The MIT Faculty Newsletter

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Task Force on Student Life and Learning

Final Report Generates Comments and Controversy

R. John Hansman, Jr. and Robert J. Silbey

During the few weeks since the Task Force on Student Life and Learning report was released, considerable controversy has arisen over the recent decision of President Charles M. Vest to house all freshmen in residence halls beginning in 2001. In his letter to the MIT community, President Vest pointed out that this was a recommendation of the Task Force on Student Life and Learning, which indeed it was.

Given the attention this aspect of the report has received, predictable though that attention was, discussion is only now beginning to turn to the report's 19 other recommendations, and to the Task Force's formulation of MIT's educational mission and principles.

Indeed, it may surprise many to learn that it was the educational mission, not the housing recommendation, that engendered the most debate during the deliberation of the Task Force. Examining the educational mission was President Vest's first charge to the committee, and the topic occupied the group for two years – right through the summer of 1998. As deadlines drew near, members of the Task Force found themselves huddled around a blackboard, painstakingly hashing out the language of the mission statement. After the chalk and eraser came to rest, however, we came to feel that the mission statement discussion had helped crystallize the overall thrust of the Task Force's work.

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A New Kind Of Department To Bring Biological Science Into Engineering

Douglas A. Lauffenburger and Steven R. Tannenbaum

The science of biology is becoming an ever more important presence at the Institute, as elucidation of molecular underpinnings stimulates increasingly productive interactions with physical, chemical, and mathematical approaches. Not surprisingly, then, research activities at the biology/engineering interface have flourished for more than a decade. Because of its exceptional excellence in engineering, biology, and toxicology MIT holds a leading position world-wide with respect to bioengineering and biotechnology research conducted by its faculty.

Formation of administrative structures to coordinate inter-departmental research initiatives has traditionally been easy for the Institute, and the biology/engineering interface is no exception. As examples, the Center for Environmental Health Sciences was initiated in 1978, the Biotechnology Process Engineering Center was established in 1984 and the Center for Biomedical Engineering was formed in 1995, all with a minimum of complication. At the same time, student interest in bioengineering education opportunities, at both the undergraduate and graduate levels, has similarly soared in recent years. But formation of an administrative structure for education at disciplinary interfaces requires more careful consideration. Essentially, it requires defining the intellectual framework for an emerging new discipline, and the process must involve participation by and discussion among faculty from the

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http://web.mit.edu/fnl

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Editorial

Leadership for the New Millennium

MIT is known for its invigorating atmosphere. The entrepreneurial spirit thrives here, pervading research activities that spawn new technologies and filtering down to the earliest undergraduate lectures. This spirit drives creativity, spawning interactions among faculty and students from multiple disciplines. Fueling MIT's unique educational environment has been the largesse of the federal government which, through research grants and contracts, has provided the funding that has allowed individual faculty to create.

There can be no doubt that this situation is changing. Forced by the Office of Management and Budget to alter the way in which it recovers graduate student tuition, MIT recently introduced a formula for collecting revenues to support students that increases the cost of supporting graduate students. Although the magnitude of the increase is not great, our position relative to that of our competitors has weakened.

In addition, for NIH-supported research assistants, a cap on the amount of funds that can be recovered from grants has created significant shortfalls for some departments heavily reliant on graduate students to carry out research. Federal and corporate funds that built dormitories and research laboratories 30 years ago no longer exist, and deferred maintenance has created a serious problem in infrastructure that many departments are only now beginning to address. The talent pool for senior faculty in several disciplines, especially in the sciences, has not kept up with the demand of institutions worldwide, and MIT faculty are now being recruited with unparalleled enthusiasm by peer institutions not only in the United States but also in Europe.

The Task Force on Student Life and Learning has just released its report (see P. 1), which reflects many of the concerns regularly expressed in the *Faculty Newsletter* over the past years. Included are the need to strengthen personal contacts between students and faculty, to provide an atmosphere where learning and living are compatible not competing priorities, and to strengthen formal and informal learning and research activities.

The talent pool for senior faculty in several disciplines, especially in the sciences, has not kept up with the demand of institutions worldwide, and MIT faculty are now being recruited with unparalleled enthusiasm by peer institutions not only in the United States but also in Europe.

How then can we meet the challenge? The answer must, of course, come from administrative leadership, and in that respect it is noteworthy that many top positions at the Institute have recently changed hands. Most important are the posts of provost and recreated chancellor, the chief academic officers responsible for the allocation of funds and setting of priorities. The faculty needs to rally behind newly appointed Provost Bob Brown and Chancellor Larry Bacow, who will require our help in finding the resources required to underwrite the changes and improvements, much of which will have to come from private gifts in a new funding campaign.

Brown and Bacow bring considerable administrative experience to the task, having collectively served as department head, dean of a School, and chair of the faculty. They know how to operate within the culture of MIT, are committed to action, and have the full backing of the president. We look forward to a decade of new buildings and renovations, reduced costs for graduate education, and better housing facilities for our undergraduates, graduates, and (hopefully) even faculty in the nearby area. With appropriate leadership we can expect more endowed support from the private sector for research programs, for senior and mid-career faculty chairs and initiatives, and for student fellowships.

Within such an improved environment, we can ourselves help strengthen the research and educational programs, improve undergraduate and graduate student life and learning, and continue the tradition that we have inherited. This tradition of entrepreneurial adventure can thrive as the atmosphere is restored. We look to the future of a new millennium.

Editorial Committee

See article P. 23 for more information

Athena Minicourses

All minicourses are offered in Room 3-343
(Classes are free and no registration is necessary)

	Mon	Tue	Wed	Thurs
noon	Sept 14 MSO	Sept 15 Matlab	Sept 16 Xess	Sept 17 Maple
7pm	MSO	MSO	Xess	Xess
8pm	Matlab	Matlab	Maple	Maple
noon	Sept 21 Frame	Sept 22 LaTeX	Sept 23 FrameThs	Sept 24 LatexThs
7pm	Frame	Frame	LaTeX	LaTeX
8pm	FrameThs	FrameThs	LatexThs	LatexThs
noon	Sept 28 Intro	Sept 29 Basic	Sept 30 Working	Oct 1 EZ
7pm	Intro	Intro	Working	Working
8pm	Basic	Basic	EZ	EZ
noon	Oct 5 Info Res.	Oct 6 HTML	Oct 7 Ser Emacs	Oct 8 Dotfiles
7pm	Info Res.	Info Res.	Ser Emacs	Ser Emacs
8pm	HTML	HTML	Dotfiles	Dotfiles
noon	Oct 12 Holiday	Oct 13 Matlab	Oct 14 Frame	Oct 15 LaTeX
7pm	No classes	MSO	Frame	LaTeX
8pm		Matlab	FrameThs	Thesis
noon	Oct 19 HTML	Oct 20 Dotfiles	Oct 21 Intro	Oct 22 Basic
7pm	Info Res	Emacs	Intro	Working
8pm	HTML	Dotfiles	Basic	EZ

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Electronic Bulletin Board Ready to go On-line

Final plans are in process for establishment of the faculty Electronic Bulletin Board, sponsored by the *Faculty Newsletter*. Mid-October is the projected on-line date, as issues of authentication and verification have been resolved.

In order to access the Bulletin Board it will be necessary for all faculty to obtain MIT Web Certificates. Certificates both authenticate user and Web server, and support the public/ private key technology that encrypts data as it is sent. Two types of certificates will be needed to gain entry to the Bulletin Board; a site certificate and a personal certificate.

A site certificate assures that the server you are connecting to is the one it claims to be, not an imposter. A personal certificate verifies to the server that you are who you claim to be; when you get a personal certificate, you also get a private encryption key. These two certificates are not paper documents. They are digital files stored as preferences in your Web browser. To get them, you must go through a multi-step, Web-based process.

For more information on obtaining certificates please see Web Certificates at MIT at <http://web.mit.edu/is/help/cert/toc.html>.✣

From The Faculty Chair

Freshman Housing Decision Highlights Year of Change

Lotte Bailyn

Much has happened during this last year, and a number of things have changed at MIT. We have changes in the top administration: a chancellor as well as a provost, and a new executive vice president; we have a task force report which asks us to rethink our educational mission and combine academics and research with community (see P. 1); we have just gone through a completely redesigned freshman orientation; and, most recently, we learned of Chuck Vest's decision to house all freshmen on campus starting in 2001 when the new dorm will be built.

There are many connections among these events; they all have a long history, and all were made particularly salient during last year's intensive reconsideration of our policies following the tragic death of Scott Krueger.

The decision on freshman housing is probably the most controversial. This is not a new issue. Ten years ago the Potter Report made the same recommendation, but the administration at that time decided not to implement it. There was objection from the FSILGs, as one might expect, and also from faculty, particularly those who had been MIT undergraduates themselves. We saw the same division among the faculty when the issue came up again last fall, in the first shocked response to Krueger's death. But, though not without some serious soul-searching, the Committee on Dangerous Drinking as well as the Task Force and the Committee on the First Year (all consisting of faculty and students, plus staff), for very different reasons, supported the idea.

The faculty reaction to this decision relates to both process and substance. There are a number of faculty who feel that the decision is wrong, that MIT's residential system, based as it is on treating even its youngest students as adults, i.e., putting their residential decision completely into their own hands when they first arrive on campus, is one of the things that makes MIT unique. Choice, not randomization; students of all classes living together; retaining the viability of the smaller, more cohesive living groups, both in the Greek system and independent – these seem to be the aspects of the present system that are particularly valued. The challenge therefore is to retain these characteristics as much as possible even when the freshmen are on campus. It is a challenge that is still ahead of us: to design a system that will include these valued aspects of the current model.

Ideally, one would have wanted the substance of the idea to be presented for open discussion and comment, before any decision was made. As a basic principle, I think administrative intent should always be announced prior to such a decision in order to give faculty time to inform themselves, to comment, and to raise their concerns. Unfortunately, the external context within which the decision on freshman housing was reached, made it not possible to do this.

The issue of process is more complicated. Not surprisingly, the two often go together: those faculty most concerned about the substance of the decision are also most concerned about the process. But logically they are separate, and the process issue concerns the timing of the decision and the seeming lack of faculty input into it. Since this is a decision that in the end rests with the president, and could not have been made by faculty vote, the question is whether the faculty were sufficiently consulted. Ideally, one would have wanted the substance of the idea to be presented for open discussion and comment, before any decision was made. As a basic principle, I think administrative intent should always be announced prior to such a decision in order to give faculty time to inform themselves, to comment, and to raise their concerns. Unfortunately, the external context within which the decision on freshman housing was reached, made it not possible to do this.

So where does this leave us? It leaves us with a decision that some of us approve of and others do not, and a number who feel that they had insufficient opportunity to make their views known. I hope that in ensuing discussion we can air all of these concerns and perhaps alleviate them to a certain extent. But mainly, the real task is still ahead: to design the system that will come into effect in 2001 in such a way that it retains the best of MIT's current system while at the same time making freshman orientation to MIT a smoother and even more rewarding experience. I hope that many faculty, especially those currently most concerned, will join in this effort.✣

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TEACH TALK

Something to Celebrate

Educational Expert Diana Laurillard Speaks at the Dedication of the Teaching and Learning Triad

Lori Breslow

Because so many of our achievements as teachers and educators are not tangible, a concrete *thing* we can point to as a symbol of our commitment to teaching and learning is a cause for celebration. So it was on September 28th when MIT dedicated the Teaching and Learning Triad, a group of three contiguous classrooms in Building 9 specifically devoted to new, innovative educational endeavors.

The classrooms of the Teaching and Learning Triad include Learning Network Central (LiNC, 9-057), a distance learning facility; the Ford Motor Company Virtual Design Studio (9-152), which allows MIT students to interact in real-time with Ford engineers in Dearborn; and the Stephen P. Kaufman (1963) Family Classroom for Instruction in Teaching (9-151), which will be used for a variety of activities to help MIT faculty and TAs improve their performance in the classroom.

Part of the program to mark the opening of the Teaching and Learning Triad was a videoconference with Diana Laurillard, Pro-Vice-Chancellor and Professor of Educational Technology at the Open University in the UK. Laurillard was invited to participate in the dedication of the Teaching and Learning Triad on the strength of her book, *Rethinking University Teaching: a Framework for the Effective Use of Educational Technology* (Routledge, 1993). When so much of what is written about education is either politically inspired or intellectually insipid, Laurillard's work is solid scholarship. She has much to say about higher education both on the micro level – that is, how it takes place in the classroom – and on the macro level – that is, the role of the university as social institution and as source and allocator of resources. This *Teach Talk* presents some of the key ideas found in *Rethinking University Teaching;* a transcript of Laurillard's address at MIT and clips of the videoconference are available at the Teaching and Learning Triad Web page <http://caes.mit.edu/mvp/triad/>.

* * *

Laurillard's book is sophisticated, rich, complex. She grapples with the big questions: What is the nature of academic knowledge? What do we know about how students learn? How can we wisely invest both our time and money in educational technology? To read Laurillard is to get a crash course in what we know about how to teach. In one volume, she offers the reader both an overview of the best in educational research, and a common-sense guide to teaching well. For me, *Rethinking University Teaching* was important in three ways: it reinforced my belief in the roles and responsibilities of teachers vis à vis their students; it helped me refine my thinking about methodological issues; and it broadened my understanding of the challenges associated with the use of educational technology.

The Responsibility of the Teacher

The core idea upon which Laurillard's work rests is that the aim of university teaching is to make student learning possible. At first blush, that notion may seem both self-evident and overly simple. But think of its implications. It means, as Laurillard argues, that much, if not most, of the responsibility for student learning sits squarely on the shoulders of the teacher. It implies that the job of the teacher is more than simply providing content. The instructor needs to consider the range of things to be learned in the classroom (e.g., skills, perspectives, approaches) and he or she must determine how best to achieve those learning goals. It means, too, that when students don't learn, we can't fall back on tried and true excuses: today's students aren't as smart, or hard working, or well prepared as their predecessors; they don't know how to manage their time well; they're not as motivated to succeed as young people once were (or, the updated version of that sentiment, they're only motivated by the desire to make money). All that may or may not be true, but if we are to understand the roots of students' failure to learn, Laurillard argues, we must first look to ourselves.

And here is one of the strengths of *Rethinking University Teaching:* Laurillard provides a blueprint for teaching well. In the words of one reviewer, "the book...is a master class in higher education...." Although the

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thrust of *Rethinking University Teaching* is on how to design educational technology, in fact, what Laurillard offers can inform the learning process no matter if one is designing an entire curriculum, a whole course, a single class, or an interactive computer program.

The Importance of Methodology

Laurillard is clear: The way to good teaching is not through theory, but rather through methodology. The goal for educators is to be able to bridge that chasm between what students know and/or are capable of doing, and what we want them to understand and/or have the skill to accomplish. But Laurillard writes, "We do not have a learning theory or instructional theory complete enough to perform that trick, and I even doubt that such a thing is impossible." (p. 183) Yet, although "we may not be able to determine what ought to be done," she writes, "...we can optimise what we ought to be doing." (p. 183)

Laurillard's own approach to optimizing teaching and learning may appear at first to be overly complex, but my sense is that her methodology not only goes a long way toward guaranteeing pedagogical success, but also to assuring that time spent on the activities associated with teaching (including, e.g., planning lectures or preparing exams) is used as efficiently as possible.

In what is surely one of the most abstract discussions in the book, Laurillard maintains that to teach well we must understand something about the nature of academic knowledge, a kind of learning, she says, that is distinctly different from "everyday knowledge." The latter is contextualized, meaning it cannot be separated from the situations in which it is used. Academic knowledge, on the other hand, has a second-order character; it is knowledge about knowledge. Because it is mediated by the instructor, "undergraduates are not learning about the world directly, but about others' descriptions of the world," Laurillard explains. (p. 5) This has important implications for what we expect students to do with academic knowledge. Using as an example the teaching of Laplace transforms, Laurillard writes:

We have to help students not just to perform the procedure, but also to stand back from that and see why it is necessary, where it fits and does not fit, distinguish situations where it is n o t , i.e., carry out the authentic activities of the subject expert. (p. 18)

So we must begin, Laurillard argues, with the goals we have for the class; these she calls our learning objectives. But it is not enough, she writes, to simply carve out a topic from the totality of knowledge that defines any discipline (e.g., "students are to understand Newton's Third Law"). Instead, to be effective, a learning objective must provide the instructor with a way to answer the questions: How will it be known "if the students do understand, appreciate, or see in a new way? What would count as evidence that they do understand?" (p. 183) Framed in this way, learning objectives guide the instructor to designing an approach to learning and constructing a class environment that allows students to acquire the kind of higher-order thinking skills that we want them to master.

Implicit, of course, in the question, "How will you know if the students understand?" is the question, "From what point are students beginning?" This is another crucial piece of Laurillard's argument. She writes, "It must be clear that it is impossible for teaching to succeed if it does not address the current forms of students' understanding." (p. 187). While *Rethinking University Teaching* provides an excellent overview of the educational research on student learning, Laurillard is savvy enough to realize that the majority of university faculty have neither the time nor the inclination to delve deeply into that literature. Nor are they going to become their own educational researchers.

Yet, every instructor has data at his or her disposal that provides a picture of his or her students as thinkers and learners. Exams and problem sets can be mined in order to identify common problems in understanding. Talking to students – even informally – can be a source of information. TAs can provide feedback on students' progress. (Laurillard cites an interesting finding from research that there are usually only a handful of mistakes that all students make in trying to understand some fundamental concept in a particular discipline. Citing an example from psychology, she notes students at first often misinterpret "short-term" memory in light of the kind of recall they're familiar with, not with "the theoretical concept that spans only fractions of a second.") Finally, Laurillard asks us to remember the places where we ourselves struggled with core concepts in our disciplines, for those memories, too, can be a source of information about where students may be faltering.

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If we can identify common mistakes in apprehension, simplistic conceptions of the topic, possible errors in logic, or confusion over definitions, we can construct our lessons in ways that can circumvent these problems. Understanding the nature of the knowledge we provide, the specific objectives we want to meet, how we will identify whether or not we meet those objectives, and the nature of our students' thinking, Laurillard argues, will all lead to stronger teaching.

From these pieces she produces a template for teaching design, an analytical prop, as she calls it. This template consists of decisions the instructor must make in the course of constructing a plan for what he or she will do in the classroom. In a simplified version, Laurillard's five-step template asks instructors to:

- create a plan for presenting the material (e.g., decide on the main point to be made, examples to be used, definitions to be included);
- examine the plan against what are likely to be students' misconceptions or errors;
- modify the plan based on the above analysis;
- ask students to reflect on the comparisons between theirs and the teacher's conceptions;
- refine the interaction between the teacher and the learner based on this further feedback;

As Laurillard herself writes of this approach:

It may look lengthy and complex...but the learning process itself is lengthy and complex, and this analysis amounts to a considerable simplification. Once internalised it becomes more automatic and skilled....(p. 194)

The Challenge of Designing and Using Educational Technology

The third contribution of *Rethinking University Teaching* is Laurillard's extraordinarily thorough treatment of the utilization and development of educational technologies. Covering audio-visual media, hypermedia, interactive media (e.g., simulations), adaptive media (e.g., tutorial programs), and discursive media (e.g., videoconferences), Laurillard analyzes each in light of its ability to contribute to teaching-learning objectives. Can the medium help the teacher describe an idea he or she wants to communicate? Can it aid the student in describing the conception? Is it useful in helping the student achieve a goal? Can it provide the student with feedback on his or her attempt to master some skill?

Laurillard makes it clear she believes decisions about educational technology should be driven by teaching aims rather than the other way around. "Vast sums are made available to investigate the best way of using computers," she writes: *where the subject matter taught is incidental. The more rational approach, seldom adopted, is to offer vast sums to investigate the best way of teaching a particular topic, and through that to fund the use of computers as an incidental part of that strategy*. (p. 7)

Because of the lack of research into the connection between how specific educational technologies can advance particular kinds of learning, Laurillard says the best we can do is to combine our understanding of learning objectives for a given topic with what we know about the strengths and weaknesses of the different media to make an informed guess about how specific technologies can be used most effectively.

Laurillard concludes *Rethinking University Teaching* with a sweeping examination of what it will take to develop and implement new educational technologies. She outlines the need for pilot programs, staff training, and resources to assess and evaluate how effective a specific medium is in reaching its goals. "We need to learn the lessons of each implementation," she writes, "and then use those lessons learned." (p. 8) She wishes for an organizational infrastructure that allows good teaching to be done without the impediments that have so far marred its development. And, in the end, she locates institutions of higher education within the social and political contexts in which they operate, and she asks us to work toward demanding those systems, as well, provide the support that is needed to enable teachers to make student learning possible.

I have only scratched the surface of the wealth of information available in *Rethinking University Teaching.* If Laurillard is to be faulted for anything, it is for the embarrassment of riches she offers the reader. This is not an easy book to read or digest, and it is liable to make those of us who are trying to do our best by our students feel either completely overwhelmed or woefully inadequate. But if we can take even one piece of advice Laurillard gives us, or follow even one tactic she suggests, we will have already come a step closer to improving our work as teachers.✣

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A New Kind Of Department To Bring Biological Science Into Engineering

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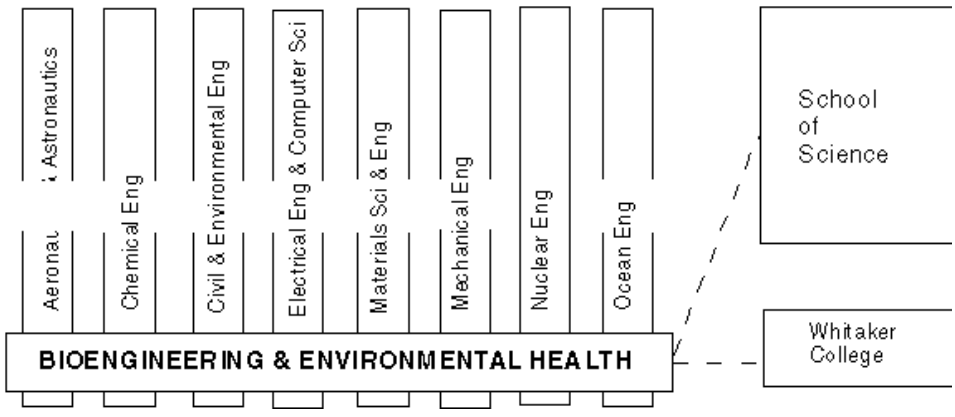
relevant contributing disciplines. Precisely this sort of process has, in fact, been proceeding at MIT for the past several years, and has culminated with the creation within the School of Engineering of a new educational entity to carry out educational curricula combining engineering and biology: The Division of Bioengineering & Environmental Health [BEH]. The name of this Division, as will be elaborated below, signifies the breadth of applications arising from marrying engineering and biology at a fundamental level, including technologies affecting human health from both medical and environmental perspectives as well as biology-based technologies unrelated to human health. The purpose of this article is to describe the structure of the Division, the intellectual motivation for forming the Division, and the process involved in the Division's establishment.

What Is The Division?

Many of the faculty involved with the discussions which led to formation of the Division feel an acute need for formal recognition of an ever-increasing load of teaching and administrative effort devoted to bioengineering efforts which cross department boundaries [see "A Modest Proposal for Biomedical Engineering Education," *MIT Faculty Newsletter*, Vol. IX No. 2, Oct/Nov 1996]. They believe that bioengineering and environmental health have evolved to the point of needing a stand-alone faculty unit, which may eventually evolve into a full department at MIT. They agree that biology must be brought into contact with traditional engineering disciplines broadly, and yet in turn be continually informed by ongoing advances in the traditional disciplines. Engineering Dean Robert Brown thus proposed formation of a "Division" within SoE, possessing department-level status, attributes, and prerogatives but which is joined in matrix fashion with the departments themselves. He further proposed that the existing Division of Toxicology be moved from the Whitaker College to join Bioengineering to further strengthen both the applied science foundation and the base of applied problems. This structure captured the philosophical vision of the faculty currently involved in teaching and advising in bioengineering and it was thus approved by the MIT Corporation to begin on 1 July 1998.

The Division of Bioengineering & Environmental Health will be composed primarily of what are termed "2-Key" faculty, i.e., faculty who will commit their time and efforts roughly equally between a core Department and this Division. In most cases, this will be characterized by a formal 50%/50% split of responsibility for a faculty member's academic salary, teaching duties, and administrative responsibilities. In some others, which should be a minority as the Division progresses, there may be formal 100% responsibility for a faculty member's academic salary by a Department (or the Division) but the level of teaching duties and administrative responsibilities committed toward Division goals will be expected to be similarly substantial.

In the initial start-up phase, these faculty will come by partial transfer from School of Engineering or Science Departments or by full transfer from the currently-existing Division of Toxicology (which will merge with BEH). New faculty can be hired into the Division in "2-Key" manner with Departments mutually interested in the individual's research area and capabilities, with responsibility for promotion and tenure decisions again equally shared. The Division Director (or Co-Directors during the beginning period, reflecting the merging of bioengineering and toxicology faculties) serves as a Department Head on the School of Engineering Council. Schematically, this interrelationship between the Division and the School of Engineering Departments can be depicted as follows:



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A New Kind Of Department To Bring Biological Science Into Engineering

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The arrangement for faculty from the School of Science, and possibly Whitaker College, requires connection outside the School of Engineering, and so will be accomplished in an individual manner for now.

We plan to start with on the order of 20 faculty in BEH, with intention of growing to a size of 30-40 within the coming decade. Examples of research program areas currently directed by faculty anticipated to join the Division at the initial opportunity include molecular design of therapeutics and biomaterials; modeling and measurement of bio-molecular, cellular, and tissue structure, properties, and function; dynamics and control of physiological systems; cell culture biotechnology and tissue engineering; computational biology; drug, toxin, and carcinogen transport, metabolism, and mechanisms of action; primary causes of genetic changes; pathogen transmission, infection, and monitoring. Building on these areas, exciting additional opportunities beckon faculty working at this engineering/biology interface, including computational biology and functional genomics (i.e., physiological phenotypic correlates for genome-based analysis); environmental genomics (i.e., physiological phenotypic correlates for gene-environment interactions); biological synthesis of new materials for non-medical applications; biomolecular motors and machines; *in vitro* surrogate toxicology and pharmacology; micro- and nano-biotechnologies; and biochemical microscopies. Some of this research, though certainly not all, is fostered through the Center for Biomedical Engineering, the Biotechnology Process Engineering Center, and the Center for Environmental Health Science.

Degree programs are planned at both the undergraduate and graduate levels, with emphasis on developing a new core curriculum combining engineering and biology while maintaining strong connection to a core discipline. At the undergraduate level, a BS Minor degree program in Biomedical Engineering currently exists (administered by the Center for Biomedical Engineering before the creation of BEH) and an analogous minor in Environmental Health is being implemented. Some commonalty in certain aspects of the core coursework between these two degree programs is anticipated. Five-year BS/MS degree programs, in which a student would obtain a BS degree in a traditional discipline and an MS degree in Bioengineering or Toxicology, are also envisioned. We do not expect a Bachelor of Science major degree to be offered by the Division, until and unless there is sufficient core disciplinary material at the undergraduate level to warrant such programs. Based on current assessment of student interest, we can anticipate that these Division undergraduate degree programs may grow to a combined enrollment of more than 100 students/class.

Degree programs are planned at both the undergraduate and graduate levels, with emphasis on developing a new core curriculum combining engineering and biology while maintaining strong connection to a core discipline.... Five-year BS/MS degree programs, in which a student would obtain a BS degree in a traditional discipline and an MS degree in Bioengineering or Toxicology, are also envisioned.

At the graduate level, a Ph.D. degree program in Toxicology currently exists, and an analogous one in Bioengineering is being planned for a fall 1999 start. As with the undergraduate degree programs, there should be some commonalty in certain aspects of the core coursework. Our initial conception is that students will enter into a core set of Bioengineering and/or Environmental Health courses that combine engineering analysis and synthesis approaches with central aspects of molecular and cellular biology and physiology, preparing for a dedicated doctoral qualifying examination. In addition, each student would be required to complete a graduate minor in a core Departmental discipline, for depth in a particular field of traditional study. Thesis research would, of course, be conducted under the supervision of

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A New Kind Of Department To Bring Biological Science Into Engineering

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faculty working at the engineering/ biology interface. We anticipate that these Division graduate degree programs will grow to a combined enrollment of at least 30-40 students/ year. Also at the graduate level, minors in Bioengineering and/or Environmental Health can be envisioned to formally incorporate training in this field within Ph.D. degree programs in other disciplines. These minors might involve another 20-30 students/year.

At both the undergraduate and graduate level, hands-on laboratory experience in experimentation and/or computation emphasizing quantitative measurement and modeling of biological systems in terms of fundamental physical and chemical processes will be emphasized in the curricula as well as in research projects.

Intellectual Motivation for the Division

The modern issues regarding education at the biology/engineering interface at MIT today are very similar to those MIT faced at the chemistry/ engineering interface around the turn of the century. In the late 1800s, the field of chemistry underwent a dramatic shift – chemists began to focus on the quantifiable aspects of chemical phenomena, and chemistry moved from a science of observation to one of prediction. At the same time, industrialization in the late 1800s created a demand for engineers with a knowledge of chemistry. Course X, Chemical Engineering, was initiated in 1888 as a Division in the Chemistry Department, and evolved as a discipline here as the new quantitative chemical sciences (physical chemistry and thermodynamics) along with the cutting edge engineering sciences were incorporated into the curriculum. Chemical Engineering finally became a separate Department in 1920, with a curriculum that defined the new discipline. MIT is recognized as the birthplace of chemical engineering.

One of our guiding concepts, then, is that we will create curricula in which biology and engineering are taught as simultaneously and synergistically as possible, rather than biology being merely added on top of an engineering background. We aim to emphasize fundamental aspects of analyzing and synthesizing biological information in an integrated manner across the full hierarchical range of scale – from molecular to cell to tissue to organism – instead of focusing on specific applications.

The remarkable changes which occurred in chemistry in the late 1800s and the impact on engineering are paralleled in modern times by a similar revolution in biology. MIT has long played a leading role in translating biological advances into technological applications, essentially defining the field of biotechnology, profoundly influencing industries as diverse as pharmaceutics, agriculture, and synthetic chemistry. Now, the advent of molecular biology has provided the tools to undertake mechanistic investigations of the behavior of cells and higher organisms, and, like chemistry 100 years ago, biology is rapidly moving from a science of characterization and categorization to one of quantitative analysis and mechanistic understanding. Very early on, the MIT Biology Department had the vision to focus hiring in the exciting new area of molecular biology, building a premier department and winning world acclaim. Biology thus now stands poised to become a foundational science, along with physics and chemistry, for engineering.

The field of toxicology at MIT also dates back to the late nineteenth century, and has origins in the Department of Civil & Sanitary Engineering (which is also the origin of the Department of Biology). The early emphasis was on sanitary chemistry and microbiology and identified for the first time the importance of biological toxins in food and water. Thus, toxicology at MIT originated in the School of Engineering and the current move is a return to its origins. The current program began in the early 1960s, which created the emphasis in molecular toxicology and led to its standing as a world leader in research and education.

MIT again is poised to play a leading role in determining the direction of how a scientific revolution advances the field of engineering. Just as at the

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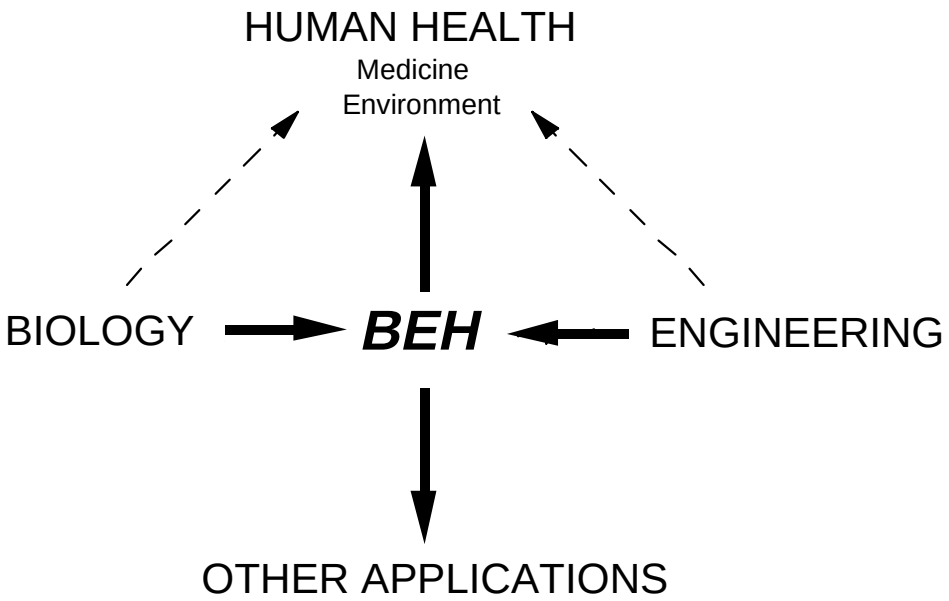
turn of the century theoretical chemistry was adopted as a sound basis for an educated (chemical) engineer at the urging of the Chemistry Department, a course in modern biology was adopted in 1991 as a requirement for all MIT undergraduates at the urging of the Biology Department.

One of our guiding concepts, then, is that we will create curricula in which biology and engineering are taught as simultaneously and synergistically as possible, rather than biology being merely added on top of an engineering background. We aim to emphasize fundamental aspects of analyzing and synthesizing biological information in an integrated manner across the full hierarchical range of scale – from molecular to cell to tissue to organism – instead of focusing on specific applications. The engineering/biology combination thus forms as a coherent whole *before* being directed toward an application field, as illustrated in the schematic below. The continued inclusion of mathematics, physics, and chemistry as part of the engineering science-base should be taken implicitly.

At the same time, we are convinced that these new curricula should remain firmly grounded in the core Departmental disciplines that have served MIT so well in flexibly responding to new fields that arise and evolve. This conviction is the cornerstone of our plans for the structure of our new academic unit, the composition of its faculty, and the organization of its degree programs.

Previously, training along these lines has occurred along a variety of individual avenues within traditional engineering and science Departments as well as more specialized curricula such as biomedical engineering and toxicology. However, we believe that today all these fields represent diverse directions for application of students who have learned how to solve problems combining engineering perspective and approach with the knowledge and tools of modern molecular biology. We believe by unifying the science/engineering base underlying these disparate applied avenues MIT will again define a new field of engineering.



How BEH Came to Be

A group of faculty from ChE, EECS, and ME – the Departments which have typically seen the bulk of the numbers of undergraduates interested in bioengineering – began to meet informally in 1991 to discuss educational issues, and by 1993 this group evolved into an *ad hoc* interdepartmental Biomedical Engineering Curriculum Committee, with members drawn from a broad spectrum of Engineering faculty and from HST. This committee evolved to include members from the School of Science, and developed a Minor in Biomedical Engineering as MIT's first interdepartmental Minor degree. The BME Minor was approved in May 1995 by a vote of the MIT faculty and over 70 students are enrolled in or have completed the BME Minor. Since its inception, the BME Minor has been run by the Center for Biomedical Engineering, which is primarily an inter-Departmental research center possessing no funding to support curriculum development, faculty time, teaching assistants, laboratory supplies, etc. Faculty time spent advising students enrolled in the minor has been essentially *pro bono*, on top of time spent on regular departmental advising of undergraduates.

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As student and faculty interest in biomedical engineering, and bio-engineering more broadly, increased dramatically at MIT following the creation of the Center for Biomedical Engineering, the higher administration responded in 1996 by forming an Institute-wide committee to define the need for new educational programs at the engineering/biology interface. Members of this committee were Professors Alan Grodzinsky (EECS; Chair), Richard Cohen (HST), Martha Gray (HST), Eric Grimson (EECS), Richard Hynes (Biology), Douglas Lauffenburger (ChE), and Steven Tannenbaum (Toxicology). Its report was received enthusiastically by the Dean and Council of Department Heads of the School of Engineering, who then proposed formation of a new Department-level Division within SoE possessing tenure-track faculty positions cutting across existing Departments with the goal of continually invigorating bio-engineering teaching and research with state-of-the-art knowledge and approaches in the other disciplines and vice versa.

Logistical details of this Division were specified by an Implementation Committee composed of Professors Robert Armstrong (ChE; Chair), Elazer Edelman (HST), Lorna Gibson (MSE), Jeffrey Shapiro (EECS), Gerald Wogan (Toxicology), Ioannis Yannas (ME), Grodzinsky, Lauffenburger, and Tannenbaum. Its establishment was then formally recommended by Engineering Dean Brown and approved by Academic Council, Provost Joel Moses, and President Charles Vest. Because of the move of the faculty from the Division of Toxicology in Whitaker College into the new BEH Division in the School of Engineering, a Process Committee chaired by Claude Canizares (Physics) was convened by President Vest to assure that the procedures followed in this were proper according to MIT policies.

The formation of BEH, aimed at the fundamental disciplinary interface between engineering and biology, brings an important new thrust to MIT's portfolio of programs related to human health as well as a broader range of application fields. In order to minimize concern about overlap, the mission of BEH has been defined in strong complement to that of the existing joint program between MIT and Harvard, the Division of Health Sciences & Technology in Whitaker College.

How the Mission of the Division of Bioengineering & Environmental Health Differs from that of HST

The formation of BEH, aimed at the fundamental disciplinary interface between engineering and biology, brings an important new thrust to MIT's portfolio of programs related to human health as well as a broader range of application fields. In order to minimize concern about overlap, the mission of BEH has been defined in strong complement to that of the existing joint program between MIT and Harvard, the Division of Health Sciences & Technology in Whitaker College. These missions have been set out as follows:

BEH: to organize education and research that combines biology and engineering, with special emphasis on biomedical engineering, toxicology, and pharmacology.

HST: to organize education and research in health sciences and technology, with special emphasis on collaborative programs between MIT and Harvard Medical School.

The combination of these two complementary educational programs puts MIT in a position of great strength to have a major impact in all fields where engineering interfaces with biology or medicine. The process of defining the mission and implementation of BEH via discussions with faculty possessing diverse interests ensured a strong and multifaceted program emerged, one we feel will endure and set the standard for education in this important new discipline.✣

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Teaching the Humanities at a Technological Institution

John Hildebidle

This article was derived from a lecture given at the University of Limerick, Ireland, delivered on October 5, 1994.

Being a thoroughly modern academic, as soon as it was settled that I would be addressing the subject announced in my title, I raced to my p.c. and tapped into the "Information Superhighway," hoping to obtain some "hard data," some numbers with which to obfuscate. But – as is not infrequently the case – technology failed me, and so I am driven back on more anecdotal and impressionistic sources, derived from the experience of teaching for more than a decade at what likes to think of itself as, after all, not AN institute of technology, but **THE** institute.

I want to comment on three aspects of my work at MIT. First, the peculiarities of teaching the humanities at a technological institution. Second, the advantages of doing so. And third – and I must admit, it is my most important and even polemical point – the necessity of such an enterprise.

First, peculiarities. The most pronounced and pervasive of which is a continuous feeling of being a distinctly odd duck. It is something you can play with (if you have, as I do, a tendency to be impish, in manner if not in size). When asked, "What do you do?" I can honestly answer, "I teach at MIT." And then the plausible hypotheses are very nearly visible in the eyes of my inquisitor: physicist? computer whiz? nuclear power engineer? hotshot biogeneticist? I wait a bit, to let the misconceptions simmer, so to speak, and then say, "I teach literature – English, American, and Irish literature – at MIT." The surprise and bafflement is immediately visible, either in a certain expression (bafflement at war with disbelief) on the face or verbally: "They do that there?"

The real fly in the ointment is that my colleagues unabashedly believe that they are fully capable of determining what I should teach and how I should teach it, and are prone to inventing systems of requirements which explicitly force my overworked students to carve out time from their menu of scientific and technical course work to "experience" the humanities. Or, worse yet, to be "exposed" to them, as though literature, philosophy, history, music, and languages were some beneficial microphage.

Yes, they do, and (for complicated historical and sociological reasons) they always have done. Which does not alter the fact that, in the world of my profession, MIT is "a place of little scholarly reputation." But it does mean that I have been blessedly spared participation in the *starting* of a humanities program at an institution that fundamentally thinks of itself as technological. That, as I understand, is thankless work indeed.

However, it is the case that none of my students and few if any of my colleagues really know what it is I do, as a scholar. At least once a term, an earnest student seeks me out after class and asks, "What do you do for *research*?" I try, briefly, to explain. Most recently, I would say something like, "I read and think about and write about twentieth century fiction written in English by Irish men and women." To which the student replies, "Yes, but what do you do for **research**?" You could see him trying to translate what I had said into the world of lab equipment, lasers, and state-of-the-art computer modeling to which he was in the process of being introduced. We had what is called a communication problem.

As for my colleagues, they pay lip service to what is glibly called "the Role of the Humanities," which seems to be a blend of providing a way for high-powered scientific workers to relax and offering some ill-defined "moral instruction." But in either case, the humanities are "soft" and only marginally relevant. And I must admit to some degree I concur, at least as to relevance in the pragmatic sense of the term. When I climbed on the plane to fly over the Atlantic for a year's sabbatical in Ireland, I must admit I didn't ask myself whether the engineer who designed the aircraft had recently read *Ulysses* or *War and Peace* or any of Kate O'Brien's novels.

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The real fly in the ointment is that my colleagues unabashedly believe that they are fully capable of determining what I should teach and how I should teach it, and are prone to inventing systems of requirements which explicitly force my overworked students to carve out time from their menu of scientific and technical course work to "experience" the humanities. Or, worse yet, to be "exposed" to them, as though literature, philosophy, history, music, and languages were some beneficial microphage.

So: oddity number one is being a sort of missionary to foreign parts, if you will, surrounded by "aboriginals" who may intend no harm or ill will but who can offer little useful advice. And there are so *many* of them. Maybe the correct metaphor is that of a counter-insurgency operative, an innumerate "mole" in the very heart of the techno-jungle. Whenever one of those Marine Corps ads ("the few, the proud....") crosses my field of vision on TV, I think of the Literature Faculty, which numbers 12 (I think). The Physics Department has, I'd guess, more administrative and secretarial staff than that. We offer some 30 courses a term (in part by a kind of shell-game in which we employ part-time and "visiting" faculty) and enroll perhaps as many as 600 students a term; which is about the enrollment of the two required freshman math courses at MIT. We have no graduate students, no post-doctoral students, only one secretary for the entire department (every so often I am reminded how many other MIT faculty of professorial rank have a secretary all of their own).

I like to play on my own oddity – pre-empting satire or hostility, in a way, by reminding my classes that I am one of a handful of people at MIT who does not "speak calculus." But then again it feels odd, to walk into a classroom with a blackboard covered with formulae, left over from some prior instructor's work, and to be the one person in the room who hasn't a clue what the formulae say. A few more quick measures of the relatively peripheral status of at least my corner of the humanities. MIT has an undergraduate enrollment of some 4500. Of whom, at the moment, eight are Literature Majors. By contrast, Mechanical Engineering claims a central role in the lives of some 445 students; while Electrical Engineering (which includes under its umbrella computer science) has 950 majors, so I'm told.

Enough grousing, surely. What of the advantages? Because it draws so heavily on the governmental and industrial support, MIT is relatively wealthy, although like all American colleges and universities, budget-cutting is the fashion of the day. Which puts my department at a disadvantage. Even were we to cut *all* of our budget for support services, it would accomplish little in terms of absolute savings. The amount allotted to me for supplies, xeroxing, phone calls, and book purchases is, by the standards of the Institute, a pittance.

My students may be confirmed non-readers whose busy (not to say overloaded) schedules allow little time for contemplation and who are astoundingly unsophisticated as analysts of literature, but they come from among the very brightest late adolescents in the entire world, and (because of the particular nature of the requirements of the Institute) they take my classes by choice, rather than by compulsion – a great blessing indeed. I pity my peers at other institutions who suffer as part of the staff of those monstrous catch-all "required freshman humanities courses" which seem terribly much in fashion, these days. And because I do not participate in the cultural habits of problem-sets, number-crunching, competitive grade-curving which is usual at MIT (more about that in a little bit), I can offer classes which are not only humanistic but humane – small, intimate, personal, and (I hope) pleasurable. All of which contributes – if not to better learning – at least to a different *style* of learning from the large lecture halls and laboratories where the scientists and engineers ply their pedagogical trade.

And one more thing, about that lack of sophistication: Some years ago, I taught for three years at Harvard, where I also earned my degrees. That institution is full of students who pride themselves – with varying degrees of accuracy – on their sophistication. It can be immensely frustrating to have to re-invent the intellectual wheel, so to speak, as one often does in Humanities classes at MIT – to restate and prove the very intellectual bases of things like literary analysis. But it can be just as frustrating to cut through layers of pseudo-literacy. My students at MIT have a refreshing way of unabashedly asking "obvious" but richly fundamental questions.

Let me indulge in an anecdote which will make sense only if you have read Nathaniel Hawthorne's *The Scarlet Letter*, which as you may know tells the story of an odd love-triangle, between the voluptuous Hester Prynne, her sinister husband Roger

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Chillingworth, and the rather anorectic Puritan clergyman Arthur Dimmesdale.

The plot of the story sounds like a television melodrama, but Hawthorne's prose style quickly establishes a more solemn (not to say sleep-inducing) plane of reference. This is "Art," after all, not *Beverly Hills 90210*. One day, as a class and I were plodding our way through metaphoric thickets in talking about the book, one young fellow raised his hand and rather tremulously asked, "You know what I can't figure out? Why would a powerful and beautiful woman like Hester ever fall for a simp like Dimmesdale?" The class laughed, but I was compelled to point out that Hawthorne had carefully constructed his novel to avoid that very question, since the tale opens long after Arthur and Hester have fallen for each other, and in fact after the birth of their illegitimate child. Which in turn let us talk – rather productively, I think – about how the **construction** of a work of fiction, the apparently simple-minded issue of where the author chooses to begin and end her/his story, can in itself have a powerful metaphoric and communicative force. A good conversation about the ways in which **how** you say something forms (or deforms, it may be) *what* you say, was generated about a book that we all found more than a little boring, and by a question which no cosmopolitan young Harvard intellectual would have dared ask.

I will resist the temptation to proliferate anecdotes. In sum, bright students, an ability (even the necessity) of dealing with first issues rather than flashy epiphenomena: that, to my mind, offsets a peripheral status, the lack of a first-rate library (Harvard's library is only ten minutes away, in any case), and the like. But what of my third point: the *necessity* of the Humanities at a technological institution?

At times, it is possible to be drawn into that discussion on more-or-less pragmatic grounds; which is, as we would say in American slang, a no-win proposition. We are back to the designer of that airplane again: studying literature does *not*, I think, make chemists better chemists or nuclear engineers build safer reactor housings. Then again, about 10 years ago I knew a woman who was pretty highly placed in the personnel office of one or the other of Boston's plethora of computer-engineering companies. She insisted that her company, when they needed a new software engineer, always went looking for philosophy majors who had a modest computer literacy. Or historians. Or even poets. The computer-science majors, they had found, were unable to approach problems in fresh and productive ways; the poets *had* to do so, since they had not been drilled and drilled and drilled on the old "wisdom" which had lead to the problem in the first place. So I may well be wrong about the pragmatic value of the humanities. An extended article by a sometime colleague of mine, Professor James Engell of the Harvard English Department, in *Harvard Magazine* recently, avers that humanists who go on to law school **and** (more surprisingly) medical school do rather better than their more programmatically, pre-professionally-trained contemporaries.

I certainly don't want to argue that the humanities produce more moral beings. Our recent governor was a classics major, at Harvard no less. The sometime president of the Massachusetts State Senate (an Irish-American tenor, as it happens) can still read classical Greek. The first man, however, has proven to be somewhat "ethically-challenged" about the problems of the so-called "underclass." The latter is reputedly one of the most crooked politicians to have played a role in a state which is famous for crooked politicians. Somehow reading Homer and Aeschylus did not make them better men, by any reasonable moral measurement. Gerry Adams, much in the news from Ireland of late, was, at one point, a writer of fiction. There are many who now, despite his claims to be the author of an historic peace, consider him to be a terrorist and murderer.

But as I hinted before, I think that instruction in the humanities, especially when it engages the students in analytic conversation about literary works or historical problems, offers important (I would even say ethically and intellectually vital) training on the score of style. First, unlike technological and scientific education, which often finds itself in an horrific struggle to "cover" an ever-increasing, ever-complicating body of material, the humanities offer a kind of learning where more is not necessarily better, or faster is automatically much preferable to contemplative.

Let me be clear – I am not arguing for a kind of know-nothingism. If learning in the humanities is not inherently sequential, it is surely accumulative. The more poetry you read, the more richly and enjoyably

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Teaching the Humanities at a Technological Institution

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and comprehendingly you can read any individual poem. The more you know about the literary-historical and sociological and ideological forces at work at a particular moment in time, the more intelligible literary works arising from that moment will be. But it is also true (as I've tried, perhaps too facetiously, to suggest already) "beginners" need not keep silence.

Which produces two more important elements in humanities instruction. First, it need not be competitive (an aspect of technological learning, MIT-style at least, that is too often underscored in an atmosphere of "right" answers and grade-curves). Anyone can offer an idea; it may prove to be improbable or unproductive of further insight, but it need not for that reason go unheard. The wackiest ideas may turn out to be the most intellectually energizing.

Secondly, learning in the humanities, to delve into current jargon a bit, "empowers" students in a way that learning in the sciences may not. After all, the physics professor wrote the problem set, so he surely "knows the answers." But, as I have tried once to argue at great length, in a volume published of all things by the Harvard Graduate School of Business, some of the best questions in a humanities classroom are those to which the Professor does not "know" an immediate answer. It is possible and productive to put a humanities student *in charge* of her/his learning at a much earlier stage in the humanities than it seems to be in the sciences and technologies.

Which produces two more important elements in humanities instruction. First, it need not be competitive (an aspect of technological learning, MIT-style at least, that is too often underscored in an atmosphere of "right" answers and grade-curves). Anyone can offer an idea; it may prove to be improbable or unproductive of further insight, but it need not for that reason go unheard. The wackiest ideas may turn out to be the most intellectually energizing.

One (nearly) final point: insofar as humanities instruction often and inherently involves discussion and conversation, it is *personal* in a way that lecture-oriented technological instruction rarely is. Students can derive feedback from their teachers and peers immediately, not some days later, when the problem-set is returned, graded. They can learn to incorporate and respond to other ideas; or to defend their notions from the questions and responses of listeners. I suppose now I am abandoning my own demurrer, if that is the way to put it: there is, and no mistake, an ethical dimension to learning in the humanities: a message about the equality of many thinkers and talkers, the value of intellectual give-and-take, with the added force of learning how to distinguish valuable from shoddy, intellectually engaging from vapid.

Let me close with one more anecdote. A few years ago I was teaching a course that raced through the body of poetry written in English, more or less from Shakespeare to Seamus Heaney. It was a lively group of students, of intriguingly varied perspectives and backgrounds. In the class was a young man who did not speak once, during the entire term. The final essay fell due, and his appeared under my door on the expected day with a long, typewritten note appended.

My heart sank. I am impatient – to put it euphemistically – with requests for extensions of time or explanations of how "I was just too busy to do as well as I would have liked." At MIT, everyone is too busy, all of the time. I foresaw a disaster in the making, or at least some shopworn excuse.

So much for "what the professor knew." The note at home in Boston opened by saying "I always thought I knew what poetry was, a sort of rearranged prose. That's why I took this course." Full marks for honesty, at least. "But I was wrong." Hmmmm. Where is he headed? He now said, "Thank you for teaching me a new way to think."

The essay he submitted was lucid, precise, and well-organized. So he more than earned his A, and more than made my day. And gives me a terse way to round off these remarks: the humanities are important at *any* institution, whether technological or not, because they teach all of us (teachers and students as well) new ways to ***think.***✣

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Admissions Update

Class of 2002: Outstanding and Diverse

Marilee Jones

We in Admissions have just a few days left in our calendar to enjoy the fruition of our work – the Class of 2002 – before we begin the recruitment and selection of next year's freshman class. This small window is the perfect opportunity to share with the faculty a profile of the Class of 2002 as well as to provide a briefing on the challenges ahead for MIT Admissions.

The primary goal of the Admissions Office is to identify, recruit, select and enroll the most outstanding students – those best matched for MIT – in the world. This is not as easy as it might sound, because as the overall quality of the top students has improved, it has become increasingly difficult to select the best among them. Applicants today present a staggering array of activities and accomplishments unheard of a decade ago. For example, nearly 20% of this freshman class have been involved with a research project in the last two years of high school, an activity that would have been rare to see in 1985. The Admissions Committee must evaluate these profiles to determine which applicants have not only the preparation, but also the drive and ambition to be successful here. We want to admit students who will take full advantage of the MIT experience, who will participate fully in their own educational experience and who will ultimately use their MIT education to benefit society as a whole. Even with the most professional and effective admissions staff in the business, this is no easy task.

We believe we have met our primary goal with the new freshman class. Table 1 (P. 19), which compares the most commonly requested metrics of the entering class over the past five years, illustrates the increasing quality of the enrolling students with respect to test scores, applications, etc. A different perspective on the Class of 2002 is provided in the MIT Numbers table (P. 28) which offers views of a more personal nature. It is particularly interesting to note that while a full 97% of the freshmen listed a significant co-curricular activity in their last two years of high school (math team, science fairs, research, etc.) 60% of them have earned distinction in the arts during that same period (not interest or involvement in, but awards at the state, regional or national level!) and 44% were varsity athletes in at least one sport in high school. A full half of this class held the highest level of leadership we've seen in their clubs/ activities in high school. So much for the "narrow Techie" stereotype.

Table 2 (P. 20) takes a historical view ('82-'98) of a few metrics judging quality from an admissions perspective. I hope you will reflect upon these statistics during that student slump period between Columbus Day and Thanksgiving when the freshmen are struggling to meet their own internal expectations. If you begin to wonder how-the-heck some of them got admitted, remember that most will be fine in the end. (Besides, admissions NEVER makes mistakes....) We should all consider ourselves quite lucky to be at MIT because, frankly, students don't come much better than this – anywhere.

Currently, MIT Admissions is in an excellent position vis-a-vis our competition. We have the second highest mean SAT scores in the U.S., have the 4th or 5th highest yield of admits, have a 23% selection rate in 1998, down from 39% in 1993. But there are signs that we will face a few significant challenges over the next decade.

First, demographic patterns of 18-year-olds are changing nationally and this will place pressure on all colleges as they compete with each other for the best students. Currently, 30% of high schoolers are students of color. That percentage will increase considerably over the next decade, and, unfortunately, this group has historically had low interest in science and technology. Indeed, interest in the overall 18-year-old population in math/science/technology has been decreasing steadily and is now at an all-time low of 5%.

Finally – and most significantly for us – we have more competition from our direct competitors (Harvard, Stanford, Princeton, Yale, etc.) as they fight to attract *our* kind of student (middle/working class techies), offering more lucrative financial aid packages and other "value added" perks such as special housing or Jr. Year Abroad at places like Oxford. MIT has been able to compete well in this market environment to date, but the pressure will continue to increase over the next few years.

Admissions is a member of the Financial Aid Task Force. Headed by CUAFA Chair Professor Hal Abelson and Director of Financial Aid Stan Hudson, the Task Force convened this past summer to evaluate the possible repercussions of this increased market pressure. This committee will make its recommendations to the Academic Council in November. In the meantime, I want to assure you that the Admissions staff

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Class of 2000: Outstanding and Diverse

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TABLE 1: Enrolling Frosh Data 1994-98

	1998	1997	1996	1995	1994
Freshman Applications	**8250**	7836	8022	7958	7135
Freshman Accepted	**1890**	1938	1947	2113	2165
Freshman Enrolled	**1043**	1067	1071	1117	1098
Percentage Enrolled	**55%**	55%	55%	53%	51%
Male	**596**	661	623	647	665
Female	**447**	406	448	470	433
Percentage of Women in Class	**43%**	38%	42%	42%	39%
International	**83**	75	87	81	88
Afro American	**61**	64	74	66	73
Mexican American	**62**	55	67	58	60
Native American	**20**	26	15	5	10
Puerto Rican	**31**	33	32	27	23
Total of Four Groups Above	**174**	178	188	156	166
Percentage of Four Groups in Class	**17%**	17%	18%	14%	15%
Asian American	**305**	312	293	316	315
Percentage of Those Ranked Who Were Valedictorians	**36%**	35%	37%	35%	32%
Percentage of Those Ranked Who Were in Top 5%	**87%**	84%	84%	87%	84%
SAT-I Verbal Mean*	**706**	699	700	696	696
SAT-II Math Mean*	**753**	748	748	744	737
Percentage Indicating an Intention of Concentrating in EECS	**26%**	23%	22%	22%	20%

*Scores were "recentered" after the class of '95; '94 - '95 are recentered estimates.

has a well-organized and comprehensive recruitment plan in place to continue to both increase applications from the right students and to increase the yield of those admitted, a plan vetted by CUAFA. This plan involves not just Admissions personnel, but MIT students, alumni, ODSUE offices and faculty throughout the Institute. In fact, there were over 3,000 MIT people involved in the recruitment and enrollment of the Class of 2002.

Attracting the right students to MIT is most effective when it is an institutional process. We in Admissions organize much of the work, but ultimately students will enroll where they feel most comfortable, where they have had the best recruiting experience. I hope that in the coming years, we will all work together on opportunities designed to bring you the students of your dreams. In the meantime, there are small things you can do to help us find the right mix of students:

• Read freshman folders this January/February and then come for half a day to help us select the class. You will be surprised how much you don't know about high schools today.

• Let us know the names/sources of any outstanding summer programs for high school students. These are potential recruitment sources.

• Send Admissions the names of any high school students you might have heard about through your professional grapevine or have read about in your local newspaper whom you think might be a good match. We will take it from there, most likely arranging for an alumnus/a to make initial contact. We'll follow up and let you know the outcome.

• If your child just went off to college or is applying this year, send us copies of materials from other schools that you found particularly helpful to you as a parent.

• Supervise an RSI (Research Science Institute) student into your lab next summer and encourage that student to come to MIT. I'll brief you more on this program in a future issue of the *Faculty Newsletter*.

• Offer to visit a top magnet high school on behalf of MIT if you travel somewhere this fall.

• Invite my staff and me to departmental meetings or *ad hoc* lunch meetings to discuss admissions issues.

(Continued on next page)

Class of 2000: Outstanding and Diverse

Jones, from preceding page

I look forward to another year of even greater success and to working more closely with all of you. Please continue to communicate any thoughts, comments or concerns you might have throughout the year. And I hope that you really enjoy this new class.✣

[Marilee Jones can be reached at marilee@mit.edu]

TABLE 2: Comparative Metrics of Freshman Classes Entering '82, '89, '98

	'82	'89	'98
Freshman applications	5811	6698	8250
Freshmen accepted	1902	2018	1890
% admitted	33%	30%	23%
Freshmen enrolled	1109	1045	1043
Yield	58%	52%	55%
SAT Verbal Mean*	631	622	706
SAT Math Mean*	729	735	753
% enrolling - valedictorians	28%	33%	36%
% enrolling - ranked in top 5%	83%	85%	87%

*all scores have been recentered

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Faculty Invited to Leonardo Dinner Lectures

Keith Amonlirdviman

The MIT chapter of Tau Beta Pi (TBP), the national engineering honor society, is sponsoring the Fall 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. 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.

The fall opening lecture, entitled "Why I Don't Believe in Science and Engineering," was given by John Deutch on September 21. This lecture served to introduce this term's lecture series and was open to the entire MIT community. Below is a list of lecture topics that will be presented this fall.

09/24/98 "Myth, Memory, and the Declaration of Independence" by Pauline Maier, William R. Kenan, Jr. Professor of American History.

10/06/98 "The Athena Experience: what we learned and what we should do" by Steven Lerman, Class of 1922 Distinguished Professor of Civil and Environmental Engineering and Director of the Center for Educational Computing Initiatives.

10/13/98 "Building Quantum Computers" by Seth Lloyd, Associate Professor of Mechanical Engineering.

10/20/98 "An Engineer Goes to Washington" by Sheila Widnall, Abby Rockefeller Mauze Professor of Aeronautics and Astronautics.

10/27/98 "Developing Student Leadership at MIT: Combining Knowledge and Personal Effectiveness" by Phillip Clay, Assoc. Provost and Prof. of Urban Studies and Planning.

11/03/98 "Application of Science to the Study of Art Objects" by Robert Ogilvie, Professor of Metallurgy, Emeritus.

11/10/98 "Exciting Advances in Bioengineering" by Alan Grodzinsky, Professor of Electrical Engineering and Computer Science and Associate Director of the Center For Biomedical Engineering.

11/19/98 "How the Mind Works" by Steven Pinker, Professor of Cognitive Science and Director of the McDonnell-Pew Center for Cognitive Neuroscience.

12/03/98 "Music Interpretation: just the notes or more?" by Ellen Harris, Professor of Music.

Dinners are free and all members of the MIT faculty are invited to participate. Each dinner is from 6-8 pm in the West Dining Room of Ashdown House, the graduate dorm across from the MIT Chapel. For more information or to make dinner reservations, visit the Leonardo dinners Web page at <http://web.mit.edu/tbp/www/dinners> or contact me as the Leonardo Dinners chair, at <keitha@mit.edu>.✣

Final Report Generates Comments and Controversy

Hansman and Silbey, from Page 1

Whereas most mission statements are inherently conservative, reflecting what has been done in the past, our mission statement represents a departure from the past. The departure is the explicit articulation of the educational triad composed of academics, research, and community. The mission statement recognizes the importance of the community aspect of the triad, and it also seeks to show the breadth of educational activities at MIT.

This mission statement is paired with 11 principles that define MIT as an institution of higher learning. Not surprisingly, four of the principles were originated by MIT's founder, William Barton Rogers. Four more principles derive from the seminal Lewis Commission of 1949, a committee many have considered the prototype for the Task Force. The final three principles derive from the work of the Task Force itself: Principle 9, which describes "an integrated educational triad of academics, research, and community," Principle 10, outlining the merits of MIT's intensity, curiosity, and excitement, and Principle 11, the importance of diversity.

The Central Finding

The Task Force's central finding is that "the interaction among the [formal and informal aspects] of the student's experience is fundamental." The report goes on to describe the educational triad concept, already listed as one of MIT's basic principles, noting that to achieve excellence higher education must go beyond classroom learning: experiences in research and community activities should be recognized for their educational value, and they should take their proper place alongside academics as contributors to the learning that takes place at MIT. The need to bring about a closer relationship between formal and informal education underlies the rest of the report, and stands as the Task Force's main argument. The report notes that bringing research and community activities into the fold with academics will require a cultural shift at the Institute: "It is a shift from demanding separation of student life and learning to demanding they be inseparable, from a community divided by place, field, and status to a community unified by its commitment to learning, from keeping research, academics, and community apart to unifying the educational value each provides."

While it might seem unrealistic to expect a cultural shift to come about at a hundred-year-old institution as a result of one committee's work, it is significant that the committee's diverse membership was able to reach consensus on this point. Indeed, the Task Force report notes that the idea for the educational triad was brought to the group by the Student Advisory Committee, a group of roughly two dozen graduate and undergraduate students who worked in tandem with the Task Force and produced two reports underlining the need for integrating research, academics, and community.

The overall thrust of the report, however, is aimed at emphasizing the need to integrate academics, research, and community activities, and the organizational change that will be required to bring about that integration. Freshman housing is by no means the only sacred cow confronted by the Task Force: recognition for faculty involvement in community and research activities with undergraduates, the departmental and faculty governance structure, advising, orientation, campus planning, UROP, and management education are all covered by the report's findings and recommendations.

Some Findings and Recommendations

Space does not permit a complete listing of the report's many findings and the recommendations that follow from them. The overall thrust of the report, however, is aimed at emphasizing the need to integrate academics, research, and community activities, and the organizational change that will be required to bring about that integration. Freshman housing is by no means the only sacred cow confronted by the Task Force: recognition for faculty involvement in community and research activities with undergraduates, the departmental and faculty governance structure,

(Continued on next page)

Final Report Generates Comments and Controversy

Hansman and Silbey, from preceding page

advising, orientation, campus planning, UROP, and management education are all covered by the report's findings and recommendations.

One of the most sweeping changes now in the pipeline as a result of the Task Force's work is a major expansion of undergraduate research experience. The Task Force has recommended that all MIT undergraduates be expected to participate in research activities at some point during their undergraduate career. To accomplish this, the group recommends expanding UROP significantly, and creating a system of Freshman Advisory Research subjects (FARs) that would establish the value of research participation early on in the student's work and help address the need for more excitement in the first-year program.

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Another major change advocated by the report is a realigning of MIT's priorities vis-a-vis its campus community – which is composed not just of students residing on campus, but also of faculty members and staff. It is the Task Force's belief that notable strengths of MIT's community, including especially its living group system, help bring about much informal learning among students, but the community as it is now arranged does little to bring about faculty-student interaction outside the classroom. Many of the Task Force's recommendations are geared toward bringing about change in this aspect of MIT culture.

The uses of educational technology were also subject to much of the Task Force's discussion. In its report, the group argues for an experimental approach to educational technologies such as distance learning, proposing that the Institute undertake aggressive experiments designed to provide more information about the technology's potential while maintaining MIT's reputation for excellence. The report also calls for educational technologies to focus on educational benefits for students on campus.

Now that the Task Force has completed its review, the Institute is beginning the process of discussing and debating its findings and recommendations. Appropriately, the community will begin to come to terms with the need for change through both formal and informal activities. The regular meeting of the faculty will be one formal setting for discussing the report, but there will be other opportunities for wider input as well.

Although this is the end of the Task Force's work, in many ways it is the beginning of the Institute's. With hard work and perseverance, we can maintain MIT's position of excellence in higher education and be a model to others in the decades to come.✣

[John Hansman can be reached at rjhans@mit.edu; Robert Silbey can be reached at silbey@mit.edu]

A Little Housekeeping

Additional copies of the Task Force report are available from Anders Hove, staff to the Task Force, at Room 4-117. His e-mail address is <anders@mit.edu>. The Task Force's Web address is <http://web.mit.edu/committees/sll/>.

Academic Computing Resources For You and Your Students

Jeanne A. Cavanaugh

Academic Computing at MIT fosters and supports a rich environment to promote varied uses of instructional technology for teaching and learning. The Athena system is a centrally-managed, scalable, secure campus-wide computing environment consisting of networked client workstations, servers, and printers available to MIT students and faculty to help them achieve their academic goals.

Athena Clusters, Tools and Software

There are 17 general-purpose clusters on campus – over 400 UNIX workstations. Athena course tools include:

- electronic "course lockers" for storing course materials;
- electronic tools for delivering course materials, including Web pages, mailing lists, and conferencing systems;
- software for use by students and faculty in doing the actual work of the course;
- software for communication among students and between students and instructors;
- cross-cutting and specialized applications – FrameMaker, Matlab, Maple, Molecular Simulations, SAS, Tecplot, and Xess;
- standard compilers, Web browsers, communication tools.

A comprehensive list of Athena software can be viewed at <http://web.mit.edu/acs/www/whereruns.html>

Classroom Facilities

Facilities for preparation and delivery of instructional technology include:

- three fully-electronic classrooms, with an Athena workstation at each desk;
- over 10 classrooms with an instructor's workstation and projector;
- 24 classrooms with an MITnet drop and projection for a carry-in computer;
- over 60 additional classrooms with an MITnet drop;
- two New Media Centers: Faculty Development Lab, Project Lab.

Note: Although centrally managed Windows or Macintosh clusters are not as yet available to students, many academic departments provide facilities for classes requiring software that runs on these platforms.

Information on classroom locations, equipment, reservations can be found at <http://web.mit.edu/acs/www/eclassrooms.html>. Information on the New Media Centers is available at <http://web.mit.edu/nmc/>.

Faculty Liaisons

Faculty Liaisons help faculty and other instructional staff use information technology in their teaching. They will help you:

- get started learning about educational media, the Athena computing environment, and the campus network (MITnet);
- find appropriate software for your courses;
- write courseware;
- create multimedia and hypermedia materials.

They can also offer expertise to support the use of computers and other technologies in your teaching, including use of the WWW and other network-based applications.

You can reach the Faculty Liaison in the following ways:
Home Page: <http://web.mit.edu/acs/www/f_l.html>;
Offices: N42 lower level (211 Mass Ave.);
Phone: x3-0115;
E-mail: f_l@mit.edu

For information on the Electronic Teaching Toolkit see <http://web.mit.edu/faculty/ett/>.

Resources for Students

To enable MIT students to successfully use Athena, Information Systems (IS) offers a comprehensive series of short courses ("minicourses") on a variety of Athena-related topics. These courses are offered frequently throughout the academic year.

During Orientation week, incoming freshman, graduate, and transfer students had the opportunity to attend four basic courses: Intro to Athena, Working on Athena, Basic Word Processing and Electronic Mail, and Advanced Word Processing with EZ. These courses are offered before classes start, so new MIT students can become familiar with the system before they receive their first problem sets and paper assignments.

During the coming year, IS is offering minicourses for all levels of users. Minicourses are held the first six weeks of each semester, the week after Thanksgiving and spring break, and during IAP. Courses are offered Monday through Thursday at noon, 7 pm, and 8 pm in Room 3-343 and are free. No registration is necessary.

We would like to encourage you to remind your students to take advantage of this excellent opportunity to learn more about the computer system that will be part of their MIT experience.

Following is a listing and brief description of the courses offered. [See P. 4 for the fall 98 schedule.] Current and future schedules are available at <http://web.mit.edu/minidev>. Contact information for the Athena Training Group is also available on this page.

(Continued on next page)

Academic Computing Resources

Cavanaugh, from preceding page

Introduction to Athena (Intro)
An introduction to Athena and Athena workstations. Topics include: what you can do on Athena, getting an account, logging in, windows, sending messages, finding help and documentation.
Pre-requisites: None

Basic Word Processing (Basic WP)
Elementary text editing with Emacs, sending and receiving electronic mail, and using the Athena printers.
Pre-requisites: Intro

Working on Athena (Working)
Just the basics: files, directories, job control, and more. What every new user should know about UNIX, Athena's operating system.
Pre-requisites: Intro, Basic WP

Advanced Word Processing: EZ (EZ)
Pre-requisites: Basic WP
Introduction to EZ, a combination text editor and formatter, with text-editing commands that are similar to Emacs. As a formatter, it is menu-driven and easy to learn, in the popular style of the "What You See Is (pretty much) What You Get" packages.

Advanced Word Processing: LATEX (Latex)
Pre-requisites: Basic WP
An introduction to Latex, a widely-used text formatter, used for converting a text file into an attractive, professional-looking document. It is a powerful and flexible program, with the capability to typeset many foreign characters and very complex mathematical text.

Customization on Athena (Dotfiles)
Pre-requisites: Serious Emacs, some Athena experience
Intended for the intermediate-level Athena user, this course will discuss the Athena login sequence and the user-configuration files (dotfiles) that affect it, as well as changes the user can make to those and other files to customize their working environment.

Introduction to FrameMaker (Frame)
Pre-requisites: Intro, Basic, WP, Working
FrameMaker is a powerful word-processing and document preparation package now available on Athena.

FrameMaker for Your Thesis (Frame Thesis)
Pre-requisites: Frame, some Frame experience
FrameMaker, with a special template, can be used to produce an MIT thesis that meets all Institute formatting requirements.

HTML – Making a WWW Home Page (HTML)
Pre-requisite: Info Res
Covers the basic features of HTML ("Hyper-Text Mark-up Language") the language of the World Wide Web, as well as the steps needed to post your own Web page on Athena.

Information Resources on Athena (Info Res)
Pre-requisites: Basic WP
A survey of the communications, help, and other resources available on Athena.

Latex Thesis (LatexThs)
Pre-requisites: Latex, some Latex experience
Using the Latex text formatter to produce a fully-featured thesis that meets all MIT format requirements.

Maple (Maple)
Pre-requisites: Basic WP
A mathematics program that can perform numerical and symbolic calculations, including formal and numerical integration, solving algebraic or transcendental systems and differential equations, and series expansion and matrix manipulation. It also has extensive graphics capabilities.

Math Software Overview (MSO)
Pre-requisites: Basic WP
A survey of major mathematics and graphing packages available on Athena.

Matlab (Matlab)
Pre-requisites: Basic WP
An interactive program for scientific and engineering numeric calculation. Applications include: matrix manipulation, digital signal processing, and 3-dimensional graphics.

Serious Emacs (Ser. Emacs)
Pre-requisites: Basic WP, some Emacs experience
The text editor introduced in Basic Word Processing has many useful features not covered in that course. This course is a must for anyone who uses Emacs more than an hour or two each week.

Xess (Xess)
Pre-requisites: Basic WP
A powerful and easy-to-learn spreadsheet, with a full range of mathematical, statistical, matrix, and string functions. It will be useful for scientific and engineering computations, as well as to general and financial users.✣

[Jeanne A. Cavanaugh can be reached at cavan@mit.edu]

Annals of Reengineering

SAP Requisitioning Has Begun

Janet Snover

The rubber has finally hit the road in the SAP rollout, and staff in departments, labs, and centers are now beginning to use the SAP software to create requisitions for both internal and external vendors. Previously, staff could look up accounting information or view their statements on-line in SAP, but only MIT's central financial offices and two pilot sites were actually doing their work in SAP.

What impact will this have on the administrative work that is done in faculty members' offices? The Management Reporting project, the Controller's Accounting Office, and Procurement (formerly Purchasing) hope that you'll hardly notice the change. However, initially, it's likely that some work will take longer as staff adjust to using new procedures.

Another thing some of you will notice is that selected support and administrative staff members in your areas will be getting more training. The decision about who needs to be trained in requisitioning is being made by your administrative officer, in consultation with his or her School and Area Coordinator. (The Coordinators have already met with about 90 percent of MIT's AOs, and they are continuing their work with the remaining 10 percent.)

The rollout of purchasing functions in SAP began in September 1998 and is scheduled to be completed by the end of the calendar year.

Since MIT's departments, labs, and centers are organized in a variety of ways (in terms of how administrative work is done) there isn't one model of who gets trained that applies to all of your offices. Nor is there one model of how approvals for requisitions will be handled. Instead, AOs have been making decisions based on business rules that make the most sense for their particular areas.

To generalize, it's probably pretty safe to say that if you work in an area with an established, centralized fiscal office, then the people who have been handling your financial work will continue to do that. If your area is more decentralized and your support staff member does the purchasing and monitors all your accounts, then it's likely that she or he will receive the appropriate SAP training and then continue to do that work for you – only now, using SAP.

How long will the training take?

First, it's important to note that requisitions in SAP can be done in two different ways — via the Web (using Netscape) or in the SAP software itself. The good news is that most people who do purchasing at MIT will use the simpler Web interface to produce requisitions in SAP. The training for using SAPweb will be provided in one-hour lecture/demonstrations that are being given in large rooms on the main campus. No registration is required.

Using the Web is appropriate for the following people: those whose only SAP task is requisitioning; those who do requisitions infrequently; graduate students; and anyone who wants a simpler interface for doing requisitions. SAPweb was developed at MIT, and the screens and on-line help are all MIT-specific. Administrative officers will inform requisitioners in your area of the dates and locations of the SAPweb lecture/demos. (These will be timed to coincide with the date when your area is "going live" in SAP.)

The staff who will use SAP for multiple functions – such as reporting (producing or reviewing statements) and transferring funds – will probably want to learn how to create requisitions directly in the SAP software. This course, given at the MIT Learning Center, lasts between 2 1/2 and 3 hours. People who approve requisitions will take an additional class of 2 to 2 1/2 hours. (The amount of time can vary because the classes use a lot of self-paced material.)

Support for SAP users will be provided in a variety of ways. The School and Area Coordinators from the Management Reporting Project will schedule post-training visits to the departments, labs, and centers that they support. The Coordinators will be on hand as staff practice doing real requisitions using the SAP software. The approval process for requisitions will also be demonstrated. In addition, staff members are being given the phone numbers and email addresses of other groups who can help with particular kinds of problems or questions. These sources of support include the Business Liaison team, staff in the Procurement and Controller's Accounting offices, and a vendor hot line. Training packets and documentation are also available to help users with the new procedures.

Will your role change?

The introduction of SAP is a major part of the Institute's move from paper-based to electronic-based financial work. Some of you are very used to signing paper requisitions before one

(Continued on next page)

SAP Requisitioning Has Begun

Snover, from preceding page

of your employees or graduate students can make a purchase. So you are probably concerned about how the switch to SAP will affect your role. Again, departments have been making decisions about electronic approvals (called release strategies) by taking into account the procedures they have used in the past. These release strategies can also specify dollar limits for requisitioners. Alternatively, some areas have decided to have a support staff member get your approval on paper before creating an electronic requisition. The best way to find out exactly how financial work will change in your particular area is to speak with your administrative officer.

Other purchasing options

An obvious issue around purchasing of goods and services is how your graduate students and staff will be affected. As in the past, there will continue to be several ways to purchase what's needed for laboratories and offices. These methods will include SAP requisitions and/or the Web interface (mentioned above), the electronic catalog (ECAT), the MIT VIP Visa card, and even paper requisitions.

ECAT, MIT's Web-based system that allows users to browse up-to-date partner catalogs with MIT-negotiated pricing and then place orders directly into a vendor's order entry system, will continue to provide an easy way to purchase items from the MIT partner companies of VWR Scientific, BOC Gases, and Office Depot. With the next version of ECAT, which will be ready sometime later this fall, users will also be able to place on-line orders for most computer equipment and supplies with partner company NECX. (Personal purchases can already be made in this way.)

Another purchasing tool that you, your staff, and/or graduate students may use is the MIT VIP Visa card for purchases under $2,500 per transaction. The card can be used in the same manner as a personal credit card, but the MIT card must, of course, be used exclusively for Institute purchases. (There are some other restrictions – such as no purchases of items like airline tickets or hotel expenses, flowers, liquor, cellular phones, animals, and a number of other "unallowables.")

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The card simplifies the "buy-pay" process by reducing the need for requisitions, purchase orders, blanket orders, requests for payment, petty cash transactions, and invoices. There are checks and balances in the system to minimize fraudulent use of the card, and both cardholders and verifiers must be trained and agree to follow established procedures. The administrative officer for your area must sign off on every application for the MIT Visa card.

And even though MIT is moving away from the use of paper, it will still be possible for graduate students (and others) to use paper requisitions for ordering supplies. This method requires data entry – usually from handwritten copy – so there is the potential for error. In addition, paper requisitions are not as cost-effective or direct as the other options. However, paper requisitions will not go away until they are no longer needed. Paper requisitions must include the new cost objects (formerly called accounts) and general ledger accounts (object codes). These are the same numbers that were used to close MIT's financial books for fiscal year 1998.

All of the new efforts are aimed at modernizing the ways we purchase goods and services on behalf of the Institute. The variety of methods that people can use to buy what they need will, hopefully, provide the flexibility necessary to effectively support your operations.✣

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

Faculty Invited to Participate in Speech and Debate Open '98

Pei-Hsin (Michelle) Tsai and Rafael Dinner

This fall, the MIT community will witness the school's first intramural forensics event, the Speech and Debate Open '98 (SDO). Encouraging participation from faculty and staff as well as students, the competition is an occasion for all to defend their opinions about the Institute. "SDO is a unique forum for the discussion of campus issues between members of the entire community, and not just between a few chosen officials," says Gary Li, director of the SDO Group, president of the MIT debate team and a junior in economics.

During Columbus Day weekend, contestants will enter four rounds of speech or debate competition, followed by semifinals and finals rounds. Keynote speeches, luncheons and awards ceremonies will frame the event.

In the speech portion, students will give memorized presentations in dramatic interpretation, humorous interpretation, impromptu (an unprepared speech on a randomly-selected topic), or duo interpretation (a memorized performance of a literary work by two people). For debate events, SDO '98 emphasizes accessibility for laymen. Training seminars will brief participants on rules and tactics, and the format is simplified from normal parliamentary debate. Teams of two students each will present arguments, cross-examinations, and rebuttals on a topic chosen before the debate. Topics will be drawn from community feedback in order to suit participants' interests.

In an effort to involve all segments of the MIT community, the SDO Group invites faculty and staff members to serve as judges in the competition. The highlight of the weekend's events will be the MIT Forum Debate, in which two teams of staff and faculty members discuss an issue crucial to the Institute. "Staff and faculty play vital roles in this whole affair, as judges, as potential participants in the MIT Forum, but equally importantly, as a source of feedback on what campus issues they are most concerned about," explains Li. He continues, "I think staff and professors define MIT about as much as students do, and their concerns are often not known to students." Treasurer of the Association of Student Activities (ASA) Matthew McGann '00 agrees that faculty participation is crucial, and believes that the Open will help "to promote faculty-student interaction, to build community, and to facilitate intellectual discussion at the Institute."

Debate and speech events have always been a training ground for MIT students to improve their communication skills and knowledge of worldly affairs while competing with other schools. Last spring, however, the new Executive Board of the Debate Team sought a way to contribute to MIT at large. The idea for an intramural competition emerged during the first meeting from the impetus of Vice President of Finance Amit Roy. The Debate Team collaborated with the Speech Team and *Counterpoint*, the MIT-Wellesley Journal of Rational Discourse and Campus Life, to form the SDO Group. The group received funding from the Campus Activities Complex Program Board. Recently, Chicago Pizza, the MIT Copy Technology Centers, and *The Tech* have become supporters of SDO '98.✣

[Pei-Hsin Tsai can be reached at ptsai@wellesley.edu; Rafael Dinner can be reached at rdinner@mit.edu]

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Letters

To The Faculty Newsletter:

Page 7 of the May/June 1998 *MIT Faculty Newsletter* announces a summer test plan for a faculty bulletin board, describing it as "...a verifiable and totally secure Electronic MIT Faculty Bulletin Board..."

Having been involved in research in computer security for some 35 years, I was very pleased to hear about this breakthrough. Up until your announcement there had been only one known technique for obtaining a totally secure computer system: turn its power off and lock it in a concrete bunker defended by a large army. Unfortunately this prior technique makes the subject computer system somewhat awkward to use. I am eagerly awaiting details on how total security has been achieved for the bulletin board, so that I can explain it to my colleagues who no doubt are wondering how they could have missed such a significant development. You should expect that the United States Defense Department, among others, will also have a great interest in this development.

On a more serious note, I followed up the article's invitation to see other uses of the Web Crossing software by surfing to the Web page listed in the article. One of the bulletin boards listed there – an "MIT community" discussion group–looked interesting, so I tried to sample it. After successfully presenting an acceptable certificate I was presented with a multi-page legal agreement that in itself was a bit of a turn-off, but I went ahead and read it. The farther I read the greater was my disbelief. When I got to the paragraph that asked me to indemnify MIT I was so astonished that I stopped reading. This legal agreement is completely over the top. I would not consider signing it, and I would advise anyone else to read it very carefully, especially the indemnification clause.

Jerry Saltzer
Prof. Emeritus, EECS

[Please see article, P. 4-ed.]

M.I.T. Numbers

Interesting Facts About the Class of 2002

Academic Distinction:

Type	#Enrolling	%Class
SAT:		
at least 1 800	528	50%
at least 2 800s	288	27%
at least 3 800s	111	11%
at least 4 800s	28	3%
5 800s	3	
800/800	43	4%
US Physics Olympiad Team	2	
US Computing Olympiad Team	3	
Gold/Silver Medals in int'l comp.	31	3%
Westinghouse Sci. Fair Winners	1	
Westinghouse Finalists	3	

Extracurricular Distinction (recognition at regional, state or national level):

Arts (music, dance, theatre, etc.):	665	64%
Athletics:		
Varsity	462	44%
Varsity plus state/nat'l:	681	65%
Community Service:	383	36%
Leadership (holding highest leadership position in ECAs):	511	49%

Other Interesting Facts:

# of languages spoken in homes of freshmen:	39
# of high schools represented in the class:	798
# of high schools represented in class with more than 4 applicants:	189
# of freshmen who did NOT do a co-curricular activity (math, science, technology related activity) in their last two years of high school:	30
% of freshmen who participated in academic competitions in the last two years of high school:	77%
% of freshmen whose parents are married to each other:	89%
states not represented in Class of 2002:	DE, ND, SD
# of countries represented in Class of 2002:	47

Source: MIT Admissions Office (See article, P. 18)