The MIT Faculty Newsletter

Vol. X No. 4 January/February 1998

Does MIT Have a *Leading* Role to Play?

James H. Williams, Jr.

Preface

I had absolutely no intention of responding to Professor Kerry Emanuel's article that is cited below. Besides, I'm on leave. The article here was written at the invitation of the MIT News Office to inaugurate its faculty editorial feature in Tech Talk. *Regrettably, I had to decline their proposed editing, which would have deleted approximately two-thirds of this article and would have compromised essential aspects of my message.*

More than a decade ago – in recognition of the advancing centennial of the *separate but equal* doctrine of Plessy v. Ferguson – I predicted this current state of backsliding. With the emergence of a black middle-class toehold, the folk wisdom of a level playing field – having lain dormant for substantial periods since 1619 – seems to be conveniently re-insinuating itself into the Zeitgeist. Only a comic would suggest the absence of bias in every facet of American society.

Conversely, it would be erroneous to conclude that blacks are not partially culpable for this backlash: the focus of a different article. The battles of a generation ago, which have been infantilized by far too many black adults and black students who are sophomoric in their knowledge of history, were about serious business, not pantomiming and trifling foolishness. Thus, even if like romantic love, this group of black students is short-lived, we should be mistaken to conclude that their transience would disqualify them from significance;

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Research in Progress

Humanitarian Demining: Does Advanced Technology Ensure Success?

Richard C. Lanza

Problems of commercial aircraft security, contraband detection, and humanitarian demining appear on the surface to represent the application of widely disparate technologies. There is, however, an underlying set of methodologies which makes it possible to apply similar scientific techniques to all three.

My research in the last six or seven years has included work with the FAA on developing new technologies for the discovery of hidden explosive devices. Terrorism and the problem of discovering clandestine explosive devices have led to many developments in explosive detection that may have applicability to landmine detection. The aircraft security problem exhibits at once the worst problems of both military and humanitarian demining. It requires very high detection probability (as does the humanitarian demining problem) as well as the high speed of military counter-mine warfare.

The problem of landmines and their effect on civilian populations well after wars are over has been of great concern to humanitarian organizations for years. Unfortunately, despite the horrendous litany of their effects on the civilian populations and economies of some of the most impoverished countries of the world, until the past few years most of the victims were out-of-sight and out-of-mind of the developed world.

Now, with the December 1997 signing in Ottawa of a convention essentially banning anti-personnel mines, the

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From The Faculty Chair

End-of-Term Violations Plague Exam Period

Lotte Bailyn

As we begin a new term, I am concerned about what happened at the end of the last one. There were again a significant number of violations of end-of-term regulations. These came directly to me or to the deans or the ombudspersons, or were posted on a password-protected Web page. As a result, there were some very upset people caught with great overload at the end of the term, which jeopardized their success not only in the subject where the violations occurred, but also in others that had to be sacrificed to meet the imposed overload.

An obvious response, one that I heard frequently, is: why don't students plan better? There is certainly an element of truth here. But some of these end-of-term violations have their source in what happens at the beginning of the semester. Faculty regulations state that during the first three weeks of the term, faculty should spell out all assignments with their due dates, and provide students with the schedule of problem sets, quizzes, and exams, as well as the plans for a final. Students cannot plan without this knowledge. And adherence to this beginning-of-term regulation makes it possible to spot end-of-term violations at a time when changes can still be introduced – something that is almost impossible at the end.

Most of the violations reported at the end of last term led to more work for students than they should have at a time when they are trying to assimilate material from the whole semester for all their subjects. Faculty tend to think only of their subject and its needs, and neglect to consider the point of view of the student who has to deal with four or five subjects at the same time. For example, some faculty felt they were doing students a favor by extending the time a paper was due into the already extremely short reading period. But for the student who is trying to use this period to deal with all subjects, such an extension feels like an unfair burden from one subject at the expense of the others.

But some of the reported "violations" I followed up on were meant to serve an educational purpose. For example, some professors wanted to use quizzes and mid-term exams as a learning experience, not only for evaluation. So they gave students more time than is usual, allowed them to take the exam home so they could consult material without having to memorize – all of which is against current faculty regulations. Others wanted to support students who approached problems in very different ways from the usual, which led them into novel formats that seemed to be at odds with stated regulations.

It seems timely, therefore, not only once again to urge everyone to follow the existing regulations, but to consider them anew, with three goals in mind:

1. to protect the students from overload
2. to enhance the learning experience of students
3. to support educational experimentation.

Don Sadoway has kindly agreed to lead this effort along with Art Smith, chair of COC, and Paola Rizzoli, chair of CAP. Please convey to them or to me your thoughts and concerns on these matters. We want to establish a set of faculty regulations that we can, *and will* follow.✣

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

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New Feature; More Input Desired

With this issue of the *Faculty Newsletter* we inaugurate another feature: Research in Progress. The article on page 1 by Dick Lanza outlines his thoughts on humanitarian demining and relates some of its technological innovations to his continuing work on airport security and contraband detection.

Through this new feature we hope to share elements of ongoing faculty research in a more informal manner than is usually available, making it somewhat more accessible to the MIT community.

In addition, at the suggestion of Paul Penfield, we've reprinted his article eulogizing former Electrical Engineering Department Head Gordon Brown (p. 14). Although not in the habit of printing pieces which have appeared elsewhere, in this case we made an exception so as to be able to share his remembrance with a wider audience than initially had access to it.

In both these instances, it was the willingness of faculty members to share something of themselves that enabled us to present them to you.

As always, we encourage submissions on any topic of interest to the faculty and the wider MIT community – and particularly would welcome articles concerned with faculty research. We can be reached by e-mail (fnl@mit.edu); FAX (x3-0458); phone (x3-7303); or post (38-160).✣

TEACH TALK

Teaching Teamwork Skills

Lori Breslow

From a number of different quarters the call has come for science and engineering students to be educated in skills beyond the traditional analytical/ technical/problem-solving abilities that have been the mainstay of an MIT education. This trend was, in part, the impetus behind the new Communication Initiative. But education in the so-called "soft skills" includes not only training in writing and public speaking; it also entails improving social and interpersonal communication skills such as leadership and the ability to work with others in teams.

The recognition of the importance of these kinds of skills in providing a complete education comes not only from outside agencies like the NSF and ABET, both of which have lobbied for their inclusion in science and engineering curricula, but it also comes from MIT faculty, alumni, and students. For example, in "The 1994 Senior Survey Report," prepared by Alberta Lipson, Norma McGavern, and the Educational Studies Working Group, 70 percent of the students surveyed thought the ability to work in team was "very important" (although only 58 percent said that skill was improved "moderately" or "greatly" during their four years at MIT). And in the "Report to the Education Committee of the Academic Council," written just this past December, the authors, the Faculty Policy Committee, issued the challenge that "[MIT] will have to model an environment where its students...learn communication skills...and have the experience of interacting with all kinds of people." (p. 1.)

But teaching students to communicate with, listen to, and work well with one another isn't simply a matter of putting them in groups and letting them go about their business. Like any skill, the ability to work effectively with others requires some basic knowledge of best practices (in this case of team dynamics, consensus building, decision making, etc.); a chance to practice the skills to be acquired; and feedback on the success of these efforts. It also requires that instructors think about how to structure teams, assignments, and class time so that the teamwork experience is optimized and the most learning that is possible occurs.

Fortunately, in recent years some excellent research has been done in using teamwork as a pedagogical tool, and several faculty members at MIT have run extremely successful experiments in using student teams. This *Teach Talk* and the one to follow will provide some guidelines on how best to work with student groups. Some of this information was presented in an IAP workshop "Teaching Teamwork Skills" that was part of the "Better Teaching @ MIT" series this past January. A similar workshop can be arranged for individual faculty through the Teaching and Learning Laboratory.

Guidelines for Using Student Teams

A distinction before beginning this discussion: All sorts of groups can be used successfully in the classroom. Students can be put together informally for one class to work on a problem or check homework. They can meet outside of class in study groups to prepare for a test. Here, however, I am going to focus on student teams that operate for longer periods of time (usually the entire semester), working on either several short assignments, on one large project, or both. This kind of experience – in which students are asked to interact with the same classmates over the course of several months – allows team members to watch the group process unfold, and, hopefully, permits trust and cohesiveness to build, which is at the foundation of all successful teamwork

What helps ensure that this goal will be achieved? Here is some of what we know about how to use teams productively in the classroom:

Assign the teaching staff the responsibility of creating student teams. If students are allowed to choose their own groups, it is only natural they are likely to team up with friends, housemates, or people living close by. While it may be helpful to have teammates who live near one another (one of the most frequent complaints students have about teamwork is the difficulty of arranging meetings outside of class), the obvious disadvantage of permitting students to select their own teams is that they won't have the opportunity to work with people with whom they're not familiar – a skill they will need once they enter the working world.

Decisions about team composition should be made according to several criteria. First, decide how large the teams should be. Four to five people is generally the number that is advised, but there may be good reasons to make groups larger or smaller. In making that decision, think about how much work you are requiring, the time frame in which it is to be done, and logistics (e.g., are there limitations on the physical space in which the team will have to operate?).

Second, determine how homogeneous or heterogeneous you want the teams to be. In fact, you need to decide what defines homogeneity or heterogeneity – differences in gender and ethnicity? intellectual interests? personality characteristics? Here, too, thinking about educational objectives, course requirements, and logistics will help you work out an effective strategy.

Provide some training in teamwork skills. Students don't come with a built-in facility for working efficiently with others. (For that matter, most adults don't either!) Again, students need to be taught the interpersonal communication and team building skills that will help to ensure

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Teaching Teamwork Skills

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smoothly functioning groups. And we have a responsibility – if we expect them to work together – to provide that training.

In a pilot project Professor Mary Boyce and I did to bring teamwork and active learning to "Mechanics and Materials II" (2.002), students were given a two-hour teamwork workshop during one of their regularly scheduled laboratory classes. The workshop covered such topics as setting norms, using a facilitator, listening, and giving and receiving feedback; it also gave students some guidance on how to deal with common problems teams often encounter. Students were given a manual that provided more information on these topics, as well as several readings on conflict resolution, decision making, and the interplay between personal characteristics and team participation. (The next *Teach Talk* will describe a comprehensive training program in teamwork skills that has been developed by Chemical Engineering Lecturer Bonnie Burrell as part of the Chemical Engineering "Projects Laboratory" (10.26) and "Processes Laboratory" (10.27).)

Coach the teaching staff in teamwork skills. If recitation instructors or teaching assistants are assigned to the class, they should also have some basic training in teamwork skills. In the 2.002 experiment, we had a two-hour training session for both laboratory instructors and TAs that covered some of the topics listed above, as well as particular problems the instructional staff might face in working with the student teams. We also presented the participants with scenarios based on three of those common dilemmas and asked the group to brainstorm possible solutions.

Give students time to work together in class. According to Management Professor Larry Michaelson, who has done extensive research on using student teams, "A key to effectively using learning groups is using practices that promote the development of group cohesiveness." ("What Every Faculty Developer Needs to Know about Learning Groups," *To Improve the Academy*, Volume 15, 1996.) One of the ways that group solidarity is fostered is simply by having group members do things together. But, as Michaelson points out, the "cost" of students getting together outside of class is often so high that the most common practice is for students to meet only to divide up the work at hand, and then to do those tasks independently. Giving students time to get together in class guards against that.

In a course taught last semester, "The Structure of Engineering Revolutions" (STS.185/6.972), Professors David Mindell and Charles Leiserson devoted 11 out of 25 classes to group work. The first two of those classes were in training on teamwork and collaborative writing. The next three focused the groups on very specific tasks as a way to break the ice and give team members an opportunity to learn about each other's capabilities. Three more classes allowed for the groups to work on their semester projects, and the last three classes were devoted to group presentations.

According to Professor Mindell, "There's no question that giving the groups time to meet in class improved their effectiveness. It also gave us the opportunity to oversee their work and help out where we could." However, Mindell did say that the drain on class time was a difficulty, and next year a discussion section would be added to the course for group meetings.

Structure assignments so students must work together. If assignments are devised so that students can simply divvy up the work and do it on their own, they are likely to do just that. (Although even assignments that permit this kind of individual effort will at least require students to coordinate their work just before the assignment is due in order to submit a cohesive package.) In the 2.002 course, Professor Boyce attempted to address this problem, in part, by creating assignments that required students to work together in the laboratory. Michaelson suggests the best assignments to foster group interaction "require students to make a decision with respect to a complex set of data" or to "make a concrete decision based on an analysis of a complex issue." For example, in assignments where students are asked to manipulate data in order to come up with a single decision or recommendation, team members must practice decision making and consensus building skills in order to complete the assignment satisfactorily.

Give feedback throughout the semester. When students have no way to gauge how well they are doing, groups can flounder. Providing immediate, unambiguous feedback helps to promote both team development and learning. Some controversy exists over whether or not feedback should be made public in order to allow comparisons with other groups. Michaelson maintains that since the "single most powerful force for the development of group cohesiveness is the presence of an outside influence that is perceived to be threatening to member goals and/or the well-being of the group," providing this kind of comparative performance data has a beneficial effect. ("Designing Effective Group Activities," *To Improve the Academy*, Volume 16, 1997.) However, that strategy may promote a kind of competitiveness in your class that is antithetical to a spirit of collaboration you may be trying to foster.

It is fairly clear, though, that if groups are to work on one large project throughout the semester, then the project needs to be broken into smaller assignments that have to be handed in throughout the semester, so students can get a sense of how the group is doing And, ideally, feedback should be on both the work accomplished and the group processes that allowed it to happen.

* * *

Next *Teach Talk*: The instructor's role in the group process, providing mechanisms for reflection on group work, and grading.✣

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Does MIT Have A *Leading* Role to Play?

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they will have been the ones who allowed a piece of the *Dream* to die.

Sunday: Jekyll

I may have met Professor Kerry Emanuel but I do not recall. Within a half-hour of receiving the November/December 1997 issue of *The MIT Faculty Newsletter*, I had read Professor Emanuel's "What Price Diversity?" and telephoned to acknowledge it. Though reaching only his voice mail, I thanked him for writing an interesting article while cautioning that such a complex subject could not be so tidily explored. He promptly responded with a note of thanks, stating that, in part, his goal was to encourage discussion.

Professor Emanuel is to be commended. I believe there is not a scintilla of maliciousness intended in his article. Malevolence seeks the cowardly corners of the corridors – and there are many long corridors at MIT – or the darkness, away from the disinfectant of sunlight. I believe it is from courage that one vulnerably chooses the squeamish landscape of public discourse; that it is from love that one seeks reason, in the Enlightenment sense, for our Institute where wizardry, emotion, and sophistry, while tolerated and even protected, should not form the basis for administrative action.

First, as if dealing with synonyms, Professor Emanuel facilely glides between the words "minority" and "black." This may not be a good idea.

Second, in quoting the MIT admissions criteria, Professor Emanuel notes that no one is admitted below the category that is officially defined as "will likely be successful." He then, in his own words, states that "the very best universities must admit marginally qualified or under-qualified students …." English is an elastic language but here Professor Emanuel ruptures it.

Third, I suspect there is an inkling of a widely held mindset when Professor Emanuel writes "we now *import* [emphasis added] under-qualified minorities … for the benefit of the majority student population." From where does he think these black students come? Professor Emanuel should be informed that blacks *were imported* during the seventeenth, eighteenth, and nineteenth centuries, but the Thirteenth Amendment declared such practices illegal.

Fourth, is Professor Emanuel advocating, in part, the admission of more whites who are categorized as "will likely be successful" to replace a decreased number of blacks who are identically categorized? We are certainly left to assume so.

Indeed, some of the notions (his "domino effect," K-12 ruminations, …) in his article are too sweeping to be taken seriously, except that they generate the fuzzy warmth of resonance and recognition in far too many faculty. Clearly, there is comradeship as well as intellect in Professor Emanuel's article.

Still, the important issues on this matter are not confined to Professor Emanuel's article; so before proceeding to a broader terrain concerning the academic performance of black students at MIT, I summarize my rejoinder to Professor Emanuel's central thesis as follows.

Crux Number 1

- Of those students admitted to MIT by the present admissions criteria, no individual black student's SAT scores are capable of predicting that individual's success or failure at MIT.
- Of those students admitted to MIT by the present admissions criteria, no individual black student's SAT scores are capable of predicting that individual's future professional success.

We *are* dealing with individuals in these decisions, so Professor Emanuel's proposal will be damaging to potentially high achievers as well as to potentially low achievers since we are unable to distinguish them individually. Justice is not administered on a statistical basis; nor should the treatment of black students who "will likely be successful" at MIT.

Further, if we can believe reports from Atlanta where the "domino effect" may not have yet reached, the Georgia Institute of Technology has already been successful in both recognizing the aforesaid bullets and matriculating black students; thus Georgia Tech may be succeeding where MIT is failing. This suggests that the locus of our dysfunction must lie *within* the Institute.

Monday: Hyde

I don't give a flying #!?& what these people do! Why do we have to scream increasingly louder and more frequently to be heard? Boston continues to be the most bigoted major city in this country and MIT is at its disingenuous epicenter. These people think there is a math and science gene, and they believe it's defective in all blacks. These people don't want us here; never have. When I leave, who will speak openly for black students confronted with such ambushes? Our schizophrenic Nietzschean dichotomy is that, in the singing of our individual songs, we build their institutions while our own atrophy. [Calm down, chill, and take a deep breath, Bro'. Luckily, it's a short day.]

Tuesday: Jekyll

These types of open debates can be psychologically hurtful to black students and even damaging to their progress here. They can be hurtful as students see themselves discussed as political chattel, reminiscing a sordid history of servitude on this continent. They can also be damaging by reinforcing any prejudices and stereotypes in the minds of faculty

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and by buttressing standards that faculty may have suddenly rediscovered, standards which far too many of us have relaxed in recent years. Indeed, peppered with the failure rates of black students, can all professors be ensured to objectively evaluate their work? I don't think so. Nevertheless, statements like Professor Emanuel's deserve to be aired, but they must not go unchecked: James Madison's First Amendment civics salve to heal black students' wounds.

It is inconsistent to have counseling deans, who are sustained by the misfortune of students, rather than professors, who are sustained by the success of students, in charge of an academic resource. Such policies are *prima facie* asinine; and because white students are not academically supported via the Dean of Students, such policies are *prima facie* "the r-word."

If the changes in admissions policies proposed by Professor Emanuel are implemented (eliminating "race" and "gender" as admissions criteria), blacks will not be the only group affected. White women (the Gordian knot of Professor Emanuel's proposal), Native Americans, Hispanics, as well as the oxymoronic "learning disabled" (5 percent of one of my recent classes, none black) will all be sent scurrying. Although I doubt such changes in admissions policies will be implemented by MIT, to continue to allow the current carnage among black students is cruel. A comparable failure rate among white students would be viewed as an Institutional tragedy, resulting in corrective action; why not so when blacks are affected? Thus, as Professor Emanuel suggests, the status quo is unacceptable. Indeed, if no other corrective action is undertaken, I feel that Professor Emanuel's *final solution* should be seriously considered.

When I arrived at MIT as an undergraduate in the 1960s, I was one of about a dozen blacks – none female – in the entire 4000-plus student body. I certainly did not know of such aids as "bibles" or study groups, and to seek the assistance of a professor in his office was unimaginable – for black students, a period of all Lent and no Easter. I heard about a few black or female professors, but I never saw any, a condition not substantially changed for many students with respect to black faculty to the present day. Unfortunately, a significant number of the present faculty may wish to return to those good old days.

As a student, I had professors who could not have been nicer to me had I been their son. Yet, approximately once per semester, I also encountered a professor who I felt certain was not objectively evaluating my work. Such negative experiences toughened me. In the intensely competitive climate of MIT, the opposite will be true for marginalized students, who may plausibly surrender to nascent doubts.

The pathologies within the black student population are the same as those among the student population at large. In an intensely competitive academic environment, such pathologies will be most acutely expressed among those who are repeatedly *told* that they are marginal.

Professor Emanuel and I share a common angst concerning the statistically poor academic performance of black students. I believe black students, as a group, can perform significantly better than presently; I do not know what Professor Emanuel believes on this point. I further believe that the Office of Minority Education (OME) is a major offender in this regard.

Facts, though a grainy mind reading, are nevertheless persistent things; a bit of history is in order.

In 1973 when I was approached to become the first director of OME, I formulated several conditions of acceptance that were assessed to be too excessive. In part, I offered to resign permanently from the faculty in order to assume a three-to-five-year staff appointment, then leaving MIT altogether. I felt that changes in the admissions criteria should have been gradual, concomitant with the development of a culture of successful scholarship. Believing that all sense of unearned entitlement should not go unchecked, I proposed that any black student admitted under differentiated criteria, though taking regular subjects in his or her chosen discipline, would be a part of my program of support and encouragement, and that any black student judged by *me* to be performing below his or her potential would be sent packing; a nightmare for shirkers. I further recommended that such a program be phased out by the year 2000, more than a quarter of a century thence.

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Then, throughout, and now, my focus has been the pursuit of excellence and the development of scholarship and leadership (*The MIT Faculty Newsletter*, March 1991; *Tech Talk*, April 10, 1991; *The Tech*, May 3, 1991). The *size* of the black student population has always been secondary to me, despite the press' reporting of my protests – leaders, not numbers, change the world.

In the mid-1980s, the OME was formally moved from the Provost's Office into the Office of the Dean for Student Affairs (ODSA), and the OME directorship – which I adamantly feel (and felt) should be at the hand of a professor in engineering or science or, at least, someone who is commensurately accomplished – was depreciated. I expressed my fervent objections to those demotions to both the president and the dean. In fact, my objections became so intense, and lamentably so personal, that I have not spoken to that now-former dean to this day.

Consider the following example, the least personal of several I could cite, to be indicative of why the academic de-emphasis of OME was a recklessly critical and tragic decision concerning the scholarship of black students; notwithstanding a recent titular consolidation of the ODSA and some educational functions.

I sometimes encounter black students who lack decorum and elementary etiquette; admittedly, it's partly a generational thing. Either they do not possess simple manners and graces or they do not appreciate their importance in a professional setting. I wanted to reinforce the etiquette of those who were already practicing it – fortunately the majority – and to enlighten those who were not. I approached the director of OME for a mailing list of black students in order to distribute a letter to the students. Though explaining thoroughly why I wanted the list, I was told: (*i*) I was not allowed to have such a list, (*ii*) any letter that I composed had to be submitted to that Office, and (*iii*) any such letter would be edited by them and sent out on their stationery.

Not only has MIT committed intellectual gerrymandering by placing intermediate-level career administrators in the role of *academic* support for black students, these same administrators serve as gatekeepers who view the rendering of their services as a permanent part of the landscape and who, out of their own insecurities and ignorance, sometimes block black faculty access to black students. Contrastingly, these individuals themselves are *de facto* victims of senior administrators who knew – or should have known – that the dispensation of illusory scholarly imprimaturs could neither imbue them with a comprehension of the rigors of the MIT intellectual experience nor validate their academic advice whatsoever to black students. It's all okay; except, without a clear sense of the intense academic and political challenges to be met and strategies for confronting those challenges, far too many black students must pay the price and bear the burden.

It is inconsistent to have counseling deans, who are sustained by the misfortune of students, rather than professors, who are sustained by the success of students, in charge of an academic resource. Such policies are *prima facie* asinine; and because white students are not academically supported via the Dean of Students, such policies are *prima facie* "the r-word."

Crux Number 2

Yes, something is out of kilter. But don't 246 years of slavery followed by a century of Jim Crow warrant a better effort than expended thus far? Hmmm, 246 years (!); that's longer than the age of the United States of America.

The current MIT president has solid instincts and a steadfast commitment to address this issue, but he should seek a vision beyond running with the pack of the Association of American Universities. Are we leaders or pack runners? Whereas individual faculty members, both junior and senior, have been consistently supportive, the MIT faculty *en masse* has been woefully lacking in its innovation, reactionary in its assessments, and diffident in its behavior. Indeed, a principal role of the OME should be the design, development, and nurturing of both broad and enduring faculty involvement; including the integration of black students into the academic support mechanisms of their respective departments, thus counter-acting some of the students' clannish tendencies. Diversity is a two-way street.

At the beginning of this decade I wrote the following (*The Tech*, April 30, 1990): "If the main focus of the U.S. consciousness during the 1930s was overcoming the depression, the 1940s defeating the Axis, the 1950s containing communism and improving the standard of living, the 1960s embracing technology and civil struggles, the 1970s recognizing global limitations and social needs, and the 1980s economic competition and the declining debt-based standard of living; then the 1990s should be about addressing our deficits: trade (international competitiveness), federal (infrastructure, savings and investment) and **people** (**education**, quality of life and pluralism)."

In the pursuit of educational justice, the job is begun but incomplete. Why not ensure the future by creating it? Does MIT have a *leading* role to play?✥

[James H. Williams, Jr. can be reached at 253-2221]

What Price Prejudice?

A response to Professor Kerry Emanuel's article, "What Price Diversity?"

Jeremy Sher, John Hollywood, and Jake Parrott for the staff of *INSTITVTE*

The article, "What Price Diversity?", that Kerry Emanuel wrote for the most recent issue of the *Faculty Newsletter* (Vol. X, No. 3, p. 12) is cause for concern. In that article, Professor Emanuel, of Course 12, argues that "the very best universities [presumably including MIT] must admit marginally qualified or underqualified students" to satisfy affirmative-action policies. In making his argument, however, Professor Emanuel misuses statistics and asserts untrue stereotypes about MIT students.

Professor Emanuel's article is troubling in many ways. He cites SAT statistics and graduation rates to show that a nationwide achievement disparity exists between white and Asian students and students in underrepresented minority groups. We do not contest his observation. However, in the same paragraph, Professor Emanuel cites the overrepresentation of historically disadvantaged minority groups among students required to withdraw from MIT from 1990 to 1995. He presents this statistic as if to support his argument that MIT has been admitting underrepresented-minority students who would not be qualified for admission if race were ignored.

Professor Emanuel is mistaken. According to Dean of Admissions Marilee Jones, the underrepresented-minority students admitted to MIT are statistically identical to white and Asian students, with the exception of their scores on national standardized tests. Underrepresented minorities may account for more than their share of required withdrawals from MIT, but so few students are required to withdraw for academic reasons that this observation is statistically meaningless. It would also be quite a presumption to assume that any disparity in required withdrawals is due exclusively to innate talent. Professor Emanuel's arguments based on required-withdrawal statistics are flimsy: According to Dean Leo Osgood, on average less than 1.5 percent of MIT's student body is required to withdraw each year, and, though Professor Emanuel did not say so, most of these students ultimately return to MIT and graduate. Professor Emanuel's argument is unconvincing, especially because of the observable fact that qualifications of students admitted to MIT do not differ significantly by race.

Furthermore, nationwide student statistics imply very little about MIT students. Regardless of their racial group, MIT students do not comprise representative cross-sections of their respective groups across the country. Moreover, national standardized tests are not known for accuracy in predicting relative achievement of students in different racial groups; neither are they noted for capacity to distinguish ability levels well in the upper range of scores. Therefore, Professor Emanuel's statements about the intellectual talents of MIT students cannot be convincingly supported by national statistical trends.

Were "What Price Diversity?" written by someone other than an MIT professor, one might attribute the flimsiness of the argument to a feeble understanding of the process of dispassionate inquiry. However, since he is an MIT professor, it is difficult to believe that this explanation could apply to Professor Emanuel. One presumes that his professional work meets a higher standard than that of his political tirades. Thus one is left to wonder what would lead a professional scientist to write a piece so fraught with unconvincing arguments.

For the academic year ending in 1996, Professor Emanuel served as chairman of the Committee on Academic Performance (CAP), which decides cases of academic warning and required withdrawal from the Institute. This troubling fact did not make it into the Professor's article. While it is far from clear that Professor Emanuel's CAP made any improper decisions, given the insinuations of his article there is some ground for concern that CAP may have done so. Therefore, MIT now has no choice but to take responsible action to address this possibility. MIT should ask itself whether any students were improperly required to withdraw during Professor Emanuel's tenure as CAP chairman. Moreover, whether or not Professor Emanuel is prejudiced, his article underscores the necessity of ensuring that persons of prejudice are not able to exercise power over students. The faculty should review its selection procedures to ensure that professors selected for committee chairmanships will exercise their duties with fairness and objectivity.

Professor Emanuel's article implied more than simply that a national achievement disparity exists between students of different races. He implied that MIT students of underrepresented minority groups are less qualified than their white and Asian classmates to attend MIT. As a professor, Kerry Emanuel's job is to teach MIT students, not to insinuate that they do not belong here. As a former chairman of CAP, he should know that a required withdrawal can happen for a variety of reasons other than deficiencies in the student's intellect.

Professor Emanuel claims that "the high failure rate and overrepresentation of minorities among poorer students cannot help but give non-minorities the mistaken notion that minorities are intellectually inferior." Fortunately, we have an English word to sum that "mistaken notion" up neatly: the word is *prejudice*. Our response to Professor Emanuel is that the statistics need not engender prejudice. Prejudice comes from ignorance, and ignorance can be countered through education. Luckily, education is what MIT is all about.✣

[INSTITVTE is a Web-based MIT student newspaper located at <http://web.mit.edu/afs/athena.mit.edu/activity/i/institvte/www/>]

Humanitarian Demining: Does Advanced Technology Ensure Success?

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issue of mines and their removal has become considerably more visible. The treaty not only forbids the use of these mines, but also obliges the signers to ensure the destruction of mines in areas under their jurisdiction within 10 years. Other signers in a position to do so are also to provide assistance.

It should be noted, that the United States did not sign the agreement, arguing that current U.S. policy is to employ only self-destructive/self-deactivating mines. The observed failure of these is about 1 in 10,000 (about this fraction will *not* deactivate after the required time of several hours to several days) but *will* become inert after about 60 days. Although it may be argued that this does not create a future humanitarian problem, the non-discriminate nature of mines is still an issue. Further, the "moral firewall" argument still remains since it is clear that some states or organizations that lack U.S. technical capability to produce such mines will produce mines up to their *own* technical capacity.

With the enhanced visibility of the demining problem has come new interest in methods for landmine detection and in particular to methods which may be appropriate for clearing the huge number of mines already planted. It is this that has sparked a resurgence in technology development for demining, including by several groups at MIT.

The usual dictum in real estate "location, location, location" forms the basis for most of the technology developed for mine detection. The deminer seeks to locate the mines in a given area by various relatively simple technologies and then later removes or destroys the mine in place. (U.S. military doctrine requires destruction of the mines in place rather than removal.) Still, the problem of humanitarian demining is only superficially similar to the military counter-mine problem.

The military problem is to detect and destroy enough mines so that the dangers from mines are comparable to the other hazards of military operations and, since time is important, to do so in as rapid a manner as possible. For humanitarian demining, we have the contradictory requirements of very high detection probability (the UN has set 99.6% clearance as a goal and now "100% removal" has been discussed) and relatively low cost (although what constitutes "low cost" is not very well defined as it is also necessary to include opportunity costs associated with the removal of farm land from productivity and the inability to resettle refugees). Fortunately, the deminers have the luxury of choosing both the time of day and duration for operations and that may make possible the success of the first two requirements.

The technologies currently employed for explosive detection range from magnetic detectors (useful for weapons), planar x-ray scanners with sophisticated use of multiple energy x-ray beams, computerized tomography (CAT) scanners, various nuclear techniques, and highly sensitive chemical "sniffers," both canine and non-canine. The most powerful scanners currently being deployed use high-speed x-ray tomography (basically high-speed medical CAT scanners) to produce three-dimensional density maps of the contents of a bag.

Yet despite the sophistication of the $1M+ CAT scanners, the false alarm rate of these technologies can be as high as 30 percent. The reason for this lies not only in the complexity of the contents of suitcases (a trip to the FAA Technical Center where the contents of lost bags are examined and classified is an enlightening experience; almost anything that fits into a bag will eventually be found in one) but in the fact that the x-ray methods don't detect explosives directly, but only measure apparent density and shape.

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contents of suitcases (a trip to the FAA Technical Center where the contents of lost bags are examined and classified is an enlightening experience; almost anything that fits into a bag will eventually be found in one) but in the fact that the x-ray methods don't detect explosives directly, but only measure apparent density and shape. Nuclear techniques which directly measure elemental composition and thus directly characterize a suspicious object, are still seen as a second tier detector rather than as a primary screener, and only then if their cost can be reduced. Still, the ability to confirm the presence of an explosive through its composition is a powerful tool.

Is any of this applicable to the removal of mines from Angola or Mozambique or Cambodia? Probably not directly, but there are important lessons which we can learn from the aircraft security problem: First, the importance of false alarms, or rather the lack of false alarms, and second, the importance of characterization of the anomaly. High false alarm rates simply convince the user that their equipment is basically useless and that the cure is to turn down the sensitivity so as not to be burdened by false alarms. Of course for the average airport baggage inspector, with odds of more than a million-to-one against there being a bomb in a given piece of baggage, this response is not surprising. In the case of mine detectors, field false alarm rates of several hundred times the actual detection rate have been reported.

Detection methods which only locate anomalies and which cannot determine whether they are mines are saddled with very high false alarm rates. Magnetic detectors have had very high ratios of alarms to actual mines and may in fact be useless in an environment where much artillery fire has occurred. A single 105-mm artillery shell can produce as many as 3000 pieces of metal that can be detected by sensitive metal detectors. Even the addition of shape discrimination (attempting a crude form of imaging) has not been demonstrated to have any particular advantage in the field, although new developments may improve performance.

Another approach has been the use of scattered x-rays. X-rays are preferentially scattered by low atomic number materials characteristic of explosives and of non-metallic mines, and thus this method is one that has been proposed as a detection scheme for plastic mines. Early lab tests have shown promise, but the realities of field tests with complicated and cluttered backgrounds still must be demonstrated.

Given all of this, is there some clever piece of technology that can cure the scourge of landmines? Probably not. The lack of success of the "War On Cancer" showed how difficult it is to cure diseases despite vast efforts, but there are undoubtedly many methods yet unexamined. Perhaps some will attack one or more parts of this problem and someday reduce the death toll, returning to people the ability to use their land in confidence without fear of injury. Hopefully some of the collective knowledge and experience of the MIT faculty will find them.

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For more information, Web sources are the International Red Cross, <http://www.icrc.org>, in the Issues and Topics section, the U.S. Army humanitarian demining site, <http://www.demining.brtrc.com/> and the Demining Technology Center, <http://diwww.epfl.ch/lami/detec/>.✣

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Annals of Reengineering

Human Resources...

Janet Snover

MIT's earliest Reengineering projects focused on improving Physical Plant services, consolidating external suppliers to reduce costs, and preparing to install a new financial system. Streamlining the ways we deliver administrative services to our students was the next major initiative. The latest new effort relates to MIT's human resource practices, and since this team now has five projects underway, it seems like a good time to update the faculty on this work.

Background

President Vest articulated the importance of reviewing MIT's human resource practices when he wrote the following to the community in July 1997: "As one of the most vigorous research universities in the world, MIT's continued success will depend on its ability to attract and retain not only the brightest faculty and students, but also the best staff. A number of forces – changing demographics, rapidly evolving advances in technology, an increasingly competitive labor market, and difficulties in juggling personal and professional commitments – have contributed to making our work lives more complex. For that reason, in June 1996 we convened the Human Resource Practices Design (HRPD) team to look into the issues and challenges of our changing work environment."

Vice President for Human Resources Joan F. Rice is HRPD's sponsor, and she views the team as a temporary, *de facto* research arm of MIT's Personnel Department. The 11-member design team began its work by identifying areas of common concern across the Institute through broad outreach to many in the community, including faculty, administrative and support staff, and senior management. Like other Reengineering teams, HRPD also did extensive research on the best practices at other universities and research organizations.

Nine basic elements of human resource practices formed the basis for the study. These included: career paths; career planning; classification; compensation, recognition, and other rewards; hiring; individual and team development; job design; planning and appraisal; and succession planning.

After presenting their findings to the Reengineering Steering Committee in fall 1996, the HRPD team members returned to their home offices. The Steering Committee considered the report thoroughly, and Joan Rice reviewed the team's recommendations with the Academic Council in December 1996. She then asked the HRPD team to schedule meetings with the five academic School Councils in order to get their feedback on the recommendations. This process brought out a number of important issues and concerns, which were reflected in the final report.

In July 1997, the full design report was issued on the Web at <http://web.mit.edu/reeng/www/hrpd/> and was excerpted as a pull-out section in *Tech Talk*. The implementation process then began with a smaller team formed to further develop the recommendations and help the Institute evolve the new practices. Patricia Brady, formerly associate director of the Center for Real Estate, has led both the design and the development phases of HRPD's work.

Current Project Teams

Five focus areas were initially selected, and project teams of HRPD were formed and began their work in October 1997. The 35 members of the project teams come from 11 different academic departments, two interdisciplinary research areas, and nine administrative offices. The employees are on loan from their home departments and are spending 20 percent of their time on these short-term projects. The teams are focusing on the following areas: Generic Roles and Competencies, Orientation at MIT, Performance Management, Recognition and Rewards, and Training Policies and Administration. Since some of these titles may sound like jargon, an explanation and examples may be helpful.

Generic Roles and Competencies

This team is exploring ways to improve hiring and job mobility within MIT. The team is defining "generic roles" for several positions across MIT by meeting with individuals who do the work and developing a template detailing the skills and knowledge required for each position. The templates can then be used to help build job descriptions. For example, the team helped to develop a generic role for an "Administrative Assistant, Personnel" in the Administrative Services Organization (ASO) in the School of Engineering. When Physical Plant needed to hire an "Administrative Assistant, Personnel" they requested and used ASO's generic role as a starting point to build the job description for the Physical Plant position. This saved time and energy, and worked very well.

"Competencies" are the underlying behavioral characteristics (like a person's style of working) that cause or predict success in a particular job. For example, "flexibility" and "collaboration" might be among the appropriate competencies for a support staff position that involves working with several faculty members. Resumes, of course, provide an overview

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of an applicant's skills and experience, but interviewers can also be trained to look for the behavioral traits that are less obvious but often critical to job performance and satisfaction. The end result should be a better fit between the candidate and the job.

Theoretically, competencies will also provide a helpful structure for improving an employee's performance. For example, employees who are hired using competencies as part of the selection criteria will also be assessed – by themselves and others – on how their work measures up to the relevant competencies. Since employees will know what is expected of them, they will be better able to determine whether they need additional training or experience in certain areas.

If competency models were publicly available (perhaps in an on-line database), individuals could match not only the skills on their resumes but also their personal strengths to positions that would best suit them, and/or they could work on developing the competencies needed for a position they want to hold in the future. Matching strengths to job requirements is a win/win situation for the employee and for the organization. The project team is developing an MIT-specific competency reference guide that will assist in evaluating what behavioral traits are critical to success in jobs at the Institute.

Orientation at MIT

This project team is responsible for developing a comprehensive orientation program for new employees. The program would not replace "local" orientation efforts in departments nor the presentation by the Benefits Office. Instead, the program will aim to help new employees understand MIT's organizational structure, culture, and resources. The team will explore a variety of options for delivering the information, such as the Web, CD-ROM, and more traditional training sessions, notebooks, and other paper-based approaches.

Performance Management

"Performance management" is a process of improving employee job performance while continuing to build capabilities and skills. Supervisors and employees share responsibility for planning, monitoring, and developing expected results and behaviors throughout the year. When clear expectations and goals are established and progress is monitored, there is a direct link between the employee's performance and the success of the organization. The objective of the Performance Management team is to provide employees, supervisors, and managers with concrete tools and proven methods to assist with this process.

The team is looking at departments and organizations (at MIT and externally) that practice performance management well. The team will conduct surveys, interviews, and focus groups on topics such as planning and goal setting, the coaching style of communication, and the actual appraisal event. Building on MIT's existing performance appraisal process, the team will learn what currently works and what could be improved.

Recognition and Rewards

The goal of this project team is to develop a basket of creative options that could be used to reward and recognize employees. (The team thinks of a "reward" as something tangible and "recognition" as an acknowledgment.) They are surveying managers and supervisors as well as other administrative and support staff about what is currently being done at the Institute. In addition, they are collecting data on how other organizations reward employees. After the team completes its research, they will come up with options and then present those to focus groups for their reactions.

Training Policies and Administration

This team was formed to look at how MIT can create and maintain a highly skilled and well-trained workforce. The goals are to create policies that provide equitable access to training and development opportunities and to define administrative procedures for delivering training in a clear and consistent way.

So far, the team has researched the current formalized training practices and policies at MIT and they are developing surveys to collect more data. After the team has studied the best training practices in higher education and industry, they will formulate recommendations for MIT.

Next Steps

As Patricia Brady often says, a human resources program is a fabric of practices, policies, and resources that needs to be woven tightly enough to support the whole organization, but structured loosely enough to yield to changes, stresses, and "local" needs. Consequently, there is a great deal of overlap and coordination among the work of these project teams, especially Generic Roles and Competencies, Performance Management, and Training Policies and Administration. Coordination comes through formal and informal communications among teams and is reinforced by sound project management approaches.

Ideas and options from all of the project teams are regularly presented to the community. Faculty reactions and input have been extremely valuable to this work, and are welcome at any time. The project teams can be reached through Ms. Brady, 258-5983, room N52-493C, e-mail: pabrady@mit.edu.✣

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

Time Constants

Paul Penfield, Jr.

The following article originally appeared in The Interface, *IEEE Education Society and ASEE Electrical and Computer Engineering Division; Number 1, April 1997.*

Some ideas came to a focus for me recently when we held a memorial service here at MIT for Gordon Brown. Many readers of *The Interface* will know instantly who Gordon Brown was, but for the others, let me explain.

Gordon served as head of the Department of Electrical Engineering at MIT from 1952 to 1959, and then as dean of Engineering for the next nine years. He retired in 1973, and lived his later years in Tucson, Arizona where for some time he acted as an energetic citizen-champion to promote the use of system dynamics in the public schools. He was almost 89 when he died last August.

It is not too much to say that Gordon Brown had more impact on engineering education during the past 50 years than any other person. As department head and later as dean, he pushed through his vision of an engineering education based on fundamental science – not the same science that was of interest to scientists, but rather "engineering science," those aspects that supported the practice of engineering. Although this concept seems perfectly natural today, it was radical in the 1950s.

In preparing my remarks for his memorial service, I came to appreciate better why such revolutionary ideas were necessary at that time, and also what other, equally radical ideas might be appropriate today.

It is all a matter of time constants. Yes, time constants. This is a concept that Gordon Brown, the expert in servomechanisms, knew very well. Just as electrical systems are characterized by natural time constants, so are natural phenomena and even social systems. We electrical engineers have a relative advantage in understanding the dynamics of such systems because of our familiarity with the dynamics of engineered systems.

We know that when dealing with rapidly changing, or dynamic, things, we can approximate slowly varying things as constant, or static. This approach is no less valid for natural or social systems than for engineered systems. For example, we think of the locations of continents as fixed on human time scales, even though they have moved on geological time scales. It is all a matter of time constants.

It is not too much to say that Gordon Brown had more impact on engineering education during the past 50 years than any other person. As department head and later as dean, he pushed through his vision of an engineering education based on fundamental science – not the same science that was of interest to scientists, but rather "engineering science," those aspects that supported the practice of engineering. Although this concept seems perfectly natural today, it was radical in the 1950s.

In engineering education, the most important time constant is 40 years, the length of one engineer's career. When designing an educational program, things that change slowly may be considered constant over a 40-year period, whereas things that change more rapidly must be considered as variable, in the sense that they may change during a single person's career.

Before 1900, advances in engineering (and in other fields) occurred at what seems today an incredibly slow rate. Fifty years passed between the inventions of the electric motor and the electric light. It took a hundred years for Coulomb's Law to turn into Maxwell's Equations. A practicing engineer could base an entire career on engineering techniques learned in school. The underlying science was changing so slowly that it could be considered as static, as far as an individual career was concerned. It is all a matter of time constants.

In the first half of the twentieth century, science, especially physics, began to change more rapidly. Atomic theory, quantum mechanics, and relativity were introduced. But engineering education was not changed; the presumption continued to be that the science that was important to the practice of engineering was static, or unchanging.

The Second World War exposed the flaw in that reasoning dramatically. The atomic bomb was developed by physicists and chemists who understood atomic theory. Radar was developed by physicists who understood electromagnetism better. Engineers played a distinctly secondary role.

Gordon Brown recognized the problem. The presumption of a static science was obsolete. What was needed was a new model, in which the underlying

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science could change. Not only could specific branches of science advance rapidly, but other branches of science that had previously been of no engineering importance could suddenly become relevant.

As department head at MIT, Gordon led the revisions of the undergraduate electrical engineering curriculum to incorporate engineering science. He included an ample amount of science, to make it possible for our graduates to learn areas of engineering based on diverse sciences. He also exposed students to many different sciences, so that they would feel comfortable learning still other branches of science later in their careers.

Then, as dean, he extended this idea to other fields of engineering. Graduates of these programs, and similar programs elsewhere, went out to populate the faculty of many other universities, and the result was that today almost all engineering education has a heavy reliance on engineering science.

A question of critical importance to the readers of *The Interface* is whether this model of engineering grounded in a dynamic, changing base of science will serve us as well in the future as it has in the past. I personally believe it will. There is no indication that the rate of scientific advance is slowing, or that new sciences will be any less necessary. The only question might be which areas of science to incorporate. Many universities (including my own) are betting that biology will be as important in the future as physics is today. We now require a semester of biology for all students.

Another question that arises is whether, if Gordon Brown were alive today, he might have his sights set on a more important change than merely the selection of which sciences to include in what amounts. I believe he would. Let me explain. Again, it is all a matter of time constants.

We continue to educate our students as though the context in which engineering is done is static, or at worst slowly varying. By the word "context" I mean the cultural, political, industrial, social, and work environment in which an engineer practices. By failing to prepare our students to deal with a dynamic, or changing context, we are assuming that such changes have a time constant longer than 40 years. In other words, we recognize that science is dynamic, but we still think context is static.

There is ample evidence that this assumption is now obsolete. During the past 50 years we have seen several changes in context. Today, society values the environment and disapproves of pollution in a way that was unknown in 1950. Today, almost half of the engineering undergraduates are women. Today, new countries are being formed every year, and new cultures are asserting their importance all the time. Today, American industry competes globally. Today, a successful engineer must be nimble, to cope with shorter design cycles, changing styles of activity, more teamwork, constantly improving design tools, and more effective global communications.

As these examples show, the context today is radically different from what it was 50 years ago or even 10 years ago. That is, context is changing too rapidly to be considered constant during a 40-year career. Once again, it is all a matter of time constants.

What should we do to equip our students to deal with a rapidly changing context? That is probably the most important question facing electrical engineering education today. Different people have different ideas.

One idea is to ensure that students have a greater classroom exposure to various contexts. The traditional way of doing this is a liberal arts education. However, engineers also need their science base, and in addition they need the engineering approach to problem solving, which liberal arts programs do not usually supply. Perhaps what is needed is a new form of liberal arts education, with a much heavier dose of many sciences, along with some engineering experience. Or perhaps what is needed is a system where engineering is a professional, graduate program open only to graduates of a liberal arts program.

Another idea might be to strongly increase the creative, design portion of the curriculum so that a variety of contexts for design problems can be experienced. Another idea might be to emphasize exposure to multiple cultures through international exchange programs.

In judging any of these ideas, ask whether the graduates will be able to cope with profound changes in their context during their career. In other words, ask whether they will continue to learn after leaving school, both in technical and non-technical areas.

One wall in our department headquarters at MIT is adorned with pictures of past department heads. Gordon Brown's picture is prominent among them. I see it every day as I come to work, and sometimes wonder how he would approach things if he were around today. The need for a change is quite clear – it is all a matter of time constants. The way of satisfying that need seems much more elusive; it represents what is perhaps today's greatest and noblest challenge for us engineering educators.✥

[Paul Penfield, Jr. can be reached at penfield@mit.edu]

Faculty Invited to Leonardo Dinner Lectures

Ien Cheng

The MIT chapter of Tau Beta Pi (TBP), the national engineering honor society, is sponsoring the Spring 1998 Leonardo da Vinci Dinner Lecture Series. Each of the dinner lectures, which are open to TBP members and all faculty, brings together about 20 students and several faculty to hear a short lecture by one of the faculty members, and enjoy fine dinner and hearty conversation together.

This term's nine dinners include talks by Phillip Sharp, Salvador E. Luria Professor of Biology and Head of the Biology Department; Philip Khoury, dean of the School of Humanities and Social Science and Professor of History; and Robert Birgeneau, dean of the School of Science and Cecil and Ida Green Professor of Physics. Topics range over the whole spectrum of engineering, science, and the humanities, with lectures on biotechnology, archeology, computer chess, manufacturing, poetry, physics, architecture, and the science and engineering of fine wines.

Tau Beta Pi sponsors the dinner series with the goal of "fostering a spirit of liberal culture" at MIT, exemplified by Leonardo's curiosity and wide range of interests, as well as to provide a way for faculty to interact with students outside of the classroom. At the inaugural lecture for the dinner series last fall, President Charles Vest said, "I think this is just a terrific idea and that it really succeeds and flourishes."

Dinners are free and all members of the MIT faculty are invited to participate. For more information or to make dinner reservations, visit the Leonardo dinners Web page at <http://web.mit.edu/tbp/www/dinners> or contact Guang-Ien Cheng G, the Leonardo Dinners chair, at <ien@mit.edu>.

Each dinner is from 6-8 p.m. in the West Dining Room of Ashdown House, the graduate dorm across from the MIT Chapel. The schedule of spring dinners is below (each is on a Thursday unless otherwise noted).✥

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Leonardo da Vinci Dinner Lecture Series

Feb. 19	"The Development of Biotechnology" – Phillip Sharp, Salvador E. Luria Professor of Biology and Head of the Department of Biology **MENU:** Red beans and rice, and jambalaya
Feb. 26	"The Humanities at MIT: One Dean's Perspective" – Philip Khoury, Dean of the School of Humanities and Social Science and Professor of History **MENU:** Fattoush and chicken with sumac
March 5	"Telerobotic Archeology in the Deep Ocean" – David Mindell, Frances and David Dibner Assistant Professor of the History of Engineering and Manufacturing **MENU:** Zarzuela: A Spanish seafood medley
March 12	"Cilkchess: MIT's World-Class Computer Chess Program" – Charles E. Leiserson, Professor of Computer Science and Engineering **MENU:** Cassoulet: Lamb, duck, and pork with white beans
April 1 (Wed)	"Designing Manufacturing Systems" – David Cochran, Assistant Professor of Mechanical Engineering **MENU:** Bisteeya: Chicken and saffron baked in phyllo
April 9	"Technique in Poetry" – Irene Tayler, Professor of Literature, Emeritus, and MacVicar Fellow **MENU:** Pork tenderloin with wild blueberries, capers, and balsamic vinegar
April 16	"Why physicists can't figure out how superconductors superconduct" – Robert Birgeneau, Dean of the School of Science and Cecil and Ida Green Professor of Physics **MENU:** Duck with fresh and dried cranberries
April 23	"The Science and Engineering of Fine Wines" – Linn Hobbs, John F. Elliot Professor of Materials **MENU:** Julia Child's Boeuf Bourguignon
April 30	"Experience, Imagination, and Architecture" – William Porter, Professor of Architecture **MENU:** Zuni lamb stew with green chilies and hominy

Building 20: The Magical Incubator 1943 – 1998

Special to the Faculty Newsletter

Building 20 was constructed during the Second World War, and initially served as the home of the Radiation Laboratory. It will be torn down in 1998 to make way for a new complex of buildings to house MIT activities in computer, information, and intelligence systems, to be named after Ray and Maria Stata.

In its 55 years, Building 20 has housed many MIT activities. It was never intended to last this long. "The building was constructed in...1943 as a war building and is of a temporary nature," reads an architect's memo, "...the life of said building to be for the duration of the war and six months thereafter."

Its "temporary nature" permitted its occupants to abuse it in ways that would not be tolerated in a permanent building. If you wanted to run a wire from one lab to another, you didn't ask anybody's permission – you just got out a screwdriver and poked a hole through the wall. Of course this was in the days before the dangers of asbestos were recognized.

This building cast a spell over those who worked in it. Many former occupants have noted the magical power of the building to bring out the best from those in it, and the very real feeling that this was a special, even a unique, place. At the same time it served as a breeding ground, or incubator, of many research areas, of the minds of its students, and of new organizations. Many MIT laboratories and centers had their origins in Building 20, or else were formed by people who had spent years there.

Commemoration

MIT is planning a commemoration of Building 20, to be held March 26-27, 1998. This will be a reunion for those who have lived in the building during the decades since its erection in 1943, a celebration of all the diverse activities that have gone on in the "plywood palace," and a chance to reflect on how many great MIT activities had their humble beginnings there. It is sponsored by the provost, the School of Engineering, the Department of Electrical Engineering and Computer Science, the Department of Linguistics and Philosophy, the Research Laboratory of Electronics, the Laboratory for Nuclear Science, the Association of Alumni and Alumnae, Resource Development, and MIT Lincoln Laboratory.

Invitations to this event were mailed in January, 1998. If you did not receive one, please send your name and address to <building-20@mit.edu>. Or, you can use the on-line registration form that is linked on the EECS home page <http://www-eecs.mit.edu/>. Or, you can call Commemoration Central x3-4624.

A list of those who have already registered for this event is posted on the Web site.

Reminiscences

The people who occupied Building 20 over the years have wonderful stories to tell. Many appeared in a recent version of *RLE Undercurrents*, and many more have been submitted by people registering for the commemoration. You can read them all on the Web site, and you can submit your own.✥

1945 photograph courtesy of the MIT Museum

Task Force Survey Results

Uses of Technology in Teaching at MIT

Lydia Snover

As part of its mission, the MIT Task Force on Student Life and Learning examined the current teaching methods used by the faculty and discovered that much of undergraduate teaching still relied heavily on the lecture method and did not appear to incorporate many of the types of technology available. To better understand this issue, the Task Force surveyed all MIT faculty on the role of technology in the teaching enterprise. The survey queried faculty on their current use of technology in the classroom and outside the classroom and how they thought they might use technology in the future. It also asked faculty what they perceived to be impediments to the use of technology in their teaching.

554 faculty have returned surveys. The overall response rates for faculty who provided data for each rank were:

Professor	44.70%
Assoc. Prof. w/ Tenure	48.10%
Assoc. Prof. w/o Tenure	43.00%
Assistant Professor	56.50%
Prof. w/o Tenure (retired)	23.80%
Visiting Faculty	26.30%

Preliminary analysis of the survey found that:

ˇ Classroom blackboards and overhead projections are and will continue to be widely used by the MIT faculty. Distance learning is still a technology that the faculty do not use or foresee using in teaching traditional MIT students. In the classroom, it appears that faculty believe that simple is better.

ˇ Over 50% of the faculty plan to use projected Web access and portable computer projection equipment in the next three years. This change has implications for classroom renovations and design. Faculty will need to connect ubiquitously to the MIT network in the classrooms. Computer projection equipment will need to be provided in many more classrooms and maintained.

ˇ Use of technology in teaching is and will be greatest outside the classroom. Over 50% of the faculty reported using word processing, spreadsheet software applications, and electric distribution of class materials using Athena currently. Over 50% of the faculty reported wanting to use word processing, electronic distribution of material using Athena, computer simulations, spreadsheet software applications, Web-based or commercial educational materials, MATLAB, e-mail discussion lists, and electronic submission of papers and problem sets in the next three years.

ˇ The faculty report that a major impediment to using technology in teaching at MIT is *time*. Time for curriculum development, time for preparation for each class period, and time for learning technology. Closely following time is staff support and the cost of developing and/or converting existing materials to use with new technologies.

ˇ Limited professional recognition, perceptions that technology and teaching is not an Institute or a department priority, personal lack of interest or the perception that the Institute culture suppresses educational innovation were seen as impediments by less than 50% of the faculty.

A few simple conclusions can be drawn from this study:

ˇ If faculty are to use more technology in their teaching activities, they must have training in how to use technology efficiently. They must be provided with basic electronic access in the classroom that is reliable and easy to use.

ˇ Change in the use of technology will come about if there are staff who can help convert and prepare materials and support faculty inside and outside the classroom. If there is enough support available, the faculty's projected use of technology in the classroom will change.

ˇ Most of the technological innovation in teaching at MIT will continue to be in non-classroom teaching activities, such as how students access and submit materials, how they get extra help, and how they continue learning beyond the classroom by exchanging ideas with other students and faculty. This has continuing implications for the presence of technology in our planned residential facilities, study facilities such as the library, and the location of computing clusters throughout the campus.

What this survey did not address is the appropriate role of technology in teaching undergraduate and graduate students. If changes in the role of technology are desired, how can these changes be introduced and encouraged on the campus? Will technology increase the burden of academic support rather than make it more efficient?✥

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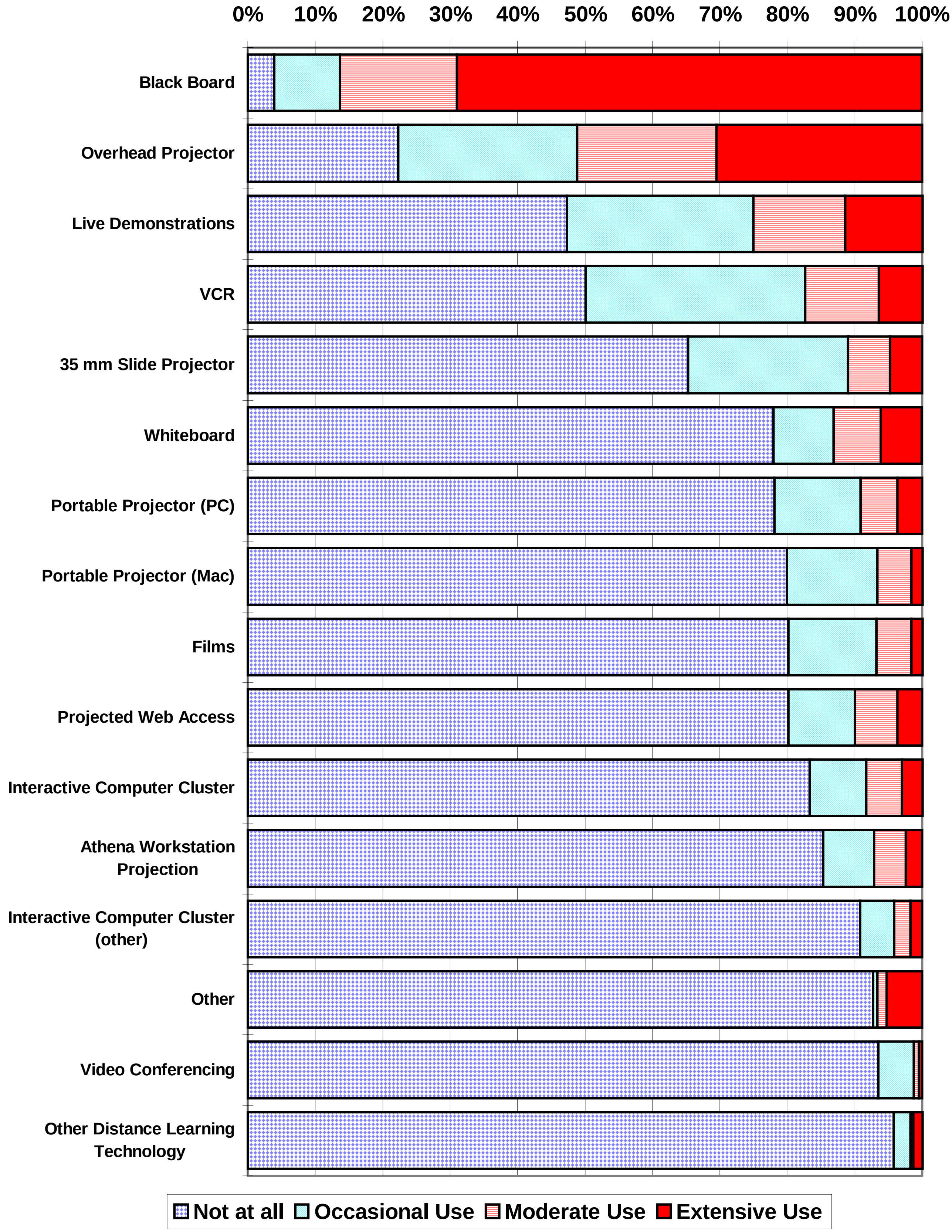
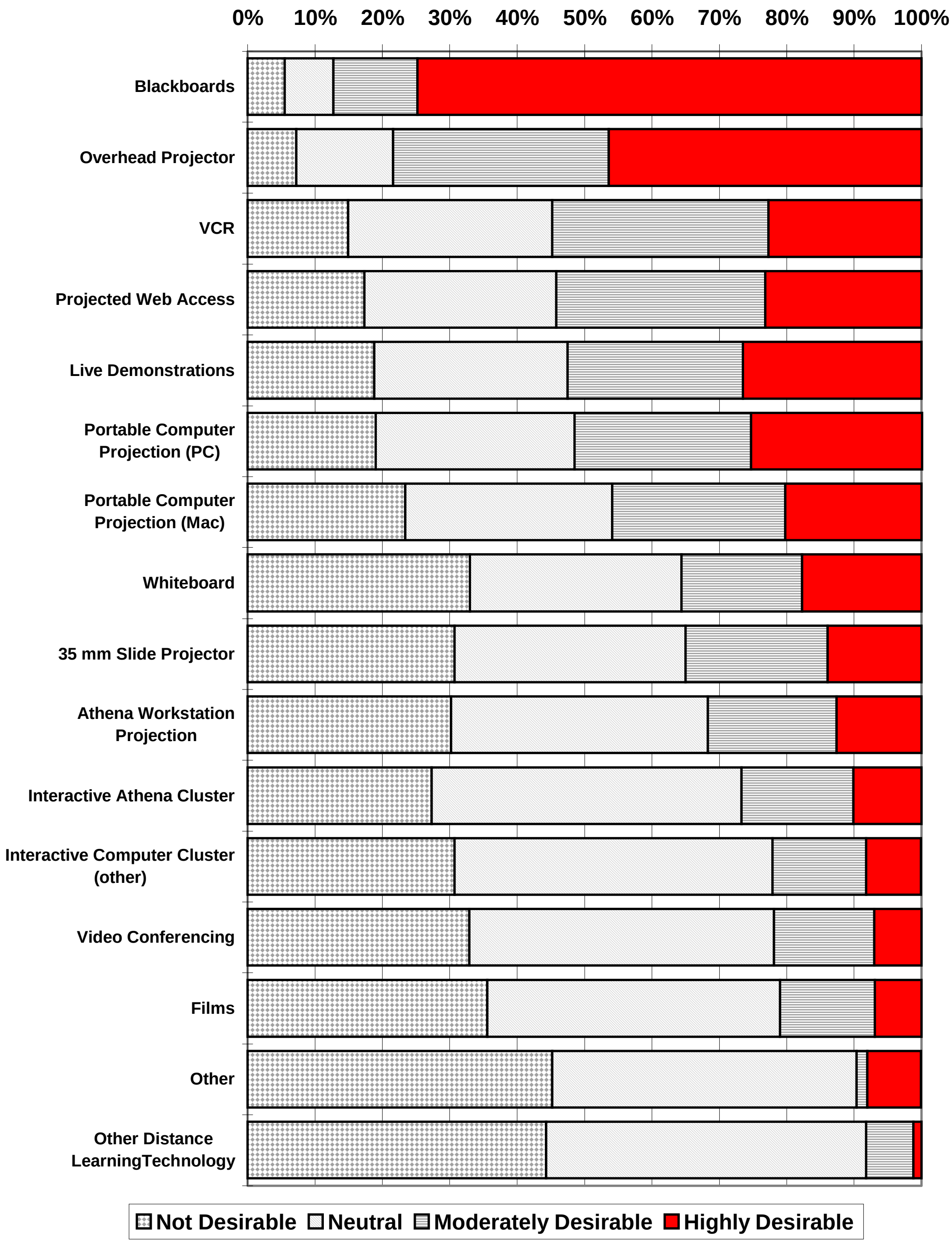
Technology Currently Used in the Classroom



M.I.T. Numbers

Future Uses of Technology in the Classroom



Source: *Faculty Survey by Task Force on Student Life and Learning* (see p. 18)