

The MIT Faculty Newsletter

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Sloan School Faculty Propose MBA Degree With Optional Thesis

Paul M. Healy

Since its formation, more than 3,500 students have completed the Sloan School of Management's master's program. By many measures, the program has been highly successful; its graduates consistently receive among the highest average salaries, and admission to the program is among the most competitive in the country.

Review of Master's Program

Despite its success, the faculty at Sloan were concerned that the master's program might not be meeting the educational needs of its graduates. These graduates would become the leaders of twenty-first century corporations and would have to deal with increasingly intense competitive pressures, caused by high rates of technological change, social change, and increased global competition. Additionally, many faculty argued that the School should review the program as part of an ongoing search for ways to make continuous improvements in our educational and research programs. Consequently, in 1990-91 the Sloan School embarked on an extensive review of the program.

As the basis for their recommendations, the small faculty committee selected to study the master's program collected data from past and current graduates, corporate recruiters, competing business schools, and corporations sponsoring research at the School. Several recommendations emanated from this review.

(1) To stress how the discipline-based research focus of the Sloan School can be used to address a broad range of

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Memorandum

Faculty Diversity

Paul Penfield, Jr.

[The following is a memorandum originally addressed to the EECS faculty by the department head. Because many of the issues raised are of Institute-wide concern, we are printing it here.]

Abstract

The term "diversity" is used today for an environment that welcomes people of many races, religions, genders, national origins, sexual orientations, cultural backgrounds, classes, or perhaps other kinds of differences. This paper examines why programs to increase faculty diversity in the MIT Department of Electrical Engineering and Computer Science may be in the department's self-interest. It is a personal statement by the author and does not necessarily represent a department consensus.

Introduction

Why do we want faculty diversity? Different people will offer different reasons. Often diversity is discussed in terms of moral principles, political philosophies, or legal requirements. However, at least with respect to the hiring, promotion, and retention of faculty in our department, the reason that seems to make the most sense is actually very simple: A diverse faculty can carry out the mission of our department better than a non-diverse one.

This argument, which is developed more fully in this paper, is firmly rooted in the goals of our department, rather

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Dizzy With Success: The Cold War and the Teaching of Engineering at Elite Universities

Leon Trilling

The following article is a condensed version of a paper presented at Stanford University at a symposium honoring Prof. Holt Ashley (September 23, 1993). It is printed here in lieu of an editorial, along with the articles by Profs. Healy and Penfield on Page 1, in an attempt to stimulate discussion on these related matters of concern to the Institute. Future issues of the Newsletter will address these concerns.

In 1930, when the Soviet economy

was undergoing a deep crisis marked by the cruelties of the forced collectivization of agriculture and the inefficiencies of the first five-year plan for industry, Stalin wrote in *Problems of Leninism*: “Comrades, dizzy with success in bringing the benefits of socialism to our people, let us stop to consider the policy changes required for the future.”

At the end of World War II, the U.S. was the world’s dominant industrial power both in technical sophistication and productive ability. We had learned to apply new physical findings rapidly and systematically to the creation of new devices and relied on the “American system of manufactures” to produce masses of standardized goods made of interchangeable parts by use of elaborate specialized tools. By the mid 1980’s, the U.S. economy was struggling to remain competitive with Japan, Germany and others in a number of high technology fields.

A variety of explanations have been proposed for this turnabout. The fault has been found in structural or motivational defects of our management, in misuse of our capital markets, in excessive or inappropriate political meddling with industry, in insufficient

attention to our infrastructure, in an overambitious imperial foreign policy, and in weaknesses at various levels of our education system, to mention a few of the more popular suspects. Each of these lines of criticism has an appearance of plausibility; yet, none by itself is fully convincing.

As an engineer who teaches at an elite institution, I want to highlight a conjuncture of circumstances and decisions which may have played a part in bringing about our problems, so that, dizzy with success, we may examine where to turn to next.

The Background in 1945

Engineering is the purposeful use of materials, energy and information for the design, manufacture, operation and maintenance of devices, processes and systems which serve societal objectives or fill personal needs at an acceptable price. Its practice is embedded in a cultural, political, and economic context and conditioned by what we know of the world about us, and by how we can reliably find out more. It usually requires a balancing of the objectives of performance, safety, and cost.

This perception guided the education of engineers in the 1930’s. It was grounded in the classical physics of the nineteenth century on the one hand, and on the practical skills of drafting, surveying, welding, machining and the industrial engineering of Frederick Taylor, Henry Ford and the assembly line on the other, and also included some economics and elements of management. Only R.A. Millikan had insisted from the first that the CalTech physics program reflect the revolution of twentieth century physics and in 1932, Karl T. Compton, the new president of MIT, began building up the School of Science here and motivated young faculty to bring

contemporary physics research to the Institute. To the degree that additional class time was needed to teach undergraduates more science, it was taken from the teaching of practical skills.

World War II provided a re-defining experience for the scientific and engineering community, as well as the military establishment and the nation as a whole. Among the many major programs rapidly developed almost from scratch, let us mention first of all the Manhattan Project which developed the atomic bomb; then, the work of the Radiation Laboratory at MIT, the CalTech rocket project, the Johns Hopkins Applied Physics Laboratory and proximity fuses; and finally first steps on the development of computers at Harvard and MIT and the invention of operations research and its application to the management of complex systems. Consistently, these new devices were developed under the leadership of mathematicians or physicists – J.R. Oppenheimer at Los Alamos, Lee DuBridge and I.I. Rabi at the Rad Lab, the Lauritsens and Willie Fowler at CalTech, Philip Morse and P.S. Blackett in operations research, Turing and Aiken in computers. Engineers are conspicuously absent from this list – though it was a statesman-engineer, Vannevar Bush, who coordinated the mobilization of American science.

Among new technologies stimulated by World War II were nuclear energy for warfare and power generation, airborne devices to deliver or fend off nuclear attack, and last but not least, the perception of the role of communication, and command and control of the electronic and computational tools they require, to marshal the large and complex

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From The Faculty Chair

Faculty to Face Wide-Ranging Issues

Robert L. Jaffe

I would like to use this month's *Newsletter* column to report on my activities this fall and preview the issues facing the faculty over the next several months. It is quite a long list, so I will be rather brief. As individual subjects come to a head, I will try to make sure they are discussed more fully here in the *Newsletter*. Many will be brought to the full faculty meeting for discussion or action. Linn Hobbs, the associate chair of the faculty and chair of the Committee on the Undergraduate Program (CUP), will describe issues primarily affecting undergraduate education in a forthcoming *Newsletter* issue.

Without further ado, here is a list of present and probable future activities. As always, I would appreciate your input and your help on any of these issues.

The Faculty and the Budget Deficit

This past fall the Faculty Policy Committee (FPC) met several times with President Chuck Vest and with Provost Mark Wrighton to discuss the impact of potential budget cuts on the faculty. The FPC emphasized the importance of the faculty in defining new goals and developing new resources for the future. It also conveyed its concern that cutbacks not leave the faculty unsupported and demoralized. The priorities outlined by President Vest at the October faculty meeting reflect those discussions, placing high value on hardening faculty salaries and supporting faculty innovation. Other goals, such as the commitment to need blind admission and full financial aid, enjoy wide faculty support.

The budget deficit has also occupied the fall agenda of Academic Council. I have strived to represent the interests of the faculty as a whole in the sometimes difficult process of deciding on major priorities in the budget process.

Faculty Retirement and Intellectual Renewal at MIT

I discussed this subject briefly in this year's first *Newsletter*. A proposal is now in the works to enable faculty members who

heretofore would have had to retire to maintain a vital and significant connection to the Institute, and at the same time to free up resources necessary to insure intellectual rejuvenation. The proposal has been reviewed by the Steering Committee on the Strategic Review of Benefits and is now being considered by the Committee on Faculty Administration. If all goes well, it will be considered by the FPC and Academic Council later this spring. It will likely be described fully in an upcoming *Newsletter* article.

UROP Funding Problems

In an article in the last *Newsletter*, Norma McGavern, the director of UROP, described a crisis which poses the most significant threat to the program since its beginnings 25 years ago. I won't repeat her thoughtful and complete presentation here, but only briefly summarize the dimensions of the problem and what might be done about it.

I take it for granted you share my view that UROP is central to the teaching and research mission of the Institute. Students often describe UROP as the high point of their undergraduate experience. Faculty support for the program is evident from their significant investments of time and research funds. The Admissions Office promotes UROP centrally in its new brochure. It exemplifies the kind of educational opportunity especially appropriate at large research universities. Other universities envy us.

The total UROP budget is approximately \$4.5M, of which about 90% comes from sponsored research. The remainder, approximately \$0.5M, comes from Institute funds including a significant amount of "work/study grant" money from Undergraduate Financial Aid. Viewed as an educational program, UROP has not been expensive to the Institute, being highly leveraged by sponsored research funds. At present, most of the Institute funds go to support summer UROPs for pay.

New government regulations require both

benefits and indirect costs to be charged on all UROP student support, resulting in roughly a factor of two increase in the cost to all sponsors. If we assume faculty support to be completely inelastic (the worst case) then sponsored research-supported UROP will drop by a factor of two, or \$2M. Although much of this \$2M will be paid to the Institute as indirect costs, it does not represent a windfall to MIT, but instead merely reduces the indirect cost rate by a point or so across the Institute. A large research contract with few UROPs stands to gain, whereas a single investigator supporting one or two UROPs on a small contract stands to lose.

There are similarities between the "UROP Crisis" and the "RA Support Crisis" recently addressed by the Weinberg Committee: in each case the federal government has changed the ground rules under which we operate; in each case the change will adversely affect the funding of a core research program for our students; in each case the response to the crisis will depend on the behavior of individual faculty controlling sponsored research funds; and in each case there is no *obvious* way to avoid a real dollar cost to the Institute. The most significant difference is that the UROP Crisis is a \$2M problem while the RA Crisis is a \$13M problem.

During the fall a group of old friends of UROP including Paul Gray, Art Smith, Travis Merritt, Norma McGavern, and myself met several times to discuss the situation. At that time there appeared to be a significant possibility that the provost would be able to negotiate an exception to the *A21 Circular* under which UROP now falls. Later, when it became clear that an exception was unlikely, we began to explore alternatives with the provost. Some of the ideas now under consideration include seeking new support for UROP from alumni/ae and corporate donors, seeking major gifts in support of UROP, redefining Institute

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UROP support so as to be free of indirect costs, and encouraging principal investigators to be as elastic as possible in their support of UROP.

Mark Wrighton will be discussing UROP with the FPC on February 3. We expect new developments to come from this meeting.

Reporting the Results of Disciplinary Processes

Likely beginning with this February's faculty meeting, the chair of the faculty Committee on Discipline (CoD) and the dean of Undergraduate Education and Student Affairs (DUESA) will once again report annually to the faculty on the results of student disciplinary cases.

Up until the mid-1980's it was customary for the chair of the CoD and the dean of students to report to the faculty on the disposition of disciplinary cases. The practice fell into disuse about ten years ago. In the meantime community awareness of issues such as academic honesty and harassment has increased. So has the diversity of our community and the variety of ethical standards brought to MIT from different cultures. The faculty should strive to establish clear standards of academic and personal behavior, especially since actions which might be acceptable in some cultures would result in severe penalties such as suspension or expulsion here at MIT.

This fall the FPC met with Dean Art Smith and Triantaphyllos Akylas – the CoD chair – to discuss these issues. The Committee agreed that some form of report would help convey institutional values to the community, and decided to reinstate the practice of annual reporting to the faculty. Steps will be taken to protect the privacy of the individuals involved by making the reports rather generic in character and by integrating back over a three-year period. The specifics will be decided after consultation with the Institute's Committee on Privacy.

Sloan Master's Degree

The Sloan School's proposal to offer a masters degree without thesis, renamed a Master of Business Administration, is presented in detail in Paul Healy's article in this issue of the *Newsletter* [Page 1].

The proposal was developed out of the Sloan School's re-examination of its master's program begun several years ago. The actual proposal was reviewed by the Committee on Graduate School Policy (CGSP), where the idea of renaming the degree emerged. After approval from the CGSP, the proposal was heard by the FPC, which approved it on January 20. The proposal will be presented to the faculty at the February 16th meeting. A vote is required on the change in degree name.

Changes in the Terms of Adjunct Professor Appointments

At MIT the rank of adjunct professor is most often used to bring practicing professionals into the Institute for extended periods of time to enhance the practical aspect of programs. The nature of professional education is changing in response to new collaborative relationships between industry and universities and concerns such as technology transfer and competitiveness. The possibility of integrating the experience of practitioners into some of our educational programs seems more attractive than ever.

Several departments are near the limits on the number and duration of adjunct professorship appointments set by the Institute several years ago. Both Academic Council and the FPC have studied a proposal put forward by Dean of Engineering Joel Moses to realign the guidelines on adjunct professorships. Overall the changes are minor, but they have significant effect on some of our departments.

The new guidelines should be ready for discussion at either the February or March faculty meeting.

Faculty Input on Classroom Renovation

Early this fall the FPC joined with Art Smith to establish a small Faculty Advisory Committee on Classroom Renovation.

Responsibility for upkeep, repair and renovation of classrooms at MIT is distributed among the Department of Physical Plant, the Registrar's Office, and the Planning Office. Programs range from humble efforts to have a sufficient number of serviceable chairs in workhorse recitation

rooms, to ambitious rebuilding as illustrated by 6-120, 1-390, and 10-280. Faculty often complain that their needs are met neither by existing classrooms nor by what they see happening in the renovation program. Yet faculty needs vary dramatically across the Institute; the intimate seminar rooms needed for HASS subjects differ dramatically from the electronic "classrooms of the future" required for engineering design subjects.

The Advisory Committee will meet regularly with Dean Smith and with representatives of these three offices in order to provide representative faculty viewpoints on renovation programs.

Informal Faculty-Student Interactions

On two occasions during the fall term the FPC met with Dean Judy Jackson and others to discuss issues revolving around race relations and the increasing racial, cultural, and ethnic diversity of the MIT community. The FPC meetings focused on extra-academic activities since the CUP was looking at the academic side of the question.

The second meeting in December concentrated on relations between faculty and students. Informal contact between students and faculty has never been easy at MIT. It assumes new importance with the increasing cultural differences between the two groups. FPC decided to make a new attempt to get faculty and students together under informal circumstances, by sponsoring a program of faculty visits to student living groups. The program will start small, beginning with dinners in perhaps six living groups this spring. After identifying interested living groups and collecting names of faculty they would particularly like to host, Dean Jackson and I will contact the faculty personally to introduce the program, arrange dates, and offer some background. If the program is successful, it will expand in future years.

HASS-D Review

The School of Humanities and Social Sciences is in the process of carrying out a review of the HASS-D requirement. The report of the review committee will go first to the CUP, then to the FPC and to the faculty this spring.

New Biology Requirement

This is the first year of the new core requirement in biology. The CUP will monitor the new subjects and report to the

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systems of resources needed to wield military, political, or economic power.

Finally, the mobilization of U.S. science in World War II had far reaching institutional consequences. The scientific community and the military learned to live together, so that for a time military necessity was the strongest argument for the support of scientific research. The wartime Office of Scientific Research and Development was fashioned by Vannevar Bush to set the basic pattern for this alliance which was continued by ONR, OSR, OAR, and related agencies such as the NACA and the AEC.

This alliance proved durable because Vannevar Bush, an academic statesman of basically conservative instincts, created an overall system of contracts with specific universities for specific results which protected most of the academic freedoms, and particularly some control over the research agenda and the institutional integrity of the universities while supplying them with very substantial funds for research combined with graduate education.

Another essential feature of the alliance was its elitist character. Since the military were largely concerned with results, they looked to the leading institutions for the intellectual resources and the leadership needed to provide those results. And Bush, Conant, Compton and their associates, all drawn from elite universities, concurred and encouraged that trend. In fact, MIT, CalTech, Harvard and Columbia received 60% of the research funds disbursed by OSRD in the course of the war.

Opportunity Knocks – 1945-1965...

At the end of the war, Harvard, Columbia, Chicago and most other major universities demobilized and returned to their traditional role – liberal arts education and professional training in education, medicine, theology, and the law. The leading engineering institutions were faced with a challenge and an opportunity: the war proved that engineering needed to be redefined to include applied science more systematically and the wartime alliance with the military suggested a way in which this expansion might be financed and carried out.

For example, the MIT “Report of the Committee on Educational Survey” (1949),

also known as the Lewis Report, recommended a prudent reorganization of the undergraduate program to include more mathematics, physics, and fundamentals of the engineering sciences, and a stronger requirement in the humanities and social sciences at the expense of traditional detailed nuts and bolts courses; it also somewhat hesitatingly accepted the notion of an enlarged graduate engineering program to

rapidly to improve the performance of flight vehicles or guidance, communication and control systems, or data processing systems; the military would underwrite development costs and provide an initial market under conditions in which cost and producibility mattered less than how fast a device could be brought on line and how well it performed. Eventually, the military would define operating standards for their version; by

At the same time, the “new engineering” could not be properly taught in four years of schooling. The MIT School of Engineering enrolled some 300 graduate students in 1940; their number increased to 1070 in 1951, 1590 in 1961, and 2300 in 1990. Before 1950, many were supported under the GI Bill of Rights; support through portable fellowships or research assistantships became prevalent...so that competitive access to government contracts became an essential requirement for the sort of graduate department called for by the “new engineering.”

be financed mostly by federal – generally defense-oriented – research contracts.

Those universities which had a solid base in physics and wanted to play a major role in the new engineering fields followed a similar policy, and over the next few years, a small group of institutions came to achieve a dominant position, particularly in electrical and electronic engineering, in communications, and in aeronautics. The list includes MIT, CalTech, the University of California at Berkeley, Cornell, Michigan, Illinois, Princeton, and Stanford.

The leaders of the new engineering were not displacing an existing pattern; they were filling a new need perceived both by the military and by such large private market players as AT&T, IBM, and their institutional and individual customers. The intellectual challenges it posed and the rewards it offered attracted a large fraction of the brightest, most ambitious younger engineers.

At the same time the new engineering introduced a distinct style and a preferred agenda into the practice of the engineering profession. The main objective was systematically to do focused research in applied physics and to use the results very

that time, commercial users would request different specifications for their marketable versions. The development of transistors by Bell Labs under Army Signal Corps stimulation and their subsequent ubiquitous use is one example of this pattern; the design of bypass and turbofan jet engines by GE and very soon thereafter by Pratt & Whitney is another.

The emphasis on the applied science in engineering had far reaching effects on how the leading departments defined the education of young engineers, and in fact on how they defined the desirable qualifications of their faculty. For example at MIT in 1951, 65% of the Aeronautics faculty and 45% of the Electrical Engineering faculty did not have an earned doctorate; by 1971 that number had fallen to 14% and in 1991 only two professors out of 156 were without that credential. During that period, the size of the faculties of these departments doubled. Since the more traditional American engineering departments trained very few such scholars, the new faculty was recruited from science departments, from abroad, but mostly from among the graduates of the leading departments, causing a notable

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amount of inbreeding

At the same time, the “new engineering” could not be properly taught in four years of schooling. The MIT School of Engineering enrolled some 300 graduate students in 1940; their number increased to 1070 in 1951, 1590 in 1961, and 2300 in 1990. Before 1950, many were supported under the GI Bill of Rights; support through portable fellowships or research assistantships became prevalent at MIT and the other leading engineering schools, so that competitive access to government contracts became an essential requirement for the sort of graduate department called for by the “new engineering.”

A fairly stable 60% of MIT graduates went to work in high tech (an even split between commercial and military electronics) computers and software development and military-related fields, including aerospace; very few went to work in traditional manufacturing fields. Three students were hired by Ford Motors in 1977, one in 1987; GM, Chrysler, U.S. Steel, Bethlehem Steel drew blanks in both years.

But Not Everybody is Listening

Our argument so far is that as a result of stimulation by the military and the perception of a large new need of specialists in both civilian and military electronics, computers and communications, leading engineering schools built upon their strengths in physics and their World War II experience and connections to redefine engineering as the generation and application of new knowledge to design high performance devices and systems – and incidentally to solidify their positions and attract the cream of the engineering applicants crop, many of whom then found rewarding careers as entrepreneurs, managers, and creators of new technologies in the rapidly growing new high-tech industries.

Many engineering schools soon began to adapt to the new approach, both by reforming their undergraduate curriculum and by competing for research contracts to build up their graduate schools. This required defining niches of strength: for example, Brooklyn Polytechnic Institute built a very

strong team around A. Ferri and was for a period a leader in high speed aerodynamics. Sometimes younger faculty or recent Ph.Ds from Cornell, MIT, or Stanford whose work was familiar to the sponsors would start new research groups. Eventually, the applied science version of engineering became widely accepted.

On the other hand, most of the U.S. machine and metals industry was unable to recruit an appreciable numbers of MIT graduates. A recent (1985) survey of placement officers from 11 large engineering schools – including four of the “leading eight” – shows substantial hiring by the machine industry only at Purdue and Georgia Tech, which has developed a well-regarded program in manufacturing engineering. The inference is strong that the “new engineering” has had little effect on the managers of most U.S. metal manufacturing enterprises.

Indeed, their experience of World War II and its immediate aftermath was very different from the electronicers’. They remembered that the application of the traditional methods of manufacturing based on the notion of the assembly line underlay the production achievements which made the United States “the arsenal of democracy” and contributed powerfully to the Allied victory. In 1945, they found themselves without a competitor abroad and with an American public now able to satisfy its pent-up demand for cars, appliances, and other hard goods by spending money earned and saved during the war. They also profited substantially from their participation in the rebuilding of Western Europe financed through the Marshall Plan.

They felt that they knew how to turn out goods, and that the goods to be turned out were substantially those already designed, with a few improvements here and there. Their main concern was to control costs, and to keep production going smoothly. This was largely a matter of labor relations, as the large industrial unions (particularly the Autoworkers, the Steel workers and the Electrical workers) sought to gain a larger share of profits and a voice in the management of shop-floor activity. In retrospect, it seems as if after a turbulent

series of strikes in the 1950’s and early 60’s, a tacit understanding was reached that union members and other workers would receive a larger share of profits, in part through higher wages and in part through company-financed health insurance and pension benefits, and in return the unions would not seriously disrupt production; the cost of the understanding was passed on to the consumer.

The lack of interest by industry in re-examining the production process is illustrated by the fate of numerically-controlled machine tools developed with Air Force funding, at first by the Parsons Machine Co. in Travers City, Michigan, and then more systematically by the MIT Servo-mechanisms laboratory. The Air Force needed a reliable method for shaping aircraft parts and turbine blades of complicated geometrical shapes to a set of tolerances which could not be achieved by the average skilled machinist. Its technical staff was persuaded that if the motion of the work and the cutting tool on a lathe or a milling machine could be controlled uniformly by a computer program embodied in a tape, a considerable improvement in flexibility and accuracy would be achieved. The Air Force therefore underwrote the design and production of machine tools in which the motion of the cutting tool could be programmed with three, and then five degrees of freedom. They mandated the use of those tools by the contractors who were producing certain critical components.

In contrast with the successful promotion of the manufacture of rifles and muskets with interchangeable parts by the Army Bureau of Ordnance in the nineteenth century, or with the stimulation of transistor use in the communication and computer industries, the machine tool industry did not invest any significant resources in this new technology. The reassessment of work and pay classifications which its introduction in the GE Lynn, Mass. jet engine plant required (1956) led to an intense conflict between management and the International Electrical Workers (CIO). The union argued that the company was trying to use reassessment to lower wages, but the hidden agenda of the dispute also involved control

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of the organization and pace of work on the shop floor.

The full range of new NC tools were only slowly developed in the U.S.; the few smaller enterprises who wanted to use this technique had a choice between mainly very elaborate, expensive American machines developed under the aegis of the Air Force for the use of its contractors, and imported German or Japanese machines of which there was a wide range from which to choose.

This example illustrates a broader point. Given the set of intellectual and policy priorities of the metal processing industries (e.g., steel, autos, appliances, machine tools, etc.), given the population from which its engineering staffs were recruited, there was little awareness of the “other,” new engineering culture, and no perception of how it could be applied to the process of manufacturing, even as late as 1980.

Meanwhile Back on the Farm....

In the same period, the industrial nations of Europe, Japan and then the Republic of Korea were developing their production facilities without the encumbrance of a large, distinct military establishment, with the clear awareness that their economic future depended on their ability to export manufactured goods. After an abortive attempt to get a competitive edge by emphasizing low price (e.g., Datsun 1960-69 and Toyota 1964) they emphasized quality and reliability. They perceived, as we initially did not, that the notions and devices of the new electronic technologies could be used to improve the production process as well as the performance of the product.

Their innovations spanned the management of production (e.g., scheduling, inventory control, reliance on electronic networks to reduce the size of the middle manager staff and improve the flow of information), the mechanical process of production (flexible NC machine tools, effective setting of closer tolerances, much better quality control), and the organization of work (greater autonomy of workers on the shop floor, quality circles, reliance on worker feedback, upgrading of the workforce). These reforms were carried out to various degrees in a context of workers loyal to their management who provided

long-term employment (e.g., Japan), in a context of strong trade unions which were given some real participation in the reform process (Germany, Sweden, Norway), and in a context of long-term underlying labor management cooperation punctuated by periodic sharp conflicts (France).

In the background, there is an ideological point of some importance: in Japan and Continental Europe, the ability to produce a wide range of technically sophisticated high quality goods is considered important to national survival; as a result, traditional market competition, which is occasionally fierce, takes place in a framework defined by values which transcend the economic calculus. Friedman & Samuels describe the Japanese version in terms of “indigenization, diffusion and nurturance”; Landes argues that in the French view: “the justification for survival [of a productive enterprise] lies... in the correct performance of a social function.” If necessary, government intervenes to provide a forum where broad policy lines are worked out.

Conclusions: The First Elements of an American Response

Concern over U.S. “loss of competitiveness” began to gather momentum some ten years ago and has led to a number of initiatives which verge on flirting with industrial policy outside the military fields: definition of “critical technologies,” discussion of the possible extension of DARPA or its equivalent to the commercial sector, examination of circumstances where anti-trust constraints might be waived to allow competing enterprises to collaborate on generic research, support of consortia such as “Sematech” in the chip technology area.

The fundamental importance of basic and applied engineering sciences, recognized since the 1940’s, still shapes the curriculum; some of the mathematics and physics, after all these years, has settled and compacted at the bottom of the pond; but in many places computer literacy, statistics and biology have quite properly been added to the mix.

More importantly, and with particular strength at Stanford and at MIT, the definition of the professional domain of the engineer (and of the educated person) has been broadened to include serious attention

to the societal and cultural context in which we practice; not only to carry out an economic cost-benefit analysis but to consider political, cultural, ecological, and human consequences of our activities.

Design broadly understood as the creation of devices and systems which really fill actual needs, are user-friendly and benign to their surroundings, has become an essential capstone of engineering education. And a number of programs, like MIT’s “Leaders in Manufacturing” are refocusing the attention of our students on the challenge of applying high tech tools and ideas to the efficient making of things and relocate design in a continuum which begins with identifying a need and ends with satisfying it.

These changes, and the shift in funding patterns which began in the 1970’s and was greatly amplified by the end of the Cold War, are also forcing changes in the institutional pattern of engineering education. On the one hand, the addition of all the new material mentioned above is finally bursting (again) the balloon of the traditional four year curriculum; in a variety of ways, we are going to a five year program in the undergraduate, largely course-taking style – and we award master’s degrees for it. This has been Stanford’s pattern for many years; at MIT, the Departments of Electrical Engineering/Computer Science and Aero-Astro have taken that step and the Sloan School is poised to follow.

The number of doctoral candidates has not yet shown much of a drop; its future level will depend on the number of jobs calling for a doctorate (especially outside academia) and on the level and modality of soft money support. In engineering, the signs seem to point downward in the short and middle time scales. It is increasingly difficult to find support and motivate junior faculty with the background and style we have become used to.

A cycle is approaching its end; we are not going back to the 1930’s, but having absorbed an entire layer of new ideas, we want to rethink the goals of the engineering profession – and we may find some older attitudes worth examining again. In fact, in a much more tightly coupled world, with far greater reach and power available to be

Committee Report**The MIT Council on the
Family and Work**

J. L. Kerrebrock

Some of you may have wondered what the Council, established late in the spring of 1992, has been up to. These comments should answer some of these questions, and hopefully stir some interest in those of you who have not been curious about our doings.

First, let me remind all that the Council was established by President Vest to provide a forum for the whole Institute, for discussion of issues at the interface between our professional and personal lives. It was expected that the Council would derive from such discussion recommendations for President Vest for actions that he can take to lessen the tensions at this interface. The Council membership, listed at the end of this article, includes faculty young and old, staff from the Campus and from Lincoln Laboratory, a graduate student and a post-doctoral fellow, for a total membership of 15. I was honored by appointment as its chair.

The Council has made some progress which I wish to describe briefly here. More important, I wish to engage the faculty through this *Newsletter*, and other members of the Institute community through other communications media, in the ongoing deliberations of the Council.

We started with a very strong base in the Report of the Ad Hoc Committee on Family and Work chaired by Peter Elias. The essence of this report was presented in *Tech Talk* on November 7, 1990. Both Peter and Lotte Bailyn, who was also a member of that committee, agreed to join the Council and have provided strong links to the prior work which we therefore had no need to repeat. Indeed one of the recommendations of that committee was that the Council be formed.

The Council's study of this report and early discussions led to a list of high priority issues for consideration, including:

- 1) The assumptions defining the work environment of the Institute and its impact on the family and personal lives of its members.
- 2) Child care facilities.

- 3) Availability of medical and dental care coverage for all members of the community.

In discussing these matters we adopted two ground rules: first, that our objective be to arrive at definite recommendations that we could offer to President Vest for action; and second, that to the greatest extent possible we would focus first on actions that could be taken with minimal additional cost to the Institute. This last condition was somewhat controversial, but the chair felt it essential in order that the Council's work yield some substantive actions soon.

The three themes have been carried in parallel for the last year and a half, and several recommendations have been made to President Vest. An early one was that medical and dental benefits be extended to same-sex domestic partners of MIT faculty and staff. This was done in June of 1993. We have more recently recommended that this policy be extended to same-sex domestic partners of graduate students and post doctoral fellows. This is under consideration.

We regard more complete child care facilities as a major need for the Institute. Their lack severely impacts young two-career families who have or plan to have children, and threatens to make MIT non-competitive in the hiring and retention of exceptionally able young faculty and staff. Our recommendations to President Vest in this area have been for short-term, low cost steps that will lead to best use of the dedicated staff of the Family Resources Center, and for longer term major investments in more adequate child care facilities on campus. It will be necessary to raise capital funds for the latter.

In addressing the very large and difficult subject of the impact of the work environment of the Institute on the family we have been intensely aware of the special character of the Institute, dictated in part by its standards of excellence, in part by its commitment to action. We have arrived at the general principle that the work rules of the Institute should be administered with maximum flexibility so as to enable each

individual to optimally balance career and personal activities. We believe such a fundamental operating premise could encourage more rational behavior on the part of both individuals and those responsible for administering the work rules.

A special but important example of the need for this kind of flexibility is temporary relief for faculty from their duties to care for a new family member. With the support of the Council, the dean of Humanities and Social Sciences proposed to President Vest that faculty of his school be eligible for a semester's leave with pay for care of a new child, and this policy has been approved on an experimental basis. The Council is discussing similar arrangements with the deans of other schools, and recently Dean Moses has announced a new policy for the School of Engineering, which is that the School will normally offer one semester release from teaching and administrative activities at full pay to faculty members who wish to spend time at home caring for a new child. This policy is gender blind. The Council recognizes that career paths and work conditions are sufficiently different in the several schools that appropriate arrangements may differ among them, as this does from the policy of the School of Humanities and Social Sciences.

I hope that these examples of the Council's approach to its charge will convince you that your support of its work will contribute to the solution of some of the Institute's most fundamental problems. President Vest is committed to such actions, and showed that commitment by the speed with which MIT acted on the medical benefits for same-sex domestic partners of faculty and staff. We

MIT Council on the Family and Work
 Canard Agassiz
 Gerald Baskin
 Louis Bailyn
 Isaac Colbert
 Vicky Diadiuk
 Peter Elias
 Stephen Fairfield
 Nicolas Fiszman
 Nesbitt Hagood
 Paula Hammond
 Linn Hobbs
 Barbara Katz
 Jack L. Kerrebrock, Chair
 Barbara Peacock-Coady
 Chester Yablonski

Sloan School Faculty Propose MBA Degree With Optional Thesis

(Healy, from Page 1)

management problems, three new perspectives courses were designed. These courses show students how theoretical economics, quantitative modeling, and behavioral science perspectives can be applied to address relevant management issues.

(2) To recognize the need to provide students with career-focused depth, management tracks were to be offered to students. These tracks would provide a theoretical basis, application courses, and extracurricular activities for students interested in pursuing careers in areas where the Sloan School excels. Three tracks have since been designed and are scheduled to begin operations this semester: Financial Engineering and Financial Management (designed for students interested in careers in investment banking and corporate treasury), New Product and Business Development (for students interested in product development at established firms or in creating their own businesses), and Strategic Analysis and Consulting (for students interested in working in firms' strategic analysis groups and in consulting firms).

(3) Students who wished to design their own career-focused program would be offered increased flexibility to follow their interests. They would be required to take at least four new functional courses from a list of six (finance, marketing, operations management, information technology, macro economics and international management, and human resource management).

(4) To recognize the need for students to learn to apply research tools to a wide variety of management problems, it was recommended that the thesis be made

optional, and that students be required to undertake research projects in many of their classes. Students who wished to pursue the traditional thesis experience, by focusing on a single management question would, of course, be permitted to pursue this option.

this suggestion, leading to the proposal for the new degree to be discussed at the faculty meeting on February 16.

MBA with Optional Thesis Proposal

Under the proposal for the new degree Sloan master's students would be free to

Under the proposal for the new degree Sloan master's students would be free to pursue either an MBA or an SM degree. However, to be awarded an SM they will be required to complete a 24-unit master's thesis. Students who complete a thesis would be allowed to receive an MBA if they wished. Their thesis would then be classified as an "advanced study project" and treated by the supervising professor as an independent study course.

The first three recommendations have already been implemented. In the fall semester, the new core courses were presented to incoming students. The reactions so far have been very positive. The Sloan School has also been working with the Committee on Graduate School Policy (CGSP) and the Faculty Policy Committee (FPC) to implement the fourth of the above recommendations. CGSP members pointed out that the Sloan School also wants to consider changing the name of its degree to reflect the new program. The Committee felt that the new degree was quite consistent with a Master of Business Administration, but not with a Master of Science. After some discussion, faculty at the Sloan School widely supported

pursue either an MBA or an SM degree. However, to be awarded an SM they will be required to complete a 24-unit master's thesis. Students who complete a thesis would be allowed to receive an MBA if they wished. Their thesis would then be classified as an "advanced study project" and treated by the supervising professor as an independent study course. Students would not be permitted to receive both degrees, nor would they be permitted to change the name of their degree once they have graduated. Below I discuss the intellectual and practical arguments for making this change.

As noted above the major intellectual merit of creating a Sloan degree with an optional thesis is to provide students

(Continued on next page)

Sloan School Faculty Propose MBA Degree With Optional Thesis

(Healy, from preceding page)

with opportunities to develop analysis and research expertise in a broad set of contexts. This provides a key competitive strength for the Sloan School, with its research orientation. It will also help the School's graduates to develop the skills they need to meet the challenges they will face throughout their careers. This is not to say that an in-depth thesis experience on a single topic would not be valuable. Indeed, we hope that many of our students will continue to complete a traditional thesis. However, we also believe that many students will benefit more from taking additional elective courses and fulfilling the research requirements for the degree through the projects required in these courses.

To help you appreciate the types of research-related requirements that our students undertake, I have reviewed the types of activities that we require in our courses throughout the program. In the fall semester of their first year Sloan students are required to prepare approximately 15 written case analyses and small papers. The case analyses are from 3 to 5 pages long, and the papers typically are from 5 to 10 pages. They must also complete a major research paper, of 50 to 100 pages in length.

In the spring semester, students typically complete at least 12 case analyses and small papers, and one major research paper. In the second year electives, students are typically required to complete at least 12 more short papers and at least five topically-focused research projects of 25 to 100 pages in length. These papers usually comprise 35 percent or more of the final grade for the course. In addition, most students take at least one elective where 100 percent of the grade is determined by a research project. Typical research

projects require students to select a management problem relevant to the course material, review the existing literature on the topic, formulate a design to address the problem, undertake the research, write up their work, and in some cases make oral presentations – the same types of activities undertaken in a thesis.

In summary, less than 10 percent of the courses at Sloan require students to complete only problem sets and written exams. Nearly all of the required subjects and most of the electives require some form of major research project which has a large influence on the final grade. We believe that the educational experiences offered by these requirements more than substitute for the traditional thesis, and allow students opportunities to apply research skills to a broad set of topics.

The decision to label the non-thesis master's degree an MBA, although not originally considered by the Sloan School, reduces any ambiguity among students and recruiters about our program with no cost to the School. Sloan faculty concurred that knowledgeable students and corporate recruiters already view our degree as an MBA, regardless of what we call it. Many students describe their MIT degree as an MBA (in parentheses) on their resume since it is more clearly understood by corporate recruiters.

Several potential costs of changing the name of the degree were discussed by Sloan faculty. Would the change hurt the master's program by reducing one of the ways we differentiate ourselves from our competitors? And, would the change lower the research image of the School? Most faculty felt that these were not serious concerns. Program differ-

entiation is achieved more effectively through the unique material covered and by the design of the master's program, rather than through the title of the degree itself. Also, the research reputation of our major research competitors, Stanford and Chicago business schools, does not appear to be affected by their offering MBAs.

One concern expressed by a small number of Sloan faculty and others in the Institute is that the change will make the Sloan School less integrated with the rest of MIT. This is certainly not the School's intention. Indeed, there are many positive indications that the Sloan School wishes to become more closely involved in other parts of the campus. On the research side a group of Sloan faculty have been involved with faculty from the School of Science in studying environmental questions. In terms of educational programs, Sloan faculty are eager to repeat the successes we have shared with the School of Engineering in the Leaders for Manufacturing Program. A new educational program with the School of Engineering is one of Sloan's highest priorities. Finally, Sloan continues to provide management education for a significant out-of-course constituency at both the undergraduate and graduate levels. These activities by the Sloan School faculty are tangible, and reflect a strong commitment to the Institute.

In summary, the proposal to be discussed by the faculty on February 16 offers an opportunity for the Sloan School to improve the educational experiences of its students, with little or no cost to other Schools in the Institute. I hope that this article helps explain the proposal in more depth.



Faculty Diversity

(Penfield, from Page 1)

than the political goals of society at large, or the self-serving goals of any special-interest groups. It is not based on personal attitudes of members of the Department, which vary greatly, or on any requirements imposed on the department from outside.

There are major advantages to basing diversity programs on our fundamental mission. First, all department people can be expected to participate in such programs, regardless of their personal feelings about the matter. Second, when such programs (inevitably) conflict with other principles or programs that are also designed to help us fulfill our basic mission, then compromises can be found by appealing to the same basic objectives. Third, the design of any program depends on the purpose it serves. If we do the right thing for the wrong reason, we may do it in the wrong way.

Faculty Diversity Today

There are several types of differences among people — race, religion, gender, national origin, sexual orientation, culture, class, and perhaps others. Of these, race and gender are the ones most obvious at a glance, and the ones that lead to the most stereotypes. I believe the Department faculty now has adequate diversity of religion, national origin, and culture. I am not sure about sexual orientation and class. This paper deals exclusively with race and gender.

Currently, our faculty of somewhat over 100 includes one black professor and seven women. I believe more minority and women faculty are needed for us to achieve the various benefits of diversity described below.

Department Mission

The primary mission of our department is to help our students get the best possible education and professional development.

To fulfill this mission we must (1) attract the best students, both undergraduate and graduate, (2) provide

them the best environment for learning once they are here, and (3) help them develop the personal and professional skills and attitudes they will need in later life, especially in their careers.

A diverse faculty is better able to do these things than a non-diverse one.

Our Changing Environment

Historically, most of our students have come from the United States, and until a few years ago most were white males.

available to replace departing white workers and then fill about 10% of the new jobs. The other 90% of the new jobs will be filled by minorities.

- The industries that attract our graduates are increasingly global in outlook, and their workforce international in origin.

One Benefit of Diversity:

Role Models

As we see, an increasing number of

A curious question arises with respect to black faculty. Can a black person from Africa or the Caribbean be a suitable role model or contribute a minority viewpoint? I have heard different opinions on this. Foreign women professors can usually be suitable female role models. However, some feel the kindred sense between African Americans and foreign blacks is far less than that felt between women of different nationalities.

And because our graduates went to work in a white-dominated society and a male-dominated workplace, some felt it unnecessary for them to appreciate other viewpoints or cultures.

Today things are different:

- The pool from which MIT seeks excellent students includes more women and underrepresented minorities. Demographic studies suggest that this trend will continue. In 1980, 20% of the high-school-age population were students of color; the figure will be twice that by 2020. The most qualified students — the ones we want — will, in time, have the same diversity as society at large. Already, the percentage of white male freshmen at MIT has decreased from 60% in 1980 to 36% in 1990.

- The workplaces in which our students will pursue their careers are changing. In the next 10 years, it is estimated that there will only be enough white workers

our students and potential students are women or minority members. They cannot do their best if they believe that their chosen profession is one in which only white American males can succeed at the highest levels. Students think of the faculty as successful professionals. Therefore it is important that our faculty include women and people from minority groups to provide role models or “existence proofs.”

Women and minority role models on the faculty also benefit white male students. During their careers all our graduates will encounter women or minority members as professional colleagues and supervisors. It is important that they recognize that excellence is found in both genders and all races. They must shed any stereotypes to the contrary they may have brought with them when they

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entered MIT.

Finally, some of our faculty may have similar ingrained stereotypes, or a lack of appreciation of how the needs of women and minority students may differ from those of white male students. Diversity on our faculty will help improve the understanding of all our faculty in these matters.

A curious question arises with respect to black faculty. Can a black person from Africa or the Caribbean be a suitable role model or contribute a minority viewpoint? I have heard different opinions on this. Foreign women professors can usually be suitable female role models. However, some feel the kindred sense between African Americans and foreign blacks is far less than that felt between women of different nationalities. One reason may be that most foreign blacks were not brought up in a society that treated them as racial inferiors, and so may not appreciate the effects of the minority experience on African Americans. Some believe that our African American students cannot regard foreign black faculty as living proof that black Americans, brought up as minorities, can succeed in engineering. Others, however, point out that African colonialism produced effects similar to American slavery and racism, and that in any event African Americans find it easier to identify with blacks from Africa or the Caribbean than with white Americans.

A Second Benefit of Diversity: An Enriched Intellectual Environment

Women and minority faculty members bring to the Department a different perspective on engineering. Whether because of biology or culture, women usually tend to have somewhat different beliefs about what is important, about appropriate uses of technology, and about how human occupations, including

engineering, are or should be carried on. These different attitudes and styles should be represented in our teaching and research program. Our students' education is incomplete without them. Although many male faculty understand these differences, they are not usually motivated to introduce them into their teaching or into the everyday activities of the Department.

A similar argument can be made with

personal crisis, have a greater-than-average need for help from people with whom they can identify; only a diverse faculty can serve that role for a diverse student body.

The Costs of Diversity

Actions on behalf of diversity should be considered with an awareness of the costs involved. These are of two sorts: the cost of the effort to increase diversity, and the cost of dealing with the effects of

Women and minority faculty members bring to the Department a different perspective on engineering. Whether because of biology or culture, women usually tend to have somewhat different beliefs about what is important, about appropriate uses of technology, and about how human occupations, including engineering, are or should be carried on.

respect to enrichment from the differences in viewpoint of minorities. These differences are more difficult for white faculty to appreciate because so few of them have minority members as close friends, and because these differences are more subtle and harder to articulate.

A Third Benefit of Diversity: Improved Counseling and Mentoring

The functions of our faculty include formal counseling, informal mentoring, and research guidance. Although our women and minority students can generally be mentored and advised satisfactorily by white male faculty, there are two potential problems. First, faculty counselors, mentors, and research supervisors should be sensitive to the needs of a broad spectrum of students; collegial interactions with a similarly broad faculty can help all our faculty appreciate such needs. Second, all students may, especially at a time of

increased diversity. Neither cost can be quantified easily.

The first cost of diversity is the time and energy spent in (1) more thoroughly searching the faculty candidate pool for diverse people, (2) expanding the number of women and minorities in this pool, and (3) judging candidates by appropriate criteria. If we say we want the benefits of diversity we must develop and use criteria, for all candidates, that place appropriate values on differences. If we use criteria appropriate only for white males, we will probably end up with only white males.

The second item above is particularly important because of the severe shortage, nationwide, of minority doctoral graduates. It has been suggested that the most effective thing we, as a department, can do to address faculty diversity on the national level would be to increase the number of women and minority members

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Faculty Diversity

(Penfield, from preceding page)

in our own doctoral program.

The second cost of diversity comes from the greater range of held values, at least those values that are gender-specific, race-specific, or culture-specific. In a homogeneous environment, much can be taken for granted at all levels of discourse. Diversity inevitably requires that common assumptions be reiterated and that care be taken to ensure that differences in style or attitude are not misunderstood. If the differing values are strongly felt by some in the community, there is a potential for friction, alienation, and loss of respect. This is especially important in a university environment, with students at an age where they are sorting through their own ethical and moral principles, and looking to faculty for guidance. They will have to deal with mixed signals in a heterogeneous community. This problem will not go away easily since it is caused by the very enrichment that is a benefit of diversity.

What We Want in Our Faculty

When judging potential faculty members, we look at many things. We look for technical expertise. We look at desire and ability to teach and act as a mentor for students. We look at research accomplishments and potential. We look for the potential of collaboration with other faculty. We look for ability to shift areas of interest. We look for depth. We look for breadth. We ask whether this person will be someone who will do exciting things, and bring luster and glory to MIT. When we are done looking at all those things, we somehow “add them up” and make a subjective judgement about how well the candidate can contribute to the mission of the Department.

Are these criteria sufficient if, to help us fulfill the mission of the Department, we wish to increase faculty diversity? Probably two other criteria are needed

— criteria that can and should be applied to all candidates, although they favor women and minority members. First, we should recognize that women and, especially, minorities grew up in the face of many obstacles presented by society. The fact that a candidate has succeeded despite great obstacles is evidence of perseverance and strength. And second, it is relevant to consider explicitly whether a candidate will add diversity to our department.

person’s race or gender. They have to do with effective teaching, research, counseling, etc. A faculty member can bring to the Department the benefit associated with racial or gender diversity only by meeting the usual standards, applied in a way that ignores race and gender.

Faculty Recruiting

Here is how faculty searches typically occur in our department. Each year, the dean of Engineering gives us permission

If we say we want the benefits of diversity we must develop and use criteria, for all candidates, that place appropriate values on differences. If we use criteria appropriate only for white males, we will probably end up with only white males.

This second additional criterion, which is intended to favor candidates who are different from current faculty, must be applied with care. Recall why it is to our advantage to have a diverse faculty in the first place. Three benefits were discussed above: role models, an enriched environment, and improved counseling. For a woman or minority faculty member to actually contribute to those departmental benefits, it is essential that he or she meet the standards of quality and performance expected of all faculty. A poor teacher or a lackluster researcher cannot be a satisfactory role model. Without the respect that comes from bona fide success, a faculty member cannot be effective at enriching our environment, nor can he or she serve as a credible counselor. A faculty member whose performance reinforces negative stereotypes is no help at all, but is instead a detriment to the Department.

The performance standards just referred to are independent of a

to search for a small number of faculty. Usually each faculty opening is designated for a specific technical area. To be successful a candidate must pass three tests: (1) a good match between the candidate’s technical interest and our need (the *field* test); (2) a high expectation that the person will succeed in our environment, be an excellent teacher and researcher, and merit receiving tenure (the *absolute* test); and (3) ranking above all other candidates (the *competitive* test). An offer is made only to a person who passes all three tests.

Why are these tests applied? The *absolute* test is one that is necessary to preserve the high quality of our faculty. By applying this test, we are saying that we would prefer to hire nobody, than to hire someone who does not meet our absolute standards. Our fundamental mission requires us to maintain faculty quality. On the other hand, the other two tests are necessary because MIT has

(Continued on next page)

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limited resources and must therefore keep the faculty size limited. The *competitive* test is required because we have a limited number of openings, and want to choose the best person. The *field* test is required if openings are designated for specific fields.

The normal search process works well for white males, and it yields an acceptable number of junior women. However, there is still a shortage of senior (i.e., tenured) women faculty, and of minority faculty of all ages. For this reason, the MIT provost is willing to consider extra faculty openings, as needed, for qualified minority and senior women candidates.

Under the provost's program, we can relax the *competitive* test, since faculty openings will be created for each successful candidate. Thus, someone hired under this program need not be judged to be the best person available that year. Also, a role model can be effective from any technical area. Therefore there is no need to apply the *field* test; we can search across the entire domain covered by the Department, although for balance we should emphasize fields that do not now have faculty diversity of the type sought. We do, however, need to apply the *absolute* test, since the candidate needs to meet the usual departmental standards in order to bring the benefits associated with diversity. In using the provost's program, I think we should apply the *absolute* test in the following way.

For junior minority faculty candidates, we should make an offer only to a person believed to be close to or above the average level of department faculty of comparable age and level of experience. The performance of the new faculty member will then not be below that of the bulk of our faculty.

For senior candidates, the arguments are more complex. It is always harder to judge whether senior faculty will succeed

here (junior faculty are still young enough to learn and adapt to our ways of doing things). And the decisions for senior faculty are more permanent because tenure is involved. Thus, the decision is more difficult and the cost of a mistake is greater. Therefore we must use more care and adhere to somewhat higher standards than for junior candidates.

In the case of senior minority candidates, we should seek a high level

we should focus on areas of the Department not currently represented by women faculty.

To see these standards in context, note that we do not ordinarily search for senior faculty, because of the risks cited above. For a white male senior candidate to be hired, there would have to be a field-specific search authorized, and the candidate would have to pass both the *field* test and the *competitive*

The normal search process works well for white males, and it yields an acceptable number of junior women. However, there is still a shortage of senior (i.e., tenured) women faculty, and of minority faculty of all ages. For this reason, the MIT provost is willing to consider extra faculty openings, as needed, for qualified minority and senior women candidates.

of confidence that the person's performance, in our environment, will be at or above that of the average of our faculty of comparable level of experience. This requirement, somewhat more stringent than for junior faculty, provides a margin of error to help us avoid costly mistakes.

For senior women, the arguments are still more complex. We currently have four senior women in a faculty of a little over a hundred, along with three junior women who we hope will, in time, become senior faculty. Although this is not enough to provide the full benefit of diversity, it is enough to permit us to be somewhat more selective than for senior minority candidates. I believe that for a senior woman we should seek a high degree of confidence that her performance, in our environment, will be significantly better than that of the average of our current faculty at a comparable level of experience. Also,

test. Then, in applying the *absolute* test, I believe we should seek a high degree of confidence that his performance, in our environment, will be significantly better than that of almost all of our current faculty at a comparable level of experience.

Summary

MIT President Charles Vest has said, "If MIT is to lead in the future as it has in the past, we will need to better reflect the changing face of America." I believe this thought applies to our department, as well as to MIT as a whole.

Acknowledgments

The writer is pleased to acknowledge helpful discussions with, and good ideas from many people, including Fernando Corbatfi, Paul Gray, Fred Hennie, Vera Kistiakowsky, Nancy Lynch, Mitch Maidique, Gary May, Bill Ramsey, Mary Rowe, Jeff Shapiro, Art Smith, Chuck Vest, Cardinal Wade, and Clarence Williams. The final paper is entirely the responsibility of the author. February 26, 1993.

Letters

To The Faculty Newsletter:

In a special edition of *Tech Talk* that appeared on November 22nd, the administration presented information about MIT's operating gap, together with plans for dealing with it. One of the articles, accompanied by a bar graph, described the staffing growth in MIT's support activities from 1984 to 1993. The graph showed an overall modest expansion in the Administrative/Support/Service categories – over the ten years, personnel in these categories grew from 22% to 23% of the overall MIT population.

A different picture of the overall trend emerges if one makes the same comparison, this time separating

administrative from non-administrative positions. The following table shows the number of people in each category in 1984 and 1993, the ratio of 1993 to 1984 staffing levels for administrative and other support and service staff, and the ratio of administrative to other in 1984 and 1993. Positions listed are EFT [Effective Full Time] staffing levels. "Administrative" here includes administrative and exempt employment categories for Support Service areas, and administrative, research administrative, and exempt employment categories for Academic Programs and Academic Support areas. (I am grateful to the Office of Financial Planning &

Management for making these figures available.)

What emerges from this is that although the overall staff increase has been modest, there has been major growth in the administrative categories in many areas of the Institute. The bar graph [next page, top] is similar to the one printed in *Tech Talk*, but shows administrative EFT staffing only.

The next chart [next page, bottom] shows the ratio of administrative to other support and service personnel.

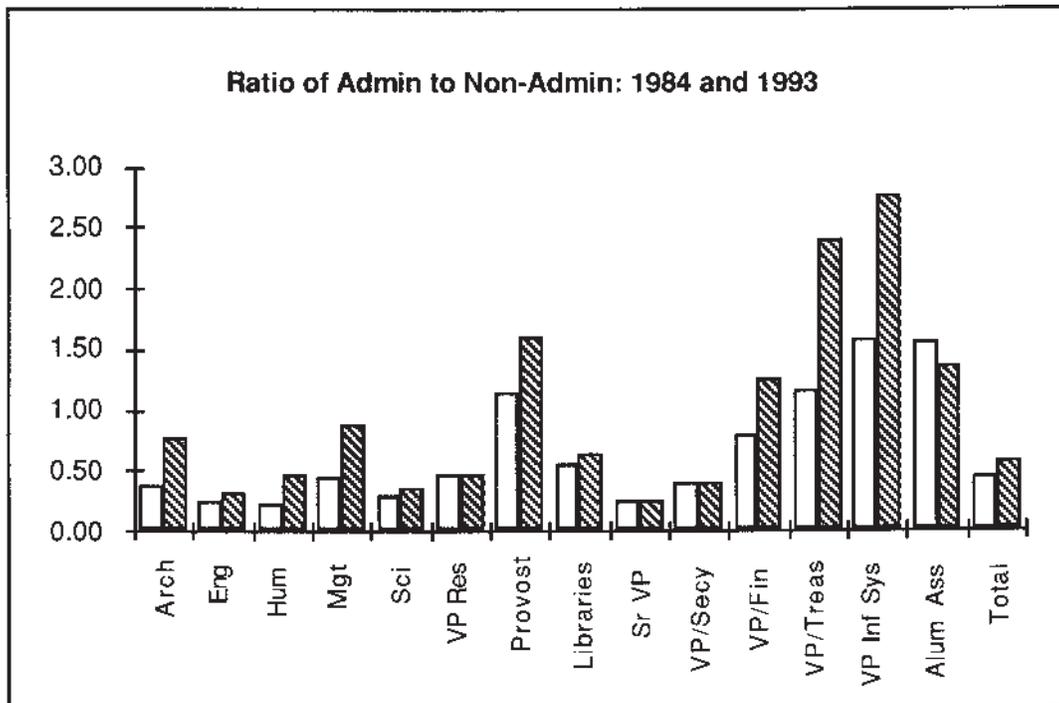
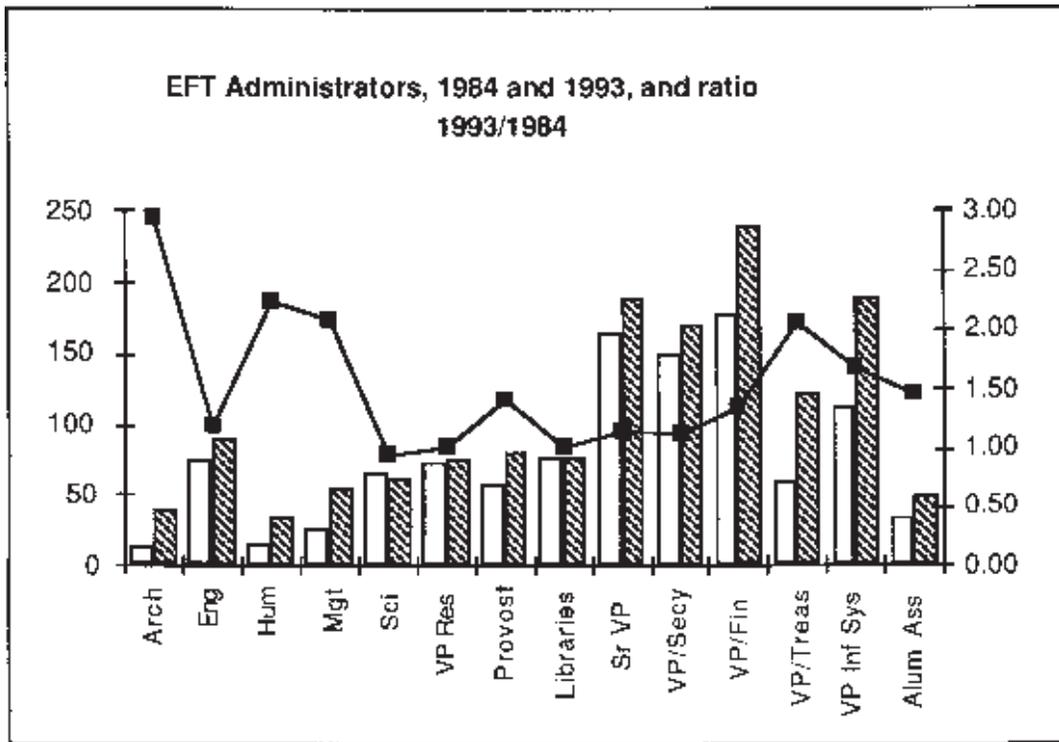
We can view these numbers in a somewhat different light: In 1984 there were 990 EFT faculty and 1101 EFT administrators – a ratio of 1.1 administrators per faculty member. In 1993 there were 885 faculty and 1471 administrators – a ratio of 1.7 administrators per faculty member.

In the same November 22 issue of *Tech Talk*, President Vest mentioned a target of reducing the faculty size by about 50 and the administrative, support, and service staff by about 400. If *all* the cuts in administrative/support/service were made in administration, this would reduce the ratio of administrators to faculty to 1.3 – still larger than it was in 1984. It is understandable why some faculty members have questioned the desirability of reducing faculty size at all, rather than taking more aggressive steps to curtail growth in administration.

Hal Abelson
Professor of Computer Science
and Engineering

	<u>Arch</u>	<u>Eng</u>	<u>Hum</u>	<u>Mgt</u>	<u>Sci</u>	<u>VP Res</u>	<u>Provost</u>	<u>Libraries</u>
1984 Admin	13.5	75.5	14.8	26	65.4	73.9	57.3	76.8
1993 Admin	39.7	89.4	33.1	54.1	61.7	75.6	80.7	77.1
A93/A84	2.94	1.18	2.24	2.08	0.94	1.02	1.41	1.00
1984 Other	35.4	297.9	64.3	59.8	221.1	161.3	49.8	137.7
1993 Other	51.4	285.8	72.8	61.7	173.7	166.5	50.3	121.8
O93/O84	1.45	0.96	1.13	1.03	0.79	1.03	1.01	0.88
A/O 1984	0.38	0.25	0.23	0.43	0.30	0.46	1.15	0.56
A/O 1993	0.77	0.31	0.45	0.88	0.36	0.45	1.60	0.63

	<u>Sr VP</u>	<u>VP/Secy</u>	<u>VP/Fin</u>	<u>VP/Treas</u>	<u>VP Inf Sys</u>	<u>Alum Ass</u>	<u>Total</u>
1984 Admin	165.3	150.6	176.9	59.5	111.8	34	1101.3
1993 Admin	188.4	169.9	240.2	122.4	189.4	49.6	1471.3
A93/A84	1.14	1.13	1.36	2.06	1.69	1.46	1.34
1984 Other	700.5	379.9	220.1	50.6	71	21.7	2471.2
1993 Other	759.6	436.6	192.7	51	68.1	36.5	2528.5
O93/O84	1.08	1.15	0.88	1.01	0.96	1.68	1.02
A/O 1984	0.24	0.40	0.80	1.18	1.57	1.57	0.45
A/O 1993	0.25	0.39	1.25	2.40	2.78	1.36	0.58



Letters

To The Faculty Newsletter:

In the November 1993 issue, Harvey Greenspan gratuitously characterized the position of Faculty Chair as being a tool of the administration. He wrote, in part, "...In practice and by design, that office has represented the administration to the faculty...never...as the advocate of faculty interests..."

The several past faculty chairs that I have known well could not possibly be described as creatures of the administration. Here are two events in my own experience.

When I was faculty chair, my every association with the administration made clear that I represented the faculty. In that Cold War era, every teacher in Massachusetts was obliged to sign a loyalty oath to the United States and to

the Commonwealth. At a weekly meeting of the Academic Council, one of the Deans reported that a young faculty member refused to sign the oath, on grounds of principle. I sat dumbfounded as it was summarily decided that MIT had no choice but to obey the law and withdraw the appointment. I took the matter back to the (then) Committee on Educational Policy, and we decided to ask that MIT find a way of challenging the law. The administration agreed. With the help of the American Civil Liberties Union, a court challenge was entered. MIT kept the faculty member on the payroll but not teaching, and submitted a brief as a friend of the court. And the law was struck down.

When the proposed association of the Whitehead Institute with MIT was about

to be brought to a faculty meeting for approval, many faculty members felt that the governance arrangements were unwise. Time was short, and a hastily-assembled group of senior faculty prepared and signed a document arguing that the matter be considered further. At a faculty meeting that overflowed 10-250, the group proposed an amendment to the motion of the administration. The debate was one of the most heated in MIT history. In any event the amendment failed, but the point to be noted here is that the strongly held wish of the administration was vigorously opposed by several former chairs of the faculty. No patsies, they.

Ascher H. Shapiro
Institute Professor Emeritus



Press Release

What: MIT Faculty Lunch

When: Mondays-Thursdays 11:30 am-1:30 pm
Beginning Monday, January 31, 1994

Where: MIT Faculty Club Main Dining Room East
Building E52

MIT Food Service, in cooperation with the MIT Sloan School and the Department of Humanities, began a Faculty Lunch Service at the MIT Faculty Club Main Dining Room East on a trial basis on Monday, January 31, 1994. Service is available Mondays-Thursdays, 11:30 am to 1:30 pm.

This Lunch Service is designed to provide an informal lunch service for MIT faculty, staff, and graduate students on the east side of campus. Menu

offerings include a daily sandwich bar, fresh salad bar, fresh baked desserts, and hot and cold beverages. All prices are *a la carte* and a full lunch can be purchased for \$6 to \$7. Purchases may be made by cash, Interdepartmental Requisition, or on your Faculty Club Charge. Dress is casual and seating is informal. Reservations are accepted for Private Dining Room catered lunches.

Club members may remember the more formal Faculty Club Dining Room,

which closed last semester. This new Faculty Club Lunch is ideal for a more casual lunch and for informal entertaining. Customers desiring more formal Club luncheon dining and business entertaining should call 253-2111 to arrange a catered lunch in one of the Club's private dining rooms. In addition to the Club's regular catering menu, there is a monthly Chef's Menu with discounted luncheon and dinner selections which make this a pleasant and economical dining option for formal entertaining.

A Letter to the MIT Administration

Principal Investigator Status: A Solution to MIT's Budget Crisis?

Kenneth Sembach*

At today's "Town Meeting" [November 30, 1993] I raised the issue of Principal Investigator status for postdoctoral associates and non-professorial research scientists. I was rather disenchanted with the answer. Perhaps I should express my concerns again.

MIT has a budget crisis. There are two ways to reduce the deficit. One is to cut spending and the other is to raise revenues. The MIT administration has clearly opted for the former in its current plan to lay off 300 to 400 MIT employees, despite the fact that such layoffs are rarely known to improve a corporate or academic institution's well-being in either the financial or morale sense.

There is a way to increase revenue **now** and prevent some of the layoffs that would otherwise occur. Grant these research scientists P.I. status.

The answer I received today to this proposal made no sense to me. While it is true that some of us can get P.I. status under special circumstances, the procedure for doing so is often more work than it is worth (to the individual). And although it is true that faculty do have P.I. status, there is a large fraction of the MIT postdoctoral community that does not collaborate solely with internal colleagues.

Most postdocs come to MIT having just finished graduate school. They almost always have some collaborations with their previous mentors and others they have met during their schooling. In most cases when an external collaborator is involved in a project with an MIT postdoc, it is almost always easier to allow the collaborator to be the P.I. and to let his/her home institution receive the monetary benefits applied for in

federal grant applications. This money (salaries, benefits, hardware funds, student salaries, and overhead) is being diverted from MIT to other institutions. I think the other response given to my question has to be one of the lamest I have ever heard on this issue: it will create too much paperwork and we don't

as a place for recent graduates to come to work at, and furthermore, it does nothing to increase morale and scientific stature of those of us already here.

I do not intend to send the message that this idea is a cure-all. It probably cannot raise the tens of millions of dollars needed to reduce the MIT deficit. **But it**

At early stages in our careers, it is important to establish a reputation for ourselves in the professional community. Submitting research proposals individually or as a P.I. with other collaborators is extremely important in getting others to recognize that the work they see before them is ours.

want to have to pay support staff to do grant proposals. Excuse me, that is what overhead and support staff salaries budgeted into research proposals are for! It seems clear that you would prefer to lay off these same support persons rather than have them help file grant applications for money to be brought to the Institute. Unbelievable!

A final point I would like to raise at this time is the effect this has on us. At early stages in our careers, it is important to establish a reputation for ourselves in the professional community. Submitting research proposals individually or as a P.I. with other collaborators is extremely important in getting others to recognize that the work they see before them is ours. (Many scientists spend as much time refereeing grant proposals as they do journal articles, and in this business, exposure is everything.) You claim that you want to keep MIT a first rate research institute. How can you possibly do this while suppressing the research ambitions of your young scientists? The current policy detracts from the appeal of MIT

can help, and best of all, it requires no effort other than for the administration to say it is so. Five simple words: "Postdocs can be Principal Investigators." This sure sounds better than the current five words you fling around: "We have to terminate employees."

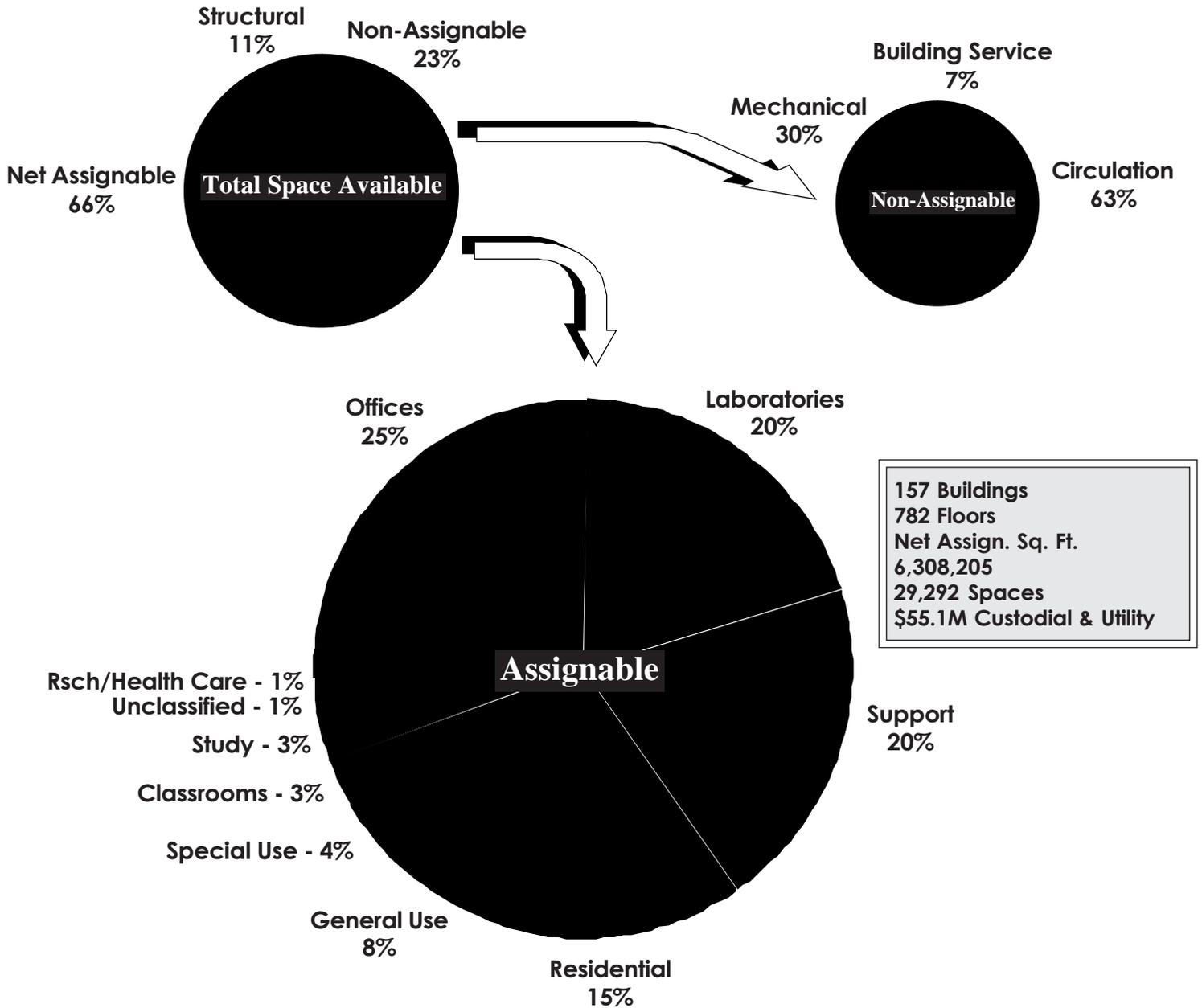
In short, MIT is losing money and talent because of its suppression of its research scientists. It is up to you whether this inequitable policy continues. Lest you think that you are safely wrapped in the blanket that says "Everyone else is doing it, so why shouldn't we?" take note. Other universities are coming around to realizing the benefits of P.I. status for postdocs (U. Hawaii is a good example). Do the Institute a favor and throw away that blanket, get on your feet, and set a shining example for others to follow. If you don't, someone else will.

***The author is a Hubble Fellow in the Center for Space Research. As per Faculty Newsletter guidelines, this piece was submitted under the signature of an MIT faculty member.**

M.I.T. Numbers

Space Use

MIT Academic Facilities



Sources: MIT OFMS, INSITE™ Space Inventory; Physical Plant & Housing Departments; Insurance & Legal Affairs; and thanks to Kreon L. Cyros, Director, Office of Facilities Management Systems.