MIT Faculty Newsletter

in this issue we offer commentary on the Institute's report regarding Aaron Swartz (see Editorial below and From The Faculty Chair, p. 5); two reflections on teaching online courses (below and p. 15); and M.I.T. Numbers concerning our incoming freshman class (p. 23).

The Rogers Building c1901
(First building on the MIT campus)

The MIT Physics Department's Experience with edX

John Belcher

I GIVE A BRIEF SUMMARY of the Department's planning for and experience with 8.02x, an online physics course offered last spring through edX. [This article is based on an article of the same name to appear in the fall 2013 issue of *physics@mit.edu*, the annual journal for members and friends of the MIT physics community.]

The MIT Physics Department has a long history of innovation in physics education, beginning with the formation in 1956 of the Physical Science Study Committee led by Jerrold Zacharias and Francis Friedman. More recent highlights include the enormous, world-wide impact of the Web physics lectures of Professor Walter Lewin beginning in the 1990s and continuing to the present, and the implementation in the early 2000s of the widely emulated interactive physics

Report to the President, MIT and the Prosecution of Aaron Swartz

Reprinted below is the Introduction to the report submitted by Prof. Hal Abelson and his committee at the request of MIT President Rafael Reif.

ON JANUARY 6, 2011, Aaron Swartz was arrested by the MIT Police and an agent of the U.S. Secret Service, accused of breaking and entering for events that

An editorial in the May/June 2013 issue of the *Faculty Newsletter* made reference to a new motto for MIT – *Mens, Manus et Cor* – that was proposed by Prof. James H. Williams, Jr. in the pages of the *Newsletter* nine years ago. A more specific reference there would have been appropriate, and we regret the omission. The proposal appeared in Vol. XVI No. 4, February/March 2004, in "A Formal Recommendation to the MIT Corporation" by Prof. James H. Williams, Jr.

Editorial
Not Blameless, But Not to Blame

IN HIS TRANSMITTAL LETTER, President Reif urges everyone in the MIT community to read Professor Abelson's committee's *Report to the President, MIT and the Prosecution of Aaron Swartz*, in its entirety (*swartz-report.mit.edu/docs/report-to-the-president.pdf*).

We agree, and we applaud President Reif's open stance and his decision to commission the report. The committee's research is thorough; the treatment, balanced; and the questions, important. The committee's chair understands MIT, he is himself a pioneer in open publishing, he is highly objective, and he and his team put astonishing effort into the work. It was the right thing to do, and it was done by the right people.

And because we are who we are, everyone in our community should look carefully at the factual data in the Abelson

contents

Photo credit: *Page 1:* Wikimedia Commons, *Page 8:* courtesy of Andrea Maier

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report before becoming prejudiced by the opinions abundantly offered in the media, on the Web, and in this editorial.

But once we have read, we must discuss, because no institution, including MIT, can be what it aspires to be unless it uses the past to improve the quality of its future. In that spirit, we have read the report and offer our contribution to the engagement and exploration that President Reif has encouraged. Like the Abelson committee, our purpose is not to assign blame. Instead, we focus on what we believe are among the lessons to be learned.

Lesson 1: Reasonable today may not be so reasonable tomorrow

Anyone can construct scenarios in which it would be right to let a criminal case run its course. Just after Swartz's arrest, when not much, if anything, was known, other than that Swartz was not and never had been an MIT student, neutrality lay in the (reasonable) part of the space of possible positions.

Over time, however, more came to be known about ties to MIT: Swartz's father, Robert, was a consultant at the Media Laboratory; Swartz's two younger brothers had been interns in the Media Laboratory; and Swartz himself hung around MIT's Student Information Processing Board and participated in activities of MIT's World Wide Web Consortium. So it appears that Swartz could have been considered a member of what might be called the greater MIT community. Moreover, some have suggested that there is a still greater community to consider: that of technically educated people who share some of MIT's values, such as open access to scientific publications, codified in the MIT Faculty Open Access Policy.

Presumably, such connections came out in meetings between Swartz's father and our administration, in letters directed at MIT's administration, and in meetings between Swartz's counsel and MIT's

counsel – but once it was decided to be neutral, the administration stuck doggedly to that neutral position through multiple reviews. Maybe if emerging mitigators were more carefully considered in those reviews, we would have shifted our position toward engagement.

Lesson 2: Confirmation bias may lead to strange conclusions

Evidently, the administration was influenced by notes prepared by MIT's external counsel following a conversation between him and the lead prosecutor:

The prosecutor said that the straw that broke the camel's back was that when he indicted the case, and allowed Swartz to come to the courthouse as opposed to being arrested, Swartz used the time to post a "wild Internet campaign" in an effort to drum up support. This was a "foolish" move that moved the case "from a human one-on-one level to an institutional level." The lead prosecutor said that on the institutional level cases are harder to manage both internally and externally.

The administration concluded that any public statement made by MIT might similarly have a negative effect by similarly irritating the lead prosecutor, but the analogy seems strained and hard to support in the face of obvious questions. Surely a carefully thought-through statement from MIT is very different from an Internet petition. And is it not possible that the prosecutor's remark was a clever

gambit intended to dissuade MIT from making a statement that would make prosecution untenable? And shouldn't MIT do the right thing whether or not a sensitive prosecutor is irritated? Was the administration just looking for confirmation of a decision already made?

> The administration concluded that any public statement made by MIT might similarly have a negative effect by similarly irritating the lead prosecutor, but the analogy seems strained and hard to support in the face of obvious questions. Surely a carefully thought-through statement from MIT is very different from an Internet petition. And is it not possible that the prosecutor's remark was a clever gambit intended to dissuade MIT from making a statement that would make prosecution untenable?

Ask why five times is one of the maxims recommended by W. Edwards Deming, the statistician largely responsible for the high quality in Japanese manufacturing after World War II. Maybe if the administration had followed Deming's maxim and asked why five times we wouldn't have seen such strong support for neutrality in the prosecutor's reported remark.

Lesson 3: Lack of public interest is not a good reason for inaction

The Abelson report notes that few in the MIT community expressed interest in the evolving Swartz situation. Why? Perhaps because Swartz knew that what he was doing was illegal and did it deliberately and repeatedly. Perhaps because there was a sense that, unlike in other cases that have attracted serious community attention, Swartz was not perceived as one of our own. Perhaps because the prosecutor's hard line on a plea bargain was not generally known.

Whatever the reasons, the Abelson report indicates that the lack of community interest was a factor in MIT's decision to remain neutral.

Not Blameless, But Not to Blame
continued from preceding page

But mitigating factors seem to have been known to the administration; likewise the administration knew that those factors were not widely known. So lack of community interest should not have been a decisive factor in shaping MIT's position.

Lesson 4: We need to get better at community engagement

In his letter to the community, President Reif articulated the need for reflection on big issues: "I have therefore asked Provost Chris Kaiser to work with Faculty Chair Steven Hall to design a process of community engagement that will allow students, alumni, faculty, staff, and MIT Corporation members to explore these subjects together this fall and shape the best course for MIT."

That we need to design a process of community engagement is itself worthy of note because it suggests we do not have one ready at hand. In the past, recent and distant, we have opened up Websites, we have witnessed vigorous faculty-meeting debates, we have conducted community forums at various temperatures, and back during the Vietnam War, we took to the streets. But none of these were designed processes of sincere and effective community engagement. Accordingly, we hope that the process designed by the Provost and the Faculty Chair will be innovative and serve as a useful positive precedent.

Lesson 5: Civil disobedience requires eyes wide open

We honor those – Thoreau, Gandhi, Mandela, and King come to mind – whose distaste for existing laws leads them to break those laws deliberately, and we should honor Swartz for breaking a law he considered highly distasteful, whether we agree with the law or not. To this day there is disagreement about what Swartz was doing. Some contend that he was downloading the material simply for the purposes of comparison and analysis. Others think that because Swartz was an activist for open access to Internet resources, he was downloading the journal articles of JSTOR in the first place because he thought the knowledge there should be available freely to everyone – not just those with university connections. Because the profits of JSTOR did not go to the academics who wrote the articles in question anyway, but to the company that put them on the Web, his was a Robin Hood act.

Unfortunately, Swartz did not expect to get caught, he did not comprehend what could be thrown at him by an aggressive prosecutor, he did not anticipate the threat of a felony conviction and jail time, and he was said to have a history of depression, which, if so, indicated heightened vulnerability to suicide.

That Swartz did commit suicide instantly turned a little-noted policy question into a widely discussed controversy. No one can doubt that wide discussion is good. What's tragically bad is that the discussion comes at a high price, with nature and events combining in such a way as to deprive the world of decades of advocacy by someone who had important things to say.

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Editorial Board Elections

FOLLOWING PROCEDURES outlined in the *Policies and Procedures of the MIT Faculty Newsletter*, an Institute-wide election for new members of the FNL Editorial Board will be held in the coming weeks. All regular faculty members and professors emeriti will be eligible to vote.

Nominees for the Editorial Board will be selected by the *Newsletter* Nominations Committee from submissions by the Institute faculty. Please submit all nominations to: *fnl@mit.edu*, or via interdepartmental mail to FNL, 11-268. Deadline for all nominations is October 15.

Elections will be electronically based, with each eligible voter receiving an e-mail with a link to the voting site. Faculty and faculty emeriti will need to have MIT Web certificates installed on their computer, to allow for voter authentication. No record of individual voting preferences will be kept.

According to the FNL *Policies and Procedures*:

"*The Nominations Committee will have the responsibility of recruiting and evaluating candidates for the Editorial Board, taking into account the need for representation from different Schools and sectors of the Institute, junior, senior, and retired faculty, male and female, underrepresented groups or faculty constituencies.*"

"*Candidates for the Editorial Board should give evidence of commitment to the integrity and independence of the faculty, and to the role of the* Faculty Newsletter *as an important voice of the faculty.*"

We encourage the participation of everyone eligible to vote. ■

Editorial Subcommittee

From The Faculty Chair
Initial Thoughts

Steven R. Hall

THIS IS MY FIRST *Faculty Newsletter* column as Chair of the Faculty. Like my predecessors, I hope to use the column as a way to communicate with faculty about ongoing issues of concern to you as well as the broader MIT community, and to invite feedback to the faculty officers and committees of the faculty.

I'm fortunate to be working with two other faculty officers, elected in May of this year. Prof. John Belcher is the new Associate Chair of the Faculty. John is the Class of '22 Professor of Physics and a former MacVicar Fellow, with research interests in astrophysics. He has led several innovations in the teaching of physics at MIT, including the development of the Technology Enabled Active Learning (TEAL) format for teaching 8.02. His expertise in the technology of learning is especially valuable at this time, as the *MITx* and edX initiatives continue to grow in size and influence. Prof. Susan Silbey is the new Secretary of the Faculty. She is Leon and Anne Goldberg Professor of Humanities, Sociology and Anthropology; Professor of Behavioral and Policy Sciences (Sloan School of Management); and head of Anthropology. With research interests in governance, regulatory, and audit processes in complex organizations, she brings an interesting perspective to MIT governance that I've found enlightening and useful.

All of the faculty officers are available for discussions with faculty. We welcome e-mail, phone calls, or face-to-face meetings. The officers can be reached collectively at *faculty-officers@mit.edu*.

Faculty Role in Shared Governance
MIT's shared governance structure gives faculty a variety of opportunities to affect the future of the Institute. There are two key ways to make your voice heard. The first is participation in faculty meetings. Traditionally chaired by the Institute President, faculty meetings are a monthly opportunity to catch up with the adminis-

> Given the many demands on faculty time, it's no secret that attendance at faculty meetings fluctuates, and we occasionally struggle to achieve a quorum – sometimes forcing the delay of agenda items. Other than the procedural problem of needing a quorum to do business, is attendance at faculty meetings a problem?

tration, members of faculty committees, and faculty members from other MIT Schools – plus to enjoy an informal post-meeting reception. This year, I anticipate a number of important issues will come before the faculty, from new degrees to exam policies to the use of the H-level subject designation.

Given the many demands on faculty time, it's no secret that attendance at faculty meetings fluctuates, and we occasionally struggle to achieve a quorum – sometimes forcing the delay of agenda items. Other than the procedural problem of needing a quorum to do business, is attendance at faculty meetings a problem? I think it is. A typical pattern is that when a vote is scheduled for an issue that especially affects a single department or unit (say, the approval of a new degree program), proponents show up in relatively large numbers to support the proposal. While special interests are inevitable, the result is that the attendance at any given faculty meeting is likely to be highly non-representative of the faculty.

While it's traditional for a new Chair of the Faculty to exhort colleagues to attend faculty meetings (and you should!), I think it's also important to look for opportuni-

ties to strengthen our governance structure to make participation in faculty governance in general and faculty meetings in particular more meaningful. For example, a common complaint I hear is that faculty meetings spend too much time on informational reports that require no action on the part of the faculty, and not enough time to consider and debate issues that require faculty attention. Yet many of those reports are mandated by the faculty, and can't simply be eliminated without further action by the faculty.

Increasing Faculty Participation
Given the importance of informed debate, is there another way to make information available? Some schools have experimented with online voting, with voting open for a short time (say, a day or two) following meetings. While online voting wouldn't be a substitute for faculty meetings, does it have the potential to make the faculty decision-making process more representative and inclusive? For those who've spent time at other institutions, we would be interested to hear comparative perspectives.

There is a second important way to participate in governance: membership on the standing committees of the faculty. Most of the work of the faculty governance system is accomplished by the 11 standing

committees of the faculty. These committees oversee matters of broad faculty interest, such as the curriculum, the library system, and graduate programs. Nominees for standing committees are selected by the Committee on Nominations, which presents a slate of candidates for open committee and faculty officer positions to the faculty at the March faculty meeting. (Members of the Committee on Nominations are appointed by the President.) In addition to the 11 standing committees, there are two awards committees (the Harold E. Edgerton Faculty Achievement Award and the James R. Killian Jr. Faculty Achievement Award Selection Committees), whose members are nominated by the Committee on Nominations and elected by the faculty, and two standing subcommittees (on the Communication Requirement and the HASS Requirement), whose members are appointed through the Committee on the Undergraduate Program.

In all, more than 90 faculty members serve on standing committees, and close to 40 must be elected or appointed each year to replace committee members with expiring terms. Generally, faculty members nominated or appointed to standing committees are selected from among those who volunteer on the Institute Committee Preference Questionnaire, which is sent to faculty early in the fall term.

While serving on faculty committees has few extrinsic rewards, there are intrinsic rewards. I've found my time on Institute committees to be interesting, challenging, and worthwhile. When you receive the survey this fall, please review the committee list and submit your preferred assignments. Most importantly, if asked by the Committee on Nominations to serve on a committee, please say yes.

Engagement Around the Aaron Swartz Review

In January of this year, our community was shocked and saddened by the suicide of Aaron Swartz. Aaron was a brilliant young programmer and activist who helped develop, while still a teenager, Internet infrastructure that many of us now take for granted, such as RSS. Aaron's death came two years after his arrest and subsequent prosecution on charges related to his use of the MIT computer network to download thousands of academic articles from the JSTOR digital depository. Aaron's friends and supporters believe that Aaron's prosecution was unjust. As the case continued, MIT received substantial scrutiny for its role in the matter.

On January 22, President Reif charged Prof. Hal Abelson of EECS to review MIT's involvement in the Swartz matter. Specifically, the review was to (1) describe MIT's actions and decisions during the period beginning when MIT first became aware of unusual JSTOR-related activity on its network by a then-unidentified person, until the death of Aaron Swartz on January 11, 2013, (2) review the context of these decisions and the options that MIT considered, and (3) identify the issues that warrant further analysis in order to learn from these events. The review panel consisted of Prof. Abelson, Institute Professor Emeritus Peter Diamond, and Andrew Grosso, an attorney and former Assistant U.S. Attorney. Their report was released on July 30. I would like to offer my thanks and appreciation on behalf of the faculty to Profs. Abelson and Diamond and Mr. Grosso for the thorough and thoughtful report that they produced.

Concurrent with the release of the report, President Reif sent a letter to the community, thanking the review committee, and beginning a process through which the MIT community will try to address the questions raised by the report, specifically the eight questions posed in Part V of the report. Among other actions, President Reif charged Provost Chris Kaiser and me "to design a process of community engagement that will allow students, alumni, faculty, staff and MIT Corporation members to explore these subjects together this fall and shape the best course for MIT." As of the writing of this column in mid-August, the Provost and I are still working on the form of that engagement. However, as a first step, we have launched a forum, *Swartz-review.mit.edu*, to gather input from the MIT community. (The URL for the site is the same as the one that was used by the review committee. Issues raised by the community provided important direction for the panel during the first part of the review.) The site can be viewed by anyone, but commenting is restricted to members of the MIT community. Current members of the community can log in with a valid Kerberos username and password or MIT network certificate. Alumni can log in using their Infinite Connection username and password. The site is organized around the eight questions posed in Part V of the report.

Prior to the release of the review committee findings, MIT, as an institution, understandably made few statements about the facts surrounding the Swartz case. My sense is that both the lack of information and the desire to see the results of the review before forming opinions may have muted discussion of the matter during that time. Now that the review is available, I urge you to read it and provide feedback on the Website as part of our community discussion on issues surrounding open access, intellectual property, responsibility, leadership, policy, and ethics.

President Reif noted in his letter that he has heard from many in our community who believe that MIT's actions were proper and justified; he also noted that others believe that MIT should have been more active in the case. I also have heard a range of thoughtful perspectives, both on the actions that were taken and how our ethical commitments might be tested in the future. I look forward to hearing more from the faculty and the broader community on these important questions. On this or any other topic, we look forward to your comments at *faculty-officers@mit.edu*. ■

Steven R. Hall is a Professor in the Department of Aeronautics and Astronautics and Faculty Chair *(srhall@mit.edu)*.

Teaching this fall? You should know . . .

the faculty regulates examinations and assignments for all subjects.

View the complete regulations at: *web.mit.edu/faculty/teaching/termregs.html*.
Select requirements are provided below for reference.

Contact Faculty Chair Steven Hall at x3-0869 or *srhall@mit.edu* for questions or exceptions.

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

Undergraduate Subjects
By the end of the **first week** of classes, you must provide:

- a clear and complete description of the required work, including the number and kinds of assignments
- the approximate schedule of tests and due dates for major projects
- an indication of whether or not there will be a final examination, and
- the grading criteria and procedures to be used

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

Tests, required reviews, and other academic exercises outside scheduled class times shall not be held on Monday evenings. In addition, when held outside scheduled class times, tests must:

- not exceed two hours in length
- begin no earlier than 7:30 PM when held in the evening, and
- be scheduled through the Schedules Office

In all undergraduate subjects, there shall be no tests after Friday, December 6, 2013. Unit tests may be scheduled during the final examination period.

Graduate Subjects
By the end of the **third week**, you must provide:

- a clear and complete description of the required work, including the number and kinds of assignments
- the schedule of tests and due dates for major projects
- an indication of whether or not there will be a final examination, and
- the grading criteria and procedures to be used

For each graduate subject with a final examination, no other test may be given and no assignment may fall due after Friday, December 6, 2013. For each subject without a final examination, at most, either one in-class test may be given, or one assignment, term paper, or oral presentation may fall due between December 6 and the end of the last regularly scheduled class in the subject.

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

In Memoriam
Pauline Maier

Harriet Ritvo

Pauline Maier

THE HISTORY FACULTY WILL feel very different this fall without Pauline Maier. It will seem more subdued without her exuberant laugh, and poorer in less immediately apparent ways without her wealth of experience and her generous engagement. To a great extent our department is her creation – the product of her high professional standards. We were all hired on her long and vigilant watch. She was department head for many years, and those of us who followed her always bore in mind her expectations with regard to commitment, integrity, and scholarship (and if we occasionally forgot, she would remind us).

Pauline's presence was genial as well as bracing. She liked her colleagues and enjoyed spending time with us; she told me that that was the main reason that she attended search dinners. She understood that life included more than work, important as work was to her, and sympathized with the challenges of balancing professional obligations with those of family, whether in the form of young children or of aged parents. (But balance was important; she felt that dedicating a first book to parents predicted continued professional activity, since that required writing a second one to dedicate to a partner.) Her interests and enthusiasms were broad and varied, and she happily shared them. She was an energetic gardener and planted on an awe-inspiring scale at her Rhode Island farm; her colleagues often enjoyed its fruit and vegetable bounty. She was an aficionado of cheese, and a talented cook. She was devoted to her dogs, as well as to the human members of her family.

The many published notices that appeared after her death appropriately emphasized the importance and distinction of her scholarly work on early American history. The generosity that characterized her relationships with colleagues and students at MIT was also evident in her writing, which, no matter how arcane and weighty the subject, addressed the general reader as well as the scholarly specialist (with striking success – for example, *American Scripture*, her book about the Declaration of Independence, was featured at Costco). It was also expressed in ways less visible from the Institute. Pauline's expansive sense of the audience for history led her to engage with groups of high school teachers. And we were not the only colleagues who benefitted from her learning, her intelligence, and her wisdom.

Along with the formal obituaries appeared a flood of very moving posts on blogs and listservs by younger scholars from around the country, who had appreciated her high standards and valuable advice, whether they first encountered her as a formal reader of a submitted manuscript, or at a lecture or conference. So our loss is very widely shared, but our corridor will be especially quiet. ∎

Harriet Ritvo is a Professor in the History Faculty *(ritvo@mit.edu)*.

Beyond the Classroom
Students and Institute Governance

Robert Redwine

HAVING BEEN ON THE MIT faculty since 1979, I have noted that a topic that comes up frequently in faculty-student interactions outside the classroom is the issue of Institute governance. This can be a contentious topic to say the least. The typical situation involves student unhappiness that they were not included more in discussions leading to decisions that affect them. The typical faculty reaction is puzzlement that the students think they should be included to the extent they do; after all, we have been in their position and our stake in the Institute involves a 40-50 year timeframe, not four years. We sometimes forget that when we were in their position we probably felt the same way they do.

I certainly do not have a magic solution to this situation, and we are likely to continue to see disagreements of this nature appear from time to time. However, I thought it might be of interest to describe some very positive involvements of students in matters of Institute governance that I have been fortunate to experience. I served as Dean for Undergraduate Education from 2000 to 2006 and as Chair of the Committee on Discipline (COD) from 2010 to 2012. In both of those roles I had many interactions with students, especially those who chose to be involved with Institute governance.

Not surprisingly, the Dean for Undergraduate Education interacts on a regular basis with representatives of the Undergraduate Association. I have always found these students to be remarkably dedicated and thoughtful. They are very proud of MIT and the education they are receiving, but they also want to do whatever they can to make it even better. They often spend a lot of their (precious) time working with faculty and staff to improve MIT education. An important example was the work of the Task Force on the Undergraduate

> MIT is distinguished from many of our peers by the fact that we have long included students (both undergraduate and graduate) on the Committee on Discipline, along with faculty and staff. In my experience the inclusion of students on COD panels provides an extremely important perspective that almost always leads to a better decision.

Educational Commons, an effort started while I was Dean. We included students on the Task Force and the perspectives they brought to the discussions were invaluable. All of the faculty members on the Task Force gained important insights from the student representatives.

The Committee on Discipline at MIT considers serious cases of alleged misconduct by students; some cases involve academic misconduct and other cases involve personal misconduct of a non-academic nature. These cases can be very complicated and often are quite painful. MIT is distinguished from many of our peers by the fact that we have long included students (both undergraduate and graduate) on the Committee on Discipline, along with faculty and staff. In my experience the inclusion of students on COD panels provides an extremely important perspective that almost always leads to a better decision. It is also the case that the student members obviously take their responsibilities on COD very seriously and try as hard as anyone to understand these complicated situations. I have gained enormous respect for the thoughtful contributions of students to COD decisions and for the individuals who provided them.

Apparently a major reason why some of our peers do not include students on discipline bodies is worry about confidentiality. I was actually stunned a few years ago to hear this from a colleague at a peer institution, because in my experience we have had no reason for concern in this regard. As I indicated above, our students take their responsibilities very seriously and they greatly improve the COD process.

Institute governance involves various components, and I am happy to say that our students make important contributions to many of them. I have been fortunate to have my professional life enhanced by many of these interactions with students. Having the opportunity to teach and interact with such amazing students is one of the chief attractions that bring faculty to MIT. I believe that we as faculty members should be very proud of the students who contribute so much to Institute governance. ■

Robert Redwine is a Professor in the Department of Physics and Director of the Bates Linear Accelerator *(redwine@mit.edu).*

Creating a Culture of Caring: MIT's First Institute Community and Equity Officer

Edmund Bertschinger

"TODAY, I CAN TELL YOU for certain that the world will respect you for what you know. And for what you know how to do. But I also want the family of MIT to be famous for how we treat people: Famous for sympathy, humility, decency, respect and kindness." President Rafael Reif gave this problem set to the MIT community in his Charge to the Graduates during Commencement in June 2013. The assignment followed his letter to the MIT community in April 2013, which stated "One of my goals as president is to cultivate a caring community focused on MIT's shared values of excellence, meritocracy, openness, integrity and mutual respect. I also want to help the entire MIT community to draw strength and energy from our extraordinary diversity of experiences and backgrounds."

I have the privilege and the daunting task, as MIT's first Institute Community and Equity Officer (ICEO), to help us reach this goal. The role expands the responsibilities held previously by Associate Provosts for Faculty Equity Wesley Harris and Barbara Liskov, whose efforts drove important progress on faculty recruiting, retention, and mentorship. In addition to supporting the success of women and minority faculty at MIT, my office will facilitate and support efforts to enhance the life of everyone at MIT – faculty, students, postdocs, and staff – with the aim of making MIT the best place to work and study for everyone.

At MIT we love to innovate and we love challenges. We will have to innovate to create a new office that has few precedents at other universities. And while the challenge is awesome, so is the thrill of working to make a difference.

I bring to this position nearly six years' experience as Physics Department head, where my own charge came from women graduate students who urged me to create a culture of caring. They gave me the encouragement and confidence to undertake this challenge by building on the existing culture of educational innovation and collegiality. I quickly linked up with others working to strengthen diversity and inclusion at MIT and elsewhere, which led to collaboration on such efforts as the MIT150 Symposium "Leaders in Science and Engineering: The Women of MIT" and the annual Institute Diversity Summits. I believe strongly that such efforts – at the department level as well as MIT-wide – make a real difference and are an important part of institutional self-improvement.

In no way does creating a culture of caring mean lowering the standards; during my 27 years on the faculty, the Physics Department has never been more successful in recruiting and retaining top faculty and students than it is today. On the contrary, people do better when they feel valued and supported. We can be the best university only by helping everyone to do their best. When we do, diversity and excellence go hand in hand.

MIT has made good progress in building community and equity over the years. We're famous for our critical self-evaluations of the status of women (1999, 2002) and underrepresented minority faculty (2010). In 2004, MIT faculty committed "to taking a leadership position among our peer institutions in the recruiting and success of underrepresented minority faculty and graduate students." Colleagues elsewhere are amazed when I tell them

that there is no majority ethnicity in our undergraduate student body. Last spring, faculty responded enthusiastically to the call for increased advising and mentoring of freshmen, and this fall the number of faculty freshman advisors has doubled from recent years. This is a perfect time to reinforce our efforts by providing facilitation and communication of best practices through the new office of the ICEO.

Since beginning in this position in July, I've been on a listening tour to learn as much as I can about the MIT community. One of my initial impressions is that MIT has not yet resolved the paradox of individualism and community.

On one hand, MIT prides itself as a meritocracy, a place where advancement is based on individual achievement. This ideal underlies our tenure system and it is essential for ensuring the highest quality faculty. Individual achievement in itself is a good thing but, taken to extreme, individualism can promote isolation and a sense of being overwhelmed. For example, as a new faculty member, I felt the same shock and self-doubt that afflicts many new students, namely the Impostor Syndrome. The Impostor Syndrome is the feeling that, despite evidence of competence, one is not as capable as others think, and will be revealed to be a fraud. It is rampant at MIT and even afflicts faculty members. The resulting stress can lead to a self-fulfilling prophecy and to a self-induced erosion of meritocracy.

On the other hand, MIT prides itself as a caring community. After an undergraduate student described her struggles with depression in 2012 and many MIT students shared their struggles with stress, an MIT faculty member shared his own

struggles with depression, showing that one can overcome mental health problems to thrive. His caring story swept aside a stigma that, like the Impostor Syndrome, prevents us from doing our best. Our community similarly showed its strength following the tragic shooting of Officer Sean Collier last spring, when the world saw an unprecedented outpouring of empathy, respect, and gratitude at MIT.

We resolve the paradox of individualism and community by strengthening our culture of caring, empathy, and respect – by valuing and supporting individual accomplishments while helping everyone to do their best. We do this by expanding the circle of caring to include not only the self-selected devotees of community, but to include everyone: Every staff member, including those who work the midnight shift. Every student, including those who challenge authority. Every postdoc, including those who struggle with childcare. Every faculty member, including those who are denied tenure. We resolve

the paradox with sympathy, humility, decency, respect, and kindness.

My role is to be a facilitator, a resource for the many people already providing support to community and equity across MIT, a focal point for organizing MIT's related activities and conversations, a practitioner and champion for best practices in equity, inclusion, and diversity.

Working under Provost Chris Kaiser, this fall I will lead a strategic planning process in consultation with, and reflecting the needs of, the entire MIT community. The deliverable outcome will be an ICEO mission statement reflecting two objectives: deepening the sense of inclusion based on MIT's shared values, and helping all members of the MIT community to appreciate and leverage its diversity of experiences and backgrounds. This strategic planning process will also articulate a set of achievable goals and the means for assessing progress toward these goals.

I need your help. Please contact me with your ideas, concerns, and dreams.

The strategic planning process can only succeed if we leverage our diversity to gather the best ideas. I'm on a listening tour and seek to meet with interested individuals and groups. Some of the questions I seek your thoughts about are:

• How do you define community and equity at MIT? What do they mean to you?

• What should be the top priorities for strengthening community, equity, and inclusion, and why?

• What are the potential roadblocks to reaching the goal of a stronger MIT community?

• What advice do you have for me?

Please send your thoughts and requests for appointments to *iceo@mit.edu*. I look forward to hearing from you. ∎

Edmund Bertschinger is Institute Community and Equity Officer *(iceo@mit.edu)*.

Resolution for Presentation to the MIT Faculty: "Establish a Campus Planning Committee"

SEPTEMBER 4, 2013

Whereas:

MIT's Charles River campus with its buildings, open spaces, and landscape is an essential component of the Institute's educational and research environment.

And Whereas:

The faculty, students, and staff are essential stakeholders in the Institute's educational and research functions.

And Whereas:

The rapid economic development in the Kendall area, increased scarcity of

available land, and increase in real estate costs, calls for very careful long-term campus planning to ensure the availability of space to support future academic needs of MIT.

And Whereas:

Critical decisions affecting the future of the campus should be made with the fully considered input of the above stakeholders.

Therefore:

A Campus Planning Committee composed of a majority of faculty members elected by the faculty, together with student, staff, and administration repre-

sentatives, shall be established as a Standing Committee of the Institute, prior to the end of the fall 2013 semester.

Respectfully submitted,

Nazli Choucri (Political Science)
Jean E. Jackson (Anthropology)
Jonathan A. King (Biology)
Helen Elaine Lee (Writing)
Ruth Perry (Humanities)
Nasser Rabbat (Architecture)
Frederick P. Salvucci (Civ. & Env. Eng)
Frank Solomon (Biology)
Roger Summons (EAPS)
Seth Teller (EECS)

Physics Department's Experience with edX
Belcher, from page 1

classroom instruction model for residential education, TEAL [Technology Enhanced Active Learning, see: *icampus.mit.edu/projects/project/?pname =TEAL*]. Given the Department's current prominence in the GIR educational experience, and its long history in physics education, Professor Edmund Bertschinger, the then Physics Department Head, positioned the Department to become involved in edX at an early stage in the last academic year, both to gain experience in using the online platform and also to influence the capabilities of that platform by being an "early adopter."

To that end, Bertschinger appointed an *ad hoc* committee, the PhysicsX Planning Group (PxPG),to create, monitor, and review the development and offerings of the first few departmental subjects on edX, and to advise him on the scheduling of subjects to go online. The online course 8.02x was approved in April 2012, before PxPG was formally convened. That course began online on February 18, 2013, and ended on June 17, 2013. The decision to begin with 8.02x was made because the Department has available a wealth of digital resources for electromagnetism, most notably Lewin's lectures from his residential course given in spring 2002. There was also an electromagnetism textbook and a number of electromagnetism simulations and visualizations created in the process of the curriculum development for 8.02 TEAL (this work was funded by the d'Arbeloff Fund for Excellence in Education and iCampus).

The next course to go online, 8.01x, was approved by PxPG in December of 2012.This course is scheduled to go online on September 9, 2013, with an end date of January 13, 2014.One additional course during the summer, Professor David Pritchard's Mechanics ReView, [*web.mit.edu/physics/news/spotlight/ 20130501_mechreview.html*] was approved in March of 2013, and began on June 1, 2013. Although not based on 8.01, this course is part of the Physics Department's

effort to learn how to use the edX platform for improving teaching and learning.

The Format of 8.02x
The recorded lectures of Professor Walter Lewin's courses, including 8.01 (Classical Mechanics), 8.02 (Electricity and Magnetism), and 8.03 (Vibrations and Waves), have been visited more than 8 million times on MIT OpenCourseWare (OCW), and more than 11.4 million times on YouTube. The first lecture for 8.01, recorded in fall 1999, has been viewed more than 1.2 million times on YouTube. Translations of Professor Lewin's courses into Chinese, Spanish, Portuguese, Korean, Turkish, and Thai have been accessed by hundreds of thousands of learners.

Given Lewin's immense reputation online, the Department decided to build the online offering of 8.02x around the 36 recordings of Lewin's spring 2002 lectures, complete and in sequence. Because the OCW videos of these lectures were put online in 2003, at fairly low resolution, the decision was made to go back to the original tapes of Lewin's lectures and redigitize them, thus producing much higher resolution videos for 8.02x compared to versions previously online. The only changes in his original lectures were edits by Professor Lewin to include three to approximately 10 "gaps" for short questions during a given lecture. Students viewing these lectures online in 8.02x had to answer these gap questions before they could proceed with the next lecture segment. This was done to provide more engagement and a better learning experience for the online students. This feature did not exist in the edX platform before the Department requested it, and it is an example of how interacting with the edX system early on helped the Department to mold its capabilities. In addition to the 2002 lectures, 8.02x used the many "help sessions" that Professor Lewin has recorded over the years for the weekly problems sets assigned in the residential version of 8.02. Also, many of the TEAL electromagnetic simulations were ported over to the edX platform for use in 8.02x,

where they run in javascript on any HTML5 compliant browser, making the simulations widely accessible. The course also featured an online discussion board where the students could ask questions of the course staff, including Professor Lewin.

The structure of the online course was designed much like the residential course. There was a problem set due every three lectures, with three exams over the course of the term and a final exam. To discourage dishonesty, the problem set and exams had problem parameters that were randomized between students – that is, different students received a different set of input parameters with a correspondingly different set of correct answers. To accommodate the various schedules of the online students and because of the limitations of the online format, the students had three days to complete the exams. Thus, even though the exams were representative of an MIT level two-hour exam, the mean score on these exams were very high by MIT standards, with typically a third of the students getting a perfect score on the exams. Not only did the 8.02x students have three days to complete the exams, they also had access to any reference or textbook material they could find, including those on the Internet. This explains the high number of perfect scores in 8.02x compared to MIT students taking a limited-time two-hour exam of similar difficulty. We give the distribution of scores on the first 8.02x exam in Figure 1.

The Demographics for 8.02x
A total of 43,758 people registered for 8.02x through the end of the course. The academic background (the highest level of education attained) of registered students who chose to reveal that information is given in Table 1. The distribution varies somewhat if we look only at the students taking the exams, but not qualitatively. Not surprisingly, using data not shown in Table 1, the more extensive the academic background attained by a given student, the higher the grade that student scored on the exams, on average.

Of this large registered number, only 5,241 attempted the first problem set. The first one-hour exam was taken by 3,490 students, and the second exam by 2,459 students. A total of 1,715 students completed the course and received a certificate signed by Professor Lewin attesting to their having passed the course.

The distribution of ages of the enrolled and active students in 8.02x is shown in Figure 2 (next page).These students came from all over the world, with the largest percentage from the United States (19.0%), followed by India (17.2%), Spain (7.8%), the United Kingdom (4.5%), the Russian Federation (4.0%), and Greece (3.1%).
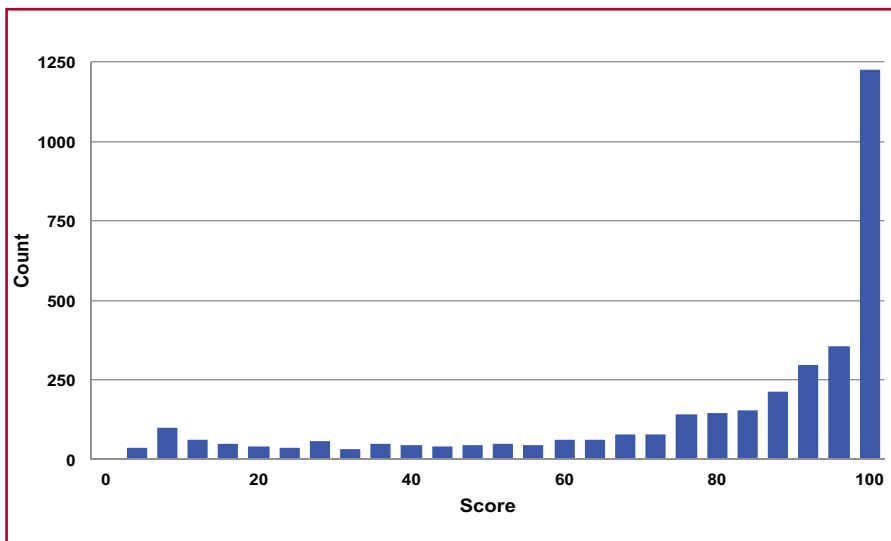

Figure 1. Distribution of scores on the first 8.02x exam.

Elementary	69
Junior High	575
High School	5006
Bachelors	4484
Masters	2570
PhD in Science and Engineering	533
PhD in Other	99

Table 1. Academic background of select registered students.

Reception of 8.02x

Overall, it is clear that 8.02x was well received by most of the students taking it. For example, in an effort to achieve personal rapport with the students, Professor Lewin broadcast a short weekly video to encourage the students, interwoven with practical advice about how to do well (or better) in the course. The reaction to these videos was very positive, as witness the following quote from an 8.02x student:

Believe it or not, I so eagerly wait for Prof. Walter Lewin's video message each week. And once it is uploaded I watch it at least 4-5 times. He is such an awesome gentleman... Hats off to you Sir!!

The satisfaction of students with the course is also evident from the general tenor of the discussion board comments. For example:

Thank you for making this amazing class available for free. I took 2 classes on line before….Not only [is] Professor Lewin amazing, of course, but the structure of the class on line is outstanding [including the] mixture of videos, quizzes, simulations HW, textbook. The electronics class I took was not only expensive but of very poor quality. This class takes advantage of the best of internet/java/... I hope it stays free. I hope for more classes like Physics 8.03 and 8.01. Bravo and thank you again.

These anecdotal opinions were verified by an online questionnaire at the end of the course. The question "How likely are you to recommend 8.02x to a friend?" scored a 9.43 on a scale from 0-10, with 10 being extremely likely. When students were asked how much they agree that the TEAL visualizations helped to achieve course goals/learn, the results were 4.5 on a scale of 0-5, with 5 being "strongly agree," 1 "strongly disagree," and 0 being "not used."

Lessons Learned

Overall this experience has been a success in that the Department has succeeded in offering the course online with few technical problems. In doing this, we gave 1,715 students around the world an opportunity to take Professor Walter Lewin's spring 2002 8.02 course in depth, and to receive a certificate from MITx. Moreover, we have facilitated the interaction of these students with Professor Lewin, with the course staff, and with each other. In doing this, the Department has gained invaluable experience with the edX platform and, by being an early adopter, helped shape the capabilities of that platform. The Department now has experience with an edX course, including how to code problem sets and exam problems, the quality control needed before such problems go "live", how to moderate discussion boards effectively, how to motivate students, and many other aspects of running a large online course. The Department also now has the knowledge necessary to use features of the edX online courses to improve our residential offerings in physics at MIT, which is a major goal of the MIT Office of Digital Learning, and of our Department.

What is less clear is how successful this course was in terms of learning outcomes. The distribution of grades on the first exam, as given in Figure 1, was unex-

Physics Department's Experience with edX
Belcher, from preceding page

pected, but obvious with hindsight. We had many very serious students taking the course, for no formal credit other than a certificate of completion, and they had three days in which to complete the test. It is not surprising that one-third of these dedicated students put in the additional hours necessary to get a perfect score on the exam, and that many did very well. But this leaves us with little information of how to rank the students in terms of ability, other than in a very coarse manner. In a residential course, we get a much more detailed impression of the relative abilities of the students. If we continue to obtain distributions such as given in Figure 1, varying the pedagogy of the online course will not tell us much about the most effective pedagogy, because we will generally end up with this kind of distribution, which tells us very little.

In the future, the edX platform may be able to require students to take the exam for a set length of time in a continuous fashion, sometime within a three-day window, but it does not have that capability now. Even if such a feature is instituted in the future, there are many obvious ways to defeat the system (by registering twice under different names, for example). The most straightforward way to get back to a grade distribution comparable to residential courses is to have a proctored limited time exam, and edX is exploring that option.

Another lesson we learned from this experience is that putting this kind of course online is no easy task. The people who worked on this effort are acknowledged at the end of this article. This is a group of talented people who dedicated many hours of their time to 8.02x. We are now past many of the start-up costs of mounting this kind of effort but, even so, refreshing 8.02x and offering it again, complete with an adequately staffed discussion board, is an expensive proposition. For example, putting a new homework problem online requires the
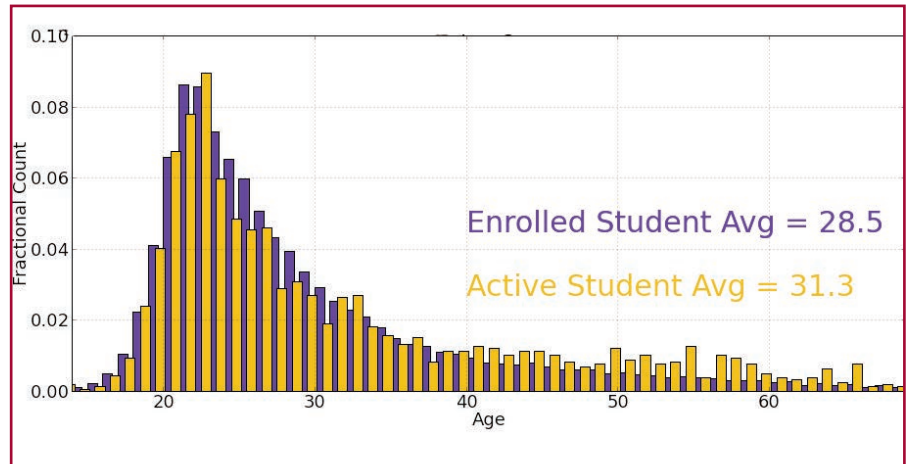
Figure 2. Distribution of ages of enrolled and active students in 8.02x. "Active" means active just after the second 8.02x exam.

problem statement, the coding to put that statement online, extensive testing of that code before it appears online, and a system to correct the mistakes that still leak through after it has gone online. Although we could perhaps simply repeat the problem sets from one online offering to the next, we would most certainly have to make new exams for each offering. Otherwise these exams and many sample solutions will be available online from previous offerings of the course, and the scores on those repeat exams in the next iteration of the course would be meaningless. For these reasons, offering edX courses on a regular basis would require a substantial augmentation of the teaching personnel of the Department.

In conclusion, we have learned much in this process, but this is just the first of many steps in a long journey. The next issue that the Department plans to address is how to bring the capabilities of the edX platform back into our residential program, particularly in the freshmen subjects. A "flipped" class is one where lecture is presented online outside of class and hands-on-work (discussion, homework, experiments) is done in class. Our present way of teaching the majority of MIT freshmen, TEAL, is half-flipped already, in that 50% of the class time is devoted to group discussion, group problems, and hands-on experiments. We plan

to experiment with completely flipping 8.02 TEAL for two to three weeks in the coming academic year, using the capabilities of the edX platform to deliver the online content. In doing this, we plan extensive assessment to compare the half-flipped and completely flipped parts of 8.02 residential, including gathering both student and faculty opinion and evaluating student learning gains. Since we have much more interaction with and knowledge of the student population on campus, this use of the edX platform in residential may also offer us useful insights as to what to incorporate into the "x" courses in future incarnations.

There is much that remains to be done.

John Belcher is a Professor of Physics *(jbelcher@mit.edu).*

My Experience Teaching 3.091x

Michael Cima

DEVELOPING 3.091X, "Introduction to Solid-State Chemistry," was a terrific but exhausting experience. I was lucky to be building upon more than 40 years of material for a very special course. Briefly, 3.091 seeks to help students learn chemical principles through the solid-state. The underlying theme for the course is that the chemical bond determines properties. The emphasis in the course is on linking basic concepts to applications; thus, it is meant to be an engineering course. Indeed, it may be the first engineering course many students take at MIT, as it satisfies the chemistry GIR.

I was asked to consider creating a version of 3.091 for the edX platform in June of 2012, with the objective to enroll students in the fall of 2012. I knew nothing about edX, and my first question was, "Is someone going to help me?" Chancellor Eric Grimson said "yes," and I did some homework. What I found was that research consistently shows equivalent learning outcomes for residence-based courses and online learning, across a wide variety of types of courses. More interesting is a growing opinion that superior outcomes are achieved by a combination of residence-based learning and online content. Thus it seemed that the 3.091x vehicle might yield the online content that could improve outcomes for 3.091 – a test I hope to examine this fall. So the only constraint I imposed was that 3.091x need have the same intellectual content as 3.091, a necessity if I was to use the online material for the campus course.

edX is like nothing I have previously experienced. There are no 50-minute lecture videos such as with OpenCourseWare (OCW). Instead there are 10-minute lecture videos on one topic, followed by a short screencast on a new topic, followed by a self-assessment problem. All of this was arranged in what I call a "learning sequence." The course was composed of a collection of these learning sequences. edX also operates as a real course. Everyone begins at the same time and ends at the same time. Students throughout the world are learning at the same pace. There are problem sets, midterms, and a final. You may have heard of the "forum." This is a chat room where students post questions on a particular video and other students, TAs, forum moderators, and faculty can post comments or answers. I learned that participating in the forum is very helpful for the faculty in charge. First, it allows me to understand what questions students have. Second, students really appreciate and are encouraged by the involvement of the professor. My habit was to spend 20-30 minutes in the forum every day. It was something I really grew to enjoy.

What It Takes

Most of the questions I get from colleagues concern how much effort edX takes. My answer is, more than I thought it was going to be. It is important to note that much help was provided by edX personnel, and I understand that the support model for these courses going forward will be different. Nonetheless, here is what it took to create 3.091x.

Beginning in June 2012, I had a full-time TA and a full-time edX person for the summer to work on course development. Additionally, we had a full-time video editor and about 1.5 FTE of software engineering support. Additional staff was added as the course came on line. These included part-time administrative support, five paid forum moderators, and four "community TAs" (volunteers from various places around the globe). Finally, we had two-to-five "beta checkers" at various points during the course. Their responsibility was to help find bugs in problems.

I was fortunate that we had access to high quality video from my fall 2011 lectures on campus. Only a handful of lecture segments were derived from fall 2012. Thus, we were able to create 330 lecture segments (50 of which we did not end up using) from my past lectures' video library. Despite this large video resource, I ended up creating 65 screen-

> What I found was that research consistently shows equivalent learning outcomes for residence-based courses and online learning, across a wide variety of types of courses. More interesting is a growing opinion that superior outcomes are achieved by a combination of residence-based learning and online content.

casts. These screencasts were originally intended to replace sections of normal lectures, but I found them also very useful for doing example problems. Finally, in 2011 I had professionally produced six mini documentaries for 3.091 with funds from the Dreyfus Foundation. These were also included in 3.091x.

Screencasts were a surprise to me. I have been on the faculty since 1986. Give me a piece of chalk and stand me in front of a blackboard and I am in "lecture mode." A video segment of a lecture captures that perfectly. A screencast captures something different. I am in my office, writing on a tablet, and speaking to the imaginary student over my shoulder. The words I use and my tone is completely different. There is no "projecting" my voice so that a student in the back of 10-250 can hear me. I am having a conversation. Mixing these screencasts with lecture segments makes for a much more enjoyable experience for the listener. Frankly, if I were starting a course from scratch, I would do it all as screencasts. Also, as a practical matter, screencasts are infinitely easier to edit than lecture segments. Five to 10 minutes of screencast took me approximately 60-90 minutes to prepare once I got used to the video editing software. So I spent much of August 2012 as well as the fall term making screencasts.

3.091x was launched October 15, 2012, and ended January 11, 2013. The late start date was planned so that the fall residence 3.091 course would not be contaminated with the online version of the class. The intention was to compare outcomes between the two student populations. It was not going to be a particularly rigorous study. Rather, it was going to be a "pilot trial"; gather enough data to make some hypotheses.
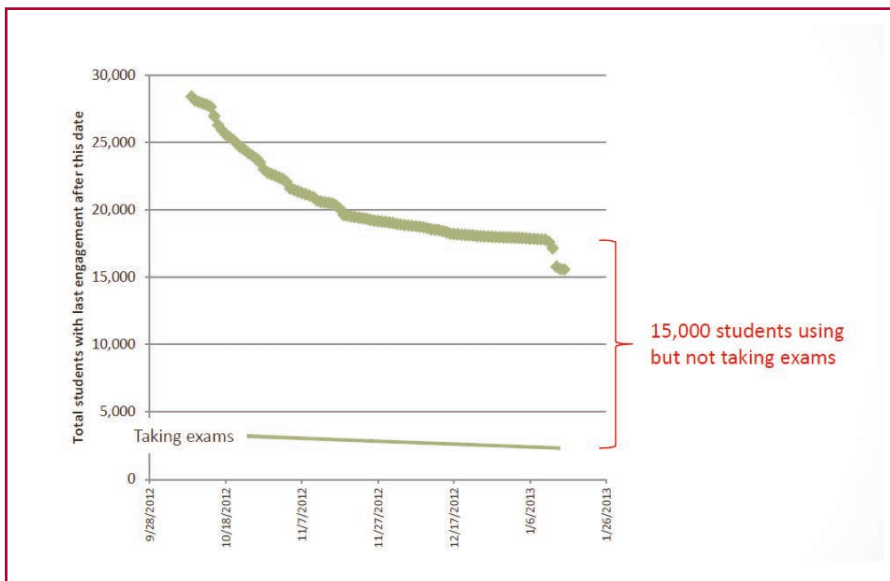
The initial registration was impressive, as shown in Figure 1. Over 28,000 individuals registered. As is common for MOOCs, however, only 10% ended up taking the exams. This was a bit disappointing to me, until I saw the chart indicating the last time a 3.091x registrant
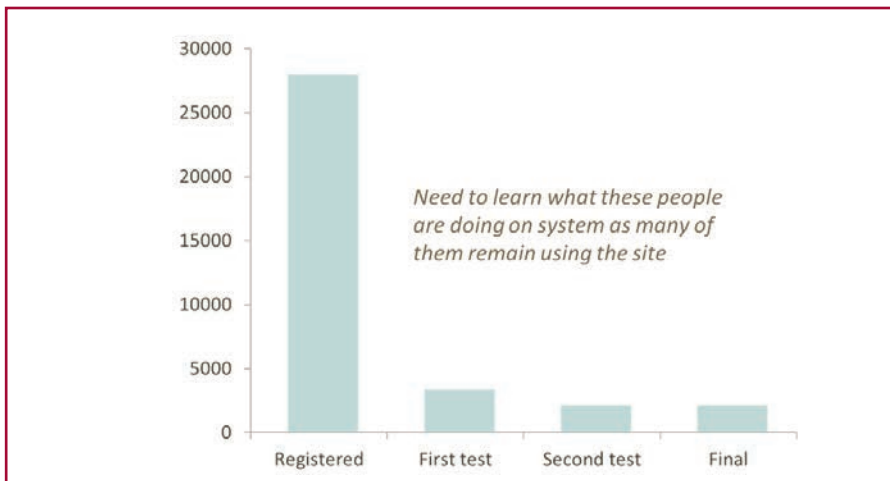
Figure 1. Initial Registration in 3.091x

interacted with the system (Figure 2). It shows that approximately 15,000 registrants are using the online material, but not taking exams.

Figure 2. Last Interaction by 3.091x Registrant

What are these 15,000 registrants doing? Our exit survey with over 1800 people responding gave me a clue. It turns out that over 52% of those registered were students enrolled in other schools. 13% were graduate students, 29% were university students, 1% were community college students, and 10% were high school students. We concluded that many registrants are using the online content as a resource for a class they are currently taking elsewhere. Why

would they take my exam if they were going to take one for the class they are already in?

A particularly fulfilling finding was the participation rate of teachers. 9% of those taking the final in 3.091x were teachers. 4% were university professors and 3% were K-12 teachers. Thus over 60 high school teachers took the final. If that same ratio holds true for the entire population using the system, it would total 540 teachers. I corresponded with several high school chemistry teachers throughout the country and the world. They were using the material to enrich their high school class.

Outcomes

How well does all this work? That is a very difficult question to answer, but I will share some data. I tried to design the finals for both classes (3.091 and 3.091x) so that I could compare learning outcomes. There are several problems with this approach. First, I give partial credit for problems on the 3.091 final. edX problems do not have partial credit. Instead we give students a number of attempts to get the correct answer. For example, if they slip a decimal point in a calculation, they get a chance to fix it. We assume that the two types of measurement converge to measuring the same thing. Second, 3.091 is closed book except for a single sheet of notes. 3.091x is open book and open Web. The only way to control for this is to use questions that don't depend on whether you have access to a book or not. Problems that ask the student to calculate something are what I took as an approximate "open book independent" problem. Finally, 3.091 has a three-hour final. Students are given an entire weekend to take the final in 3.091x. I could not think of a way to control for time, so that needs to be a factor in interpreting the outcomes.

Figure 3 compares outcomes between 3.091 and 3.091x students. These outcomes measures try to control for partial credit grading of 3.091, by only counting students that reported the numerically correct answer for that problem on their final. The 3.091x scores only report the number of students that answer correctly on the first try. Only three outcomes are meaningfully different between 3.091 and 3.091x; weak acid titration, acidity of solids, and surface energy. The 3.091 students scored particularly low on these outcomes. A second look at the written exams shows that these problems had a high proportion of students having provided no response, not a wrong one. I assume that the 3.091 students followed the standard advice; "Look over the entire exam and do the problems that you understand first." Could the problem be that it is not that they did not know this
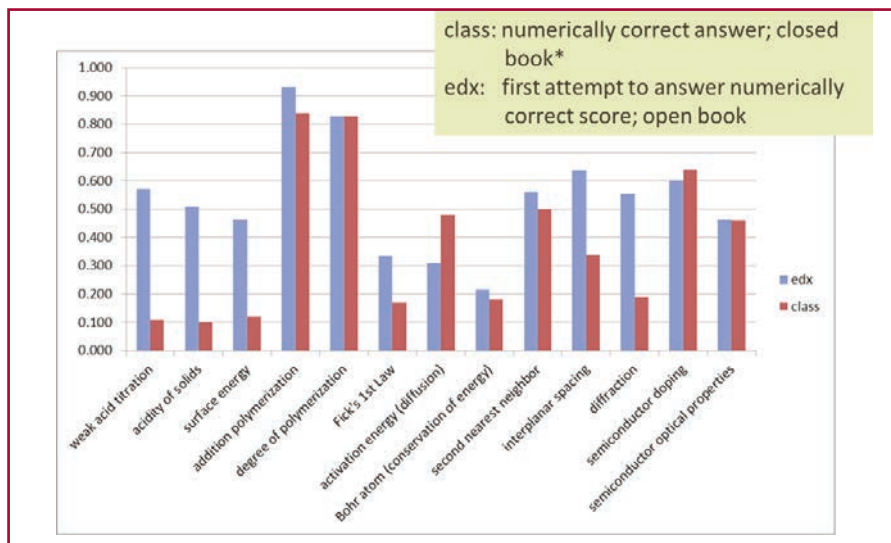

Figure 3. Comparative Exam Outcomes Between 3.091 and 3.091x Students

material, but rather that I did not give them enough time to actually measure what they know?

3.091x students rated the course highly during the exit survey. 27% rated it "Best course I have taken." 60% rated it "Great course" and 11% rated it "About what I expected."

My plans on how to use the online content in the residence-based course will be tested this semester. Briefly, I will be using the online content of 3.091x as the text for 3.091. 3.091 has not had a formal text for many years. We normally used a combination of a standard university chemistry text, course notes written for the class, and a reader of individual chapters from many other texts. None of these sources covers the detail that we actually cover in the class.

The second part of the experiment is to change student assessment. Instead of written exams, we will be using online assessments in a proctored environment. Students will use drop-in hours to evaluate their mastery of 27 skills that we have defined for the course. Each assessment is a single problem selected at random from a problem database on that topic. If a student does not pass a given assessment, they are given the opportunity to try again the next day. There is no time pressure on these assessments. The idea is to overcome the deficiencies of our classical examination model.

I have spoken with numerous other faculty from other universities involved in online courses. Nearly everyone has enjoyed the experience, although we are all still unsure where to best deploy these types of courses. My sense is that the large early courses offered at many universities, like 3.091, are a natural place to start. These courses offer the broadest appeal to students throughout the world. It is also not unrealistic to me that by using an edX type medium an MIT undergraduate experience may someday be one year off campus and three years on campus. I feel online content in our residence-based instruction will probably emerge first in other ways. The screencast medium for instruction is particularly important in my mind. It can free up valuable contact time with students. Rather than taking lecture time to get into the mechanical details of a topic, I can reserve that for a screencast. Instead, I can use the time for discussion on the ideas behind the topic and its implications. ■

Michael Cima is a Koch Professor and Director of the Lemelson-MIT Program (mjcima@mit.edu).

The HASS Exploration (HEX) Program

Diana Henderson
Christine Walley

Call for HASS Exploration Program Expansion

THE HASS EXPLORATION (HEX) Program (formerly known as the First Year Focus Program) is looking to expand its roster of subjects. The Office of the Dean for Undergraduate Education (DUE) is collaborating with the Committee on the Undergraduate Program's Subcommittee on the HASS Requirement (SHR) in soliciting interested faculty to design and teach new subjects that meet the HEX Program criteria. To support that effort, the DUE has included such subject initiatives as part of the Alex and Brit d'Arbeloff Fund for Excellence in Education's call for proposals.

A Brief History of the HEX Program

In 2006, the Task Force on the Undergraduate Educational Commons proposed the creation of HASS subjects geared toward first-year students, to generate a common discussion among undergraduates and familiarize them with fundamental concepts and different disciplinary perspectives within the Humanities, Arts and Social Sciences. Funding from the SHASS Dean's Office and the d'Arbeloff Funds for Excellence in Education enabled the design and continuation of these pedagogically innovative, often team-taught experimental subjects. Following upon the Task Force's work, the Educational Commons Subcommittee recommended the creation of SHR as part of the revision to the HASS Requirement approved by the faculty in 2009 (the same revision that replaced the HASS-D system with a simpler Humanities, Arts, and Social Sciences Distribution requirement). SHR has been charged with the task of recommending to the Committee

on the Undergraduate Program (CUP) whether the First Year Focus Program should be made a permanent part of the HASS Requirement by academic year 2014. Consequently, it began evaluating the program in 2009. Since that time, SHR has determined that these subjects should be available to undergraduates of all years in order to better serve its core constituency; has revised the parameters for HEX subjects accordingly; and has recommended HEX subjects to students as an appropriate introduction to scholarship in the humanities, arts, and social sciences at the collegiate level.

The HEX Program Defined

To join the Program, a subject must meet most of the Program's subject criteria. HEX subjects should be appropriate for all undergraduates (no prerequisites), approach topics from multiple disciplinary and/or interdisciplinary viewpoints (often, but not necessarily, in team-taught formats), and emphasize close interaction with faculty (an absolute maximum of 25 students per faculty member/senior lecturer). Students in a HEX subject will:

- Explore a topic using contextual and/or qualitative modes of inquiry.

- Think critically and analytically about a complex issue, theme, or concept from multiple viewpoints – either within or across disciplines in the humanities, arts, and social sciences.

- Practice foundational skills for understanding and addressing the complexity of the world in which we live.

- Gain focused substantive knowledge and wide-ranging familiarity with alternative scholarly methods, insights, and analytic resources.

Join the HEX Program Community

Advantages for faculty in being part of the HEX Program include the opportunity to explore topics through multiple lenses, team teaching (if applicable), becoming familiar with the pedagogical strategies of colleagues, and sharing or developing new research and curricular ideas. Instructors in the SHR-recommended Program have occasion to build relationships with fellow faculty in other departments and teach previously unreached students about their area of expertise. Events such as the annual HEX Instructors Luncheon over IAP provide opportunities to share experiences, perspectives, challenges, and pedagogical innovations.

How to Participate

To find out whether your subject might fit into the HASS Exploration Program and how you might receive help in designing and teaching a thematically innovative subject to be considered for the Program, contact your Department Head, Christine Walley (SHR Chair), or Diana Henderson. To view this year's roster of HEX subjects, visit: *web.mit.edu/hassreq/exploration.html*. ■

Diana Henderson is Dean for Curriculum and Faculty Support *(dianah@mit.edu)*;
Christine Walley is Chair of the CUP's Subcommittee on the HASS Requirement (SHR) *(cwalley@mit.edu)*.

Request for Preliminary Proposals for Innovative Curricular Projects

The Alex and Brit d'Arbeloff Fund for Excellence in Education

THE OFFICE OF FACULTY SUPPORT seeks preliminary proposals for faculty-led projects to enhance the educational experience of MIT undergraduates. Projects that involve faculty-student direct interaction, that cross disciplinary boundaries, or that aspire to provide dynamic, effective teaching, particularly through the introduction of online learning, are all appropriate.

Projects can be focused at any level of our undergraduate education. Special attention will be accorded to enhancements of subjects offered in the first year and as General Institute Requirements (GIRs). The d'Arbeloff Fund Review Committee is interested in proposals aimed at fostering faculty participation in the educational experiences of undergraduates, especially freshmen, beyond the classroom. The Committee also welcomes proposals for projects that will explore the ways in which online learning experiments can be applied to MIT subjects. Collaborative projects with the potential to affect large numbers of students over time, transcend specific departmental curricula, or span multiple subjects are particularly valuable.

Examples of possible proposal areas include: establishing and enhancing HASS Exploration (HEX) (*web.mit.edu/hassreq/exploration.html*) subjects; creating online modules to be used within a subject or across subjects; providing opportunities aligned with the faculty res-olution (*web.mit.edu/fnl/volume/254/grove et al.html*) that envisions every MIT freshman having a faculty mentor; and enhancing freshman participation in appropriately focused group UROPs, project teams, or other forms of supervised research with faculty.

For all projects, the d'Arbeloff Fund Review Committee encourages assessment of the value of our educational innovations and the dissemination of results.

For guidelines and more information, visit *web.mit.edu/darbeloff* or contact the Office of Faculty Support at x3-6776 or *darbeloff-fund@mit.edu*.

Preliminary proposals, with an estimated budget, are due by Friday, September 27. ■

Nominate a Colleague for the MacVicar Faculty Fellows Program

THE MACVICAR FACULTY FELLOWS Program recognizes MIT faculty who have made exemplary and sustained contributions to the teaching and education of undergraduates at the Institute. Together the Fellows form a small academy of scholars committed to exceptional instruction and innovation in education.

MacVicar Faculty Fellows are selected through a competitive nomination process, appointed for 10-year terms, and receive $10,000 per year of discretionary funds for educational activities, research, travel, and other scholarly expenses.

For more information and the nomination process, visit *web.mit.edu/macvicar* or contact the Office of Faculty Support at x3-6776 or *macvicarprogram@mit.edu*.

Nominations are due on Thursday, November 21. ■

Report to the President
continued from page 1

occurred on the MIT campus. In July 2011 he was charged in a federal indictment with multiple felony offenses, specifically violations of the Wire Fraud Act and the Computer Fraud and Abuse Act. On January 11, 2013, Aaron Swartz's partner found him dead in their New York apartment, a victim of suicide.

At the time of his death, Aaron Swartz was a 26-year-old computer programmer and an Internet celebrity – a former child prodigy who as a young teenager had worked alongside the leaders of the World Wide Web to create some of its basic technology for sharing information; an entrepreneur whose startup company became a key piece in a major news and entertainment service; an activist who co-founded an advocacy organization with more than a million members that organized petition drives for civil liberties and against censorship; and a Fellow at Harvard University's Safra Research Lab on Institutional Corruption.

Only Swartz knows why he committed suicide. However, for the final 24 months of his life, he was the subject of a vigorous investigation and prosecution by the U.S. Department of Justice, with an indictment and then a superseding indictment that could have resulted in years in prison. The charges stemmed from his actions, starting in fall 2010, when he surreptitiously downloaded massive quantities of scholarly journal articles from the JSTOR digital library through MIT's computer network.

Two days after the suicide, MIT President Rafael Reif asked Computer Science Professor Hal Abelson to lead the present review of MIT's involvement in the events, beginning with those in September 2010, when MIT first became aware of unusual download activity on its network, and continuing until Swartz's death in January 2013. The purpose of this review is to describe MIT's actions and consider what can be learned from them.

In conducting the review, Abelson has been joined by MIT Economics Professor and Institute Professor Emeritus Peter Diamond; and Andrew Grosso, a Washington, D.C. attorney and former Assistant U.S. Attorney, with special expertise in computer law. When this report refers below to "we," "the reviewers," or the "Review Panel," it is referring to the three of us. MIT Assistant Provost for Administration Douglas Pfeiffer provided staff assistance. The process we used to gather information for this report is detailed in Appendix 4.1*.

Other than the announcement of the review on January 13, MIT has issued no statements before this report, in the interest of providing an account that is full, accurate, and fair. Since that time, we have received no further instruction from the MIT administration other than several public indicators that we should take as much time as we needed.

News of Aaron Swartz's death ignited a firestorm on the Internet. In the six months since our review began, there have been memorial services honoring Aaron Swartz in several cities, including one on Capitol Hill. The American Library Association posthumously awarded him its 2013 James Madison Award, and the Internet Society posthumously inducted him into the Internet Hall of Fame. A bill was introduced in Congress ("Aaron's Law") to revise the Computer Fraud and Abuse Act under which he was indicted. There has been a Congressional investigation and a petition to the White House demanding the firing of the prosecutors involved. There have also been several anonymous cyberattacks – three of them against MIT – in protest of Swartz's prosecution, hate mail directed towards MIT employees and federal prosecutors involved in his case, and a hoax report of a shooter on campus that shut down MIT for a morning.

There have also been thousands of news articles and commentaries, many of them roundly critical of MIT. Reactions range

from puzzlement, to headshaking disappointment, to anger, to dark hints of conspiracies. We hope this report, by laying out a full history of MIT's involvement, will put people in a better position to judge for themselves the plausibility of the various comments and positions taken, and to evaluate MIT's conduct.

Both the writing and the reading inevitably involve hindsight: how does one maintain a perspective uncolored by the shock and tragedy of Aaron Swartz's suicide, or – knowing of him and his accomplishments – by the realization that he was the person who did the downloading and who was then arrested? Just as we have tried to limit the effects of hindsight in the writing, we hope readers will do the same when interpreting our report.

In brief, among our more significant findings are the following:

1. Until the arrest in January 2011, MIT was unaware that the person who engaged in the downloading of JSTOR's data beginning in September 2010 was Aaron Swartz. Until the arrest, MIT's concern was to stop the use of its network, by an unknown person, to download massive numbers of articles from the JSTOR database, which was in violation of MIT's licensing agreement with JSTOR and whose scale threatened the operation of the JSTOR network to the extent that JSTOR blocked MIT's access to JSTOR for three days. When, on the morning of January 4, 2011, MIT's network personnel located a laptop – covered by a cardboard box and plugged into a router in a basement data closet in a campus building – they were not sure with whom or with what kind of situation they were dealing, and they contacted the MIT Police. For the same reasons, the MIT Police sought forensic assistance from a detective in the Cambridge Police Department who had expertise in computer crime and with whom they had worked repeatedly in the past. The Cambridge detective, who was a member of the New England Electronic Crimes Task Force, responded to the call, accompanied by an agent of the U.S. Secret Service. While the inclusion of the Secret Service agent was not

the intention of MIT, it was a recognized possibility. It was not until a few days later, when Aaron Swartz was arrested, that MIT learned the identity of the person involved in the JSTOR downloading. Thus, we find that MIT did not focus on Aaron Swartz at any time during its own investigation of the events that led to his arrest, and that MIT did not intentionally "call in the feds" to take over the investigation.

2. MIT never requested that a criminal prosecution be brought against Aaron Swartz. Early in the prosecution by the U.S. Attorney's Office in Boston (the "USAO"), MIT adopted a position of remaining neutral, with limited involvement. MIT hired outside counsel who had experience in criminal law and in the functioning of the Boston U.S. Attorney's Office; and MIT requested and received subpoenas for the production of documents. Some documents were turned over to the USAO prior to receiving a subpoena, but, for the reasons discussed in this report, this production did not violate federal laws.

3. In keeping with its stance of neutrality, MIT never issued a public statement about Swartz's prosecution or advocated publicly on his behalf, even though doing this was urged by Aaron Swartz's family and legal team and by two members of the faculty. One of the reasons for MIT's silence was the good-faith belief, based on private conversations with the lead prosecutor, that the Institute's opinion would have no effect on the prosecution, and that public statements might make circumstances worse for Aaron Swartz. MIT did inform the prosecution that it was not seeking punishment for Swartz, and it did inform the defense that it was not seeking any civil remedy from him.

4. Before Aaron Swartz's suicide, the MIT community paid scant attention to the matter, other than during the period immediately following his arrest. Few students, faculty, or alumni expressed concerns to the administration. In preserving MIT's stance of neutrality and limited involvement, MIT decision-makers did not inquire into the

details of the charges until a year after the indictment, and did not form an opinion about their merits. MIT took the position that U.S. v. Swartz was simply a lawsuit to which it was not a party, although it did inform the U.S. Attorney's Office that the prosecution should not be under the impression that MIT wanted jail time for Aaron Swartz. (MIT did not say it was actually opposed to jail time.) Among the factors not considered were that the defendant was an accomplished and well-known contributor to Internet technology; that the Computer Fraud and Abuse Act is a poorly drafted and questionable criminal law as applied to modern computing, one that affects the Internet community as a whole and is widely criticized; and that the United States government was pursuing an overtly aggressive prosecution. MIT's position may have been prudent, but it did not duly take into account the wider background of information policy against which the prosecution played out and in which MIT people have traditionally been passionate leaders.

Part I of this review recounts the actions MIT took from the first discovery of the downloading up to the time of Aaron Swartz's arrest. Part II reviews actions after the arrest by those involved other than MIT, in order to set the context for Part III, which describes MIT's own decisions and conduct between the arrest and the death of Aaron Swartz. Part IV highlights some of the options that MIT faced throughout this history. Part V provides some questions for the MIT community that the review panel believes should be starting points for discussion within MIT.

It was not part of our charge in this review to draw conclusions, but rather to determine facts and to consider what can be learned from this tragedy. Part V accordingly poses questions, not answers. These questions are for everyone at MIT, not just the Institute's leadership. They concern the kind of community that MIT is and the kind of community it could become. The questions reflect not only the particular events of the Aaron Swartz case, but

also the overall Institute circumstances and climate in which the events occurred. The most difficult questions challenge us to become better at negotiating the tension between prudence and passion, as great institutions must.

*The Review Panel realizes that there has been significant controversy surrounding the events described in this report. We appreciate that many of the people involved have legitimate concerns about their privacy and their security, and we know that some have even been personally threatened. Consequently, our report generally does not identify individuals by name. Many of these individuals have already been identified in court filings and other public documents, and we are fully aware that their names are readily discoverable on the Internet. Even so, we see no need to further erode their personal privacy. So as a rule, people in this report are identified by their role or position rather than by name. There are a few exceptions. In cases where including their names makes the narrative more understandable, we've named public officials – such as prosecutors, detectives, federal agents, judges, or police officers whose role in the events has already been described in public court filings. For some people actively involved in the events described, such as defense counsels for Aaron Swartz, we have used their names with their permission to do so. We have also named some people whose connections are only tangential to the events described in the report without having sought permission.

Cambridge, MA
July 26, 2013

Harold Abelson
Peter A. Diamond
Andrew Grosso
Douglas W. Pfeiffer

[Editor's Note: The entire report can be viewed at: *swartz-report.mit.edu/docs/report-to-the-president.pdf*.]

letters

Disturbed By Abelson Report

To The Faculty Newsletter:

WE WERE MUCH DISTURBED to read, on page 69 of the Abelson Report [*Report to the President, MIT and the Prosecution of Aaron Swartz*], about a meeting between Robert Swartz and the Chancellor and General Counsel:

"Second, Robert Swartz connected the matter of his son to that of Star Simpson, arguing that the Star Simpson matter was a precedent that would allow MIT to make a statement. The Chancellor and the General Counsel took a different view, explaining that after MIT had made those statements its administration had been (justly) reprimanded."

We have to wonder how the Chancellor and General Counsel construed the Simpson case as a precedent arguing against coming to the aid of someone in need of help. Surely any thoughtful person who attended the debate preceding the vote on the Manning-Winston resolution understood that our proposed resolution – some still call it a vote of no confidence – was in opposition to characterizing an innocent student as "reckless." Both the Chancellor and General Counsel were there, both know that the vote failed and that the faculty narrowly sustained a policy that

permitted, indeed encouraged, the administration to act thoughtfully – either by public comment or by behind-the-scenes negotiation – on consequential matters involving MIT. The Simpson case raised concern that the administration did not act thoughtfully, while the Swartz case is about a failure to act.

Kenneth R. Manning
Thomas Meloy Professor of Rhetoric and History of Science

Patrick H. Winston
Ford Professor of Computer Science

Praising America's Public Libraries

To The Faculty Newsletter:

IN HIS ARTICLE ENTITLED "How Online Education Might Impact the Future of Mathematics Departments," published in the May/June 2013 issue of the *MIT Faculty Newsletter*, Professor Daniel Stroock offers his perceptions of America's public libraries:

"Ever since Andrew Carnegie provided every large city in America with a library, vast reservoirs of information have been available to the general public. However, only a small fraction of the population even attempts to tap those reservoirs, and only a small fraction of those profit from their efforts."

I write not to comment on the merits of Professor Strook's position regarding the future of mathematics departments, but to offer an alternative perspective on the use and value of America's public libraries.

In fiscal year 2012 , the Boston Public Library hosted more than 10,000 public programs, lent out more than 3.8 million books and audiovisual materials, and received more than 7.8 million visits to its Website. In the same year, the Boston Public Library helped more than 37,000 Boston residents sign up for library cards, hosted more than 800,000 free computer sessions, and had more than 3.4 million people pass through its doors. Over a decade ago, the Boston Public Library began digitizing its out-of-copyright books, and in 2011 became host for the Library for the Commonwealth, a statewide digital library. The BPL is a key player in the development of the Digital Public Library of America (*www.bpl.org*).

Nationwide, in 2010 58% of Americans 16 years and older had library cards and 80% said borrowing books was a very important service libraries provide. Americans go to school, public, and aca-

demic libraries more than three times more often than they go to the movies. Public libraries circulated 2.46 billion materials in 2010, an average of more than eight books a year for every American. Public libraries made 18.5 million eBooks available for circulation, and eBook readers were available for checkout at 39% of public libraries. Almost 89% of public library outlets now offer wireless Internet access, and more than 60% of libraries report offering the only free Internet access in their communities (*www.ala.org*).

America's public libraries continue to offer highly valued and heavily used services – in person and online – to the population of the United States. As my public library colleagues like to say, "check one out."

Ann J. Wolpert
Director of Libraries

M.I.T. Numbers
Class of 2017 Enrolled Students: Admissions Statistics

	2013	2012	2011	2010	2009
Freshman Applications	18,989	18,109	17,909	16,632	15,663
Freshman Admits	1,548	1,620	1,742	1,676	1,676
Admission Rate	8.2%	8.9%	9.7%	10.1%	10.7%
Freshman Enrolls	1,125	1,135	1,126	1,069	1,072
Yield	72.7%	70.1%	64.6%	63.8%	63.9%
Male	616 55%	609 54%	620 55%	588 55%	594 55%
Female	509 45%	526 46%	506 45%	481 45%	478 45%
African American	79 7%	93 8%	97 9%	93 9%	93 9%
Asian American	327 29%	313 28%	310 28%	280 26%	272 25%
Caucasian	437 39%	420 37%	424 38%	422 39%	386 36%
Hispanic	167 15%	174 15%	165 15%	141 13%	154 14%
Mexican American	76 7%	67 6%	77 7%	69 6%	83 8%
Puerto Rican	19 2%	28 2%	30 3%	27 3%	22 2%
Other Hispanic	72 6%	79 7%	58 5%	45 4%	49 5%
Native American	6 1%	7 1%	7 1%	10 1%	10 1%
International	90 8%	114 10%	109 10%	93 9%	88 8%
Other/No Response	19 2%	14 1%	14 1%	30 3%	68 6%
Underrepresented Minorities	252 22%	274 24%	269 24%	244 23%	257 24%
First Generation to College	185 16%	147 13%	159 14%	169 16%	200 19%
Valedictorians*	194 41%	203 44%	225 43%	238 44%	232 40%
Top 5% in Class*	435 92%	431 92%	473 90%	499 93%	524 89%
High Academic Distinction	296 26%	297 26%	330 29%	287 27%	227 21%
Identified Athletes, Artists, or Musicians	236 21%	281 25%	249 22%	214 20%	210 20%
SAT-I Math (Mean)	769	765	762	763	754
SAT-I Math (Median)	780	780	770	770	770
SAT-I Verbal (Mean)	723	716	710	710	699
SAT-I Verbal (Median)	730	730	720	730	710
Geographic Representation					
U.S. States	48	46	46	48	48
Foreign Countries (citizenship)	52	52	59	54	51
Number of Students by School Type					
Public	750 67%	728 65%	748 66%	696 65%	745 69%
Private	172 15%	181 16%	185 16%	180 17%	157 15%
Religious	90 8%	94 8%	93 8%	86 8%	80 7%
Foreign	85 8%	102 9%	78 7%	80 7%	68 6%
Home Schooled	8 1%	9 1%	5 0%	8 1%	13 1%
Other/Unknown	20 2%	21 2%	17 2%	22 2%	9 1%

*Percentage shown is a proportion of enrolled students from schools that report class rank.
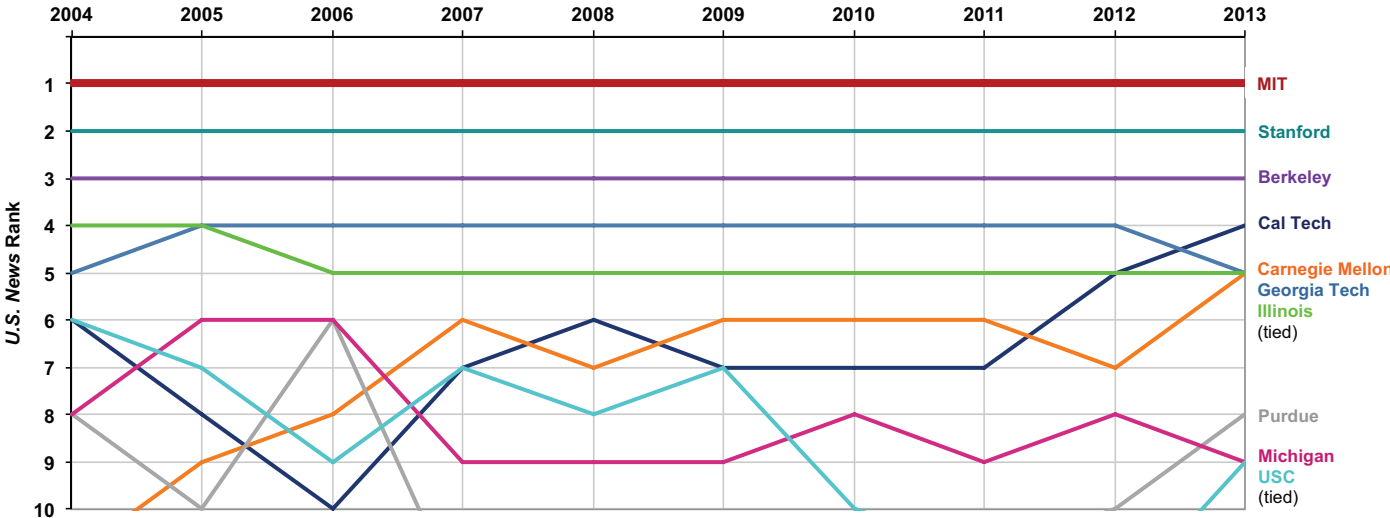Enrolled figures as of June 3, 2013.
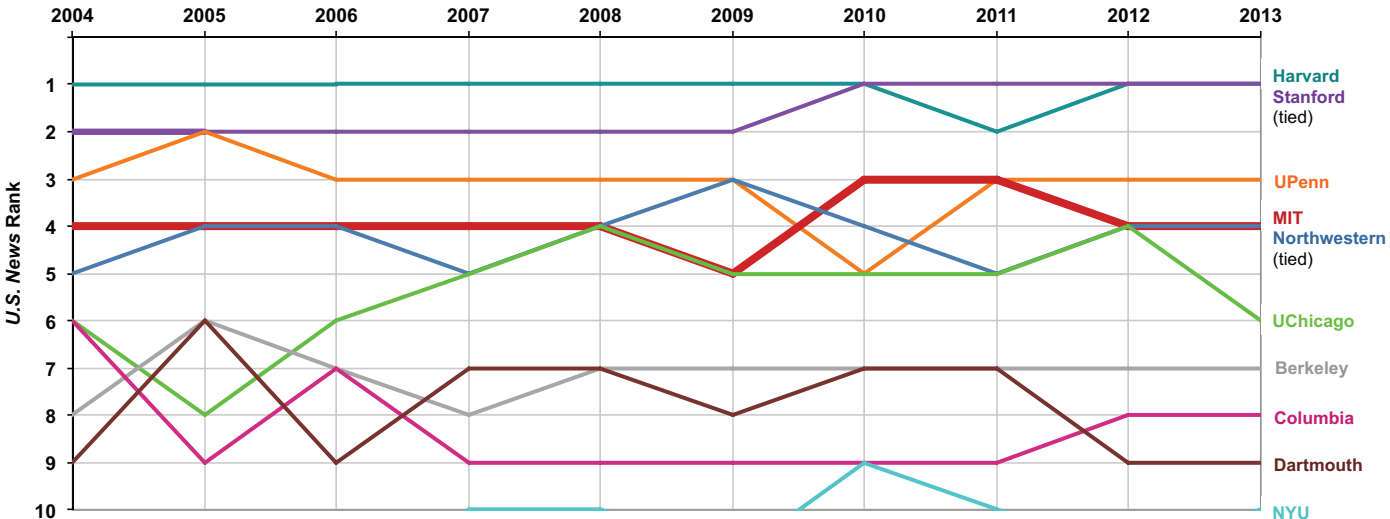
Source: MIT Admissions Office

M.I.T. Numbers
U.S. News & World Report: Graduate School Rankings 2004 – 2013

Ranking the Top 10 Engineering Schools

Ranking the Top 10 Business Schools

Source: Office of the Provost/Institutional Research