The MIT Faculty Newsletter

Technology-Enabled Education and "Stellar"

Mike Barker, Vijay Kumar, Dick Larson, Jeff Merriman

This article is the first in a series about the innovative ways technology is being used to enhance teaching and learning at MIT.

Commenting on technology-enabled education, President Vest recently noted, "I have believed that *what* we do is far more important than simply doing *something*."

The purpose of this article is to introduce an innovative Institute initiative in technology-enabled education. A new Web-based learning management system for hosting and managing MIT courses and programs is being developed at MIT's Educational Media Creation Center (EMCC).

Code-named *Stellar*, this system's development is as ambitious as it is educationally significant. The open standards approach adopted by *Stellar* has attracted considerable interest from a broad range of other colleges and universities. The Mellon Foundation recently announced its decision to provide funding to support MIT's Open Knowledge Initiative (OKI) which will support further Stellar development with the goal of extending its usefulness to various other institutional settings.

Moving from "one off" Websites to a sustainable enterprise system

By now, the majority of MIT faculty members have had some experience in using the Web for teaching and learning. These experiences vary widely. Often we are enthusiastic about using the Web for our own teaching but not being

Golf Courses and The Wall Of Slavery

James H. Williams, Jr.

Perspiring Palms

The flight attendant nudges me across the veneer that separates her reality from my daydreams: ". . .in preparation for landing into Dulles International Airport, please fasten your seat belts. . .". As I glance out my window, I see a luxurious golf course and a white Victorian mansion that no doubt serves as its clubhouse, gracing the gently rolling, plush Virginia landscape below. Yes, this is Northern Virginia, not the southeastern region of the state where I spent a fantastic youth of fun, rollicking, and harmless mayhem; a region to which I have vowed never to return. Since my mother's death, I can not return to Newport News, too painful. All the colors in my life have since been muted, and the light in some of its corners has been extinguished. I was Margaret Holt Williams' mama's boy.

But my focus is on the golf course – tree-lined fairways, not links; Scottish pot and hourglass fairway bunkers, seven on one hole; elegant, bent grass greens I can almost read from 3,000 feet in this crisp glancing morning light; and lots of water too, beautiful ponds and streams in which to lose lots of balls. As always, I enjoy this golf course assessment exercise. Golf is a magical *pas de deux* between the mind and the body, a sport of enormous elegance and technical sensitivity, a pastime with numerous lifestyle metaphors (forget the previous shot, focus on the present shot; don't attempt what you can't do;. . .), exceedingly more cerebral than the casual fan might think. It is a game without defense. And, it is the most subtle, near fickle, blend of power and finesse – physical and mental

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SPECIAL REPORT

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From The Faculty Chair

Rethinking Graduate Enrollment

Steven R. Lerman

There are very few opinions that are as universally shared among the faculty as the view that we are all too busy. The combined demand of teaching, research, administration, proposal writing, thesis supervision, meetings, voice mail, e-mail, fund-raising, and participating in conferences and other professional meetings often takes far more time than we want. These commitments leave too little time for spontaneous interaction with our students or the relaxed, creative thinking that all of us treasure. They also compete for the time we want to spend on our families and relationships outside MIT in ways that may, in the long term, make us less satisfied with our lives.

Most of the faculty I talk to find the demands of their calendars oppressive. They also tend to view this situation as something that is an unintended consequence of the complexity of modern academia and, as such, largely out of their control. Moreover, most of us view this deplorable situation as unlikely to change in the foreseeable future.

The increasing infringement of scheduled events on our time is to some extent externally generated. Academic administration has grown more complex in response to an ever-expanding set of regulatory requirements. Research sponsors often require more direct contact and more detailed reports. Electronic communication is an integral part of staying abreast of research in our respective fields and maintaining communication with both our students and colleagues. All of these arrived not as a result of any conscious decision anyone made. However, there are decisions that we, as faculty, have made that contribute to the demands on our

time, over which we have some degree of control and, which with some collective action, we can change.

It is my view that one of the best "points of leverage" that can move us back to a better balance in our time commitments is the size of the graduate student body. In 1991, MIT had a total of 4854 graduate students who were in residence at MIT and studying for a degree. (This figure omits non-

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residential students who require little of our time and special students who are generally taking one or two courses and not writing theses.) In 2000, we had 5566 graduate students (again omitting non-residential and special students), an increase of nearly 15 percent. In that same time period, the number of faculty members actually declined from 961 to 931. Our undergraduate enrollment has declined slightly from 4389 to 4258 during that same time period. Some of our more senior faculty can even recall a time when there were more undergraduate students at MIT than graduate students.

In the case of undergraduate enrollment, we carefully plan and manage the number of students we admit.

Each year, the Enrollment Management Group carefully examines a range of alternatives in the number of students we admit, including complex financial analysis of the full costs of various options. This group makes recommendations to the Academic Council to advise the President on admissions goals, and he in turn reviews these recommendations with the Corporation Executive Committee. All of this

planning generally results in our actual undergraduate student body size being within 50 of our target, and generally much closer.

A reasonable question is whether the growth in the number of graduate students is the result of conscious policy decisions or an unintended outcome of other forces. Clearly, there is nothing in our governance structure for graduate student admissions even remotely like the Enrollment Management Group. Some of the growth we have experienced was planned. For example, the administration did make an explicit decision to increase the size of the Sloan School, allowing the faculty and student body to grow to reflect the growing

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importance of key fields in that school. Similarly, some thought was given to the growth in the student body that would result from offering the Master of Engineering degree in Electrical Engineering and Computer Science, though the projected number of students electing to take that degree was much smaller than the number now enrolled. Another substantial element in the total growth, however, was the result of unplanned, incremental growth across many departments that, when combined, resulted in considerable growth. To a great extent, the size of our graduate student body is the sum of numerous, independent decisions by admissions committees in the various departments, divisions, laboratories, and centers that have graduate programs. Each of these units is thinking and acting locally.

It is my contention that, as a faculty and as a university, we would be far better off with fewer, rather than more, graduate students. The faculty would be less over-committed, and each undergraduate and graduate student would have more of our time and attention. There would be fewer theses to supervise, doctoral exams to be given, dissertation committees to be on, and students in crisis. Beyond just the reduction in the demands on faculty time, we would have less need for student office space, research funding to support graduate assistants, and competition for our scarce on-campus housing for graduate students. Stated goals such as housing at least 50 percent of our graduate students on our campus would be more easily reached in the next two years, and friction with the City of Cambridge over our students competing with long-time Cambridge residents would be reduced. In addition, unlike earlier times, MIT now bears a

considerable part of the cost of each graduate research assistant. We recover only 35 percent of the tuition of each research assistant from research grants; the rest is paid from MIT's budget. In addition, MIT waives tuition during the summer for graduate students who are only registered for thesis or research.

Assuming we do decide to reduce the number of graduate students, the next appropriate question is how, given the high degree of decentralization in admissions and funding decisions, we would actually do so. Moving to a centralized admissions process for graduate students would, in my view, be a cure vastly worse than the disease. Individual departments and other academic units are in a far better position to make admissions decisions than any centralized group could ever be. We clearly need some mechanisms that appropriately balance the strengths and reasonable prerogatives of the diverse academic units with the legitimate collective concern regarding the MIT-wide consequences of having so many graduate students. There may be good reasons why some departments should have even larger graduate enrollments while others should have smaller numbers.

At the local level, we should be careful to ensure that we consciously plan the number of students we admit each year with attention to how that number will affect the demands on the faculty. The deans, provost, and president need to exercise greater authority and oversight on these decisions.

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The senior administration has already made it clear that unless there is an explicit agreement to the contrary, growth in graduate enrollment is not a compelling case for additional space, fellowship support, or faculty positions. This puts some pressure on preventing further growth, but does little to push enrollments lower. Departments should consider admissions strategies that will significantly reduce graduate enrollments over time rather than accepting the current numbers. Assuming there is agreement with the dean and senior administration on such plans, these decisions should not result in budget or faculty size reductions.

The number of graduate students in each department is an area of administration where there is no simple formula that can be applied. Even well intentioned efforts at direct control of graduate admission by the senior administration would be a serious

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mistake. We need a more nuanced strategy that allows for more discussion and negotiation. Departments need to more carefully examine the number of students they admit. We should avoid a mindset that necessarily equates a decline in graduate enrollment with a decline in the quality of a department. Each of us should think more broadly about how many students we should have in our labs and centers in light of the demands on our time, and we need to convey those views to admissions officers at the departmental level. By paying attention to the larger consequences of high enrollments, we can create some pressure for decreasing the number of graduate students at the Institute.

MIT's superb reputation is, after all, built not on quantity but on quality. Decreasing the number of graduate students in a department is a strategy for improving the quality of our students and the quality of their educational experience. It can also provide us all with some desperately needed time for us to focus our attention on being more accessible to all our students.✣
[Steven R. Lerman can be reached at lerman@mit.edu]

Teaching this spring? You should know …
the faculty regulates examinations and assignments for all subjects.

Check the Web at **http://web.mit.edu/faculty/termregs**.
Questions: contact Faculty Chair Steven Lerman at x3-4277 or lerman@mit.edu.

THE FACULTY APPROVED THESE RECENT CHANGES FOR UNDERGRADUATE SUBJECTS:

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

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

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

No Testing During the Last Week of Classes
Tests after Friday, May 11 must be scheduled in the Finals Period.

TEACH TALK

Transforming Novice Problem Solvers Into Experts
The first of three *Teach Talk* columns to focus on the implications of research into learning for actual classroom practice
Lori Breslow

It's a common refrain that came up again recently during a conversation among several faculty members after a seminar on new educational technologies. The discussion had winded its way around to the intellectual strengths and weaknesses of the students, and the question popped up, as it often does around this subject: Why can't students be better problem solvers? Professor Heidi Nepf from Civil and Environmental Engineering summed up the faculty's sense of frustration particularly well. "I can give my students a set of problems that all follow a certain model, and they'll do fine," she said. "The minute I throw in a novel condition or create a problem that doesn't look like something they've seen before, they're lost." Then she turned to me and asked, "How come?"

I don't think anyone would argue that the problem is a complex one. It is connected to such factors as the kind of high school education our students received, their own proclivities, and their stage of intellectual maturity. But I'd like to suggest that at least part of the answer lies in the fact that too often we don't explicitly teach students the *process* of problem solving. We expect that as they listen to us in lecture or watch us in recitation they will somehow absorb the skills they need to make the jump from using "plug 'n' chug" to employing more sophisticated problem solving strategies. But as Donald Woods, professor emeritus of chemical engineering at McMaster University and

a leading developer of problem-based learning curricula, writes, "In a four-year engineering program, students observed professors working more than 1,000 sample problems on the board, solved more than 3,000 assignments for homework, worked problems on the board themselves, and observed faculty demonstrate the process of creating an acceptable internal representation about fifteen times. Yet despite all this activity, they showed negligible improvement in problem-solving skills . . .." (Donald Woods, "How Might I Teach Problem Solving," in J. E. Stice, ed., *Developing Critical Thinking and Problem-Solving Abilities. New Directions for Teaching and Learning,* no. 30, 1987, pp.58-59) Yet I don't think instructors should be blamed: My guess is that if a representative sample of MIT faculty were asked to describe how they go about solving problems, they wouldn't be able to. In that regard, they wouldn't be any different from most experts who have so internalized their problem solving abilities that these skills have become transparent to them.

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> **Happily, thanks to the work of cognitive psychologists, educators, and researchers in artificial intelligence, who have been studying problem solving for at least the last 30 years, we do know something about how skilled problem solvers recognize, approach, and ultimately solve problems. Much of this research has revolved around examining what distinguishes expert problem solvers from novices.**

at least the last 30 years, we do know something about how skilled problem solvers recognize, approach, and ultimately solve problems. Much of this research has revolved around examining what distinguishes expert problem solvers from novices. Educators have then gone a step further to develop methods that can be used both inside and outside of the classroom to strengthen the novice's problem solving skills.

In this *Teach Talk* I'd like to focus on the expert/novice dichotomy, because I believe it contains an especially rich lode of information regarding the skills

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our students need to develop. In fact, this column is the first of three *Teach Talks* that will be devoted to describing recent research in learning in higher education. (The next two columns will deal with the theories of constructivism and situated learning.) Each column is designed to inform readers on how this research can be applied to improving actual classroom practice, for this knowledge has direct implications for structuring the MIT educational experience.

The Components of Problem Solving

The most useful definition I have found for problem solving begins by conceptualizing a continuum that runs from "learning" to "problem solving" to "creativity." In this schema, learning refers to the students' ability to demonstrate they have internalized the material to which they have been exposed by displaying it in a context similar to that in which they were taught. "Transfer of learning" is demonstrated when the situation is somewhat different from the original one. If, however, the transfer situation is substantially different from the original, or if students meet some barrier or difficulty in using the learning, then they are faced with problem solving. (This is the situation to which Professor Nepf referred.) Creativity is at the far end of the continuum where the situation is so vastly different that what has been learned is transferred to a totally new context.

Several scholars, including Donald Woods, have sought to break down the process of problem solving into its component parts. Woods' six-step plan, which he credits as an extension of the plan devised by György Polya in his classic book *How to Solve It*, directs problem solvers to: read about the situation; define the given situation or problem; define the "real" problem and

create a "representation" of it (more on this below); plan; do it; and check, look back, and implement. Woods further decomposes each step into smaller parts. For example, "defining the situation" (step two) is rooted in analysis, which consists of reasoning, classifying, identifying series and/or relationships, creating analogies, and checking for consistency. While there may be disagreement about the exact nature or order of the steps in the problem solving process, the underlying point remains valid: Problem solving can be dissected into a set of *skills* that

students can be exposed to along with course content. One cannot substitute for another. (Interestingly, attempts to teach problem solving as a separate course have not been as successful as when problem-solving skills are interwoven into a "content" course. Giving students problems from the "real world" and using those problems as the basis for teaching problem solving is particularly effective. In fact, Woods maintains that the types of problems students are typically given in science and engineering classes are not appropriate at all for teaching problem-solving skills.)

Finally, while we are likely to think of problem solving as a cognitive capability, a number of researchers have also looked at the role of attitudes, values, beliefs, and emotions in successful problem solving. (Actually, the research of neurologist Antonio Damasio suggests that emotion and cognition should not be viewed as separate activities in the brain at all; rather, they work in concert.) We know, for example, that if students believe they are incapable of solving a certain kind of problem, they are likely to be unable to do it. De Bellis and

> There are a number of characteristics that differentiate the expert from the novice problem solver. But at the heart of the matter is that experts think about, consider, and examine the problem as a whole before beginning to work on a solution. They classify a problem according to its underlying principles, deciding to what class of problem it belongs. They engage in a planning stage before even attempting a solution. Novices jump right in.

Goldin have examined the "influence of values, i.e., one's psychological sense of what is right or justified, on problem solving," report Annie and John Selden in "What Does It Take to Be an Expert Problem Solver?" The Seldens go on to write, "For example, some students may feel they 'should' follow established procedures, whereas others may value originality and self-assertiveness." (*MAA Online*, 8/30/97, p. 4) Other students who feel they should know the answer to a problem may become easily frustrated, which can "lead them to

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guess or use plausible, but inappropriate, procedures," the Seldens write. (*MAA Online*, 8/30/97, p. 4)

Good problem solvers are more often than not intrinsically motivated by curiosity, challenge, and fantasy. (Joanne Gainen Kurfiss, "Critical Thinking: Theory, Research, Practice, and Possibilities," *ASHE-ERIC Higher Education Report No. 2,* 1988, p. 47) Good problem solvers are not daunted by the unknown, but are challenged by it. They may experience frustration in their work, but it doesn't defeat them; instead, it spurs them on. What else differentiates the experts from the novices?

What Do the Experts Do?

There are a number of characteristics that differentiate the expert from the novice problem solver. But at the heart of the matter is that experts think about, consider, and examine the problem as a whole before beginning to work on a solution. They classify a problem according to its underlying principles, deciding to what class of problem it belongs. They engage in a planning stage before even attempting a solution. Novices jump right in.

In a classic 1978 study comparing individuals who were expert at solving problems in physics with novices, Simon and Simon found that experts use a "working forward" method, looking at the givens of the problem first and moving from the statement of the problem to a physical representation of it. Only after they do this analysis, identifying likely ways to reach an answer, do they

employ equations. Then they call upon successive layers of equations, first using ones that can be solved with the givens in the problem. They also add information that will help them solve the problem from their own reservoir of learning. The experts' use of equations, in other words, is guided "by the planning already done." (D. P. Simon and H.A. Simon, "Individual Differences in Solving Physics Problems," in R. S. Siegler, ed., *Children's Thinking:*

What Develops? 1978, as reported in Larkin, Heller, and Greeno, "Instructional Implications of Research on Problem Solving," *New Directions for Teaching and Learning,* 2, 1980, pp. 55-57)

Novices, on the other hand, use a "working backward" strategy trying to determine what procedure will get them to an answer. They tend to take more "piecemeal approaches" (Larkin, Heller, and Greeno, p. 59), working by trial and error. They memorize, then try to apply equations independent of context or any relationship to the inherent characteristics of the problem. Especially

problematic is that they try to translate the problem directly into a mathematical representation, using a means-ends analysis. Or as one writer characterized it "[they] . . . select a 'first impression solution.'" "In effect," write Larkin, Heller, and Greeno, "experts understand problem situations better than novices." (p. 59)

The good news is that when studies compared successful students with those having difficulty solving

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problems, the former looked much like the effective problem solvers of the Simon and Simon study. Successful students are able to apply specific pieces of knowledge to help answer the problem. Unsuccessful students can't relate what they have learned to the question if the question is asked in a form that is different from the one they have seen. (Greenfield, p. 15) Successful students work more actively; unsuccessful students more passively. Successful students are careful and systematic. Unsuccessful students leap into a problem with at

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best a haphazard plan, move without direction, and are unable to focus on any particular starting point. Their knowledge base has no hierarchical organization to it, and they are easily distracted by some difficulty or something irrelevant. On the other hand, like their professional counterparts, successful students begin with a plan, modifying it as needed. They carefully develop and organize their knowledge base, structuring it around fundamental principles and abstractions. (Greenfield, p. 15)

If we accept the premise that good problem solvers are made and not born (allowing, of course, for differences in innate capabilities), and that we have a responsibility to instruct in this area as well as in content, the simple question is, how? In other words, what are the implications of this research for what happens in our classrooms?

Teaching Problem Solving

I'd like to reiterate what I wrote earlier: The process of problem solving has to be taught explicitly if we want to raise the general level of students' problem-solving abilities. Although many students will eventually internalize the habits of good problem solving, this can occur earlier for more students if the necessary skills are described, modeled, and practiced, and if the instructor provides students with feedback on their behavior. As with many skills, learning happens when a discussion of best practices are combined with opportunities for learners to try their hands at the skill, and are told both what they are doing correctly and how to improve.

Greenfield suggests six things instructors can do to teach problem solving. They should:

• model problem solving (making an occasional error or going down a blind alley is good!) so that students see the process is not straightforward or linear;

• demonstrate there is more than one way to solve a problem, so that students don't look for the one right way;

• redescribe the problem in qualitative terms and apply relevant underlying principles;

• help students create a plan for the solution, estimating the range in which the answer might lie;

• show how to break the problem down into manageable parts, identifying and clarifying key concepts, drawing a diagram, translating the problem into a simpler form;

• help identify and isolate factors that might lead to wrong solutions and develop strategies to counteract these problems. (p. 19)

The author also suggests using the "think aloud" process first developed by Jack Lochhead and Arthur Wimbey in the early 1980s. In this instructional method, two students work together to solve a series of short problems. One student becomes the problem solver, and he/she reports out loud everything that is going on in his/her head as he/she attacks the problem. The other student is the listener whose "primary objective," write Lochhead and Wimbey, "is to understand in detail every step and every diversion or error made by the problem solver."

The listener can also use a checklist that the authors have developed to help him/her notice errors in the problem solver's reasoning process. ("Teaching Analytical Reasoning through Thinking Aloud Pair Problem Solving," in Stice, p.75) After the first student solves his/her problem, the two students switch roles and work on another problem. There are obviously a number of benefits to this method: students call direct attention to the process they are using and reflect on it; the process is monitored and can be called into question by another; and students practice working with others as they will be doing in the professional world.

Some educators say that what is needed is a "cognitive apprenticeship" approach to instruction. The elements of such a pedagogical method would consist of modeling, coaching, scaffolding (i.e., providing expert guidance at the beginning of the process and then removing it), articulating, reflecting, and exploring. (Kurfiss, p. 45) This is a very different model from the one in which the instructor does the problem solving for the class, but doesn't reveal the "secrets" of his/her success. If we want students to be better problem solvers, we have to be like magicians who are willing to show our audience how we do our sleight of hand. If we want students to be better problem solvers, we need to be better teachers of the process for solving those problems. ✣

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– of any sport yet invented. But these days something is different; I mean really different: the palms of my hands are *not* perspiring!

It was 1972, during a similar flight approach, that I became aware of my perspiring palm syndrome. With blacks only recently being allowed to play the public – even municipal – courses in my hometown, I interpreted those moist palms to be evidence of my burgeoning love for the game. During that period, typically after viewing a golf course from the air, I would rotate my face forward, close my eyes, tilt my head back onto the seat's headrest, and imagine a serene fairway, a five iron in hand, an ideal drawing shot into a slightly depressed green, and the enjoyment of every inch of a 170-yard perfect flight of the ball. Sheer pleasure; but always accompanied by perspiring palms.

Then, during the period 1975-78, when I did not play a single round of golf, when I was hardly a casual spectator of the professional tour, my palms – whenever I flew over a golf course – continued to exhibit this strange perspiring response. Furthermore, I was beginning to detect a bit of psychological anxiety accompanying my moist palms, angst. What was wrong with me? Was I exhibiting some kind of peculiar stress syndrome? With so little interest in the game, why were my palms still perspiring?

Too frequently, removing a painful barrier does not produce an immediate or even anticipated healing. Was there a residual effect from those years of being denied access to all golf courses in my youth? Or was my problem deeper still? Such questions concerned, even annoyed, me more than I thought they should. They led me to a probing self-examination; to think seriously about my past, both recent and ancestral. My

answer was to be years in coming, and rooted in a past that was far more distant than I had imagined.

Who Are Black Americans and How Did We Get *Here*?

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> Like the omnipresence of gravity, the slavery of black Americans and the century of Jim Crow that followed it are so ingrained in our national experience and spirit that, without great effort of search, Americans can not readily detect some of their residual effects. But like it or not and admit it or not, slavery and Jim Crow are the reference points by which all whites see blacks.

not readily detect some of their residual effects. But like it or not and admit it or not, slavery and Jim Crow are the reference points by which all whites see blacks. That is the basis for the *external harm* of it. But more critical, and far more enduringly damaging, they are also the reference points by which all black Americans see ourselves. That is the basis for the *internal harm* of it.

Like so many projects within my engineering world, the exploration of this *external-internal duality* took its place alongside my teaching and research at the frontiers of applied knowledge. But unlike engineering, in this endeavor I had no guiding principles such as conservation of energy or conservation of momentum by which to frame my exploration. Although realizing that race is the major subtext of nearly all sociopolitical dialogue in America, I

was not grounded by any laws of nature or, at least, not any I understood.

American Slavery

I am in every way – physically, emotionally and psychically – not very far from slavery. My mother's paternal grandmother, at whose feet I sat as a child, had been a slave. Born on the Edwin M. Holt Plantation in Alamance County, North Carolina, Margaret Holt Shoffner (1854-1954) was "scheduled for the fields" during the spring of 1865 and would have so gone had Lee not surrendered to Grant at the Appomattox Courthouse on April 9th of that year. Since my mother's death, when I take off my socks, I often see her feet; feet that no doubt resemble my great grandmother's, feet that no doubt resemble those of former slaves.

Simply abolishing slavery does not set an enslaved peoples free. Like a theoretical solution of using a hundred-foot plank to traverse a hundred-foot chasm; it may look and sound good but, as a practical matter, won't carry any weight. My perspiring palms would be all the evidence of this fact that I would need. There are economic, cultural, and psychological issues; all of which must be addressed to secure true freedom. Slavery affected both blacks and whites, and it continues to affect all Americans

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to this day. Black Americans need to engage in serious introspection to comprehend the psychological and emotional effects that slavery and its Jim Crow aftermath continue to impose upon us and within us.

Even if slavery had ended ideally – that is, with no residual prejudice from whites and with monetary reparations, in addition to the "forty acres and a mule" – it would have taken many generations for blacks to recover to wholeness. Much of what blacks have had to confront has resided continuously within us because when we have buried our parents, we may have buried their scarred bodies but we certainly did not, could not, bury all of their scarred psyches. Their personal psychic mutilations persist, as no child reared by deeply psychically damaged parents is ever completely free from that psychic harm.

Throughout the 246 years of American slavery, slaves were frequently not allowed to build families – children were sold separately from parents, wives and mothers from husbands and fathers, and sisters from brothers. Even when slave masters tolerated such family bonds, they generally perverted those kinships into chains: ties to maintain submissiveness as well as to discourage flight. Under threat of whipping, slaves were prohibited from learning to read, and attempts to escape could and often did mean loss of life. Even upon death, slaves could not bequeath their modest belongings to their families or friends. Generation after generation after generation after. . .; a womb-to-tomb physical and psychological servitude was imposed.

The horrors and pain of slavery were, and continue to be, so devastating to the black body, mind, and soul that a writer as skilled as Toni Morrison, in her novel *Beloved*, as the movie illustrates so well, could only express blacks' postbellum psychological hell in a spatially distorted mysticism of whiplashed scarred bodies, rampant insanity, fear-laden voyeurism, dancing inanimate objects and mangled time in which the past, present and future were incoherent and indistinguishable. The movie's muted, sepia, and black-and-white images contain so much sexual abuse, psychic pain, infanticide, witchcraft, promise and hope, loathing and love, horror and heroism, mutilation and murder, and voodoo (not to mention the uncontrolled spitting and vomiting), that one is reminded of the worst of William Peter Blatty's *The Exorcist*. Indeed, it may well be that black Americans need an exorcism.

Clearly one of the mechanisms of blacks for self-preservation during slavery was *emotional detachment* and thus simply not caring, about things external and things internal, another facet of the external-internal duality. In great part, for many blacks one of the continuing struggles of the past century has been not so much about re-establishing African languages and cultures that are, in fact, lost forever, but in simply caring about anything, external or internal.

Jim Crow

A century of legalized racial hostility followed slavery. At the pinnacle of this sovereign white subjugation of blacks was the Supreme Court "separate but equal" doctrine of Plessy vs. Ferguson (1896) that formed the foundation for all institutionalized segregation statutes, commonly called Jim Crow: separate schools, separate hotels, separate drinking water, separate toilets, separate Bibles for taking oaths as witnesses, separate telephone booths, separate stairways and entrances, separate elevators. . .. Hence, in limited major public and private facilities – such as state colleges and universities or municipal libraries, hospitals, and golf courses – Jim Crow imposed not only separation, but often *exclusion*. Furthermore, these legal codes were fused with racial prejudice to fortify a broad cultural sanction for whites to ostracize every aspect of black life, public and private; and to do so by any means they chose, especially via pseudo-science and in the media.

Several famous nineteenth and early twentieth century naturalists – Agassiz, Cuvier, Darwin, Lyell and Morton, to name a few – argued fervently that blacks resided in the evolutionary chain between monkeys and Caucasians. These pseudo-scientific impressionistic opinions entered both the public and scientific mainstreams, in part, because of the stature of their authors, but more importantly and conveniently because they served the social and political ends of purveyors of anti-black sentiments.

Throughout most of the twentieth century, in the powerful images of the movies and television, blacks were depicted almost exclusively as irresponsible, ignorant, and innately irredeemable. Along with Coca-Cola and the Golden Arches, these images – with their accompanying racial epithets – were, and continue to be, distributed around the world, creating anti-black prejudices in individuals who have had little or no contact with black Americans. Blacks are "niggers" in places we have never been!

Thus, with little or no money, formal education, shelter, or social infrastructure, *millions* of blacks were set "free" into an America that did not want us, into an America that was "scientifically proving" our inferiority, and into an America that was

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constructing the legal barriers to confirm and confine us as lazy, criminal, and evolutionary miscreants. America was clearly mean-spirited toward its former slaves.

Higher Education and the Continuing Aftermath of Slavery and Jim Crow

A malignant seed has been buried deep inside each black American, and it has been buried alive! Living entities need sustenance.

Following two-and-a-half centuries of slavery, this seed was nurtured for an additional century by Jim Crow. Today it is fed by the social, political, and media air we breathe; but, it is also cultivated by black failure and a shortage of commitment to excellence. The assertion of black Americans' inferiority as "fact" is buttressed daily by black deficient academic and standardized test performances, crime data, and poverty statistics, in addition to white stereotypes and condescension.

At MIT, for example, many black undergraduates enroll without a sense of its rich history, intense culture and ardent work ethic, thus underestimating the required effort for success. Although many of them now enter from comfortable middle-class families, black students are disproportionately oblivious to their handicap of having come from environments that do not understand, and in a few instances do not respect, the intensity of the challenges they confront. At MIT they are allowed, indeed encouraged, to cluster into pre-dominantly black environments that have similar histories of disassociation from elite academic habits. Out of this ignorance and with neo-liberal adult encouragement, a culture of performing toward a least common denominator is developed and reinforced by lowered expectations from faculty, admini-strators, and especially themselves.

Their deficits in those qualities that are fundamental to the love of learning – inquisitiveness and intensity – have not only led to under-performance by black students, but have also eroded their numbers at MIT and at other elite academic institutions that currently use a questionable and an increasingly encompassing definition of the "African American" category in order to puff their diversity statistics. (In what is effectively a declining enrollment of

black Americans, we are witnessing the progress of the "transience" of black students that I foreboded in *The MIT Faculty Newsletter*, Vol. X, No. 4, January/February, 1998.) Black students' disproportionate academic difficulties, coupled with an unfortunate lack of manners exhibited by a small though significant fraction of them, feed a tension and a disconnect between them and many faculty, which I have struggled to assist in overcoming. So, although black students and I share the bonds of discrimination, ham hocks and collard greens, as a black professor who has consistently demanded both decorum and high academic standards, I have frequently felt like a bat in the war between the mammals and the birds.

I believe that whites' diminished expectations and evaluations of black

Americans are too frequently interpreted by blacks as overt racism, when in fact it is probably something less insidious: a combination of ignorance, insensitivity, and thoughtless succumbing to political correctness. "Racism" is such a strong and strident word that it should be reserved for the true hate mongers, and not casually slung as a rapier of convenience at any white person who, though certainly conditioned to think less of blacks, may commit an ill-

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considered act against a black. But blacks cannot afford the work of exploring the psyches of whites, especially since the power of American whiteness is so omnipresent (consciously or not) to do harm and create hurt (intentional or not).

Our American racial drama is replete with ironies and paradoxes as well as tragedies and woe.

Although the drawbacks of affirmative action cannot be denied, the cessation of all policies relating to race is currently inadvisable. I am not a Pollyanna in believing that all has been set right in American society. I have not yet been duped into the bootstrap foolishness of neo-conservatives and the Right. Blacks who want to burn bridges of opportunity across which they have walked and whites who use words such as "quotas"

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both suffer an integrity deficiency. There are major social ills – though with a patina of blackness, affecting both blacks and whites – that continue to warrant our diligent public attention. Homelessness, hunger**,** and pitiful urban public education, all of which affect our children, rank near the top of any comprehensive list. Furthermore, although there has been immense progress during the past few decades, there continue to be subtle issues affecting black access: to jobs, promotions, and public procurement contracts, to name a few. Yet, none of these imperatives releases any individual from personal responsibility. After all, no assistance program can lift an individual to a level to which he does not believe he belongs or toward which he is not willing to work diligently.

Black Americans must also be exceedingly wary of paternalistic liberals, both white and black – whites who want to return to the "plantation" and blacks who never left – who persist in providing for blacks in ways that perpetuate black addiction to victimization. In academia, neo-liberals are unprepared to encourage and embolden black students to develop into strong independent men and women. In doing so, these neo-liberals, perhaps unconsciously, but frequently and theatrically intrepid in their ignorance, display a lack of respect for young people who should be tempered into leadership rather than indulged into dependency. The bulk of this white politically correct self-indulgence is rank patronization of all blacks, and it is especially stunting to young blacks at elite academic institutions.

Thus, black Americans must now come to realize that there is an intrinsic core of our circumstances that only we can change; primarily by assuming responsibility for ourselves and our children, by expanding our commitment to excellence (especially in academic pursuits where lifelong habits are inculcated and anchored), and by better focusing our dedication to goals. What blacks now need most, whites do not own to give.

Detour Through Africa

The teaching and research of black, white, brown, red, and yellow scholars in "Afro/African American Studies" have broadened the intellectual landscape of colleges and universities worldwide, as well as the common culture. In my textbook on classical dynamics, a discipline whose beginnings are commonly attributed to Galileo or Newton, I constructed a history of the subject that establishes its origins on the African continent, given the written quantitative invention of time, geometry, and mathematics in Ancient Egypt. But the point of the history that I constructed – and this is important – is that "African" and "European" are geographic adjectives, not synonyms for black and white, no more so than "American" designates a race. Throughout my historical retrospective I chose to emphasize the internationalism of fundamental contributions, to observe that people worldwide have sought to quantitatively characterize the universe in which humankind finds itself. Debates to the effect that race "X" did more than race "Y" in art, science, athletics, or music constitute a foolish game into which blacks should not be drawn.

Afrocentric arguments in such debates are too frequently not well developed and are ultimately doomed to failure. For example, the accomplishments of black Americans that are cited are often not the seminal achievements within a discipline; and, therefore, to exaggerate their relevance is to mis-educate blacks.

Here too, blacks consistently fall for the ruse perpetrated by whites who, for each generation, select "that one contemporary black scientific leader"; generally of marginal scientific accomplishment, always politically compliant, and often displayed for public consumption alongside the classical contributions of others within that scientific discipline.

Counter to the goals of the Afrocentrists, a Wall of Slavery prevents essentially all direct individual connection of black Americans with Africa. Black Americans don't "feel" African for reasons. No individual's cultural identity can be defined on a tapestry as large and as variegated as the African continent. Notwithstanding a few isolated examples, such as the Gullah culture of the Sea Islands along the southeastern U.S. Atlantic coast and Alex Haley's fictionalized accounts of his family, black Americans, for the most part, do not know from what part of the vast African continent some of their ancestors came. Given that the geographical area of Africa is three times larger than that of Europe, my black golfing partner's ancestral language and customs are probably as historically different from mine as an Irishman's from an Italian's, or more. Furthermore, since both my black golfing partner and I – as well as most black Americans – have one or more white ancestors, I may be part Danish Caucasian and he may be part Portuguese Caucasian. So, although there is certainly a relationship between black Americans and Africa, its coupling is so secondary that to emphasize it is an act of diversion. The Wall of Slavery will never allow the truth to emerge.

Designating American blacks as "African American" has been counterproductive in our recognition of the Wall of Slavery and its continuing

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psychological effects; it's a designation with extremely little practical, cultural or emotional significance. We can not create an identity that ignores an impenetrable wall between us and that identity. This is certainly not to attack the honorable goals and worthy intellectual pursuits of departments variously titled "Afro/African American Studies"; but simply to emphasize that individual self-exploration, with a commitment to addressing our psychological injuries, is far more important for black Americans. The Wall of Slavery is so immense that most black Americans have come to disregard it. Yet this wall and the succeeding Jim Crow have been too destructive for us to ignore their psychic damage, including their manifestations of personal angst and anger.

Some of the Afrocentrists have taken their research pursuits to exaggeration as a means of connecting blacks with Africa, in spite of their laudable goal of (re)building a cultural identity. Black Americans, however, must be cautious in romanticizing a present-day Africa – where, in several areas, women are sexually mutilated, tribalism is broadly and stridently enforced with deadly consequences, people are sold into bondage, and corruption is openly practiced – in which we cannot take pride and not find visceral comfort, despite our sincere efforts to respect the cultural practices of others. We must also be intellectually honest in not praising or touting a historical or present-day Africa whose intellectual contributions must be placed alongside the world's greatest scientific, philosophical, and literary contributions. There is no room for a flimflam here.

So, as a practical matter, what does Africa have to offer most black Americans; and what do most black

Americans have to offer Africa, or desire to give an Africa that is riddled with oppressive debt and 25 million people infected with the AIDS virus? Unless we are prepared to seriously consider these questions, are we sincere in our Afrocentricity?

Blacks have failed to realize that in the name "African American" the *external-internal duality* is again exposed. It is the "African" that relates to our outside;

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how others see us and our attempt to construct for others (and ironically to a lesser extent ourselves) a history before the Jamestown of 1619. But it is the "American" that relates to our insides; how we genuinely feel in the mornings when we select our breakfast and our daily attire; it is about our aspirations for our children and ourselves, about our preferences for football over soccer and baseball over cricket, and about the Olympians whom we cheer.

Given our American history, black Americans can take enormous pride in our indwelling spirit and resilience, our recovery, and our significant accomplishments. Our American survival, success and continuing struggle toward wholeness are our miracles, not a distant history or a collection of innumerable diffuse cultures overseas. Believe me, if I thought it would make my life better, I'd pack up and go to

Africa tomorrow – after deciding specifically where to go, of course, because Africa is a continent, not a street address.

**Growing Up Black
In Jim Crow America**

Growing up in America's 1950s South, I knew that I could not go to the movie theaters downtown, that when getting onto many buses I should go straight to the back, and that I could not drink from

"water fountains" unless they specified "For Colored." I knew that many of my school textbooks had been fully stamped on the inner covers – assuming there were any covers that remained – with names of schools and people I did not recognize: white schools and white people. And, I knew that I could not sit at a downtown lunch counter to eat a hot dog or a grilled cheese sandwich. Those were physical limitations and facts. I also knew that I could not gaze at attractive white women. That too was a physical limitation and fact, a fact that had resulted in the deaths of southern black boys just about my age, an age when gazing began to feel interesting. But what I did not – could not – know or understand was the *psychic harm* to me that was conjoined with those physical limitations. Thus, by the simple fact of my being denied access, there was an

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exclusivity associated with very ordinary activities, very ordinary people, and very ordinary places in the white world – but especially to golf courses – that allowed my conditioned psyche to rationalize and to accept my exclusion.

Throughout my youth, the prevailing view of blacks was that we were incapable of intellectual pursuits of quality, and that we had no history except that of nomads of far-flung jungles from which slavery had rescued us. As a young boy, I remember repeatedly hearing that blacks were too lazy ever to win a marathon and too stupid to excel at professional basketball. Professional quarterback was out of the question. In my all-black high school, although I had some brilliant and amazingly thoughtful teachers who sought to challenge me with quizzes and exams that had three-to-four times as many questions as those taken by my classmates, I had other teachers who were bewildered, to near ridicule, by my ambition of someday attending MIT. And, if I had ever allowed a dream such as becoming an MIT professor to slip from my lips, it would have certainly landed me in the state asylum; the black state asylum, of course.

My Epiphany

In George Orwell's *1984*, the Ministry of Truth, by constantly "correcting" the historical records, functioned under the Party dictum "Who controls the past controls the future: who controls the present controls the past." Black Americans have been defined and controlled by the laws and the culture – past and present – in ways that have been self-serving to whites, negatively serving blacks, and in many instances ultimately fulfilling purposes that were demeaning to blacks. This fact has been a constant throughout American history. For example, America's Founding Fathers

were mindfully schizophrenic in their language of freedom, justice, and the pursuit of happiness on the one hand and of the protection and maintenance of slavery on the other. The U.S. Constitution that they wrote defined my ancestors as "three-fifths" of a person; chattel slavery banned us from the human race.

The Wall of Slavery is so immense that its omnipresence escapes our

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awareness. The Wall of infinite height and infinite width blocks essentially all attempts by blacks to reference ourselves within the human community prior to coming to America. There are no unambiguous sight lines to a pre-American culture or history. Thus, all references to who we are must be made from this side of The Wall; the side that tells us that we are intellectually inferior, that we have made few contributions to society, and that our relatively poorly academically-performing children will ensure our inferiority for generations to come.

The source of my personal angst and anger is clearly the 246 years of slavery followed by a century of Jim Crow. Few black Americans have established for ourselves the root cause of our angst and anger; a *miasma of angst and anger* that we struggle constantly to control. Yes, *all* black Americans experience this

miasma of angst and anger: those who do and know it and those who do and don't know it; no other categories exist.

The true brutality of American slavery was obvious in its physical manifestations *within* each generation, but far less obvious, though even more damaging, in its psychological harm *across* generations; a harm in which lies were forged deeply into the souls of black people. And a century of legislative

and judicial Jim Crow served to extend this psychic harm into the lifetimes of many living Americans. Without doubt, my historical slavery and my real-life Jim Crow childhood have continued to linger within my soul; and in the early 1970s, they were oozing up from deep within my unsuspecting interior during any fly-over of a golf course. That realization, in 1980, became *my epiphany*.

No More Perspiring Palms

Having explored The Wall, experienced my epiphany, and recognized the importance of both, I possess a positive and unhindered spirit, and a clear awareness of where I've been and who I am. I harbor no need or desire for affirmation or validation from others. Nowadays, when enjoying a golf course from an airplane, my palms do not perspire; and I think I know why.✤
[James H. Williams, Jr. can be reached at jhwill@mit.edu]

Technology-Enabled
Education and "Stellar"
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computer geeks, we are limited to our own knowledge and that of our TAs and other close colleagues.

Sometimes we are lucky and find a superbly qualified TA who does digital magic one term – only to find that after she leaves, the magic slowly fades away without good local support. *Sustainability* is a key word here – we want the products of our good efforts to last from term to term.

Our goals in using the Web also range widely, from the simple posting of a subject's syllabus, to the use of simulations, animations, and even virtual reality as Web-based learning tools. Those teaching in the Singapore MIT Alliance (SMA) have become "media moguls." Each of their live lectures is recorded on videotape, converted to digital video, and stored on a substantial computer called a video server; these digitized lectures are then available asynchronously over the Web – by the click of a mouse button – at a student's desktop at MIT or in Singapore.

For the creation of our Websites, most of us want something as simple to use as a word processor (perhaps even simpler, considering how bloated with unneeded features they have become!). We want something that we can use easily without assistance from "experts" to load our subjects' Websites with "all the usual": syllabi, schedules, homework assignments and solutions, PowerPoint slides, hot links to related sites, a discussion board, and perhaps more.

Stellar will make it possible do "all the usual" with ease. It will also provide discussion and chat functions, to facilitate interactions among faculty, students, and TAs. *Stellar* is being designed by MIT computer professionals to be sustainable, extensible, and scaleable.

Why should we at MIT build our
own course management system?

While a number of firms offer Web platforms for hosting university and college subjects, private sector offerings are most often "one size fits all" platforms. MIT's creative and innovative community requires more flexibility than can easily be provided by a commercial vendor. Stellar is being designed from the ground up to support development of innovative applications, ranging from advanced and customized learning process tools, to systems that address advising and scheduling issues surrounding our students' academic progress.

Further, some of MIT's enterprise databases, such as those containing student scheduling and registration data, require high levels of security and confidentiality. Commercial systems do not easily integrate with enterprise databases.

How might this help
you and your students?

One of the key benefits of *Stellar* will be coordination of the various components. For instance, when you add a quiz to your syllabus, it will automatically be included in the course schedule and gradebook. You will also be able to select only the features you want to use, and add others, as you need them.

But perhaps one of the most important benefits of *Stellar*, will be the ability to share and reuse content, outlines, and components. For example, if someone develops a great set of materials around extrapolation beyond experimental data, that material can be made available for use in other courses. Or if someone adds a simulation system to *Stellar*, it can (optionally) be made available for use by others.

Another planned *Stellar*-based application could help you reduce stress on students by your knowing when they are having exams, homework assignments, and papers due in other subjects. If you provide input about your subject's tentative schedule, the application will suggest modest alterations to make your students' workloads less variable over the term.

MIT's Council on Educational Technology is currently identifying *Stellar* advisory groups which will provide strategic guidance for this initiative to ensure its alignment with institutional priorities and directions; provide technical/operational guidance; and ensure that the interests and inputs of stakeholders are represented in the development and implementation of the platform.

How can you help?

Those of us designing *Stellar* value your input. Please tell us what is important to you in a Web-based subject management and delivery system. If you have used Web-based tools please let us know about functionalities you find indispensable, and those that you can do without. If you are interested in advanced applications, share with us your wish list with regard to functionality. At our Website we have created a simple-to-use faculty survey page in which you can tell us your needs for *Stellar*. This can be found at <http://web.mit.edu/stellar/www/comments.html>. Be advised, however, that we cannot promise to meet all of your needs with the initial *Stellar* release.

There are a number of activities around the design of *Stellar* where we could use your active engagement. Focus groups are being brought together to help us prioritize feature specifications and identify issues regarding the educational use of Web technologies at MIT. We are also soliciting individuals to engage in usability testing – helping us to identify user interface requirements and issues as we move forward with the design of *Stellar*. Let us know how you would like to participate by contacting us at *stellar-suggest@mit.edu*. Your involvement is crucial to *Stellar's* success.✣

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Errors

John Hildebidle

Let me make it clear that I hold no brief for James Joyce. There was a period of my intellectual life when I would set myself the task, each summer, of re-reading *Ulysses*, if not with anything like full comprehension, at least with some measure of enjoyment. But along about 100 pages or so into that behemoth, I would find myself baffled. I couldn't tell who was talking, or about what. And the truth is, I just didn't care.

That said, the man seems to me to have put his finger on the truth, every so often. Once, and with typical arrogance, he remarked "[E]rrors . . . are the portals of discovery." Putting aside the invocation of genius, I think he is preaching a gospel we might all listen to. Or perhaps we should opt for that other Irishman, Samuel Beckett: "Ever tried. Ever failed. No matter. Try again. Fail again. Fail better."

One of the accepted truths at the Institute (a byproduct, of course, of our staunch faith in the grading curve as part of what Moses brought down from the mountain) is that, in any group of under-graduates enrolled in a class (a group that will, inevitably, comprise the brightest young people of their age anywhere in the world), some must fail. It would seem to me that that belief is an horrific condemnation of our pedagogy – do you mean we cannot bring such a talented crew up to some minimally acceptable standard? Maybe, if we are going to hold to that creed, we need to start acknowledging the benefits of failure.

I don't mean to offer cheap consolation, of the sort favored by inept football coaches (a group I have been part of, in my time): "Learn from your mistakes, even if they cost you the exam or the game or . . .." But the real fact of the matter may be that what looks like error might just be the path to new

discovery, which would make "failure" a prediction of remarkable success, in due time.

I sometimes thank my lucky stars that my own field of scholarship is largely without "right answer," in the strict sense. Of course, there are laughable misconceptions (not all of them produced by adolescents; consider the conviction that Shakespeare's plays were not in fact written by William Shakespeare, or that the title character of *The Great Gatsby* is in fact African-American), anachronisms

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(especially changes in the denotative and connotative meanings of words), and failures to see appropriate and necessary context (which leads to much of the "political correctness" trashing of dead writers). But pure error is so rare as to be nonexistent, in the study of literature.

Which isn't to say that seemingly wild and improbable ideas do not, and should not, arise. I once had a student write an essay proving (to her satisfaction, at least) that a detective story by Dashiell Hammett and a tale by Nathaniel Hawthorne were in fact "the same story." She badly overstated her case, and took such a general approach that almost any pair of narratives could be made to coincide. But in the process she moved well into both narratives, and hit upon a way in which the hard-boiled detective story arises from Romantic notions of the human mind and the work of human comprehension.

I fear I digress. I invite my colleagues to reflect on their own fields of specialty, and see if there are not perhaps more than a handful of cases in which "error" (especially when it meant flying in the face of received knowledge, and even intuition) proved the necessary first step in discovery. It is in fact a myth that Einstein as a schoolboy failed mathematics; but (if we can believe Werner Heisenberg, at least) it is fair to say that, as for physics, he started out on a distinctly wrong foot:

. . . it was among the self-evident presuppositions of science that space and time were two quantitatively different schemes of order, forms of intuition, under which the world is presented to us. . . . The whole of physics had been conducted since Newton's day upon these self-evident assumptions . . . Einstein had the uncommon courage to cast all these assumptions into question.

That may be brave and even seductive enough, if one is a physicist. But I dare say it would not have gotten the poor extravagantly-haired lad very far on a problem set in whatever version of 8.01 enrolled him, in days of yore.

To which one might add Copernicus, Galileo, Roentgen. Of course, there are those, still, who insist that Darwin was wholly wrong.

I rest my case on the shoulders of my colleagues. And I remind us – *all* of us – to be a bit more appreciative of the student who gets the wrong answers. Especially if she or he gets there for what might be the right reasons. Another way to think of it is (to return to the theme-tune of one of my prior homilies in these pages) we would do well to have less certainty that we are fully in possession of all the *right* answers, all the time.✤

[John Hildebidle can be reached at jjhildeb@mit.edu]

Special Report

. . .from the Ad Hoc Faculty Committee on Intellectual Property and External Faculty Commitments

Introductory Message from the Provost

Dear Colleagues:

Important new issues face MIT and other universities as higher education changes in the age of electronically available information. The creation of the Internet and of new means for distributing educational content have led to new opportunities for faculty members and universities to deliver education. These new opportunities also create potential conflicts between personal initiatives of a faculty member and their responsibilities to MIT. These issues differ from many of those we have worked with in the past because they involve creating intellectual property developed around educational content, as well as from research.

It is important for our faculty to think about the impact of electronically available information, about the mission of the Institute and our core values, and to establish the set of principles that will help guide faculty governance in this rapidly changing arena. The goal of my letter is to involve you in the process that has been established to found such principles.

Last spring, I asked Associate Provost Professor Philip Clay to chair an Ad Hoc Committee to think about intellectual property and faculty commitment in the context of the Internet and electronic delivery of educational content. I asked this committee to propose a set of principles to help guide MIT in establishing policies for faculty involvement in outside educational activities and for ownership of the Intellectual Property created for electronic distribution. My charge to the Ad Hoc Committee appears in the Statement of Principles, included in this issue [see next page].

The committee members were: Professors Hal Abelson, EECS; Randall Davis, EECS; Peter S. Donaldson, Literature; Steven R. Lerman, Director, CECI, Faculty Chair, Civil and Environmental Engineering; David Litster, Vice President and Dean for Research; Dava Newman, Aeronautics and Astronautics; Steven Pinker, Brain and Cognitive Science; and Thomas M. Stoker, Sloan School.

The committee has reported to me, and their draft Statement of Principles is published here for your review, as well as on the Web <http://web.mit.edu/committees/ip>. The Website also contains a document comparing the intellectual property policies of several of our peer universities, and a link to a Website containing relevant policies from many other universities.

I am writing you to start a formal discussion of the report of the Ad Hoc Committee. The schedule for the discussion period is:

• Report of the Ad Hoc Committee to the provost filed: January 1, 2001.
• Open comment period involving MIT faculty: January through February 2001.
• Discussion at MIT Faculty Meeting, February 21, 2001.
• Discussions in Academic Council about potential changes in MIT Policies and Procedures: March through April 2001.
• Report to Faculty at MIT Faculty Meeting, May 2001.

I urge you to read the Statement of Principles and become involved in the discussions in your department as well as the larger forums. Our goal is to craft a set of principles that will help our faculty make optimal use of the emerging technology for education, while maintaining the collegiality of our campus, the essential open dissemination of information, and our faculty commitment to the mission of MIT.

I look forward to the discussion that will occur.

Sincerely,

Robert A. Brown
Provost

Ad Hoc Faculty Committee on Intellectual Property
and External Faculty Commitments
[Draft] Statement of Principles
15 December 2000

Digital technologies have changed the environment in which we teach and disseminate our intellectual work. We are in the first phase of what will be many years of continually evolving technology. The new digital environment greatly expands the opportunity for faculty to share and disseminate ideas, but it also offers some substantial challenges. As an institution we have a continuing obligation to ensure open dissemination of ideas, and the collaboration with colleagues at other institutions and outside the academy. But we also want to enhance and protect MIT and advance its mission.

While we have traditionally encouraged unrestricted dissemination by the faculty of their work, MIT as an institution must ask how the new technologies will affect teaching and scholarship, and the prospect that the Institute might lose control of instructional resources and energy. We want to encourage experimentation and innovation in technology and instructional materials, but also want to avoid commercial exploitation, loss of control of intellectual property by faculty, and dissipation of faculty commitment and energy. MIT will support the use of educational technology by faculty, share revenues that sometimes result, and reward the faculty for their innovations, we want to assure that the use of technology does not degrade collegiality or reduce the focus on on-campus teaching.

Faculty are expected to devote their full-time creative energy to teaching, research and service at MIT. MIT commits to supporting faculty in their teaching and research roles, including investing in infrastructure to support state-of-the-art instruction and educational innovation.

This committee was formed to clarify how best to frame these commitments and affirm this mutual expectation in the wake of changes in how intellectual property is treated in a digitally enabled environment.

Provost Robert A. Brown has asked our committee to explore issues related to intellectual property for educational material, conflict of commitment, and external activities of faculty members. Members of the Faculty Committee assigned to explore these issues include: Professors Hal Abelson, EECS; Randall Davis, EECS; Peter S. Donaldson, Literature; Steven R. Lerman, Director, CECI, Faculty Chair, Civil and Environment Engineering; David Litster, Vice President and Dean for Research; Dava Newman, Aeronautics and Astronautics; Steven Pinker, Brain and Cognitive Science; and Thomas M. Stoker, Sloan School. Phillip L. Clay, associate provost, and professor of City Planning chairs the Committee.

The charge to the committee is to develop a *set of guiding principles* that will address the following areas:

Ownership of Intellectual Property: Traditionally MIT has exerted ownership of intellectual property created from research and done so only rarely in the arena of educational material. Ownership has been determined by, and has been based on the use of MIT resources in the development of the intellectual property. What constitutes intellectual property in the arena of new educational technology, and how do our principles apply to deciding whether the intellectual property was developed using Institute resources?

Faculty Commitment to MIT: Implicit in faculty governance is an understanding of a faculty member's commitment to MIT. What constitutes a conflict of commitment in the new world of educational delivery?

Faculty Dissemination of Scholarly Material: A critical part of the academic enterprise is the control by the faculty of the dissemination of the products of their scholarly work. Any new principles must be consistent with this understanding. How has the new medium changed the dissemination of the faculty's work?

Reporting of Faculty Outside Professional Activities: The Institute has relied on faculty reporting of outside professional activities to monitor the potential for conflict of interest. Does our present reporting process satisfy this need to monitor the conflict of commitment?

The following is a brief discussion of the context for these issues and how MIT might approach them. This draft is based on the committee's discussions with faculty and other members of the community, a review of the literature and experiences at other schools, and extensive discussion within the committee. The listening process is continuing, and we welcome both your general comments and reactions to the specific principles we propose. (Send comments to *ip-feedback@mit.edu*.)

A. The Nature and Origin of the Problem:
The Nature of a Solution
How Did We Get Here?

If we are to set out appropriate guidelines and principles for dealing with the issues arising from the information age, it would be well to understand what the issues are and where they come from.

Several events have brought us to the current situation:

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• Information technology has vastly reduced the cost and effort of reproducing and distributing information. This is not new – the printing press did this centuries ago and stimulated major changes in all aspects of society. We may be in the midst of another such change.

• A specific example of this general phenomenon concerns MIT (and similar institutions) in particular: information technology has vastly reduced distance as a barrier to delivery of education. This in turn has enabled such mixed blessings as the ability to deliver courses, live or recorded, almost anywhere in the world, with low or limited cost of distribution or delivery. Videotaped lectures are routinely downloadable now via the Web, enabling self-paced education anywhere in the world at any hour.

• Education has become more immediately valuable and increasingly commercialized. New technologies in particular have made training more valuable and education more of a business. Increasingly, education extends beyond traditional students or traditional offerings. In addition to universities and non-profit organizations, there are now a host of commercial entities that assemble educational and training materials, package them, and market them. Sometimes these entities attempt to use faculty to give the appearance that their offerings are equivalent to on-campus courses.

• Research results have become more immediately valuable. In biotechnology, information technology, and a variety of other fields, the lag time between the laboratory discovery and start-up activity has shrunk considerably, at times to near zero.

These factors put increasing pressure on both the educational and research products developed at MIT (and similar institutions), and increase the importance of ownership, control, and commitment issues.

What Are We Worried About?

The emergence and evolution of digital learning has raised concerns and fears. Just what is it we are trying to protect against? What should we be worried about? Within MIT, there are issues of ownership, commitment, the character of the community, and control and dissemination of works. Outside MIT, there are issues of competition, dilution of the uniqueness of MIT's offerings, the character of the wider research community, and control and dissemination of intellectual works.

Concerns within MIT

Ownership: As the products of our educational and research efforts become more valuable, concern grows about who ought to have an ownership stake and how ownership is to be

shared. Unlike textbooks that are produced externally and sold in discrete units, course content and delivery (as well as supporting materials) coming from the faculty represent MIT products and activities. Universities have long ago ceded external publication rights to faculty, but instruction is a core mission activity of the Institute, which is not appropriate to cede.

Questions arise about the distinction between textbooks and instructional materials in light of these new developments. In the past faculty have produced textbooks and lectured at other institutions. What has changed to raise these concerns and why should MIT care now? While a textbook may be used as part of instruction, and even supplemented by additional course materials (i.e., CDs, Web pages, etc.) instruction does not take place until the key components of the instructional process exist. These instructional components are the direct interaction of the faculty with students, managing a learning environment, advising students, evaluating their work, and certifying their performance.

Given this understanding of the instructional process, we propose no changes in the way rights are assigned to textbooks, even when a textbook exists online. Only when a faculty member engages in instruction outside of the MIT community must the rights be reexamined in light of the principles outlined in this document.

Commitment: The digital environment presents faculty members with the opportunity (or distraction?) to offer courses and scholarly work to audiences outside MIT. Will the desire to deliver to other audiences compete sufficiently for faculty time as to influence the commitment faculty have as members of the MIT community, adversely affecting both their teaching here and the competitive position of MIT?

MIT Community: There is enormous value to the collegiality in the MIT community. Collaboration, which is part of the MIT culture, facilitates and strengthens both teaching and research. The increased interest in educational innovation raises the question: Will the output from experiments in teaching and learning be as freely shared in the future within our community, or will commercial or other external interests strain the bonds that define our community? Given MIT's commitment to advancing learning and its investment in infrastructure to support educational technology, how do we preserve our values in the face of evolving technologies and the opportunities they present?

Control: The opportunities and constraints of the digital revolution create heightened concern about controlling the

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circumstances and character of scholarly dissemination. There are two concerns. First, faculty have less control over their publications and are under pressure from publishers to cede even more of their rights. Second, we are concerned that work produced by the faculty may not be able to be shared with students and colleagues without payment or restrictions mandated by the publishers. Will the sorting out of these issues adversely affect our community? What role will MIT play in the dissemination of educational materials? What leadership role will MIT play in the national discussion about how educational materials should be disseminated? Will MIT support and provide incentives to faculty to pursue educational innovation inside MIT, such that the faculty will not feel obliged to seek or accept external opportunities?

Concerns Outside MIT

Competition: Will the increasing opportunity (and financial reward) for faculty to teach outside MIT, sometimes covering the same material they teach here, produce competition for MIT in attracting students, dilute MIT's uniqueness, or limit the advantage that MIT has in using its instruction to enhance the Institute?

The Research Community: There is a long tradition of, and strongly held belief in, the notion that the academic community prospers most with open sharing of information. With the increased value of research results comes the possibility of a reduced willingness to share results with the research community at large. How do we avoid this situation and take advantage of the opportunities for collaboration presented by technology?

Control: Just as control of dissemination can adversely affect the community within MIT, it can reduce the effectiveness of the research community at large. We have the challenge to do two things. First, we have to articulate the opportunities for enhanced collaboration in education and research and not be deterred by the fear of openness. Second, we have to note that the growing value and interest in our intellectual products may stimulate a desire for greater control over scholarly dissemination, including limitations by publishers on the right of faculty to use and improve on their own work. MIT and its peer institutions must determine how to limit such efforts by publishers to restrict sharing of materials. This means we must develop new business models to defray legitimate costs associated with publishing.

The Nature of a Solution

Our community is founded on respect for some basic legal principles, but it is also grounded in a social contract: The MIT community did not arise by defining what was legal; it arose

rather from determining what was desirable and what social conventions would produce the type of environment that promoted education and scholarship.

This is important because we live in an increasingly litigious society, producing the temptation to address the current set of questions by asking what the law says. What is the legal view of intellectual property? What is the latest in employment contract law?

We suggest that the answer is to be found instead in an examination of the social contract that defines our community. The most important properties of that contract are that it is seen as fair and that it is seen to be widely adopted, i.e., most everyone thinks it is fair, and most everyone lives up to it. The social contract need not conform to legal conventions. Note too that we are constructing this; it is fundamentally an act of synthesis, not analysis. We can look outside and at others for ideas, but the final product is ours to design, and ours to live with and by.

One example of this is found in MIT's current set of policies on intellectual property, e.g., the way licensing royalties are shared among faculty, department, and the Institute. Those policies respect basic intellectual property law, but they are based on social contracts whose most essential property is that they are seen as fair and are widely enough shared within the Institute. So too our principles regarding intellectual property and instructional materials, and our framing of faculty commitment should be seen as fair and widely shared.

B. Draft Principles

Our approach to the issues raised above is to define a set of principles that might guide the faculty as we face issues of intellectual property and external relationships brought on by educational technology. The importance of defining principles (as opposed to policies or procedures) is to underscore that we are trying to extend the social contract. These principles arise from a conversation with the community and are proposed as a means to benefit from evolving technology while avoiding its pitfalls.

1. Statement of the Core Mission and Values of MIT as It Relates to These Principles

Principle

In unity with the mission and tradition of MIT, principles on intellectual property and faculty commitment must embrace accepted norms and values for the advancement of knowledge through education and research and the Institute's commitment to create and disseminate knowledge.

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Background

MIT's mission statement (2000 *MIT Bulletin*, p.10) is as
follows:

*The mission of the Massachusetts Institute of Technology is
to advance knowledge and educate students in science,
technology, and other areas of scholarship that will best serve
the nations and the world in the 21st century.*

*The Institute is committed to generating, disseminating,
and preserving knowledge, and to working with others to
bring this knowledge to bear on the world's great challenges.
MIT is dedicated to providing its students with an education
that combines the rigorous academic study and the excitement
of discovery with the support and intellectual stimulation of a
diverse campus community. We seek to develop in each
member of the MIT community the ability and passion to work
wisely, creatively, and effectively for the betterment of
humankind.*

**2. Respecting Faculty Research and Scholarship and the
Right to Unfettered Dissemination.**
Principle

In the case of copyrightable works owned by the faculty,
MIT's mission has generally been best served by allowing the
individual faculty member to decide when, how, and in what
form new knowledge should be disseminated. Where
significant Institute resources are involved in producing a
work, or where there are contractual requirements, MIT and
the faculty author share responsibility for these decisions.

Background

A central element of MIT's mission is the creation of new
knowledge for the public good. For knowledge embodied in
patentable works (where MIT owns the resulting intellectual
property), the inventors have been and should continue to be
engaged deeply in decisions on licensing of those patents. The
same should apply to copyrightable works produced with
substantial Institute resources.

MIT has avoided to the greatest extent possible contractual
commitments that might inhibit our ability to distribute the
results of our scholarship in ways that maximize their value to
society. Any such contractual restrictions should continue to
be avoided in the area of electronic educational materials. In
addition, we should avoid contractual obligations that limit
faculty rights to use or improve their own work in either their
teaching or research activities.

3. Principle of a Unitary Institute Community
Principle

Principles regarding rights and responsibilities of faculty-
and staff-created educational materials should be reasonably
uniform across the entire MIT faculty. This includes, but is not
limited to, requirements for disclosure, ownership and revenue
sharing rights, licenses granted to MIT by owners, and the
rights to create derivative works from materials created by
others.

Background

MIT has consistently viewed itself as having a single,
unitary faculty instead of a collection of school- or department-
based faculties. For example, faculty members hold tenure at
MIT, not in a sub-unit. Besides having a uniform set of polices
across MIT, we should take measures to ensure that the
application of those policies is reasonably consistent across
schools, departments, laboratories, and centers.

While the principles should be the same for all faculty and,
where applicable to other members of the community, there
may be local rules related to the nature of the discipline or the
nature of the unit's agenda. For example, where professional
education is part of a unit's mission, there may be different
expectations about participation in internal and external
programs compared to other units where there is no such
mission driven activity. Similarly, contracts and agreements
with outside partners may incorporate expectations related to
participation in the relevant activities.

**4. Statement Regarding Education as a Community
Enterprise**
Principle

The contract between students and the Institute entitles
them to learn from all the faculty, consistent with program and
degree requirements and limited only by practical considerations.
Background

Education at MIT is a community enterprise in which the
whole faculty should be more than the sum of its professors.
The Institute exists so that faculty members may learn from
one another and students may learn from a variety of teachers
with overlapping areas of expertise.

Restricting access of students to teachers and teaching
materials goes against the community ideal and can be justified
only by practical considerations such as limits on class or lab
space, faculty time, and program or degree requirements.
Instructional materials produced at MIT should be available
to all students who might benefit.

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5. The Principle of Faculty Commitment
Principle
Persons holding full-time academic appointments at MIT are expected to devote the bulk of their professional energies and time in service to the MIT community. Faculty should seek the permission of their Dean when they have the opportunity to teach at other institutions or when they are presented with opportunities that might conflict with their faculty commitment as illustrated below. This principle reflects the existing statement in *Policies and Procedures* (Section 4.3).

Background
MIT's educational mission is reflected in the commitment to provide courses of instruction developed by its faculty for its students. This instruction may also be made available to Institute partners and clients. Providing instruction (e.g., student interaction, educational materials, mentoring, evaluation, etc.) is an essential component of what the faculty does.

There are several expectations of faculty. MIT expects that faculty will devote the bulk of their professional time to advancing the core mission of MIT. Among other things, this means that they will not serve as a manager of another educational entity or enterprise, will not trade on the MIT name or use Institute resources for personal or commercial purposes or allow others to do so, and will not engage in instructional activities outside MIT that compete with MIT's core mission.

The educational and research missions are joint commitments that the faculty have in common. For example, courses rotate among faculty, colleagues share material, discretionary departmental resources support course development, etc. Research collaboration is also a joint enterprise. More than at many other universities, the lines between education and research are blurred. This serves us well in the education of our students as well as our relations with sponsors and partners.

Competition is normal and indeed worthy of being encouraged in certain research activities. For example, faculty may compete with each other for research funding, and participate in labs or centers in different parts of MIT who compete, or even participate outside MIT in competition for funds with their MIT colleagues. This is by tradition and serves the Institute well.

The instructional area is different, however. Competition among faculty and competition with MIT are not appropriate. Faculty make a joint commitment to advancing MIT's instructional goals. It would be destructive of collegiality if faculty were competing with MIT and their colleagues for students, or if MIT students had to compete with outside "students" for faculty attention, or if faculty were withholding of instructional effort in order to provide such services outside of MIT, or if faculty were commercializing work personally when the work is in any way a community product.

Faculty must trust their colleagues to be committed to the social contract implied in our mission. A conflict of commitment or the appearance of a conflict could erode the collegiality so essential to faculty cooperation. The language here is not intended to discourage outside collaboration. The purpose of this principle may be advanced when faculty collaborate with others, including commercial or industrial entities as well as universities. These collaborations may include joint teaching efforts. In such cases, however, it is important to maintain MIT's institutional interest in managing its resources and advancing its mission.

While faculty traditionally are allowed up to one day per week for outside professional activities, the determination of conflict of commitment is not based on the time spent but on the nature of the activity.

We recognize that there may be a thin line between what has been traditional external collaboration and what we are discussing here. The aim of this principle is not to discourage the collaborations faculty have traditionally had with their colleagues at other universities or to restrict sharing information or materials about teaching or research. Rather, the aim of the principle is to guide the choice of appropriate collaborations, control MIT instruction, manage the opportunities for competition that the new technology presents to MIT, and discourage those activities by our faculty that would compromise faculty commitment, hollow out campus teaching, or open up MIT resources to commercial exploitation.

6. Principle Regarding Notification and Disclosure
Principle
Faculty who engage in education and research activities as part of their external professional activities or who enter into contracts or other arrangements to share work produced at MIT are expected to inform their department head and Dean in advance of such commitments. Department Heads and Deans are to work with faculty to remove or manage conflicts or the appearance of conflicts.

Background
By tradition, faculty report external professional commitments, and in some cases, financial information

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annually to their department head that assists MIT in assessing whether conflicts of interest exist.

The technology-enabled educational environment and increasing external interest in engaging faculty in commercial activities require that we be especially attentive to preserving an open and collegial academic environment. While faculty need not be expected to share all their external commitments with their colleagues, they should inform their Department Head and Dean of any external commitments related to the development of educational material or participation in external educational programs. We do not expect that these activities will typically conflict with commitments to MIT. It is normally valuable for faculty to share ideas with colleagues at other institutions. When mutual benefit occurs, or in cases where there is a contribution to the discipline, such activity should be encouraged. The Department Head and Dean have the responsibility to work with the faculty to manage conflicts or what might appear to be conflicts.

7. Definition of "Institute Resources" and What Makes a Resource Institutional
Principle

The Institute provides, and should invest in, a variety of resources and infrastructure enhancements to support faculty in effectuating MIT's institutional and research missions. Incentives should strongly encourage the faculty to utilize these resources to strengthen their teaching and research.

Background

MIT invests considerable resources including faculty time, desktop computers, libraries, office space, etc., that are considered to be part of the core infrastructure, which is available to the entire faculty. While faculty are presumed to have made significant use of these resources, by tradition, MIT has waived revenue from works such as textbooks that have used these resources. The textbook in and of itself (without the other components of the educational process) reflects no instructional service by the faculty. (See the fuller explanation of the distinctions between textbooks and the instructional process on page 20 in the section on Ownership.) Given this understanding of the instructional process, we propose no changes in the way rights are assigned to textbooks, even when a textbook exists online.

There are, however, new investments in technology (e.g., Web-based instruction) that could represent a significant extension of faculty resources by enabling *instruction* to occur off-campus.

MIT is making a substantial investment in educational innovation and digital infrastructure in order to provide the best teaching and learning environment for our students and our partners. MIT has made and continues to make investments in high-speed networks, electronic classrooms and studios, research equipment, technical and support staff, etc. Specific units have made other investments to support their instructional mission. As the technology evolves, additional investments will be made.

Consistent with other principles outlined here, faculty should be encouraged – with competitive financial incentives, marketing, and technical and design quality, etc. – to use the facilities for the dissemination of their ideas for teaching and learning at MIT, and with appropriate agreements outside MIT. When MIT resources are used to educate others outside of MIT, a business plan should clarify if and how MIT will be compensated for the use of the MIT resources.

The competitive advantage MIT has from its teaching and research strengths and from its ability to address societal problems is dissipated or degraded when faculty decline to develop their ideas in-house or when they do not take advantage of the synergy and leverage that would distinguish an MIT educational enterprise from dozens of MIT faculty acting separately outside MIT, or when they are associated with entities whose standards reflect poorly on their MIT affiliation. MIT-encouraged initiatives can have advantages for faculty as well. Such efforts can sustain collegial collaborations for internal and external opportunities, provide access to state-of-the-art technology, have access to "risk capital," and permit financial and reputational benefits to faculty and the Institute that derive from important contributions.

8. Principle Regarding Use and Protection of the MIT Name
Principle

Faculty have the responsibility to prevent the misuse of the Institute's name. If faculty agree to create educational materials without MIT resources, care must be taken to ensure that the use of the Institute's name and their own names and affiliations do not imply that the product was created or endorsed by MIT or that the product is the equivalent of an MIT product.

Background

Traditionally, when used in textbooks, institutional affiliation has been understood mainly as identification. A textbook written by an MIT professor was not assumed to provide the reader with an MIT education. In the digital arena, some

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companies have sought to link material presented on their Website with the institution from which the faculty comes and claim for commercial purposes that their cyber-product is equivalent to the on-campus educational offering. We take the view that an MIT education is more than the materials, the lecture, or the evaluation and feedback tools that might be placed on the Web. On-campus interaction with faculty, student-to-student learning, and participation in research and other projects are central to an MIT education.

MIT has existing policies that require faculty and staff to assume responsibility for preventing the misuse of the Institute's name. Faculty members must ensure that the Institute's name and their affiliation are not used in ways that suggest an endorsement of projects, products, or services.

9. Principle Regarding Revenue-Sharing
Principle

The revenue sharing model must create incentives for the faculty and for the Institute. While these principles do not specify any given formula, the faculty must expect a competitive financial benefit from their contributions. The Institute should expect a return from its investments, and the net resources should be reinvested to sustain and enhance the academic enterprise. For school or department mediated initiatives, there is a similar expectation consistent with local missions.

Background

By tradition and law, MIT shares proceeds from patents with faculty and other inventors, home units/departments, and the Institute. This process has served to encourage faculty and staff initiatives, promote collegiality, and contribute to the excellence and reputation of MIT. The resources have also enhanced the Institute's research infrastructure and serve as an incentive for faculty.

In addition, by tradition, faculty have retained all financial rewards from the publication of their work in books and other media. This has been the case even when MIT has supported the production of the work by salary, support staff, office space, computers, *and so on.*

The digital environment requires that faculty have adequate incentives, including financial incentives. Closer to the world of inventions, digital product development may require the use of significant Institute resources and often requires the creative and intellectual contribution of many people (e.g., Web designers, TAs, and technical staff) beyond the faculty member who may be the primary author of the course content.

A textbook, on the other hand, is created outside of MIT, and involves no instruction on the part of the faculty. The faculty are free to disseminate content whether as an article, textbook, in paper or digital media.

10. Principle Regarding Competition and Faculty External Activities
Principle

Faculty should not enter into contracts with outside parties to develop new materials that would constrain teaching or scholarly responsibilities at MIT, including specifically the use of their work in research or teaching at MIT.

Background

An essential feature of MIT's role in the world is offering the best possible education for its students, and developing and maintaining the highest quality educational materials to facilitate that role. As such, MIT has a critical stake in the educational materials developed by MIT faculty and used in MIT educational programs. We expect faculty to provide that instruction, and we want to ensure the full benefit of the instructional contributions and creativity the faculty possess.

While faculty are free to disseminate their scholarly work, MIT has a much greater claim on their instructional contributions, including instructional material developed with significant MIT resources. Having made the commitment to encourage and support the use of the digital infrastructure to support innovations in teaching and learning as part of the core mission, we would not want faculty to withhold contributions to MIT because of real or imagined external opportunities.

We recognize that the new technologies give faculty considerable freedom to operate as "free agents." While we have outlined the expectations regarding commitment to MIT, we have to balance this with the desire on the part of some faculty to use their creative energies and resources to respond to public service opportunities (e.g., a PBS series instead of an MIT course) or a contribution to a discipline (e.g., how to teach middle school math instead of how to teach MIT calculus). In the interaction with faculty on matters of intellectual property and obligations to MIT, the Institute must allow faculty some latitude in choosing how to contribute to the core mission of MIT education, research, and public service. Where MIT resources are concerned or faculty commitment is the issue, the same latitude should not be available when the choice is between meeting one's obligations to MIT and personal enrichment from external obligations.

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11. Statement on Dispute Resolution
Principle

When disputes arise regarding electronic materials, on-line courses and other new forms of intellectual property, every effort should be made to resolve these disputes within the departments and centers. The principles articulated in this document are not intended as permanent policies or rigid rules, but as guides to evolving community standards and as points of reference in existing planning, decision-making, and conflict-resolution processes. When disputes arise, we expect they will be settled by school Deans. The Provost is the final arbiter.

12. Principle: Advancing Scholarship Through Collaboration and Open Dissemination
Principle

MIT's policies on intellectual property must give utmost deference to the principle that scholarship is best served through open, unconstrained sharing of information and by maximizing the opportunity for scholars and inventors to build upon each other's work.

Respect for this principle must be balanced with respect for individual academic freedom and the ability of authors to control the disposition of their works.

Background

Achieving a balance at MIT requires resolving the inherent conflicts between the ownership, control, and credit due to the author with the benefits the community can derive from these works. In addressing these potential conflicts, our policies and practices should recognize three levels of sharing and collaboration: (1) within the MIT community itself; (2) within the wider community of academic institutions; (3) with the general public.

Within the MIT community, sharing and collaboration should be encouraged consistent with our understanding and the acknowledgement of individual contributions. Materials produced at MIT and licensed for distribution should retain for MIT the continued right to make unrestricted use of these for research and education. MIT policies should severely limit any use of confidential or proprietary information in educational activities, and students should never be required to deal with confidential or proprietary information in their courses, theses, or other educational assignments. Faculty and Deans should counsel students about such matters.

Within the wider academic community, use of MIT materials should be encouraged and regarded as an opportunity to amplify the impact of MIT's own resources. In particular, we

should make it easy for students and faculty who leave MIT for academic careers elsewhere to continue to work with course materials they have used at MIT.

With respect to the general public, provision of materials in a way that allows people to build upon and enhance MIT works should be preferred over methods that accomplish only dissemination. At a minimum, MIT authors who wish to allow unfettered dissemination of their works should be permitted to do so as a matter of course.

The issues here are complex and controversial, and they are evolving against a backdrop of radically changing technology for disseminating information. We should resist viewing policy making here as primarily a task of formulating rules and regulations. Instead, we should recognize the opportunity to reinforce attitudes that respect the value of scholarly collaboration, and we should encourage practices that promote open dissemination.

13. Principle Regarding MIT Advocacy or Faculty use of their IP for Educational Purposes
Principle

Together with its peer institutions, MIT should advocate for faculty "shop rights" for educational materials at institutions where faculty teach. The Institute should provide assistance to faculty so they may avoid entering into copyright agreements that unreasonably limit their freedom.

Background

The ability of faculty researchers to discuss their work with colleagues and to publish their results in a manner they choose has been a cornerstone of the academic enterprise for centuries. Nothing should be done to put this at risk, but faculty need to be aware that choices of how they publish their scholarly results can have unintended consequences – especially with recent changes in copyright law and the policies of many publishers.

Faculty should be aware that the assignment of copyright could result in their losing control over their scholarly output, including the right to incorporate elements into future work or to use copies of their work in their teaching. Contract restrictions sometimes limit the ability of faculty to use their own work at MIT and might force MIT to pay to use the course material. Copyright restrictions may also jeopardize the ability of the MIT Libraries to make materials needed for their studies available to students.

While we advocate faculty freedom, we have a responsibility to warn faculty of developments and advocate for policies

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more sympathetic to the economic interests of all parties and not just the publisher's bottom line.

14. Principle Dealing with Students and Educational Technology
Principle

The development of new technologies is intended in part to benefit students as learners. Students should also be recognized as creators and authors of their own material. The academic and financial rights of students should be honored in the creation and dissemination of intellectual property.
Background

Creating and disseminating educational knowledge is a community enterprise among faculty, students, and staff at the Institute. Students come to MIT to learn, grow, and actively participate in their education. Students have academic duties and rights in our community and can play many roles at the same time. Students often create and disseminate knowledge in their educational and research experiences. As learners, colleagues, and co-authors, students are an integral part of our university community. Students are fully vested in the Institute's initiatives on enhanced education using new technologies.

It is MIT policy that agreements governing intellectual property created by students should explicitly give ownership of original material (other than computer software) authored by students to the student. Copyrights in original material authored by students working at a sponsor's facilities will be disposed of in accordance with the terms of the applicable agreement.

For student work on campus, intellectual property generally is owned by the student, except where the work is subject to the terms of a sponsored research agreement, or when a graduate student is a research assistant supported by a grant, or where the student has made significant use of Institute-administered funds, space, or facilities. In such cases, the intellectual property will usually be owned by the Institute. (In the event MIT takes title, the student contributor will receive a share of MIT's royalties.) Students may not claim ownership based on "no significant use" when pre-existing agreements assign ownership to MIT. ✥

Additional Information Available Online at:
http://web.mit.edu/committees/ip

• Comparison of policies from peer institutions;
• Links to other academic policies.

Conflict of Commitment

The following are examples of what may and may not be acceptable activities. Faculty must discuss specific proposals with their Dean.

May be Acceptable

A colleague at Harvard asks a colleague at MIT to teach their classes for a week when they must be away.

A faculty member is asked to lend his name and expertise to a grant proposal to establish a laboratory at another institution. The faculty member will not get paid, but the area of research is in direct competition with MIT.

A faculty member makes their course notes and related materials generally available on the World Wide Web.

An MIT faculty member and her colleague at Stanford design and teach a collaborative course using distance technology. The course is offered for credit at both institutions.

A faculty member presents a lecture or series of lectures to a professional society or at another academic institution.

A faculty member works with another academic institution on a consulting basis to review and improve their curricula.

May not be Acceptable

A faculty member is asked to teach one of their MIT courses for credit at another institution.

A member of the faculty is asked by another institution to help them develop an online or traditional course that will be offered for credit on a topic that is part of the MIT curriculum.

A faculty member declines to develop a course or assist colleagues at MIT, but consults with another university or entity in preparing a similar offering.

Nibbling the Bullet

Daniel Kleppner

This article is reprinted from the June 1998 Physics Today.

At the age of 95, Professor X passed away peacefully while working in his laboratory, just as he had desired. His obituary touched me deeply, and I would like to share a portion with you.

"Professor X was a physicist's physicist who never lost his passion for science, his imagination, or his irrepressible enthusiasm. Although the years dimmed his vision, stiffened his fingers, and, one must admit, somewhat dulled his mind, his students revered him. Following his wishes, there was no funeral. Instead, colleagues and friends gathered at the interment for a moving ceremony conducted according to his own instructions. X was buried surrounded by his notebooks, his laboratory equipment, his stores of supplies and spare parts, and his students."

X's devotion to science was total. By refusing to let death itself interfere with his research, he has added yet another first to his illustrious record: First physicist to pursue posthumous research. Although it will take a little time to judge the ultimate success of his final career choice – a year or two is usually required to restart a laboratory, and there may be additional delays due to special problems of death – the prognosis is good. His equipment is excellent, his supplies are ample, and his students are all first rate.

But much as I admire X's dedication to science, I cannot conceal some misgivings. Other physics faculty are likely to follow his example, and as they do the character of physics departments will inexorably change from generally alive to mostly dead. Students are sure to notice that their teachers have become profoundly disengaged, and may subject them to ridicule. Young scientists may turn their backs on academic careers when they notice that the faculty positions are all filled, for eternity.

In spite of these misgivings about X's career decision, in fairness I should point out that it is hardly revolutionary: He merely took one more step along the path that Congress charted with the Age Discrimination in Employment Act (ADEA) of 1964. By extending the age for mandatory retirement from 65 to 70, the ADEA made continued employment possible for millions of citizens who can work, want to work and often need to work. The arguments for the ADEA were so attractive (or perhaps the senior citizen lobby was so insistent) that in 1984 Congress amended it to totally eliminate mandatory retirement. Mere age is no longer a reason to stop working: as long as you can do the job, you have the job.

The ADEA permitted exceptions for a few occupations in which errors in judgment can have tragic consequences – airplane pilots, police, and judges, for instance – but aging professors pose little risk, and academia was given no special consideration save for a grace period of a few years. Finally, in 1994, mandatory retirement was abolished in U.S. universities and colleges.

Only a cold heart would argue that someone whose work is satisfactory should be forced to stop because of age. There is no great mystery in determining whether a person's work is satisfactory. Good management practice dictates that supervisors periodically review their employees' performances. Employees whose work is good should be rewarded, but if their work is unsatisfactory, they should be let go regardless of their age.

The problem is that although good management practice may dictate periodic evaluation, the tenure system essentially forbids it. Academic tenure is usually awarded only after a demanding, even harsh, evaluation process, but once tenure is awarded, evaluation ceases. Further evaluation is prohibited because freedom from interference lies at the very heart of tenure, and to evaluate is to interfere. It is because evaluation is irrelevant that the responsibilities of professors are generally left vague and academic lines of accountability are practically invisible. In principle, faculty members report to department heads who report to presidents (with variations depending on local customs). But as department heads and higher-ups know to their frustration, within broad limits no one can tell a tenured faculty member what to do or what not to do.

The ADEA has thrown a monkey wrench into the tenure system. Previously, tenure meant freedom to work without interference, until retirement. Now, tenure means freedom to work without interference, forever. Tenured positions, always highly privileged, have become highly

(Continued on next page)

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overprivileged. By guaranteeing aging professors perpetual employment irrespective of their performance, the ADEA has created a grave problem for universities.

It is hardly surprising that the tenure system itself is now being questioned. Does tenure deserve to be preserved? Its fundamental rationale is usually based on academic freedom, though in reality political or ideological disputes rarely intrude into the physical sciences. For scientists, the essential value of tenure is its guarantee of intellectual freedom. Seminal scientific advances rarely emerge from five-year plans; they are more likely to emerge from an apparently unproductive period of simply "messing around." Whatever the reasons, professors cherish tenure sufficiently to accept the anxieties of earning it, and to choose academic appointments in favor of much more lucrative careers. If tenure is discontinued, it seems probable that some of the best minds will turn away from academia.

In refusing to exempt tenured faculty from the ADEA, Congress not only threw a monkey wrench into the tenure system, it created major problems for universities and aspiring faculty, and generated some potential obstacles to our scientific future. Universities now have the financial burden of paying aging professors top salaries. The burden is actually doubled since these professors must be paid twice – once in the pensions that the universities previously set aside and once in the continuing salary.

This financial windfall for aging professors comes at the expense not only of the university but also of young scientists for whom academic positions are blocked. The blockage is not a mere transient effect. If the average tenured career of professors were to lengthen from, say, 30 years to 35 years, the

appointment rate would be permanently reduce by 15%. The actual reduction would be even greater, since faculty size is usually determined by department budgets, and a senior professor typically costs twice as much as an assistant professor.

The ADEA has further costs. One of these is borne by students who must be taught by aging faculties. Some extraordinary teachers continue to excite and inspire through old age, but teaching

> **The ADEA should be amended to permit mandatory retirement for tenured professors. Tenure is a great privilege, and accepting retirement at age 70 for instance, is not an unreasonable price to pay for it, particularly if there are opportunities to continue a professional life.**

is hard work and most teachers slow down. Another cost is borne by science. With aging faculties and a dearth of young scientists, old lines of research are sustained at the expense of the new.

The ADEA should be amended to permit mandatory retirement for tenured professors. Tenure is a great privilege, and accepting retirement at age 70 for instance, is not an unreasonable price to pay for it, particularly if there are opportunities to continue a professional life. Politically savvy friends, however, tell me that the senior citizen lobby would oppose the smallest change. Failing such a change, the tenure system will be doomed unless universities and professors can achieve a reasonable accommodation. First, universities must accept the general principle that retirement from an academic position need not be synonymous with retirement from a professional life. For emeritus professors with active programs that require space and facilities, universities should make every effort to allow them

to continue their research, with some reasonable plan for eventually turning over the space to younger faculty. At the minimum, emeritus professors should have an office and opportunities to maintain professional involvements.

But no matter what accommodation universities make, tenure will be doomed if professors refuse to retire. In some fortunate departments there is no problem. By general agreement no one past the age of 70 blocks a faculty position. Perhaps other departments can learn from their example. But if professors refuse to retire at an appropriate age, morale throughout the department will inevitably suffer. And if I may be permitted a private word to Professor X, whose subscription to *Physics Today* I assume is still intact: We think you are wonderful, but this is a good time to give up your Chair, to step aside or roll over, whichever you prefer. Young scientists are waiting for an opening, and while they wait, your department is going broke paying you. There are all sorts of things to do without hanging on to your professorship. Possibly you can keep your research going, perhaps you can strike up some new collaborations, or maybe you would enjoy something totally different. With so many possibilities, retirement no longer means that you must simply bite the bullet. But don't ignore it, either. At the very least, please nibble.✤

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The Role of Retired Faculty at MIT:
A Story of Continuing Contributions
Henry D. Jacoby and Lydia S. Snover

In support of a study by the Faculty-Administration Committee of the services provided to retired faculty, the Office of the Provost surveyed schools and departments about the retired faculty in their areas. Although the original purpose of the study was to develop information on space use by retired faculty, the analysis produced insights into other aspects of faculty behavior.

Because of the nature of the data-gathering process, where information is drawn from both central MIT databases and surveys of department administrative officers, not all the data presented below is necessarily precise. For example, there may be some differences among departments in the classification of a person as "active" *vs.* "not active", as recorded in the tables and figures below. For other data series, complete coverage of all retired faculty was not possible, and there are some data series and cross tabulations for which the information is simply not available within the MIT system. Nonetheless, the data are descriptive enough to provide an overall picture of retired faculty at MIT.

The patterns of behavior by faculty at the end of career have been strongly influenced by several events over the last decade, including changes in national law regarding mandatory retirement, which occurred in 1992, and MIT retirement and incentive programs during the 1990s. An attempt is made to interpret the effect of these events, but they necessarily complicate any story of how faculty behavior is evolving over time.

Finally, in presenting information on faculty decisions to retire, and their activity after retirement, we make an arbitrary division at age 65. With the removal of any mandatory retirement date, this particular age is arbitrary as a break point, although it does still hold significance for a number of aspects of legislation concerning retirement, such as Social Security and Medicare.

Retirement Patterns

The first point to note is faculty behavior regarding the decision to retire. The data suggest that tenured faculty are waiting longer to make this move. The patterns are shown in Table 1. The increased number of retirements stimulated by the most recent retirement incentive plan can be seen in the 1996-1997 period, when the number of retirements jumped from a previous level of around 10 per year to 36 in 1996, and 51 in 1997. Interestingly, the average age at retirement is relatively constant over the period from 1995-1999.

An important series in Table 1 is the total number of faculty who are 65 and older in each year. The success of the incentive plan in reducing this number can be seen in the drop from 91 to 61 from 1995 to 1996. However, since that date the number over age 65 has climbed steadily. Of the 83 faculty 65 years or older in 1999, only six were part time. Care must be taken in interpreting this trend because it is hard to account for the various "shadow" effects of the retirement incentive plan. However, these data appear to show a gradual lengthening of the time of service in regular tenured slots.

Post-Retirement Activity

After retirement, MIT faculty fall into three rough categories. One group has no regular contact with the campus, because its members have completely shifted to other activities in the Boston area, they have moved away, or are deceased. The two other groups are comprised of people who come to MIT regularly. They are shown in Table 2. This group, in turn, falls into two sub-categories: those defined as "active" and those "not-active." In general, the "active" group tends to be more regularly present at the Institute, and to be involved in research or teaching, or both. As can

Table 1
Faculty Retirement Patterns 1995-1999

	1995	1996	1997	1998	1999
Number of regular faculty 65 and older as of October 30	99	61	71	78	83
Number of Retirements	13	36	51	11	8
Average age of retirement cohort	65	65	66	65	66

Table 2
Retired Faculty who are Still Involved at MIT (come to MIT regularly)

School	Not active	Active	Total	% Active
Architecture	6	9	15	60%
Engineering	32	62	94	66%
Humanities	16	23	39	59%
Management	2	6	8	75%
ODSUE	6	1	7	14%
Provost	3		3	0%
Science	8	55	63	87%
Total	**73**	**156**	**229**	**68%**
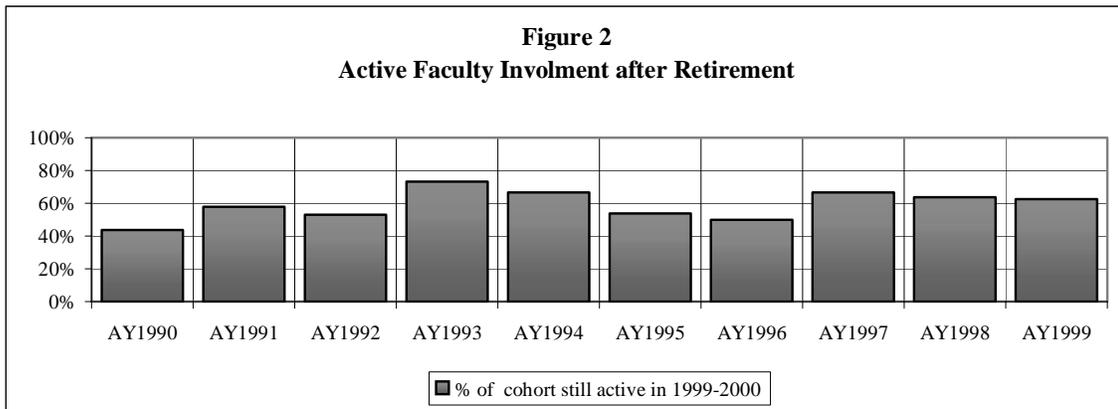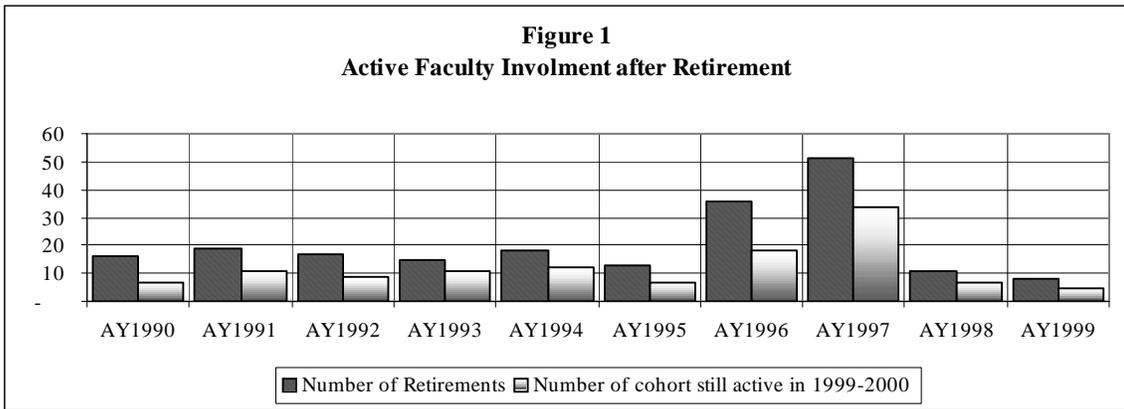
Figure 1
Active Faculty Involment after Retirement

Figure 2
Active Faculty Involment after Retirement

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be interpreted from Tables 7 and 8 (p. 35), the "active" group occupies an amount of space per capita roughly four times that of "not-active" emeriti.

Although all of the 229 faculty members in Table 2 are relevant to the discussion of retirement incentives, most attention in this survey was given to the 156 faculty who currently are "active." A striking fact about those retired faculty who remain active is how long they remain in this status. Figure 1 shows the actual number of retirements by year

since 1990, and the number of each cohort who remain active in AY 1999-2000. Figure 2 shows the percentage of each of these cohorts who remains active. Only for the 1990 cohort does the active participation rate drop below the 50% to 65% range.

This same phenomenon can be seen in the average number of years since retirement for those who remain active. Figure 3 shows these data by school, and again the results are striking. The behavior is consistent across schools, and the Institute-wide average length of

active post-retirement involvement by these "active" faculty is 6.9 years.

Another interesting aspect of post-retirement life is the variety of practice, most likely varying across schools and departments, in the appointments given to retirees. Figure 4 shows the distribution of both the 156 active and 73 not-active retirees who are still coming regularly to the Institute in 2000. All of the active retirees hold some form of appointment, if only Professor Emeritus. Most hold the appointment as

Figure 3
Average Number of Years since Retirement of Retired Faculty who are Still Active

Figure 4
Titles held by retired faculty
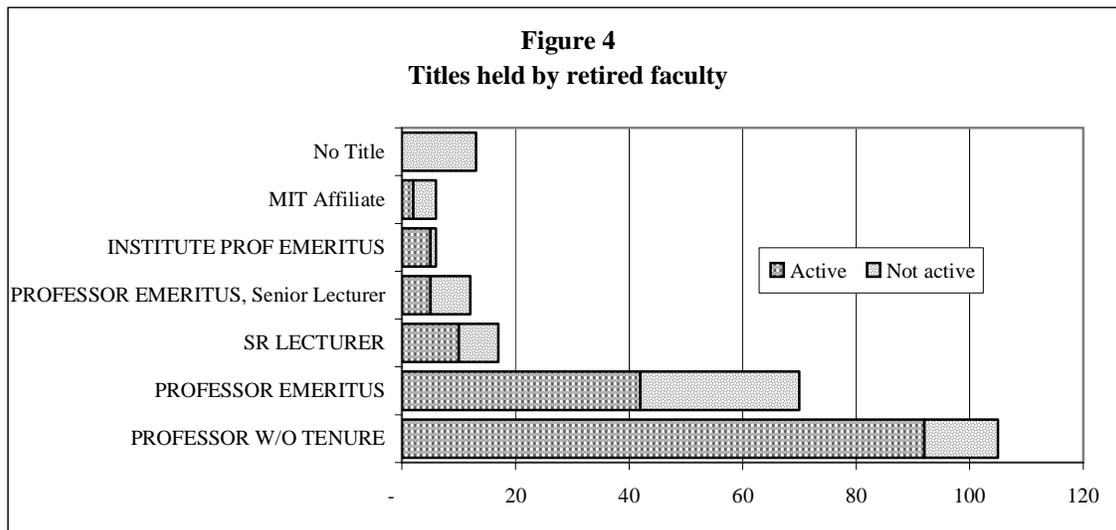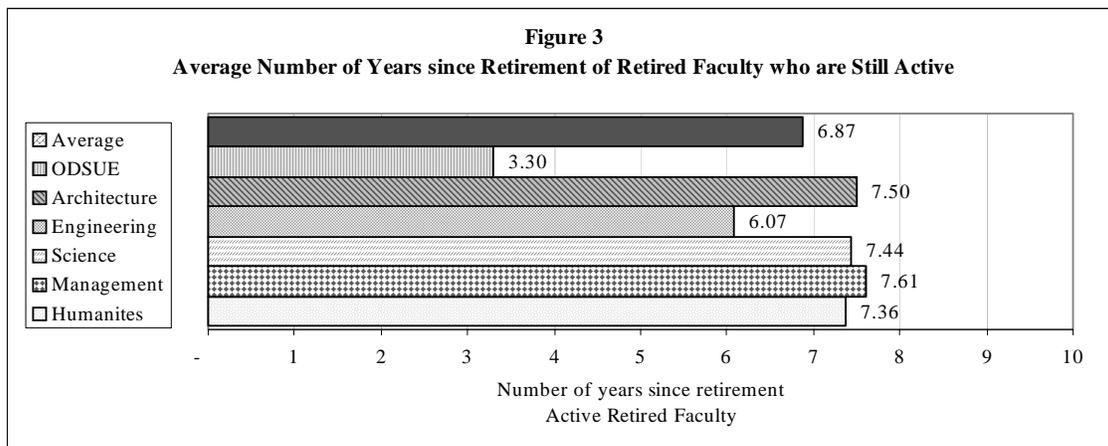
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Professor without Tenure, Retired. Note, however, that the title of Senior Lecturer, which was phased out for retirees at the time of the 1996 incentive program, is still held by a number of faculty. Most likely, few if any new appointments to Senior Lecturer have been made since 1996, and these are people carried over from the earlier regime.

Benefits and Costs of Post-Retirement Activity

Teaching and Research

Retired faculty continue to contribute to Institute life. Here again we focus on the active group, although those classified as "not active" no doubt contribute as well. Table 3 shows the available data on their participation in teaching, advising, and research. No doubt, there is substantial overlap in the numbers shown for teaching and advising. Also, the estimate here of the numbers engaged in research probably understates the continuing contribution of retired faculty in this area. For one thing, faculty conducting writing projects may not be listed as participating in research.

The research contribution is also suggested in Table 4, which shows research volume attributed to supervisors of grants and contracts and who currently are retired. These data will be an underestimate, because retired faculty may be substantial contributors to research performance, but not be listed as principle investigators or supervisors in the MIT data system.

Retired faculty can be paid up to 49% time by MIT, but only about one-third of active retirees receive any compensation at all from the Institute. The breakdown by school is shown in Table 5.

The source of these salaries is overwhelmingly from general funds, as shown in Table 6. Again, regarding research involvement, it is interesting to note that only 15 of the 156 active faculty are receiving income from research accounts, or from a combination of research and general funds.

Not captured in this survey is another potentially important contribution by retired faculty: their participation in Institute and faculty committees, and other administrative and mentoring

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Table 3

Number of Active Faculty who Teach, Advise and/or Conduct Research

School	Teaching	Advising	Research	Active Retired Faculty
Architecture	1			9
Engineering	12	13	18	62
Humanities	1	1	4	23
Management	5			6
ODSUE	1			1
Provost				
Science	10	4	12	55
Total	**30**	**18**	**34**	**156**
% of Total	*19%*	*12%*	*22%*	

Table 4

Research Expenditures of Faculty Who are Supervisors of Grants and Contracts and Who Were Retired in FY2000

	1997	1998	1999
School	Research Volume	Research Volume	Research Volume
Engineering	$ 7,883,760	$ 6,076,224	$ 6,071,503
Science	$ 4,976,263	$ 3,980,336	$ 2,616,728
Total	**$ 12,860,035**	**$ 10,056,560**	**$ 8,687,732**

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activities. Also, we do not include the contribution to the reputation of the Institute that comes from the fact that many of these active emeriti are members of the National Academies, or are the recipients of Nobel and other prizes. For example, of the 102 members of the MIT faculty in the National Academy of Science, 50 are emeritus. Of the 100 members of the faculty in the National Academy of Engineering, 53 are emeritus.

Parking and Office/Lab Space

Several categories of resources are required to sustain involvement at MIT by retired faculty, including secretarial and other administrative support. Here we have data only on parking and Net Assignable Square Feet (NASF) of office and laboratory space. Of the 229 still involved at MIT in 2000 (active and not active) 141 hold parking permits. If receiving salary, the retiree pays the same sticker fee as other faculty; if not being paid the fee is $50. (Access to a parking permit is available to all emeritus faculty whether still involved in the Institute or not.)

The office and lab space devoted to retired faculty is shown in Tables 7 and 8. Table 7 shows the 156 retirees here classified as active. The Science and Engineering Schools devote more space to this purpose per capita than the other schools, in part because of residual laboratory assignments, but also due to differential pressures for space to house regular faculty. Those faculty who are still involved at the Institute, but not active, are shown in Table 8. They have about one quarter the space per capita as the active group, no doubt reflecting the common practice of shared offices for faculty in this category.

Summary Points

Several points are worth highlighting from the data series presented above.

• Faculty appear to be waiting longer past age 65 to retire, in the absence of special incentives, and the number of faculty over 65 is growing steadily.

• When faculty retire, well over half do not leave the Institute for many years. Around 60% stay active and still others maintain a presence (many with office space) in their schools and departments.

• Not many of the active faculty (and none of the not-active) are being paid by MIT while continuing to be involved in the Institute.

• Substantial differences exist among schools and departments in their policies (and available resources) for providing office space to emeritus faculty, particularly those in the "not active" category.

We draw some summary conclusions from these results. A substantial fraction of senior faculty do not want to leave MIT, or their departments, until their mid-70s. However, at around age 65 many would like a change in intensity of commitment and or responsibility at the Institute. Also, a large fraction of these faculty have the health and the financial resources to stay involved with little or no financial compensation. The system seems to be working very well as a way of opening positions for faculty renewal and simultaneously allowing the Institute to gain the services of faculty who are advancing in age but still productive. However, a key to this pattern of behavior is access to office space, and management of this resource likely will continue to be an important component of overall space planning at the Institute.✤

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Table 5

Compensation of Retired Faculty by School

School	Non Salaried	Salaried	Total	% Salaried
Architecture	8	1	9	11%
Engineering	43	19	62	31%
Humanities	20	3	23	13%
Management	1	5	6	83%
ODSUE		1	1	100%
Science	37	18	55	33%
Total	**109**	**47**	**156**	**30%**

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Table 6

Sources of Salary for Retired Faculty

Source of Salary	# of Faculty	% of Total
General	22	46.8%
Research	8	17.0%
General & Research	7	14.9%
Unknown	5	10.6%
Funds	3	6.4%
General & Funds	1	2.1%
Other	1	2.1%
Total	**47**	

Table 7

Space used by Retired Faculty who are Still Active

School	# of Rooms	Net Assignable Sq. Ft.	# of Faculty
Architecture	5	697	9
Engineering	65	14,967	62
Humanities	18	3,052	23
Management	4	601	6
ODSUE	1	220	1
Science	92	19,522	55
Total	**184**	**39,058**	**156**

Table 8

Space used by Retired Faculty who are NOT active

School	# of Rooms	Total NASF	# of Faculty
Architecture	2.5	488	6
Engineering	15.5	3,163	32
Humanities	4.0	654	16
Management	1.0	170	2
ODSUE	0.0	0	6
Provost	0.0	0	3
Science	2.0	288	8
Total	**25.0**	**4,763**	**73**

News from the Dean

Ike Colbert, Barrie Gleason, Blanche Staton

When the Dean for Graduate Students posed the following question to different focus groups of graduate students, faculty, and alums, he got an earful.

The September 1998 report from the Task Force on Student Life and Learning states that "An MIT education should prepare students for life through an educational triad composed of academics, research, and community." How is this relevant for graduate students?

Here are snapshots of what the Dean heard.

Students say that the triad is what the typical student would like to have. This is more than a preference: they stress the importance of the triad – and the depth and breadth of opportunities in academics, research, and community – as essential to their psychological well-being and integral to their intellectual development. Students cite Ashdown House as a microcosm of the educational triad, and suggest expanding that model.

Also convinced about the relevance of the triad, *alums* believe that "community" is given short shrift at MIT. They recommend that the Institute "operationalize" the triad, especially with regard to community. Alums relate community experiences to a broader array of skills sought by business and industry in the graduate students whom they hire, and recommend that the graduate experience stress this reality.

Faculty are very realistic about the educational triad. The general sense is that MIT "does fine" with academics and research, but fails to provide the sense of community that would integrate the graduate experience. In this regard, MIT has typically focused its efforts on the undergraduates. Challenges for creating community ("operationalizing the triad") lie with assigning responsibilities for implementing change and in resolving the very serious issues of housing and financial resources.

There are some common themes in what these three groups have to say about the educational triad. All three constituencies agree that:

• Paying more attention to the "community" aspect of the triad, and advocating benefits for the student, would provide MIT an important competitive edge;

• Because the graduate experience is uniquely different from the undergraduate experience, needs for community experiences differ;

• Community involvement opens opportunities for students to refine skills in teaching and communicating, which have universal importance;

• Responsibility for creating a stronger community is shared by all the members of the community; and

• MIT must strengthen its public relations overall.

Background

How did the Graduate Students Office (GSO) come to ask this question of graduate students, faculty, and alums?

The impetus for this research was a "wake-up call" to the Dean that occurred more than two years ago. At that time, the GSO undertook what seemed to be a straightforward project, that is, hiring a writer to rewrite the chapter in the course catalogue on graduate education at MIT. Once the Dean read a proposed draft, he realized that this was a chapter for a publication that did not yet exist.

Why was that important? Although the energy and excitement conveyed by the new description did not "fit" the existing course catalogue, the Dean was convinced that its vibrant tone and content *should* be part of existing communications about graduate education at MIT. And it wasn't!

The implication for the GSO was to conduct a systematic and complete review of existing communications in an effort to identify the gaps, what was working and what wasn't, what was not in place that needed to be. Then and there, the Dean took the plunge and began a strategic planning process – with the goal to create and implement a communications strategy for graduate education at MIT– that has dramatically changed the way the GSO conducts its business.

Methodology

A communications strategy is the business of developing and implementing coordinated and persuasive communications over time. There are three streams of work entailed: completing a constituency analysis; developing a message strategy; and articulating business objectives.

The Dean identified a nimble core team with representatives from the Dean's Office/GSO, Public Relations Services, MIT Libraries, International Students Office, and the Graduate Student Council. Working intensely over a period of 10 months, the core team developed a customer taxonomy of 26 unique constituencies, organizing them in grid fashion as internal or external customers; and as key customers, very important customers, and other important customers. A thorough *analysis* of each customer segment provided a list of customer "benefits" (clarifying the "value added" offered by the GSO) and "liabilities" (what should be happening). The team also identified existing modes of communication.

Pushing their analysis one step further, the team identified seven key themes around which to categorize the liability statements. These themes (such as workflow, internal marketing, and

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resource/time) provided another framework from which to prioritize business *objectives* and short-term action items.

To craft *messages*, the core team needed to address questions such as: What is graduate education at MIT all about? What do we want to say? Are there consistent, identifiable messages throughout MIT's communications? Are they the right messages? Are we using the right media for our messages and for our audiences? Only by answering these questions could the team create a set of overarching messages that fashion a clearer picture of the full range of experiences available at the Institute and complement departmental outreach about unique programs.

To begin, the team planned a series of focus group sessions to investigate the graduate experience by asking students (in so many words), "What are you getting?"; by asking faculty, "What are you providing?"; and by asking alums, "What did you get?" In the replies they captured, the team planned to look for patterns, and the extent of overlap or "disconnect" in the perceptions of the three groups. From this material, the team could identify and validate key messages regarding graduate education at MIT.

Collaboration

To begin, the Dean welcomed "a new agenda of collaboration" as a key aspect of the work undertaken by the GSO. The three person "Dean's team" (Dean Ike Colbert, Associate Dean Blanche Staton, and Barrie Gleason, director of the Communications Office, Public Relations Services) served as the mainstay for planning and implementation. Project teams always represented other Institute organizations and the student body. And on a regular basis, the Dean's team scheduled

information sessions to update key stakeholders and senior administrators on work-in-progress.

More recently, the GSO sponsored the design and implementation of a two-part series of workshops on collaborative leadership, the first of which was co-led by Executive Vice President John Curry and Director of Organization and Employee Development Margaret Ann Gray. The first workshop introduced a conceptual framework and language

describing "collaboration" and "leadership." In the second session, co-led by Dean Ike Colbert and Margaret Ann Gray, participants deliberated over a shared work agenda for the coming year.

Included among the GSO's collaborators are the offices of admissions, career services and preprofessional advising, alumni/ae association, the libraries, resource development, student life, public relations services, and the graduate administrators.

A "quiet revolution"

It's evident from what we've already learned that MIT needs to address a sea change in the model of what young people have come to expect of the Institute. This challenge is not unique to MIT, but represents a "quiet revolution"

in graduate schools across the country, in which graduate students are expressing a desire for something different, more relevant, from their graduate experience. [*Chronicle of Higher Education*, January 16, 2001, describing survey sponsored by the Pew Charitable Trusts] Through its work-to-date, the GSO is positioned to address the challenge by playing a *clear, supporting role* in the development of community, and by implementing its freshly minted business objectives in

> It's evident from what we've already learned that MIT needs to address a sea change in the model of what young people have come to expect of the Institute. This challenge is not unique to MIT, but represents a "quiet revolution" in graduate schools across the country, in which graduate students are expressing a desire for something different, more relevant, from their graduate experience.

the following arenas.

Fashion key messages for Institute communications

The Dean's team will complete focus group sessions with students, alums, and faculty, including sessions with each and every department. Then, by convening the appropriate colleagues, they will analyze all comments, identify patterns, and shape high-level, overarching messages that present a clear and coherent picture of the graduate experience at MIT. Complementing what the departments do, these messages and themes will reflect a firm understanding of the unique attributes and strengths of MIT that need to be reinforced. They will be reflected in the GSO's new Web and print publications – already in the pipeline – and inform the work of

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Institute level, or at the personal level. At the Institute level, for example, consider what opportunities are available for students to "connect" with senior administration, the occasions for senior administrators to "hear" the concerns expressed by graduate students, and for students to "hear" about the Institute's pressing priorities and relevant policies. The "opportunities for priceless encounters" at the most intimate level of the graduate culture are those naturally occurring and informal, personal encounters around such magnets as location, ethnicity, gender, or cultural background.

One student compared the three levels of community experience for graduate students to learning how to dress for the New England winter. "It's difficult to achieve the right balance," he said. "You need to learn how to dress in layers, with a warm jacket (the Institute layer), then suitable attire for the business of the day (the department layer); and, close to the skin, your thermals." [Graduate student Christopher Jones, in conversation, January 2001]

What support must MIT provide to ensure that students pull that outfit together and achieve the best "fit"? At the level of the department, MIT needs to articulate where the opportunities for priceless encounters work best, and why; but at the same time, examine at the Institute and personal levels, how we can do better with encouraging and enabling graduate students in their "solitary endeavors." MIT must enhance the graduate experience by ensuring that opportunities for its priceless graduate students are considered in a comprehensive and integrated fashion, rather than a fragmented and unexamined manner, for which no single individual or organization claims responsibility.

In summary

While the GSO is contributing to the sense of graduate student community and will continue to do so, the responsibility for promoting an institutional vision is a shared one. (This is not the place to detail current programs and activities of the GSO; however, they are clearly outlined in the Dean's annual report 1999-2000, online at <web.mit.edu/ communications/pres00>.) In the short term, the GSO plans to complete its focus group sessions; analyze the data collected in these discussions, and craft a message strategy for describing the graduate experience at MIT in a relevant and engaging manner. Between now and the next progress report, Dean Ike Colbert (*ikec@mit.edu*) welcomes any comments or suggestions on the work at hand.

Acknowledgments

We wish to express our appreciation to all those whose earnest and thoughtful comments contributed to this overview. We especially appreciate the acknowledgement and support so generously offered by Vice President and Dean for Research Dave Litster and Professor Gordon Kaufman; and for the support of "ex officio" members of the team Chancellor Larry Bacow and Vice President and Secretary of the Corporation Kathryn Willmore. ✤

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M.I.T. Numbers

Enrollment Statistics 2000-2001

Graduate Students	**5,832**
international	2,287
minority	796
women	1,580
Undergraduate Students	**4,258**
international	324
minority	1,984
women	1,755
Current total graduate alumni	**51,000**

Institute Launches
Rewards and Recognition Program

Janet Snover

For many years, MIT employees who feel that their work is not really valued or appreciated have described the Institute as a "praise-free zone." But the Human Resources Department is working to change that perception by establishing a Rewards and Recognition (R&R) program that began in January 2001.

For the views of two prominent faculty members about the R&R program, please see the comments from Professor Lotte Bailyn and Dean for Undergraduate Education Robert Redwine.

The R&R program will be in addition to the standing Institute awards and to local initiatives that are already in place for recognizing and rewarding employees. And it is expressly distinct from base pay.

The new program is designed to provide opportunities to recognize employees for exceptional contributions to their office, department or School, or to the Institute as a whole. Both individual and team efforts will be considered. And the program provides several different ways to recognize or reward outstanding performance.

The program also is designed to help foster an environment of shared success and commitment. In addition, R&R will highlight behaviors and activities that have benefited MIT, and it will showcase employees as role models.

There are three parts to the R&R program:

The "Infinite Mile" will be the first award to be implemented. It is intended to support the objectives of each area, so it will be customized to reflect the work, values, and/or behaviors that are specific to a unit. (Each School is an independent unit.) The rewards will

Lotte Bailyn

Most employees, including those at MIT, do their work and, if they're lucky, get an evaluation once a year which is somehow, usually in an unknown fashion, connected to a salary raise. Over and above that, we have some Institute-wide and in some cases School-wide awards given for exceptional service. These are wonderful and begin to recognize some of the contributions made by employees. But it's the immediate recognition of an especially important contribution, of an extraordinary effort, that is often missing in MIT's "praise-free zone."

In recognition of this lack, and based on evidence collected by the Human Resource Practices Design Team, the Human Resources Department is introducing a number of new reward and recognition opportunities. Some augment the already existing annual awards to allow more people and more teams within MIT to be recognized. But a number are also geared to immediate recognition of work particularly well done. These are not large, and are more symbolic than material, but are meant to give an employee or groups of employees a real lift: dinners, perhaps, or tickets and other small gifts.

MIT attracts an extraordinarily loyal workforce, despite, in many cases, salaries that are lower than employees could get in other arenas. But as research in psychology and organizational behavior has long shown, money is not the only motivator. The ability to do good work and to get it recognized, to feel valued for what one is doing – these are key aspects of what employees want, and their presence supports the kind of

Robert Redwine

I had the opportunity to serve last year on the Design Team for the Rewards and Recognition program. While the program is not primarily focused on faculty (who, after all, have their own systems of rewards and recognition, both inside and outside MIT), faculty understanding of and involvement in the R&R program are crucial to its success.

Many of us who have been in a supervisory role for support and administrative staff realize that MIT's expectation of commitment and hard work is not always matched by the sort of rewards and recognition traditionally available to such employees at other institutions. This deficiency has led in many cases to a feeling of not being "on the team," with the understandable corresponding loss of commitment and effectiveness. It seems clear that we can and should do more to ensure that all of our staff feel a part of our efforts in education and research.

The new Rewards and Recognition program is an important step in this direction, and I hope that the faculty will take the time to understand and use the program to promote a fair and supportive environment for all members of our community. ✤

[Robert Redwine can be reached at redwine@mit.edu]

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environment that creates an employer of choice. And that is what this new program is aiming towards. By augmenting the opportunities for recognition and allowing special contributions to be rewarded at the time they are made, it helps MIT create a "praise-full zone." ✤

[Lotte Bailyn can be reached at lbailyn@mit.edu]

Institute Launches
Rewards and Recognition
Program
Snover, from preceding page

take a variety of forms, such as financial awards, dinners, tickets, or gift certificates.

Funding will be allocated locally but budgeted and managed centrally through Human Resources. The program administrator is working with the assistant deans to plan award criteria that are appropriate to each School and to ensure that the awards will be meaningful to recipients.

The "MIT Award" will be an annual, Institute-wide event at which up to 40 individuals or teams will receive meaningful financial awards and recognition at a public ceremony.

Throughout the year, any member of the community may submit a nomination to the R&R program administrator. An employee committee will review and select award recipients. Accomplishments will be cited during the awards ceremony, and recipients' names will be displayed in the Infinite Corridor.

Human Resources will manage the funding for the MIT Award, and it is expected that individual recipients will receive $2,000, and team recipients will share a $10,000 award (with a maximum of $2,000 per person).

The "Appreciation" award will include relatively small gifts and "thank-yous" given throughout the year at the time that an employee demonstrates exceptional results or effort. All members of the MIT community are encouraged to acknowledge their appreciation for the efforts of others and to share these kudos with an individual's or a team's manager.

What will be rewarded?

The R&R Website at <http://web.mit.edu/personnel/www/rewards> provides some examples

of efforts or results that might be rewarded either locally or by the MIT Award. These include the following:

• The creation of a new system that increases retention and could be replicated by other departments;

• The development of orientation events that bring new staff, faculty, and students together;

• A "road show" in which an office sponsors a local event to let employees know about their services;

• The simplification of a common procedure with Institute-wide impact that would provide better information to users.

Where did the idea for Rewards and Recognition originate?

The idea originally came from a recommendation of the Human Resource Practices Design (HRPD) Team. This group was chartered in 1996 to define best practices for human resources that would support the changing needs of MIT and its workforce and help make the Institute "as excellent an employer as it is an educator."

An HRPD project team on recognition and rewards subsequently surveyed more than 3,000 MIT employees from all employment categories, gathered information on current R&R practices at MIT, and did research and benchmarking on current trends at other organizations.

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In May 1998, they published their conclusions and recommendations.

The recommendations around rewards and recognition were put on hold until MIT had hired its new vice president for Human Resources to replace Joan Rice, who was retiring. Once Laura Avakian was on board, she made R&R one of her top priorities. Program co-chairs were appointed, a design team was formed, and a budget was allotted to the program. And now it's underway.

If you have questions about the R&R program, please contact Jackie Stinehart, its administrator, by e-mail to jstineha@mit.edu or by phone at x3-1719.✤

[Janet Snover can be reached at jsnover@mit.edu]

From The Libraries

Master Space Plan Envisioned
Libraries Work with Architectural Firm
and Engage Campus Input
Ruth K. Seidman

Background

Over the last several decades, services and collections of the MIT Libraries have expanded dramatically. As MIT's educational and research agenda has grown, the Libraries' print and digital resources have grown to keep pace. The Libraries' footprint and capacity on campus, on the other hand, have remained largely unchanged during this time.

For faculty, one important consequence of this capacity constraint has been the rising percentage of books and journals shelved in off-campus facilities. As on-campus shelving capacity was exceeded, one by one the MIT Libraries resorted to remote shelving facilities to house their collections. By the mid-1990s, a strikingly high percentage of the Libraries' collections (nearly 25 percent) were housed in off-campus facilities. In the fall of 1997, the Libraries leadership began a discussion of space planning with the Faculty Committee on the Library System. The committee was, and continues to be, deeply interested in the Libraries' space planning problems, and supportive of the need to investigate options for the future.

The challenges confronting the Libraries were outlined for faculty in an April 1999 article in the *MIT Faculty Newsletter* entitled "Toward a Master Plan for Libraries' Space" <https://tute.mit.edu//afs/net.mit.edu/project/afs32/athena/org/f/fnl/www/fnl115.pdf>, p. 18. In this article Carol Fleishauer, MIT Libraries associate director for Collection Services, discussed the many reasons why a thorough and thoughtful review of library space had become necessary. Print collections continue to be important, electronic information resources require new types of space and facilities, and group study space has become a part of today's educational needs. The continued importance of print resources to MIT faculty was affirmed in a survey of MIT faculty, conducted by the MIT Libraries during 1999/2000.

Architectural studies
and campus input

To begin the space review, the Libraries engaged the architectural firm of Shepley Bulfinch Richardson and Abbott (SBRA) to assist in the development of a Libraries' master plan. This firm has considerable experience in planning and designing for academic libraries, including recent work at Yale University, Emory University, Dartmouth College, Harvard University, and the University of California, Riverside. Two architects from SBRA, Geoffrey Freeman and Carole Wedge, worked with the MIT Libraries to design an approach, identify concurrent planning efforts at the Institute, examine the issues facing the Libraries, and gather and review data. This work took place during the summer and early fall of 1999. During this time, the architects and library administrators held a series of meetings with interested parties on campus, including faculty, Institute administrators, and students.

In September 1999 the architects generated a series of scenarios for library space and facilities on the MIT campus. These scenarios ranged from the conservative and traditional to the provocative and creative. One question examined at length through the scenarios was the degree of decentralization appropriate for MIT's Libraries, particularly in light of the emerging digital environment. At issue was whether to maintain the concept of decentralized library facilities, to consider a centralized library for all academic disciplines, or to propose something in between. Various alternatives were envisioned. In October, these scenarios were presented to the Faculty Committee on the Library System for their reactions and additional ideas.

One of the compelling concepts to emerge from the SBRA recommendations and subsequent discussions, is that the Institute consider the option of two large, focused libraries in strategic locations on the MIT campus; one for science and engineering and one for humanities and social sciences (bearing in mind the need to define the scope of these latter collections). This concept would reduce the number of divisional libraries from five to four, and beneficially reduce fragmentation among the collections – a frequent complaint of faculty. Key to the concept was the location of each of these libraries on or near high-volume pedestrian pathways on the campus.

To complement these two large libraries, the concept plan also called for specialized libraries to provide service anchors at each end of the campus. Toward the west side of the campus, Rotch Library for art, architecture and urban planning, renovated in 1990, would remain. Dewey Library, for

Master Space Plan Envisioned

Seidman, from preceding page

management, political science, and economics, would anchor the east end of the campus; with significant renovations or perhaps space in a new building as plans for the east campus are further developed.

How plans stand at present

Although new facilities would be ideal, SBRA advised the Libraries that it would be reasonable (and is, indeed, customary) for a library at this stage of planning to

first explore options for accomplishing needed change and expansion within its existing facilities.

Engineering studies would be the next step in determining whether the Libraries existing facilities, specifically those portions of Buildings 14 and 10 now occupied by the Libraries, have any prospect of accommodating the proposed concept at a rational cost. Discussions with faculty, especially those in the Schools and Departments affected by such a plan, will be essential to discovering the advantages and limitations of this option from a faculty perspective.

Building 14, now housing the Science and the Humanities Libraries, has the highest likelihood of accommodating

any significantly expanded capacity. With added capacity for undergraduate study needs, possibly a tower for stack shelving next to the existing building, and increased shelving capacity in the basement, sufficient space for an expanded facility may be possible. The outdoor courtyard, now underutilized, could be enclosed for year-round service as a café and attractive gathering place. The library facility in Building 10,

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currently occupied by the Barker Engineering Library, has its greatest potential as a magnificently restored historical space. The Great Dome could be restored into a fine study and exhibition space, capturing the grandeur of the original Bosworth design. Depending on the results of the engineering assessment, if the building can accommodate structural expansion another floor or balconies might be added. Compact shelving would make better use of the existing floor space in Building 10, as in Building 14, if the floor loading can be accommodated.

Space changes for current year

A much more limited facilities project is scheduled for Building 14 this year.

The Libraries received CRSP approval for two changes. The first is to expand basement shelving capacity through the installation of one bank of compact shelving. The second is to improve the circulation flow and resolve a number of safety issues around the entry to the Hayden Library in 14S. The Libraries are currently working on these improvements in consultation with the Faculty Committee on the Library System. Construction is anticipated during the summer of 2001.

Future directions

One goal of the planning process is to identify fundable components that might attract the interest of donors. The renovation of the Music Library in 1996 was made possible through the generosity of Cherry ('41) and Mary Emerson, whose major contribution launched that award-winning improvement. The Music Library was subsequently renamed the Rosalind Denny Lewis Music Library, in honor of Mrs. Emerson's mother, wife of the late MIT professor Warren D. "Doc" Lewis, who had been Cherry Emerson's advisor. Several of MIT's other Libraries have not yet been named, which offers a potential opportunity for donors.

The Libraries are still in the early stages of planning for the next generation of MIT's Libraries. Much more remains to be done in terms of discussions with faculty and the MIT community, engineering and costing studies, synchronization with MIT's larger campus planning efforts, and development of the necessary funding. Continued input from faculty and students will be sought as the planning moves forward. ✠

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Mercury Recycling Continues

James T. Curtis

MIT, in conjunction with VWR, our partner for chemicals and lab supplies, operates a mercury thermometer exchange program that serves to remove mercury from the environment. This program is contributing to MIT's goal of eliminating all products that contain mercury from our campus.

The program is based in the VWR chemical stockroom in Building 56, Rm 56-070. MIT staff or students may bring a mercury-containing thermometer to the stockroom when purchasing a replacement, and then VWR pays to return the old thermometers to the manufacturer for destruction. When the program began about four years ago, a large number of thermometers were being returned, but the quantity has trailed off significantly as mercury thermometers are removed from campus.

Why target mercury?

Mercury in the environment is of particular concern because of its toxic characteristics, persistence in the environment, and its ability to bio-accumulate. Mercury is well-established as a toxic agent, and long-term exposure to it has been shown to have negative effects on the brain, kidneys, and the central nervous system.

Developing fetuses are especially susceptible to even small amounts of mercury, with developmental problems prevalent among babies whose mothers are exposed to workplace or environmental mercury. This exposure may result from breathing mercury, exposure through the skin or from eating mercury-containing foods. In some locations, including many in Massachusetts, expectant mothers are cautioned against eating certain species of fish due to the elevated mercury levels they contain. (Fish can concentrate mercury in their bodies by eating other fish and food that contain lower levels of mercury.)

What about other sources of mercury?

In addition to certain thermometers, other significant sources of mercury include thermostats, barometers, batteries (especially "button batteries" such as those in calculators and hearing aids), fluorescent bulbs, tooth fillings, and electrical equipment. Research laboratories also may stock mercury.

While the exchange program operated by VWR applies only to thermometers, other mercury-containing items also are recovered for proper disposal by the Environmental Management Office (EMO). If you have such equipment, liquid mercury from laboratories, or old thermometers that are not being replaced but that you would like to dispose of, call 452-EMOO or use the on-line waste pickup request form found at <http://web.mit.edu/environment/hazmat_form.html>.

Questions about mercury can be directed to the Environmental Medical Service at x3-5360 or the EMO at 452-EMOO.✤

[James T. Curtis can be reached at curtisjt@mit.edu]

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Input Sought on Vendor Partnerships

Thomas S. Hoole

The Procurement Department is very interested in your opinion regarding the overall performance and value of our seven Vendor Partnerships. If you utilize any of the MIT Partner Vendors, we would like to hear from you. Your responses will help us better evaluate the strengths and weaknesses of each partnership. We will use the results from this survey to help the Partnership Managers work toward improving the overall value of the Partnerships to the MIT Community.

We would appreciate you taking a few moments to complete our Partner Vendor Web Survey. Our survey can be found on the Web at <http://web.mit.edu/cao/www/procure/websurvey.html>. Here you will be able to complete the survey online (anonymously if you wish) and submit it electronically.

Thank you in advance for taking the time to complete our Partner Vendor Survey. If you have any questions, please feel free to contact me directly.✤

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Student Leaders Report

Undergraduate Association

MIT: The New School of the Book
Or
The Need for a New Library
Peter Shulman

Several months ago, while preparing a presentation for a literature seminar, I parked myself in front of a library computer terminal in the Hayden Humanities Library. Typing in the keywords for my search, the computer identified several texts listed as "In Library," and I hurriedly scribbled the call numbers on a scrap paper (actually an old card catalog entry, the vestigial organ of the library system). After meandering a path through the Hayden stacks, I found the catalog shelf for my books, and I scanned it for the call numbers on my card.

Three of the four texts for which I searched did not appear on the shelf.

This frustrating realization is by no means unexpected when researching in a library: texts are often removed from their shelves and placed elsewhere in the library (perhaps even on an adjoining shelf), rendering them invisible to the eyes of subsequent researchers. Operating with open stacks, as most of our libraries do, one must accept this occurrence as unavoidable. But my story does not end here, for unlike the mysterious organization of the great library in Umberto Eco's modern classic *The Name of the Rose*, our library system groups texts together by subject, and a cursory scan of the shelf before me revealed several related texts that quite (over-)compensated for those I discovered missing. A step back, a glance left, right, then up and down, revealed books from other fields, each related in some way to the material I required for my presentation. Unfortunately, as MIT's collection grows daily (every new book on the shelves pushes another one into storage), space limitations on shelves and in libraries increasingly prohibit this once standard practice of the library experience.

MIT owns a truly remarkable collection, with texts dating back centuries, and a collection totaling over 2.6 million volumes. Five major branches and five smaller ones comprise the on-campus library network, each serving as educational resources to the MIT community. However, nearly one-third of MIT's collection resides in off-campus storage, mostly in a facility known as the RSC, or RetroSpective Collection, the rest in storage space rented from Harvard University. Yet for the typical undergraduate, if a book does not lie on a shelf in

Graduate Student Council

Counseling: Two Overlooked Types
Soulaymane Kachani

In this edition of the *Faculty Newsletter*, I wish to address two types of counseling services thus far overlooked at MIT: career counseling and international students counseling.

Careers. That's an issue that preoccupies the minds of most graduate students when coming to or leaving MIT. What options are available? How can one join such a career? The question has to be asked: Do graduate students have all the resources to make a wise judgment while at MIT? Well, the answer may not be that obvious.

Sure, the job market is buoyant, thanks in no small part to the "new economy." And it will remain so for quite a while. But do graduate students necessarily know everything they need to know before they embark on their long journey, a career? Again there are no clear-cut answers. At least, not an emphatic, yes!

How about graduate students who prefer to stick to the traditional career path, academics? Do they have enough resources at hand to plan out a career on becoming an academic in the new millennium?

Generally, it is the expected norm that the graduate student's research advisor will also serve as career counselor. However, long gone are the days when the advisor's contacts get his/her students jobs in industry and academia. Nowadays, there is great competition for each and every hired position. Better still, companies look for graduate students with a wide skill set, apart from the usual academic excellence.

Knowing the required skill sets, developing the necessary ones in time for the big day, takes ages of preparation. That is if one already knows what career he or she wants to pursue. Narrowing down the choices, is a dissertation on its own!

This is where organized career counseling plays a large part. Irrespective of students' backgrounds, expert counselors help students address their queries. Much of the time one-on-one meetings with the counselors are necessary. Then comes the question: Are there enough such counselors? Can every single faculty being a research advisor match

Student Space:
Personal and Academic
Shulman, from preceding page

one of MIT's on-campus libraries, it might as well not exist in our collection at all. I will avoid here the appeal to the very busy schedules of MIT students and the nearly unavoidable occurrence of waiting until the night before an assignment is due to wander into the libraries looking for material, for time constrains all members of MIT and surely I make no excuses for those who do not plan ahead (for surely *I* have never waited until the night before. . .).

Thus while books in storage remain nominally accessible, unless present in stacks, the creative and familiar process of browsing the shelves disappears. Much innovative research relies upon the fortuitous discovery of the right text, the right reference, the right springboard to further investigations; books outside the MIT library system cannot participate in that serendipitous research process. Clearly something must be done, and given the current climate for experimentation, change, and innovation at the Institute, nothing could reflect that spirit more than the investment in a new library complex to return books in storage to the hands of the students (and faculty) who need access to them.

The plight of the undergraduate is unique among other groups at MIT, for unlike faculty and graduate students (who receive access to Harvard University's outstanding library system), MIT undergraduates find themselves restricted to MIT's collection. This may be attributed to academe's expectation that undergraduate institutions should adequately provide for the library needs of its own students.

For decades, predictions from America's techno-elite have heralded the end of the era of the book: libraries of the future were promised to contain entirely digital collections. Indeed, the traditional library could be expected to disappear entirely, for access to millions of texts could lie in every networked computer. Ease of access to individual texts does, in fact, increase under this model. But in reality, the library remains more than a warehouse of tomes; they uniquely represent a social space, a place of study, an architectural construct organizing knowledge in visual form. A

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better understanding of this aspect of libraries is crucial to developing the true library of the twenty-first century.

As MIT leads the world in so many fields of natural and social science, engineering, the humanities, management, and architecture, it is time for MIT to take the helm in leading library science into the new millennium. With our capital campaign enjoying huge success (over two-thirds of the initial goal met in less than one-fifth the allotted time for the campaign), MIT stands poised to design and construct the library of the future, incorporating a deeper understanding of notions of common space and the social psychology of the research environment. This library, perhaps designed to house one of the world's greatest collections of science and engineering texts on Earth, would provide a model for other expanding institutions. This new space

would also permit the Hayden Humanities Library to expand in its current home in Building 14S, thereby creating a true Humanities (and perhaps also Social Science) Library and showcasing MIT's commitment to its HASS school, students, and faculty. If planned carefully, this new library would permit the return to campus of all the texts currently housed in the RSC or in Harvard storage, once again allowing the educational experience of "losing oneself in the stacks."

In this scenario, everyone in the MIT community benefits, as both students and faculty members will again have access to the entirety of our collections. No doubt, this proposal demands significant financial resources, real estate commitments, and community-wide support. Yet the benefits remain clear: more efficient research, a better educational environment, and MIT's promise of creating the model library for the future. On behalf of MIT's Undergraduates, I formally request the support of the Institute in this initiative, and I hope someday to witness the groundbreaking. ✤

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Counseling: Two Overlooked Types

graduate student skills and their expectations with the right field or group of companies that will satisfy these? Certainly not. But expert counselors can. Expert counselors are, however, in short supply. The Office of Career Services and Pre-professional Advising (OCSPA) tries its best to serve graduate students with its limited resources. Its high time to heed their calls for increased resources to cover additional staff and programming. *It is also high time the single reporting structure to the Office of the Dean for Undergraduate Education was replaced by a dual reporting structure; reporting to both the Undergraduate and Graduate Deans.*

Programming is a big part of the career mentoring process. Professional development sessions (as currently run by GSC under the Professional Development Seminars) on such topics as "Communications Skills," "Conflict Resolution and Mediation," and "Consulting as a Career" provide students with an opportunity to start thinking about such issues. There are many other topics, such as "Choosing the Right Career," and "Alternative Careers," which need to be delved into further. All these require manpower and financial resources.

There are many things that could be done at a departmental level, too. Faculty members who have good rapport with industry could, for example, act as career mentors. They could also act as information sources to students locally. This can be done jointly with the OCSPA office.

Student satisfaction at MIT is partly dependent on services they receive at MIT. The higher the satisfaction, the more likely students will come back to help MIT in whatever way possible!

This would also apply to international students. International students

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comprise about 36 percent of the MIT graduate population and more than a quarter of the whole student population. Yet there are very few programs available to help these students integrate into a new culture and country.

International educational exchange nurtures a lifelong global perspective. Unfortunately, severe staff and budget limitations prevent the MIT International Students Office (ISO) from meeting the needs of MIT's international population. With only three student advisors, the ISO cannot respond to the needs of international students, who visit the ISO office on average 2.5 times a year. We propose creating a working group to examine the needs of the ISO. We also propose

the creation of an International Center, managed by the ISO, that will strive to:

• Provide services to enhance the experience of the international community at MIT;

• Encourage the MIT community to make use of internationally focused educational opportunities;

• Enhance relationships and create a sense of multicultural and international community among international and American students, faculty, staff, community volunteers, and local residents.

Such an initiative would help MIT compete with other world class universities for top international students, although Stanford's Bechtel International Center <http://www.stanford.edu/dept/icenter/> offers much more than what we are proposing. International alumni donors could be solicited to contribute to this center as part of the Capital Campaign.✣

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M.I.T. Numbers

Distribution of Faculty By Age
October 2000

Source: Office of the Provost