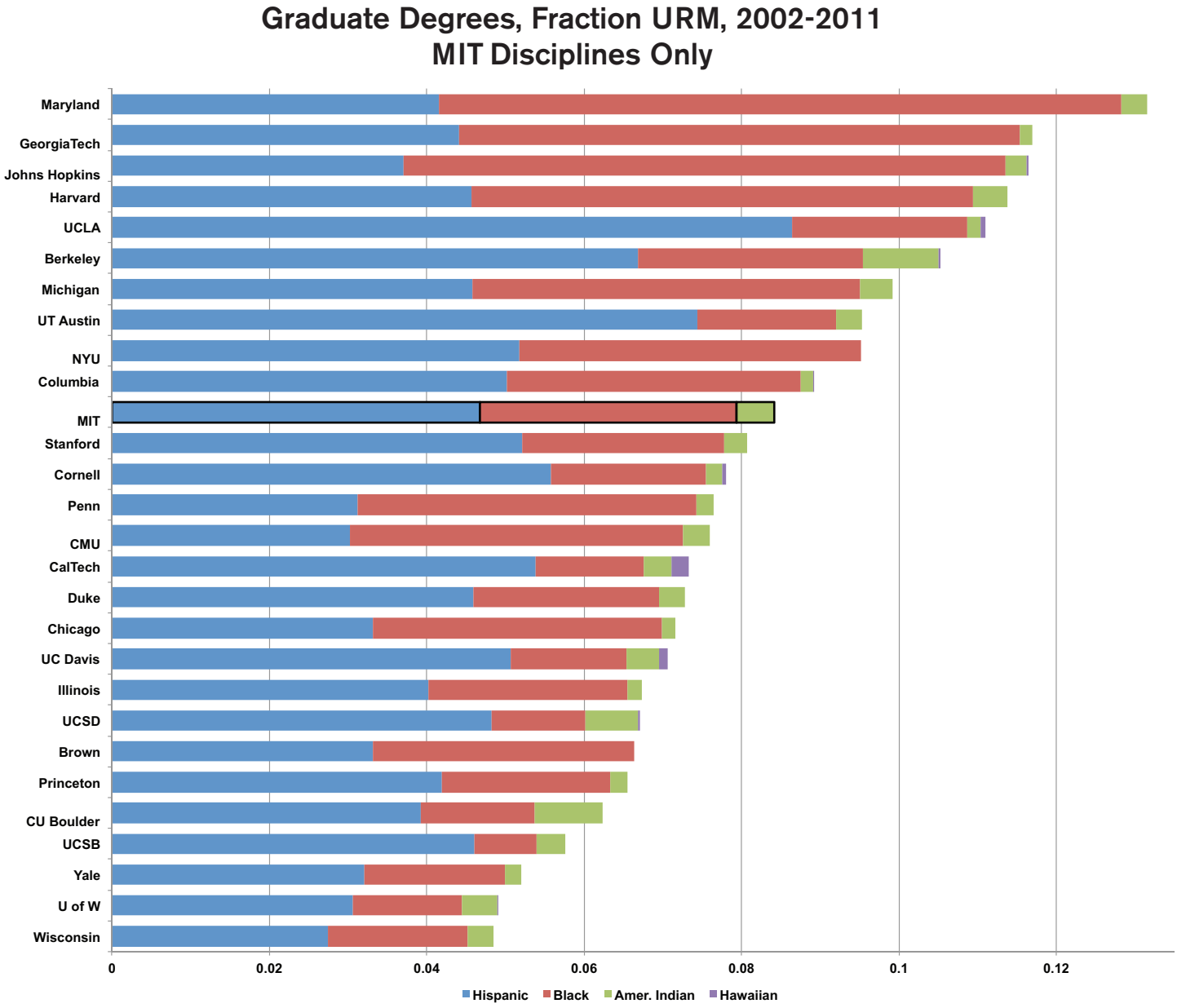
M.I.T. Numbers
Underrepresented Minorities (URMs)



Source: Office of the Provost/Institutional Research