The MIT Faculty Newsletter

Vol. II No. 4 **February, 1990**

NEWSLETTER HIGHLIGHTS FACULTY CONCERNS

This month's issue of the *MIT Faculty Newsletter* focuses on a variety of topics of particular concern to the MIT faculty.

Beginning on Page 6 is a special section devoted to articles on hiring, salaries, tenure, minority and women faculty, and retirement. There are also two articles on MIT admissions practices, submitted to the *Newsletter* in response to pieces from previous issues.

This is a particularly large edition of the *MIT Faculty Newsletter*, and we would like to thank all those who took the time to express their concerns in writing, and were willing to submit them for scrutiny by the MIT community.

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FLASH!!!

As we went to press with this issue, Faculty Chair "Jake" Jacoby announced that Professor Phillip A. Sharp, previously announced as the nominee for the next president of MIT, has withdrawn his name from consideration by the Corporation Committee on the Presidency.

A copy of Professor Jacoby's announcement has been reprinted on Page 3.

GLOBAL CHANGE

The Need for Interdisciplinary Research

Nazli Choucri

At MIT the disciplinary approaches to global environmental changes are composed of three distinct thrusts: the basic sciences, technology and engineering, and the social sciences (institutional, political, economic dimensions of human activities). Each, grounded in its own disciplinary foundations, brings crucial knowledge to bear upon our understanding of global change. The substantive issues are formidable, as are the theoretical and analytical challenges. The elements of each component are already in place at MIT - but at different levels of formalization - and together they reflect the unique combination of skills which represents our comparative advantage.

The issue of global environmental change has already become intensely political. And the dependence of policy-making in this area on science and on technology and engineering is perhaps more pronounced than in other issues of national concern. MIT is in a unique position to provide the intellectual linkages, cohesion, and development among the three broad disciplinary research agendas currently being pursued.

The politicization of global change has already injected scientific evidence (and uncertainties) in the policy domain. And it is the political processes that will marshall social responses to global issues and

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ACADEMIC CHANGE

Difficulties Encountered by Education Innovations

Margaret MacVicar

Most attempts at changes, and the changes themselves, are not successful; one success in five is an enviable long-term survival rate for educational changes. The world is generally welcoming of technology widget changes but hostile to changes affecting the relationships between peoples, the ways organizations are structured and govern themselves, or the emphases of resources.

An initially bright idea to improve the quality or delivery of education is successively developed and modified as it spreads from the originator through adjacent sympathetic groups into the world of indifference and opposition. At every stage both hostility and sympathetic attention cause continuous metamorphosis in the form of the innovation and in the justification for its adoption and expansion. In practice, this means that each criticism of a proposed program must be examined carefully to see in what way it might be used either to improve the program or to improve the method of presenting it. The fundamental difficulty of establishing an innovation is that all problems of survival must be solved simultaneously.

I present here and in the next *Faculty Newsletter* two checklists: (I) difficulties encountered by education innovations and (II) tactics that may help proponents to aid establishment, survival, and dissemination of educational changes in the face of such

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Editorial

MIT Today: Mystique and Malaise

There is a malaise at MIT and it is eroding the Institute's traditional strength, its innovations in research and teaching, and its ability to respond to social and political challenges. What are the sources of this malaise? Its manifestations? What can be done? Can the mystique be preserved?

The MIT mystique is rooted in its strength in science and technology, in a demonstrated capacity to remain at the frontier of knowledge - and even at times to define the frontier itself. The technological revolution of the post-war period is indisputably a major factor in the economic growth and well-being of the United States and to a large extent the Free World as well. MIT has played an important role in the advancement of technology and in the improvement of the human condition. MIT's reputation as a prominent academic institution with far-reaching effects is well justified: thousands of well-trained professionals have entered the U.S. labor force; an MIT degree is certification of excellence. Three out of nine post-World War II presidents of the United States chose MIT faculty as their Science Advisor; MIT graduates have been instrumental in establishing a large number of avant-garde industrial enterprises of the post-war era; and MIT's contribution to broad fields of science has earned several Nobel laureates on its roster.

MIT's success to date is due largely to three factors which together provided a winning formula: a high standard for admission of students; a flexible and demanding set of guidelines for hiring, promotion, and tenure of faculty; and a unique and highly adaptive organizational and administrative structure that encouraged and promoted entrepreneurial spirits among students and faculty and gave them a very high degree of freedom. This combination produced sophisticated engineering graduates (who have crowded Route 128). It created new units in the Institution who could adapt and reorient themselves to pressing demands for scientific and technological change and achievement (the I-Lab, Lincoln Lab, Energy Lab, Whittaker College, Whitehead Institute, Linguistic, Brain and Cognitive Sciences, and the Political Science Department.)

But during the past decade or so the success of the formula seems to be eroding. Some reasons are to be found outside MIT; others appear within the Institute. On the whole, there is a changing perception of technology by the public at large; there is disappointment, created in part by the misplaced optimism of earlier decades and in part by a new appreciation of the real difficulties inherent in technological change. The free spirit of research is constrained by a legislated definition of social responsibility rather than defined by our code of scientific ethics, moral responsibility, and obligation of citizenship. Scarcity of resources dictates compliance with ever-increasing government interventionist requirements.

The MIT response - to these very real external developments - has itself contributed to the problem by engendering the sense of malaise that may undermine the strength and the mystique of MIT. The administration served as a pass-through for what government mandated and has centralized authority in its academic offices. It has done so with little consideration for the values that might be undermined and has imposed an additional set of rules and regulations to implement the centralized strategy.

In effect, MIT's administration has bureaucratized itself in unprecedented ways. This internal

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February 20, 1990

To Members of the Faculty

I write to let you know that Professor Phillip A. Sharp has withdrawn his name from consideration by the Corporation for the presidency of MIT. Professor Sharp has told the Executive Committee of the Corporation that, while deeply honored by their confidence in him, he had come to the difficult personal conclusion that he could not give up his scientific research and teaching.

The Executive Committee has accepted this decision with great regret. The Chairman of the Corporation has informed me that there will not be a nomination placed before the trustees at the March 2 Corporation meeting and that the presidential search, after review by the Corporation, will be resumed.

Phil Sharp was one of many highly qualified candidates for the presidency. While it is a disappointment that Phil will not be our next president, it is good to know that he will continue as a faculty colleague, carrying on his outstanding scholarship in molecular biology at MIT.

Sincerely,
Henry D. Jacoby
Chair of the Faculty

MIT Today: Mystique and Malaise

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bureaucracy, particularly in the academic offices of the administration, assumed a life of its own. It expanded, became nearly autonomous, and in the past few years challenged faculty authority and on occasion its integrity. The ABS blowup was symptomatic; it is not an isolated case. The faculty suddenly realized that it no longer is a party to the decision-making process at the Institute - they were being treated as hired hands - and began seriously to look at the compact that existed among the key components of MIT since World War II. The faculty is dissatisfied with the erosion of the compact, and its mood has soured.

There will soon be a new administration. We are entering a new era of dramatic changes, nationally and internationally - changes that are unprecedented in scale and scope since World War II. To retain its strength, MIT must now reexamine the elements of the formula that has assured success in the past; it must reestablish the compact that committed the faculty to the Institute and committed the administration to protecting the strength of MIT and its faculty. The world is changing, and so must our education strategy. We must adapt without undermining our traditional strengths.

There are new debates, new compromises, and new opportunities. Discussions over our admission policy, the "battle of nerds", what we teach to our students (the HASS, Science requirements, Science distribution, five-year undergraduate education in the engineering school, spirit of IAP, relevance of Context courses) are issues related to the students element of the formula. This *Newsletter*, covering issues regarding underrepresented minorities, women, new faculty, tenure and promotion policy, retirement, and salary, directly affects the faculty. Research funding, graduate student support, quality of teaching, industrial support, and industry-wide cooperation are issues of concern to the academic units. The relationship among the three elements of our formula - students, faculty, and administration - needs to be reexamined.

The new administration will need to confront these issues directly; it cannot ignore the malaise, and it must protect the mystique and the strength of MIT. Given these issues and given emerging national and international concerns - such as the peace dividend, globalization of science and technology, interdependence, and global change - the new administration faces new challenges with perhaps new resource constraints, given the diminishing sources of traditional funding. To meet its responsibilities with faculty support and enthusiasm, the new administration must forge the compact again, reestablish an effective alliance within the Institute to propel MIT into the scientific and technological frontiers of the 21st Century.

Editorial Committee

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Next Issue

Next month's MIT Faculty Newsletter will address the question "What's Wrong With MIT?".

As we embark on a new decade with a new president, it's critical for the faculty to make known those areas of greatest concern. In addition we will focus on the incoming president, and hope to present a variety of viewpoints and perspectives.

We encourage contributions on these topics or any issue that is of interest to the MIT Community.

Please forward your submissions to: ***MIT Faculty Newsletter,* 38-160**; or to any member of the Editorial Board.

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FROM THE FACULTY CHAIR

Some Thoughts on Change

Henry D. Jacoby

So you've been pondering the quality of academic life at MIT? Cambridge and its great universities are featured in a recent issue of Gourmet Magazine, and the article gives new insight into the way we live and work. Gourmet observes, ". . . the flavor is distinctly youthful and the pace slower; the day is savored and philosophies are explored. People amble, coffeehouses brim day and night, skulls glide past." No? Maybe you were out of town that day.

Unfortunately, those of us who don't amble already are unlikely to develop this new gait in the near future. One reason is that a clear theme of our internal discussions of the presidential selection is the need for change at MIT. Many faculty share a perception of radical shifts in the external environment within which MIT has so clearly thrived. And they believe that substantial adaptation is required if we are to maintain the Institute's prominence, attractiveness to top faculty and staff, and service to society. It will not come without effort.

The list of external changes is all too familiar. The United States is not as strong as it once was, either in relative economic power or scientific and technical leadership. One result is growing friction between our international reach and our domestic sources of research money. There is a shrinking pool of dedicated, well prepared high school students in mathematics and science. In part this is because of changing student and family values and poor quality of high school teaching; in part it is a result of the fall in size of the college-age cohort. Federal R&D budgets are tight, priorities are shifting, and the pork barrel is claiming more and more of the resources. Even on the merits, competition grows stiffer for students and faculty as well as for research funds, and it is small consolation that some of our toughest competitor schools are led by our own graduates. Government financial aid has been reduced, placing a greater financial burden on those schools who admit students regardless of ability to pay. And on and on.

It is easy to agree that these circumstances call for action. Not surprisingly, however, we faculty hold divergent views of what we need **do** to meet the challenge, and what must be conserved as the life blood of the Institute. In the presidential search, a key criterion in the minds of the selection committees has been a candidate's likely ability to work with faculty to achieve a broad enough consensus to be able to move. But whatever the prestige and skills brought to the job, the new president will succeed or fail in this difficult arena depending on the level of interest that faculty take in these matters. Any substantial change will threaten the prevailing organizational culture, and the primary repository of this culture is the faculty. It does not matter that I could not write five coherent sentences about what that culture is. It is there, and it is a nearly overwhelming conservative force.

It will not be hard for the new president to get time commitments from a few of us for those special tasks of study and planning that inevitably will be needed in the transition. More problematic is the willingness of the vast majority, from deans and department heads to the rank and file, to keep abreast of external developments and internal discussions in the various schools, and to participate in community debate of proposed changes. It is important that we try to achieve this wide involvement, however, because at key points of decision there can be such a great weight of conservatism from people who missed the lead-up discussion and are either uninformed about what is going on or unhappy that their ideas are not incorporated.

Many of the key issues are already on the agenda, of course. I think of the ongoing review of undergraduate educational programs and living arrangements; the re-design of engineering education; the continuing debate about the role of the humanities, arts and social sciences; the tension between the centralizing force of Institute-level financial stringency and the decentralized entrepreneurial style many of us have valued so highly. And there are the problems of adjusting Institute policies to accommodate changing patterns of family and work, and the need to recruit and retain a faculty that is representative of the diversity of the society, or even of our own student body.

I believe in the next few years we will make choices that will set the course of the Institute for decades to come. We have the academic strength and reputation, and the physical plant and financial base, to take creative new directions yet maintain and even improve the quality of academic life. The challenge will be to identify the right directions and marshall a strong enough faculty consensus to take action. If we can achieve that, it should be a time of great excitement, if not much opportunity to develop our ambling skills.

Hiring/Retiring

Hiring at MIT: Emerging Issues

Lotte Bailyn

The world is changing. No longer can MIT - or any other top research university - expect that the people it wants to appoint to its faculty will accept an offer. Partly this results from the fact that excellence in science and engineering, as well as in other fields, is now much more widely dispersed and there are more stimulating and creative university environments than there were even in the recent past. Also, Cambridge and Boston, which once were strong drawing cards, now have liabilities, particularly the high housing costs. And the economic conditions of research funding play a role; researchers can get jobs in industry or national labs with high salaries and without the constant pressure to raise money. Finally, with no fixed retirement age and generally tighter financial conditions, the pressure on tenure at MIT may be increasing and thus may detract from an initial offer.

With increased participation of women in the work force the relation between work and family has dramatically changed for all employees. The model of an earlier generation...is no longer tenable.

These structural changes in the academic world are affecting MIT's ability to attract the best young men and women to its faculty. But there are other, more personal changes that are also important, perhaps even more important. For young people starting their university careers today, the necessity to commit all their energies to work - presumed to be required by science and reinforced by MIT's promotion and tenure procedures - is problematic. With the increased participation of women in the work force the relation between work and family has dramatically changed for all employees. The model of an earlier generation, where faculty members could count on wives to take care of home concerns, including children, is no longer tenable. But the institutional expectations of that era - perpetuated by the personal experiences of the senior faculty - have not kept pace with these changing circumstances. So an untenured male faculty member writes:*

"MIT's extraordinary expectations about one's commitment to individual career - to the exclusion of spouse's career and family - make it virtually impossible

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Retirement Plans at MIT

Paul A. Samuelson

Most private universities use TIAA-CREF (Teachers Insurance & Annuities - College Retirement Equities Fund) for faculty and employee pensions. Not MIT. It runs its own plan inhouse. Whether this has been optimal is moot. Long ago an independent actuarial service recommended the inhouse set-up (but of course those actuaries were the ones hired to implement the plan).

Most faculties are apathetic and ignorant about pension matters. The MIT faculty has been outstandingly uninvolved. Fortunately, paternalistic Institute administrations, goaded by a few informed professors, have done fairly well by teachers and other employees over the years. But some of the favorable innovations have been tardy in coming; and in the changed environment just ahead for TIAA-CREF and other pension institutions, there is a real danger that the understaffed MIT bureaucracy will lag behind the avant-garde in American higher education.

I can only touch impressionistically on a few major points in this brief survey. Ideally Sloan School and other experts should organize a faculty-wide committee - as was usefully done a couple of decades back when tax deferral options were explained to the MIT community in several public forums.

Most faculties are apathetic and ignorant about pension matters. The MIT faculty has been outstandingly uninvolved.

For, as I write, employees at Stanford, Harvard, Yale, and a thousand other colleges do newly have more retirement options than the MIT system provides. And there is no superior recompense that our present system can promise as an offset.

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Years ago tenured MIT professors benefited because MIT permitted nontenured employees to stay out of the pension system for a longer time than TIAA would have done. Result: shortsightedness of young temporary employees, loathe to pay their half, saved MIT a bundle and permitted it to be a mite more generous to professors like me. It was bad ethics but financially expedient

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Salaries

Salary Spread and Other Issues

David Gordon Wilson

In the best of all possible worlds, salaries would be set by an open, group discussion. This is often how it is done, in fact, in small start-up companies. As the company grows, the discussion decreases. There are probably two reasons for this. One is that the proportion of the average individual's time spent in communication increases with the number in a group, until eventually some people spend virtually all their time communicating,

Faculty salaries are discussed neither in faculty meetings, which few faculty attend, nor in any of the committees on which faculty sit.

usually in committees. The second reason is that there is, properly, a degree of embarrassment if the take-home pay of the president is a hundred times that of the janitor, and a cloak is drawn discreetly over the counting tables where the salary decisions are made. (The spread of US business salaries is, incidentally, regarded in Japan as immorally large.)

MIT is a university, which by one definition is basically a faculty that has power over all decisions. A large university obeys the laws of size, however, and the MIT faculty has, over the years, delegated its decision-making powers to an administration of inevitably increasing size. Faculty salaries are discussed neither in faculty meetings, which few faculty attend, nor in any of the committees on which faculty sit.

Having been persuaded by the *Faculty Newsletter* editor to undertake the invidious task of writing on salaries, I have talked with many people at different levels of the faculty. I have been surprised at the strong feelings expressed, even by people at a senior level. The word "alienation" has been used, and the statement has been made that MIT is no longer a university, but is more like an industrial corporation, with memoranda issuing regularly from administration offices that seem to treat the faculty as difficult employees.

Some of the perceived difficulties are treated in companion pieces in this issue. Two others on which I have little data, but about which there is some concern, are salary compression and salary spread.

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Psychic Income Versus Real Income

Samuel Jay Keyser

A few years ago Ken Hale, a colleague of mine in the Department of Linguistics and Philosophy, spent two months in Harbin, China where he gave a course on theoretical linguistics. He told me the following story when he came back. One day he went out walking with a student in his class. The student wanted to go to a poetry reading but was afraid that she would not be allowed in since the reading was very crowded and since she was merely a student. So she told the gatekeeper that her companion was a professor from MIT. Not only was she allowed in, but Ken was whisked to the front of the room where he was given a front row seat and, after the poetry reading, was asked to say a few words to the audience, which he did, in Chinese.

Two things stuck out about the incident in Ken's mind. The first was how embarrassing it was to him to be treated as if he were a foreign dignitary, and the second was how important MIT loomed in the minds of people halfway around the world, and in a Chinese city a thousand miles north of Peking.

I remember the story because it illustrates something very important. To a large portion of the world MIT is an intellectual Mecca. Ironically, the greatness of the place is something that we are often in danger of forgetting because, by virtue of our being here everyday,

Twenty-seven years ago...I was paid $10,000 a year and I bought a house for $30,000. Today that house is worth ten times the starting salary of a young faculty member....

its familiarity seems, well, so familiar. This familiarity can make us overlook something of tremendous personal importance to each and everyone of us; the sense of pride that we take from being part of a superb intellectual community by virtue of that community's choice as well as our own. Let me speak for myself. My own teaching career spans roughly twenty-seven years during which time I have been a member of three other faculties. None of them compare with the extraordinary intellectual vitality that I have encountered here. This sense of personal satisfaction is what I would call psychic income.

Recently, I spoke to John Deutch about psychic income and how important it was to me. He replied that

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Tenure

Mixed Messages: The Pressure to Conform

Stephan L. Chorover

This started out to be a piece about policies and procedures concerning faculty tenure decisions at MIT. It was originally prompted by the predicament of a young colleague of ours who is an award-winning classroom teacher as well as a productive, well-funded, research scientist, and whose future at MIT is uncertain following a departmental tenure-case meeting which ended in a split vote.

Let me suggest that this is no isolated miscarriage of justice. Indeed, what needs to be most carefully examined is a recurrent pattern which, in my experience, often looks something like this:

A young person of outstanding academic and professional promise - the one chosen from a field of many applicants - arrives at MIT, hoping and expecting to continue her/his personal development in an intellectually demanding and hard working but otherwise supportive and fair environment. S/he soon becomes actively and energetically involved in the life of the Institute. Not uncommonly, her/his on-campus activities include both conscientious classroom teaching and substantial community service.

For a while, all is well. Eventually, however, concerns begin to be expressed in at least some quarters within the person's own department about, e.g. "the potentially adverse effects that may be exerted upon the trajectory of one's academic and professional development

The official "line" has it that both research accomplishments and classroom effectiveness are highly valued....The reality, however, often turns out to be quite different.

by involvement in an undue diversity of activities." In due course - especially if the subject of these concerns fails to "rectify" her/his behavior - more tangible signs of trouble develop: progress up the academic ladder slows, and (if and when it comes to that) her/his departmental tenure case turns out to be problematical. Almost always, reservations are expressed concerning the "quality" of the candidate's scholarship, research "productivity" and/or the "relevance" of the latter to "mainstream interests" or "departmental objectives." And on it goes.

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Thoughts on the Tenure Process at MIT

David H. Marks

It is now tenure season. During the month of February, MIT takes a very close look at its junior faculty around the age of thirty- five and determines if it wants to make a long-term commitment to them.

In my role as a department head I have observed that this is a perfect position to be in to see the best and worst of MIT. In the past five years I have been able to

Junior faculty narrow and concentrate their initiatives on how they will affect their chances for tenure. Senior faculty judge junior faculty on standards that are...becoming more narrow and difficult.

see the tenure process from both sides. In the name of faculty development I counsel (gingerly for we want them to retain their independence) young faculty on the nature of the tenure process and how immediate initial steps in their career impact on their chances for tenure. The Institute's unofficial message delivered by the grapevine is whispered - but clear: "Keep your head down;" "tend to your knitting;" "measure all commitments carefully in terms of the coming tenure evaluation;" "concentrate;" "get those publications out;" "make sure they know you out there;" "do good teaching but do not go overboard and waste your time;" "beware of senior faculty who would like to exploit your energy but rebuff them in a way that will not anger them;" are part of a standard department head's litany to his young faculty.

On the other side, as a member of the School of Engineering Council, I help judge the resulting cases concerning the tenureability of junior faculty. There we measure, in addition to the elusive quality of what has been done, how well our warnings and injunctions have been followed. The people who are making it through this process are unbelievably impressive on these dimensions. But is that all we want?

I am not opposed to a detailed review of a faculty member at some early point in his or her career as it is healthy for all involved; and, in fact is part of almost all professions (making partner in a law firm or leaving, making major in the army or leaving, etc.). Without a tenure process driving such a review, I doubt whether academia would really have the courage to look its young

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Minority and Women Faculty

Underrepresented Minority and Women Faculty at MIT

Vera Kistiakowsky

The numbers of underrepresented minority and women faculty members are compared with the total numbers for the years 1980 and 1989 [See **MIT Numbers**, Pages 16 and 17]. These tables are based on data made available to me by Dr. Clarence G. Williams, Special Assistant to the President and Assistant Equal Opportunity Officer, and I am very grateful to Dr. Williams and Robert L. Dunbar of his office for the major effort involved in compiling these numbers. A quick comparison of the two tables emphasizes the scarcity of both groups among the faculty, and indicates respectively a decrease and a small growth in their representation.

It is instructive to examine these data more carefully. Let me first discuss the changes in the underrepresented minority representation on the faculty. This group consists of U.S. citizens and permanent residents who are Black, Spanish Surnamed, or American Indians. There are, however, no American Indians in either of the cohorts described in the two large tables. From the data on which these tables are based, one may derive the percentages of each professorial rank who were underrepresented minority faculty, and the results are given in Table I (Page 22). Both the number and percentage of Black American faculty have decreased in the nine-year period, with a large part of the change coming from a decrease in both number and percentage of assistant professors. The percentage and number of Spanish Surnamed Americans in all ranks have remained approximately constant, but the percentage and number of professors have increased. The total number of underrepresented minority faculty has decreased by 19%, from 31 to 25. The largest contribution to this decrease occurred in the School of Architecture and Planning which **(Continued On Page 23)**

Both the number and percentage of Black American faculty have decreased in the nine-year period, with a large part of the change coming from a decrease in both number and percentage of assistant professors.

Minority Faculty Recruitment and the New President

Phil Robbins

Yes, I know - I've heard all of the reasons and excuses a hundred times. The pool of candidates is small and getting smaller. Awareness of and interest in science must be generated at the grade school and high school levels before we can expect to see real progress at the Ph.D., postdoctoral, and faculty levels. The luring of black faculty from the campuses of predominantly black universities to large institutions such as MIT only weakens the infrastructures of schools which should serve as important pools of minority candidates. "Bidding wars" among major universities for available well qualified minority faculty are of questionable advantage to either the minority candidates or to incoming non-minority faculty. The tale of woe goes on and on....

For a moment let's forget about all of the above. Let's imagine a statement by the new incoming president, a statement that he or she views the lack of minority involvement in science and engineering as a national crisis - that during the next decade MIT will become dedicated to exploring every possible approach to the problem - that recruiting outstanding minority faculty will be a first priority. It could make a real difference, here at MIT and at the national level as well.

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UPDATE ON FOREIGN LANGUAGES

Catherine V. Chvany

Dean Ann F. Friedlaender, Acting Head of Foreign Languages and Literatures, announced that the FLL section, the HASS overview committee, and the CUP have approved the following insertion in the MIT Bulletin.

"Language option. Because the Institute regards competence in foreign language as a fundamental value, students may substitute one language subject at the level of III or IV for one HASS-Distribution subject. Of the two remaining HASS-D subjects, one must come from categories 4 or 5 [i.e., the Social Science or History areas, CVC]. Students selecting this language option may not choose a second distribution subject taught in the same foreign language or literature."

The practical effect is to reinstate L III or IV as Distribution options, without forcing the "mechanical" HASS-D requirements on subjects for which they are unsuitable. Another welcome effect is that Japanese (or any other FL at level III or IV) is now eligible, alongside French, German, Russian, and Spanish.

Admissions

Admissions Practices Show Change

Harold Abelson

January's issue of the *MIT Faculty Newsletter* included an exchange between Prof. Kerry Emanuel and Prof. Vera Kistiakowsky over MIT admissions policy and the question of denying admission to applicants with high numerical indices and low personal ratings. Prof. Emanuel is disturbed by this practice, on the grounds that it too often leads us to reject people with a "single-minded devotion to math and science." Prof. Kistiakowsky supports the practice. As she writes: "MIT should certainly seek to produce scientific leaders, but the likelihood of increasing their numbers by admitting students who have never demonstrated any sign of individuality or creativity, is small."

Unfortunately, phrasing the issue this way misses the real concern about recent admissions decisions. It is not that we have been rejecting people who are notoriously one-sided, or who are socially impaired. Rather, a look at admissions data shows that: (1) The "high numerical index, low personal rating" debate is vacuous. Only a small fraction (about 5%) of high numerical index applicants have markedly low personal ratings. (2) We have been rejecting significant numbers of applicants who are at the top of the pool academically and whose nonacademic qualities are "merely good" or even "merely superior." (3) This represents a change in admissions practices from previous years.

To support these claims, I'll compare admissions data from 1978 and 1988. Note: In the final admissions decision process (round-up) applications are organized for review according to two scales. One, the numerical index, is based upon class rank, high-school grades, and scores on standardized tests. The other, the non-numerical index (or personal rating as it was called under the previous admissions system) is a subjective score assigned by readers of the application. The numbers I cite below are taken from the "pie charts" that are compiled each year at the end of round-up. This data is somewhat incomplete - in particular, it does not include foreign students.

In 1978, we had 4102 applicants, and offered admission to 1802 or 44% of them. Numerical indices in 1978 were computed on a scale of 0 to 100. Table 1 shows the numerical index (NI), the percentage of the total applicant pool with numerical indices in each 10-point span (%pool), the percentage of each of these groups to whom admission was offered (%admit). It also shows the percentage of all admissions offers that went to

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Dinosaurs, Geniuses, and MIT Admissions

Peter C. Perdue

Once upon a time, a thirteen-year-old boy demonstrated extraordinary ability at tasks requiring great skill in mathematical reasoning, memory, and logical analysis. He had practiced his skill, and nothing else, since the age of five. Antisocial, egotistical, and completely obsessed by his particular skill, he had no outside interests. He dropped out of high school to practice his skill professionally, and at twenty-nine he had become the world champion in his field. But three years later he abandoned his career for personal reasons and fell into obscurity. Today he works as a hotel employee, his great gifts tragically wasted.

Bobby Fischer was one of my boyhood idols. Now he represents to me the epitome of the dangers of extreme specialization. "Scornful of everything outside himself and his chess, he understood little of what he scorned." Although it would be absurd to suggest that a liberal education by itself would have allowed him to make better use of his gifts, he might well have used the opportunity to develop other interests. It would be equally absurd to claim that anyone could foretell his future at age eighteen. The same goes for Richard Feynman. Feynman, whose interests included drawing, Brazilian congo drums, and Tuvinian nomads, is the most unlikely candidate for a nerd one can imagine. Nor could the notoriously imprecise SAT test have predicted their different futures. The change in weighting of factors in deciding MIT admissions rightly reflects growing suspicion that a single standardized test has very limited, if any, value in predicting future academic achievement. (See The Case Against the SAT.) In debating who should be admitted to MIT, let us not try to smoke out potential geniuses. Let's discuss what kind of community we want MIT to be.

The change in weighting of factors in deciding MIT admissions rightly reflects growing suspicion that a single standardized test has very limited, if any, value in predicting future academic achievement.

Has MIT gained its reputation solely by specializing in what it claims to do best: science and

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Salary Compression: What is it and How Does it Affect Support Staff?

Laurie McLaughlin

Salary compression has two factors which combine to keep the salaries of long-term workers low. The principle cause is that the yearly percentage increases in salary (here at MIT these are called 'merit' raises) never let an individual rise in the range of salary for his or her position - for example, if you were hired at a low rate, you will continue to be paid a low rate within the max/min range. The annual increments of the 'merit' raise are not calculated to allow a person in the low range to reach the mid range, and likewise, someone in the mid range will almost never reach the top level salary for that position - even after working twenty years with high recommendations every year! This strategy keeps salaries stagnant relative to the actual 'range' in particular positions, which shows little respect for the additional experience and often additional duties that a support staff person adds to her/his job each year.

The situation is labelled compression when, relative to the salaries offered to newer employees, those employees who have remained at MIT for years are actually paid less than the new hires. This is the second factor in salary compression - and this situation would not be possible if it were not for the continued downward pressure on the salaries of long-term employees. In those cases where the salaries are higher for the long-term employees than for the new hires, proportionally many long-term employees are actually being paid less when their years of service are taken into account.

When the Harvard Union of Clerical and Technical Workers tackled the issue of salary compression, they had to consider several factors. The Harvard administration insisted that a 'merit' raise be a part of the process, and the Union wanted to ensure that all workers would have the possibility to advance through the salary range for their position. The 10 Harvard workers on the committee to deal with salary compression, along with input from HUCTW employees, carefully worked out a 3-part strategy which satisfied both requirements. These three forms of salary adjustment are called structure, merit, and progression.

Structure increases for each fiscal year were agreed upon percentages of salaries for the following three years. These increases apply to all employees. Annual merit increases range from 0 to 3 percent based on job performance. Progression is more variable than the first two parts of the salary program, and is specifically included to prevent stagnation within the salary range.

An interesting aspect of this talk was sympathy...expressed by a professor...who described how the policies in existence keep him from retaining qualified workers.

"Annual progression increases equal to 3 percent of the grade minimum salary shall be paid to employees who have completed one year of service...and whose salary is less than the 'progression point' (140 percent of the minimum) of the employee's salary grade effective January 1, 1990, 1991, and 1992. A progression increase may not increase an employee's salary beyond the progression point of his or her salary grade." [From the HUCTW Agreement.]

Additionally, as a crucial first step towards addressing salary compression, all employees whose base salaries were below agreed upon 'slot' levels had their salaries adjusted to those levels. The slot level is equal to the minimum salary of an employee's grade plus an amount equal to 1.5% of the minimum salary times the employee's years of service. From *ad hoc* discussions around MIT, this type of basic minimum adjustment would favorably affect a significant number of support staff salaries.

MIT support staff has been keenly interested in the issue of salary compression for some time now. A well-attended Women's Forum meeting on office issues, "Drowning in the Typing Pool, Part II", (May 1, 1989) had a panel of speakers - two from MIT and two from Harvard. Two main issues were elaborated upon by MIT employees - salary compression (complete with charts and first-hand examples) and workplace privacy. The self-education effort on the part of the Women's Forum participants to prepare for this event was invaluable. Data was gathered from our own experiences and that of some of our co-workers to generate 'home-grown' graphs showing examples of salary compression here at MIT. (In preparation for this meeting we attempted to get salary statistics from the MIT Personnel Office but were refused.) The audience was enthusiastic and contributed examples from their own experience. An interesting aspect of this talk was sympathy for the cause of clerical and technical workers expressed by a professor in the audience, who described how the policies in existence keep him from retaining qualified workers - both clerical and technical.

It is important that more and more connections are made among support staffers who realize that solving problems together will result in more respect for our rights and more acknowledgement on our part that we can unite with faculty to improve our working conditions at MIT - which will improve the quality of life for **all** members of the MIT community.

Global Change: The Need for Interdisciplinary Research

(Continued From Page 1)

ultimately legitimize the responses to evolving scientific evidence and technological choices. Since human actions may well have contributed to interventions - perhaps even alterations - in global environmental processes, understanding the societal underpinnings of these interventions (institutional, political, economic) is an essential part of an overall global change effort at MIT.

The need for sustained interdisciplinary research on the global environment is based on the following factors:

First, clearly, anthropogenic sources of global changes are traced back to three interdependent social processes: human activities and institutions (population growth, emphasis on economic growth, legitimization of wasteful use of natural resources), technological and industrial development, and patterns of natural resource use (deforestation, energy, water, and land). The scientific and technological dimensions are obviously crucial. The human factor, however, is central, since demographic changes worldwide generate environmental effects, both directly and indirectly, through resource use patterns and application of technology, knowledge, and skills. Without adequate focus on the human factor - and socioeconomic, political, and institutional processes - both the sources of change and the possibilities for appropriate response will be missed.

Second, the reality of policy formulation and implementation, both nationally and internationally, itself necessitates interdisciplinary assessments and approaches. Since human effects on the global environment are generated through activities mediated by the institutions of society, understanding the role of institutional frameworks is crucial to understanding the social foundations of man-made environmental effects.

Third, the analytical and intellectual efforts on global change - the sciences, engineering, and the social sciences - have followed an independent course in addressing environmental challenges. The necessity (and convenience) of disciplinary research is at odds with the complexities (and uncertainties) of global change. Disciplinary efforts are essential and must be pursued; but they do not suffice for formulation or implementation of social, institutional, and regulatory interventions required for arresting - even averting - further environmental deterioration on a global scale.

Key *inputs* into policy formation about the natural record on global change must come from the sciences: key *policy processes* can only be understood in the context of analysis in the social sciences.

In this context, then, an interdisciplinary Institute-wide program on global change should stress policy dimensions - national and international - *derived from our research in the sciences, engineering, and social sciences.* It is obvious that the state is crucial in this regard. The state remains the only institution enfranchised to act on behalf of citizens or to regulate their behavior. Regardless of the policy responses envisaged - and the role of industry, multinational corporations, and others - the state cannot be bypassed as a significant actor.

Analysis of the policy responses and the institutional contexts for social adjustments are fundamentally contingent upon the sciences and engineering. Key *inputs* into policy formation about the natural record on global change must come from the sciences: key *policy processes* can only be understood in the context of analysis in the social sciences. The range of policy responses, or outputs, are influenced by prevailing applications of knowledge and skills, engineering, and technology. The task is to integrate these complex dimensions and competing conceptions of global change, clarifying the linkages among them and articulating the nature of the policy agenda, both national and international. In essence, the task is to create intellectual foundations which would provide bridges across the three disciplinary orientations.

The challenge for MIT as a whole is less finding ways to enhance disciplinary-based research, but rather finding ways to facilitate the interdisciplinary intellectual venture. MIT will be expected to be a source of insight, even guidance, as the national policy agenda begins to address the global environment more seriously and its international dimension becomes more pronounced. Since the policy responses will not, and cannot, be based solely on disciplinary-based knowledge alone, the interdisciplinary venture is the distinctive contribution that MIT can make to the crucial task confronting the nation and the international community as a whole - helping to frame the policy debates and contributing to the formation of effective responses.

America's R&D Perestroika

James R. Melcher

First thing each morning, I use a syringe to inject 38 units of NU100 insulin into the subcutaneous tissue of my stomach. As it is for my many diabetic compatriots, this is so routine that my mind is likely to be on other matters. For example, I think about one or another of the talks that I have been giving over IAP in an effort to mature my thinking about how MIT can play a positive and even leading role on rapidly evolving economic and political stages. Although aimed at discussions of how R&D should and can be restructured, typically the preponderance of these events is spent in attempting to establish a sense of crisis as a base for discussion. By the time this crisis without apparent consequences is in view, the time is up. If only there were an inoculation that could be used to get past arguments over how threatening is our current state of economic and political affairs! Then, we could get on to some creative discussion of how we go about having MIT lead in America's R&D Perestroika.

The injection would be made up from two parts. One would provide an awareness of America's uncomfortable reality. By now, most of us can speak to what has happened since 1981 (take a deep breath), to the US Current Account Balance with its undeniable implications for industrial competitiveness; to the US debt with recent horrifying revelations on the obfuscation of its service; to the US control of its own industry which is being sold to support an addiction for borrowing; to the innumerable debts to infrastructure that range from clean ups after nuclear weapons, S&Ls and worthless weapons programs, to falling bridges, acid rain, chemical waste...; to the US demise of K-12 education to....

The second part of the inoculation would avoid arguments over the state of America's Public Mind and its weakness for what Bill Moyers calls "comfortable lies" instead of "uncomfortable truths." Massachusetts politics, dominated by the Gospel According to Anderson, provides us with a sense of the prevailing confusion between patriotism and selfishness that is endemic to the tragedy evolving on the national stage. Barring a conversion of the electorate, one that is unprecedented except at the price of allowing crises to degenerate into depressions or wars, this self imposed political oppression of good sense in the 80's haunts us as we enter the 90's even as we try to restructure. As a participant in the IAP Context Forum "Is the Arms Race Winding Down?", I tried to inject these thoughts. My objective was to shift the focus from guessing about future world events, with the implication that they would continue to dictate our own actions, to searching for ways that we could regain control of our own destiny. "Half of US R&D is funded by the government, 2/3rds of that through the DOD. We must recognize that a strong civilian economy can support real national security, part of which is the military, but not the reverse," I intoned. Lester Thurow commented that military endeavors are currently absorbing 40% of our technical manpower. In regard to what would happen to these people if the US actually cut back on its military commitments, he went on to not-so-facetiously say that these professionals would surely be employed, just not doing technical work.

Barring a conversion of the electorate...this self-imposed political oppression of good sense in the 80's haunts us as we enter the 90's....

Does this prospect square with the needs of US industry? Not according to my experience as well as that of others in my laboratory who work closely with industry. Too frequently, we see engineering groups that we wish we could help that are thinned in numbers and talent through a buy-out, struggling to integrate and enhance their products with new technologies. Often added to the liability of shortsighted management is an inheritance of antiquated methods or an incapacity to innovate when that demands the crossing of disciplinary lines. These groups are crying for a new breed of people that can help them return to a competitive posture.

Industries that are more obviously in need of restructuring are those seeing the Threat of Peace, as the IEEE Spectrum called it. These are the so-called defense industries, which have or by now should have special groups and divisions trying to match their company's capabilities to civilian needs. Called for at the R&D level is a combination of technical expertise and opportunity awareness that tends to be beyond the ken of those only accustomed to that Washington Customer. In the case of the defense industry, what is called for is again a shift in manpower, but in mind rather than place.

Sitting in the front row at this same Context Forum, perhaps thinking of his extensive experience with the DOE, Gerry Wilson expressed reservations about how well any government agency can use tax dollars to get US industry back into civilian business. This reminded me of two

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Thoughts on the Tenure Process at MIT

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friends and colleagues in the face and dispassionately tell them that they have or have not passed muster. My thesis is that the process has quietly drifted away from its intent: to choose the people who in the long run will be the sort of MIT we want it to be. Who, by their thoughts and acts, make MIT succeed at its goals in education and research for its students and as a leader in education and research for the world. I submit that we are measuring only what can be easily measured; not what should be measured. I submit that our approach has been transmitted to our junior faculty. Junior faculty narrow and concentrate their initiatives on how they will affect their chances for tenure. Senior faculty judge junior faculty on standards that are ratcheting up each year, becoming more narrow and difficult. How many of them face the night-time specter of concerns about whether they in fact could make it today? I could stop here and say this is the law of the jungle, and of MIT, and we want to have only the best and the brightest; however, I am concerned that the standards that we are applying are denying to MIT, in many cases, the people it needs to provide its substance and leadership in the very turbulent future facing us.

We want to lead scientific research and to be measured well against our peers; however, it is becoming more and more apparent, as the problems we face become more interactive...that this lone-wolf style may be missing important new areas and may be out-of-step with the future of academia.

We have so many agendas here. Our long-term partnership with the federal government is falling apart and becoming adversarial. How do we again get them to understand the value of what we do and aid that process? The public needs help in understanding the policy implications of our knowledge. Our voice is muffled and disguised. We want to lead scientific research and to be measured well against our peers; however, it is becoming more apparent, as the problems we face become more interactive, more interdisciplinary, more concerned about interactions with society and technology, that this lone-wolf style may be missing important new areas and may be out-of-step with the future of academia. We, at MIT, want to be leaders in education but have largely abdicated the choice of our undergraduates (how they are advised, how they are acultured to the Institute and what they are taught) to non-faculty members. (Do you know what goes on during R/O week?) Can we expect faculty strained through the fine filter of our present tenure process to then widen and blossom to provide leadership for all our activities?

As in most of my diatribes, I see problems but no immediate solution. For instance, Engineering Council attempted to add an educational component to tenure considerations but this is even harder to measure than research ability. In most cases we opt for the easy quantitative way of numerical student evaluations. Are these simply popularity contests? I see my colleagues on Engineering Council grapple with cases. You would be amazed at how fair, careful, non-parochial and probing the process is. We are all trying to understand the larger dimension of a person, what is not written down, and not quantified. It is a very imperfect process and will always be that way.

My own impression is that our tenure problem, as I portray it, is part of a larger issue. What does MIT want to be? So many of the basic paradigms we have based our thinking on, over the last forty-years, must now be challenged as events indicate that we must evolve. A clear idea now of what we want to do and how we want to organize to do it is essential. Once in place, a description of the people necessary to carry out that vision, and hence the sort of person we want to tenure, will emerge. We must resist the easy measures to get to the heart of the issue. We, MIT, are who we attract and retain as faculty and students. At present we are concerned about the choice of students. I suggest that a parallel problem is going on in our choice and retention of faculty. Fully understanding and remedying these problems will be a slow, difficult and painful process but must be first on the agenda of a new administration at MIT.

Talbot House Needs Artwork

We are in the process of improving the interior decor at Talbot House, and funds are very limited. Accordingly, I am looking for interested individuals or departments to donate 2D or 3D artwork that would be appropriate for enhancing the many bare walls and rooms. This could be hand-done works and prints as well as photographs and computer-generated art. If you can help, please contact **Diane Gilbert, Talbot House Coordinator, X3-4158.**

Who Controls Intellectual Property?

Glorianna Davenport

At an institution such as MIT, where learning and research are inextricably intertwined and where professional recognition is requisite to academic survival, developing a framework for issues concerning intellectual property is a Rubicon awaiting most members of the junior faculty. Designation of authorship is probably the most common port of embarkation. A publication, proposal, presentation, or patent application may launch your raft. Incentives, prior art, control over distribution means, and sponsor interests are pockets of white water, likely to be traversed between shore and shore.

My journey began last spring, six months after my promotion from Lecturer to Assistant Professor. Although I will still be perplexed from time to time, I do not ever again want to confront the question of authorship - "whose work is this?" - head-on as I did when I first decided to co-author a paper with a graduate student.

To step back for a minute. As lecturer/researcher, I was first party to my own research. While MIT clearly owned what I was working on and several students helped me to develop software, there was no question about primary authorship. When I signed on as faculty, rather then being a sideshow to a graduate program, my research became the central focus around which all my other activities revolved. Several projects emerged from one. Rather than participating in the very focused hands-on nitty-gritty of making (e.g., a film or computer program), a function to which I was accustomed, I began to explore a range of issues with different students who were now my research assistants.

Today, my camera - which we can equate in some ways to a word processor - waits patiently for those ever rarer moments of action when I ascertain that something is going on which I can explore through a lens. Meanwhile a very talented freshman UROP is charged with the task of making a movie from some of my rushes; this allows her to learn all about our editing gear and challenges her storytelling ability. Happily, credits in the movie industry are plentiful and clear, and she gains the distinguished credit of editor.

What I discovered on my journey was that the faculty - individually and collectively - are arbiters of intellectual policy; in this role we wield considerable influence over the ethics and incentives which will shape invention in tomorrow's society.

The difference between my life as lecturer and as junior faculty member is not just that I am desktop bound. I also have more information and more influence than I used to, and I have a different relationship to the community of the Institute. Information funnels past me on a wide range of topics - personal, technological, literary, philosophical. Frequently I am asked to make presentations about the current state of the art. For the first time last spring I asked a graduate student to co-author a paper with me about a current research project. Although I believe in the joint authorship of this project, my initial shock and confusion upon reading a paper which did not read at all like those I write cannot be ignored. Who was the author? With this question, I unexpectedly opened a Pandora's box of philosophical, practical, legal, and financial concerns which surround disclosure of intellectual property. In developing a strategy for distributing the work, I began to discuss some of these issues with other members of the faculty and so became exposed to the diversity of style with which individual faculty disclose and distribute work.

Who owns ideas? What is a given idea worth? How do we attribute authorship when a particular articulation - an abstraction, algorithm, or design - emerges from a general idea, theory, or program goal? What are the ethics of collaborative authorship? How can we effectively fuse proof of concept with incentives for entrepreneurial pursuits? From a somewhat different but relevant perspective, what is the relationship among education, research and invention?

What I discovered on my journey was that the faculty - individually and collectively - are arbiters of intellectual property policy; in this role we wield considerable influence over the ethics and incentives which will shape invention in tomorrow's society. On the surface MIT owns all tangible property developed either 1) under research contracts or 2) with significant use of MIT facilities. However, it is up to the faculty or principal investigator on a project to disclose technological invention and attribute authorship. This allows the faculty member a fair amount of latitude in determining the preferred strategy for disclosure and distribution.

Frequently students play a central role in implementing a research concept. In order to draw out the commitment necessary for project success, we need to provide students with certain incentives. Sometimes the incentive is a job as in a research assistantship or a UROP. Recognition and citation can also be viewed as incentives. However, the strongest incentive may rest with our ability to

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M.I.T. NUMBERS

Underrepresented Minority and Women Faculty at MIT
March, 1980*

	UNDERREPRESENTED MINORITY			WOMEN			ALL FACULTY		
	Prof	Assoc Prof	Asst Prof	Prof	Assoc Prof	Asst Prof	Prof	Assoc Prof	Asst Prof
School of Architecture and Planning									
Architecture	1		2		3	2	13	12	11
Urban Studies and Planning	1	1	3	1	2		10	15	4
School of Engineering							4	3	
Aeronautics & Astronautics		2		1			24	7	3
Chemical Engineering							14	5	6
Civil Engineering		2				2	19	15	11
Electrical Eng./Computer Science			2	1	1	2	59	24	20
Material Science & Engineering					1		23	6	5
Mechanical Engineering		1				1	28	12	18
Nuclear Engineering						1	15	4	4
Ocean Engineering			1		1		10	7	6
School of Humanities and Social Science									
Economics				1		1	18	1	7
Humanities		1	2	2	7	8	15	21	22
Linguistics & Philosophy				2		2	16	1	5
Political Science	1		1	2	1	2	18	3	2
Psychology					3		8	4	0
Science, Technology & Society			1			1	6	2	4
Sloan School of Management	1			1	1	1	30	17	18
School of Science									
Biology				1	3		25	9	5
Chemistry						2	21	5	7
Earth & Planetary Sciences		1			1		13	10	4
Mathematics			1		1		34	5	11
Meteorology							7	1	4
Nutrition & Food Science		1	2		2		15	11	5
Physics	1		1	1	2	3	60	17	12
Institute Professor							8		
Athletics			1		1	1	1	9	4
Other					1	1	6	6	2
Totals	5	9	17	13	31	30	520	232	200
Total of totals		31			74			952	

Underrepresented Minority and Women Faculty at MIT
June, 1989*

	UNDERREPRESENTED MINORITY			WOMEN			ALL FACULTY		
	Prof	Assoc Prof	Asst Prof	Prof	Assoc Prof	Asst Prof	Prof	Assoc Prof	Asst Prof
School of Architecture and Planning									
Architecture					1	2	12	7	6
Media Arts & Sciences				1		2	4	4	3
Urban Studies and Planning	1	1	1	2	2	1	14	7	2
School of Engineering							1	3	
Aeronautics & Astronautics		2		1	1		16	7	8
Chemical Engineering						1	19	3	4
Civil Engineering	1	1		1	1	1	22	10	4
Electrical Eng./Computer Science	2	1		2	1	2	59	30	12
Material Science & Engineering					1	2	18	8	5
Mechanical Engineering	1					2	28	16	18
Nuclear Engineering						1	16	3	2
Ocean Engineering					1		13	7	1
School of Humanities and Social Science									
Economics				1		1	19	2	6
Humanities	2			10	5	3	31	16	7
Linguistics & Philosophy			1	1			13	2	3
Political Science	1			2		1	15	4	4
Science, Technology & Society					1	1	6	1	1
Sloan School of Management	3			1	4	6	38	15	28
School of Science							1		
Biology				3	2	2	32	10	9
Chemistry			1	2	1		26	3	3
Earth & Planetary Sciences				1	2		23	8	5
Mathematics		1	1		1		36	8	6
Physics	2		1	3		1	61	6	14
Whitaker College									1
Brain & Cognitive Sciences				4		1	17	5	5
Toxicology							2	1	1
Institute Professor				1			9		
Athletics			1		3	1	1	10	5
Other					1	1	31	3	3
Totals	13	6	6	36	28	32	583	199	166
Total of totals		25			96			948	

*Taken from a table supplied by Dr. Clarence G. Williams, Special Assistant to the President and Assistant Equal Opportunity Officer

Mixed Messages: The Pressure to Conform

(Continued From Page 8)

I believe that a longstanding **structural problem** underlies this pattern, that its deleterious consequences extend well beyond the domain of tenure decisions and that unless and until it is rectified it will continue to be harmful to our community as a whole.

As a way of beginning to identify the problem, let me say that it involves a cultivated insensitivity to an otherwise perfectly obvious fact: all attempts to evaluate human behavior are incurably value-laden. This insensitivity is fundamental, and the commitment to it virtually sacrosanct. For without it, an essential illusion would be impossible to sustain: the illusion that some relatively clear-cut standards exist which are capable of serving as a valid and reliable basis for defining academic and/or professional "excellence." And that illusion is the basis for a further one, according to which those performing the evaluation are not only in possession of those standards but also have what it takes to use them for the purpose of determining the presence or absence of "excellence."

This is only the beginning, but it is enough to ensure that the academic and professional socialization of our junior colleagues proceeds under the influence of a whole host of mutually-inconsistent and often frankly contradictory "double-messages." For example, the official "line" has it that both research accomplishments and classroom effectiveness are highly valued and may be expected to be given roughly comparable (if not precisely equal) weight in connection with tenure decisions. The reality, however, often turns out to be quite different.

The MIT administration may be properly faulted for helping to create a climate in which such things occur. The point, however, is that it cannot be properly described as "their" problem because our acquiescence and participation in the process is essential to its perpetuation. And it does go on, progressively becoming a more and more commonplace aspect of our everyday work life. Gradually, through habituation, we become blind to the simple truth that we are not practicing what we preach.

Further to the point, this power to define our "value" is routinely exercised in secret, using criteria arrived at covertly, and in accordance with standards that remain essentially undisclosed.

And what about our creative, ambitious and hard-working young colleagues? They see it, but amidst the academic and professional challenges of this already highly demanding and competitive community what can they do? In effect, they are trapped - and we have helped to trap them - in a classic "double bind." As first described by the late Gregory Bateson and his colleagues, the "double-bind" is a situation where: (1) there is repeated and/or prolonged exposure to mutually-contradictory injunctions with substantial negative consequences foreseeably following from all available responses; (2) the existence of the contradictions is at least tacitly recognized by all concerned, but discussion or negotiation regarding them is precluded; and, (3) those most directly and adversely affected are unable to escape from the field of conflict. (Bateson, G., Jackson, D.D., Haley, J. & Weakland, Behavioral Science, I, No.4, 1956).

Bluntly put, "double-binding" is a form of repression whose capacity to stifle personal creativity has been clearly demonstrated in a variety of clinical contexts. It has no place in a university community that professes to value intellectual freedom and diversity.

And that brings us back to the "structural problem" and the idea that its effects extend well beyond the domain of tenure decisions. It is rooted in the use of language as a means of behavior control in organizational contexts and relates to what Hobbes called the "power to give names and to enforce definitions." Its workings are clearly apparent in situations where **some** people (e.g. administrators) are in a position to use the power of naming as a means of controlling the behavior of **other** people (e.g. faculty members).

Consider, for example, the annual faculty salary review situation at MIT. Leave aside, for the present, the fact that the whole review process is entirely invisible to those most directly affected by it, that it goes on in a manner that (by design or otherwise) pits "each against all" and that it has evidently engendered substantial salary disparities both within and across school and department boundaries. Focus, instead, on the question of what it is that keeps almost everyone from recognizing those disparities for the inequities that they so often really are!

The answer is that besides controlling the purse strings, MIT administrators also enjoy the more fundamental (and thus far essentially uncontested) power to define, for all pecuniary intents and purposes, what is (and what is not) acceptable (or "excellent") in the way of academic and professional behavior on the part of the faculty. Further to the point, this power to define our "value" is

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Mixed Messages

(Continued From Page 18)

routinely exercised in secret, using criteria arrived at covertly, and in accordance with standards that remain essentially undisclosed.

Please do not get me wrong. I am not trying to suggest that it is bad to rely on a system of positive and negative reinforcements as a way of inducing conformity to (and discouraging deviation from) prevailing institutional norms merely because it leads to inequities. The use of money as a means of enforcing social norms had an extended (if not altogether honorable) history long before it found its place in the value system of universities. But, in order to be fair (let alone administratively efficient), the behavior patterns subject to such reinforcement must be made clearly explicit and must be scrupulously adhered to via a process that is itself open enough to permit oversight by and negotiation with those most directly affected.

Nor should I be understood as complaining that it is wrong for administrators to try to evaluate and control what goes on within the organizations they are responsible for administering. Plainly, they cannot otherwise do their jobs. But too often the exercise proceeds as if inspired by the idea that an off-balance membership is easier to manage and that the desire to be defined as a "success" and the fear of being defined as a "failure" are capable of goading people into productive efforts they might not make if they were more secure. Once again, the essential point is that the issues being discussed here are not generally and routinely open to negotiation. In conclusion, there remain many aspects of the prevailing MIT *modus operandi* that share with other, more blatant forms of intimidation the capacity to incite fear, to induce conformity, and to force people with dissenting views into positions of marginality. Is this as it should be?

America's R&D Perestroika

(Continued From Page 13)

other remarks, one from Tom Lee who often says that the government does the best job in interfacing with industry when it is the customer. Although that might have described the Hoover Dam Project in days gone by, I took this as referring to the DOD. Also complimenting the DOD was a rejoinder that came from Jim Ling, a White House-based senior policy analyst visiting MIT in December in quest of insight concerning future technology policy. In response to my concern that we recognize the inherent inefficiency in funneling R&D funds through the DOD, he commented that the overwhelming technical expertise was now in the DOD, not for example in the Department of Commerce. The misplacement of technical expertise in industry is mirrored by that in government.

What we face in the 90's is the ultimate educational challenge. Industrial and governmental America need the new breed of people that MIT has in mind for the 90's, both as graduates and as graduates renewed by an education continued.

The urgency of an American-style R&D Perestroika is overwhelming. But, what does that have to do with MIT?

If education is key to the mobility of human resources, if it is a shift in talent polarized around science and engineering imbued with economic, political and managerial insight that is called for, then our country is now in need of what we at MIT aspire to offer as never before. What we face in the 90's is the ultimate educational challenge. Industrial and governmental America need the new breed of people that MIT has in mind for the 90's, both as graduates and as graduates renewed by an education continued. But, with the challenge so clear to those willing to see the larger picture, we suffer with pressures that head us in the wrong direction. To make things right, there must be restructuring in government, in industry, and in our kind of academia as well.

The swinging of a pendulum is often used as a metaphor in philosophizing about the state of human affairs. Viewed in a state-space with an attractor point or in terms of a potential well, its evolution can be largely guessed from an incremental view of its current state. Its global response is much as you would guess from knowing the current local forces. That the global evolution may be very different from what might be guessed in taking an incremental view is part of our MIT heritage. The Lorenz model, with its strange attractors and its potential for chaos would be a more appropriate metaphor for what is happening to America.

If America is to return to some semblance of free enterprise, if she is to be economically competitive, her institutions cannot act incrementally. This is true for government, it is true for industry and it is true for us...for MIT. Make a list of the pressures you feel in your MIT environment along with the easiest responses. I am hard put to think of many that are not degenerate for America and for its relationship to the global community on a decade time scale. To buck those pressures, we must restructure on a scale that extends across government, industry, and academia. Only then will we remove the strange attractors and the associated dangers of chaos.

Academic Change: Difficulties Encountered by Education Innovations

(Continued From Page 1)

difficulties. Neither list is sufficient alone: enumerating difficulties can lead to cynicism and impotence; tactics by themselves do not aid in recognizing and appreciating the particular human, professional, and institutional arena in which the game is played out.

Difficulties of Change

1. *The Entrepreneur Effect*: Education innovations are often due to the initiative of one person or a very few individuals. As long as that individual or group keeps working on it, the innovation survives. When they stop, it dies. The rock rolls back upon them.

2. *The Isolation-of-Infection Effect*: By calling it Carla's new program, one is excused from becoming involved and may go about one's regular business without seriously considering the innovation.

3. *The "Standards" Standard*: An innovation encounters opposition at exactly that level of the hierarchy at which mention is first made of maintaining standards. Blessed are the formula pietists, for they are untroubled by questions of goodness, virtue or worth.

4. *The NIH (Not Invented Here) Syndrome*: If we have not invented the innovation we cannot claim credit for it and thus fail to gain the prestige that accompanies something new. It is better to be uniquely mediocre than to copy a worthy innovation.

5. *The Threatened-Department Effect*: Many changes possible within a department are suddenly not possible if cooperation with other departments is necessary or if partial surrender of autonomy, certification power, or professionalization is implied.

6. *The Narrower The Needle The More Aquiline The Nose*: The more specialized and abstract the discipline, the closer to divine truth it is.

Theoretical mathematicians look down on applied mathematicians.

All mathematicians look down on all physicists.

Theoretical physicists look down on experimental physicists.

All physicists look down on all chemists.

Theoretical chemists look down on experimental chemists.

All chemists look down on all biologists.

Microbiologists look down on descriptive biologists.

All physical and life scientists look down on all social scientists.

All social scientists look down on all humanists.

All humanists look down on all engineers.

All engineers wonder just what it is that theoretical mathematicians do that is worthwhile.

In such a structure, how can a change be made simply for the good of humanity?

7. *The Tyranny of The Rubric*: No nonphysicist (defined in terms of degrees earned) may teach physics.

8. *The Other-Discipline Effect*: That would be fine in department X but not in ours.

9. *The Prima Facie Affront*: Whereas I have spent a significant fraction of my professional life perfecting my lectures and otherwise investing conscientiously in the status quo, therefore to suggest an alternative is, by definition, to attack me.

10. *The Prima Donna Affect (sic)*: The crucial features of a new format of teaching, necessary for its success, must be modified for my use because my methods and viewpoint are unique, my students are special, and, generally, no one can tell me how to teach my course.

11. *The Presumption of Guilt*: All who raise objection to or suggest modification of my proposal are thereby proved to be against all change and have betrayed my goodwill and that of the Almighty.

12. *If You Speak English Loudly Enough, Any Foreigner Can Understand*: When colleagues do not understand my proposal, I take it as an objection and state my case again in the same way, only louder.

13. *Nothing Can Be Done for the First Time*: The uncertainties of change are too scary for some, leading to a demand for proof of the excellence and success of a proposed innovation before installation.

14. *Everything is Successful for the First Time (a corollary to 13.)*: Should you actually mount your innovation, and its participants like it and perform well, it will be attributed to special circumstances, the uniqueness of the participants, lack of baseline for comparison, and your own maverick nature; and therefore, will prove nothing.

15. *The Presidential Primary Gauntlet*: The proposal must pass exhaustingly through six levels of committees and boards, successfully at each stage, before the innovators can turn attention to the real job they have set themselves.

16. *The Muscle-Bound Faculty*: The faculty as a whole has all of the brakes and none of the engines. There will be a clear majority against anything you can mention.

17. *The Tall Tree Attracts Lightning*: Influential professors often feel an obligation to have doubts for the rest of the faculty. A resulting fire that spreads to the underbrush may prove impossible to smother.

18. *The Overloaded Bandwagon*: Since it is good, let's all do it, together.

19. *The Special Commission Ploy*: All those desiring change are segregated

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Academic Change

(Continued From Page 20)

into a group to "study the entire situation thoroughly," thus ridding the institution temporarily of change-desiring misfits, placing a misfit label on the proposed programs, and reducing the number of proposals due to in-fighting in the commission.

20. ***The Conqueror-of-China Effect***: For centuries China was able to assimilate one set of invaders after another. Academic institutions can swallow innovations, particularly textbooks and curricular materials, without a trace.

21. ***The Evil-Other Distemper***: Personally I'm all for what you propose, but they will never allow it.

22. ***"We Tried It and It Didn't Work"***: Ten years ago, twenty years ago, thirty years ago, when the world was different, somebody tried something not really the same. And failed.

23. ***"We are Already Doing It"***: Our present program has features to which one can apply words similar to those describing the proposed innovation.

24. ***"It Costs Too Much in Faculty Time"***: Any change must cross a threshold of planning and initial dislocation. A happy later life is not visible because attention is riveted on the trauma of birth.

25. ***"It's Fine But It Isn't Academic"***: Some changes alter the meaning of intellectuality, so are excluded by definition.

26. ***"Look at What It Will Cost Us If We are Successful!"***: The students may be able to leave in three years instead of four. The biology subject will need to be taught every term. All of the living groups will want one.

So much for some of the difficulties faced by an educational innovation. What tactics might be useful to help the changes occur, survive, and prosper? Tune in next month.

[*Adapted from Occasional Paper No. 11 of the MIT Education Research Center, 1972.]

Hiring at MIT: Emerging Issues

(Continued From Page 6)

to live a life in which personal goals can be considered (much less accomplished) apart from work....This is communicated in many ways, including deans who suggest that because they made sacrifices and had spouses who supported their careers and their children so should the rest of us. Unfortunately, the days are gone when any of us could afford to live on one income and expect wives or husbands to live at home cleaning house and doing child care so that the MIT employee could serve MIT."

Just over 10% of MIT faculty who responded to last year's family/work questionnaire report working more than 75 hours per week; close to half report work weeks in excess of 60 hours.

It is the quantity of input and quantity of output that are at issue - not the quality of work. Just over 10% of MIT faculty who responded to last year's family/work questionnaire report working more than 75 hours per week; close to half report work weeks in excess of 60 hours. This aspect of the MIT culture - reflected also in students taking 6 or 7 subjects a term - is part of the "pace and pressure" problem at the Institute. That it creates difficulties for young faculty in today's world is reflected in the comments of another untenured male faculty member:

"For motivated two career couples, work weeks of 40 hours can be managed by both partners (utilizing part time day care) if employers are flexible on work schedules. MIT is strong in this regard. However, employers must permit 40 hour weeks to be sufficient service for evaluating promotions. At MIT this is clearly not a sufficient time commitment for tenure promotion. This is forcing a decision on junior faculty: family or tenure. Should MIT be forcing this choice? What are the consequences?"

One consequence may be that MIT will lose out in its search for the best talent. We have anecdotal information of people turning down offers because the combination of junior faculty salaries with living conditions in the Boston area makes personal life sufficiently undesirable to overcome the attractions of the Institute. And a possibly telling result from the family/work survey should give everyone pause. About a quarter of a small number of faculty who responded to a question in the committee's long questionnaire have seriously considered leaving MIT because of conflict between family and work. Not a single person over 45 gave this response (and only 1 who was over 40), compared to 41% of those under 35. Younger faculty live in a changed world; they face different issues from those that confronted senior faculty during their pre-tenure years. Do we want to risk losing these people? What can we do to attract and to retain them?

There are no easy answers to these questions. But the faculty must address them and not perpetuate - out of habit and without reconsideration - assumptions and expectations that no longer fit. For if we persist in outmoded attitudes and ways of thinking we may do harm not only to the young people now coming on board, but to the Institute as an institution of excellence.

[*All quotes and figures are taken from data collected by the Family/Work Committee, under the chairmanship of Peter Elias, which was appointed by the President and Chair of the Faculty to investigate these issues.]

Underrepresented Minority and Women Faculty at MIT

TABLE I

Percentage Of Each Faculty Rank Who Were Underrepresented Minorities

	Prof.	Assoc. Prof.	Assist.Prof.	All Ranks	Number
Black Americans					
3/80	0.8%	1.7%	5.5%	2.0%	19
6/89	1.2	1.0	1.9	1.3%	12
Spanish Surnamed Americans					
3/80	0.2%	2.2%	3.0%	1.3%	12
6/89	1.0	2.0	1.9	1.4%	13

TABLE II

Percentage Of Each Faculty Rank Who Were Women

	Prof	Assoc. Prof.	Assist.Prof.	All Ranks
10/75	1.8%	9.5%	13.5%	6.3%
3/80	2.5	13.4	15.0	7.8
6/89	5.8	14.1	19.5	9.5

TABLE III

Number of Women Faculty In Each School and
The Department of Psychology/Brain & Cognitive Sciences

School	10/75	3/80	6/89
Architecture & Planning	11	8	9
Engineering	7	12	12
Humanities & Social Sciences*	18	28	26
Management	2	3	11
Science	15	16	21
Psychology/Brain & Cog. Sci.	3	3	5

*Not including the Department of Psychology

Underrepresented Minority and Women Faculty at MIT

(Continued From Page 9)

went from 8 underrepresented minority faculty in 1980 to 3 in 1989.

These data made it possible to see which individuals on the tenure track faculty in 1980 were still here in 1989. Three of the 5 professors were still here, one left, and one retired. Three of the 9 associate professors became professors, 2 remained associate professors, and 4 left. Three of the 17 assistant professors became professors, 2 became associate professors, and 12 left, yielding a 70% attrition rate for this cohort. Twenty-three percent of the underrepresented minority professors in the 6/89 cohort joined the MIT tenure track faculty since 3/80, and 40% of the underrepresented minority associate professors.

Turning to the changes in the representation of women on the MIT faculty, I had available to me not only the information on the 3/80 and 6/89 cohorts, but also names and numbers which I compiled in 1975 from the MIT Bulletin issued in October of that year. Table II gives the percentage of each professorial rank who were women in each of the three years, as well as the percentages for all ranks. Overall there is a modest, but steady, increase. Table III shows how this trend varied by School. Numbers for the Department of Psychology/Brain & Cognitive Sciences are given separately, since the name change and a move from the School of Humanities & Social Science to Whittaker College took place between 3/80 and 6/89. It can be seen that the increase between 1975 and 1980 occurred principally in the Schools of Engineering and Humanities & Social Science. Between 1980 and 1989 the increase was mainly in the Sloan School and the School of Science.

Following individuals through the three data sets, one finds that six of the nine women who were professors in 10/75 are still at MIT, one having become an Institute Professor. Two have retired and one is deceased. Thirteen of the 18 associate professors in 10/75 became professors, 11 of whom are still here, one has retired, and one left the Institute. Two of the remaining 5 are still here as associate professors and 3 have left. Six of the 30 assistant professors in 10/75 became professors and are still here, the other 24 left, yielding a 80% attrition rate for the 10/75 woman assistant professor cohort.

The obvious way for MIT to increase the number of underrepresented minority and women faculty is to make the Institute a friendlier environment for them so that they do not leave voluntarily, which is happening in a number of cases....

Among the women who were on the faculty in 3/80, but not in 10/74, one was a professor, 10 were associate professors, and 23 were assistant professors. Of this group 6 are now professors, 3 are associate professors, and 25 have left. Nineteen of the 23 assistant professors left, an attrition rate of 83%. Twenty-two percent of the 6/89 woman professor cohort joined the MIT tenure track faculty since 3/80, and 85% of the woman associate professor cohort.

In conclusion, I would like to make one additional observation on both groups. The 6/89 data distinguished tenured from non-tenured associate professors, making it possible to calculate the percentage of each group that was tenured. The results are that 72% of the underrepresented minority faculty were tenured, 56% of the women faculty, and 75.4% of all faculty. The difference between the numbers for the underrepresented minority faculty and the women faculty is principally due to the relative dearth of underrepresented minority junior faculty, a situation that should be rectified. It would be interesting, if laborious, to obtain attrition rates for all assistant professors over the same period to permit a comparison with the numbers presented here for women and underrepresented minority faculty. However, even in the absence of such a comparison, it strikes me that 80% is a high attrition rate for junior faculty.

The obvious way for MIT to increase the numbers of underrepresented minority and women faculty is to make the Institute a friendlier environment for them so that they do not leave voluntarily, which is happening in a number of cases, and to do a better job of mentorship of assistant professors so that they may achieve tenure.

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Real peace is more than absence of war. To fulfill human expectations peace must be a condition which permits the release of the latent creative energies of all the people to the end of enhancing and elevating the quality of human life on this globe.

I. I. Rabi

Salary Spread and Other Issues

(Continued From Page 7)

Salary compression comes about when, in a newly popular field, MIT has to compete for young faculty with well-heeled companies and institutions also anxious to hire bright new Ph.D.s. Starting salaries have to be raised, sometimes to the point where a newly hired assistant professor will be paid more than someone who has already been working here for a year or two. The differential between an assistant and a full professor also lessens. Most faculty would recognize that this type of compression is a requirement of the market, and will live with it. The alternative (probably impossibly costly and not necessarily a fairer arrangement) is to raise everyone's salary within that field, leading to differentials among people of the same rank but in different fields. There is a sentiment that the faculty would like to have perhaps an annual report giving general data on where and to what degree salary compression is occurring.

If everyone is given, year after year, the average increase, the differences among faculty on different tracks steadily increases. If individual members of the faculty are not informed of their positions in relation to their cohorts, they are being given, in effect, "hidden grades"....

Salary spread can be defined as the ratio of the highest to the lowest salaries of people at the same rank in the same field. It appears that this ratio can be 1.5-2.0 and possibly more for extreme cases (perhaps a Nobel prizewinner in the same group as someone who has been "left behind"). A great deal of freedom in setting salaries is given to department heads, although there is some oversight from others. Faculty are allocated into roughly defined tracks, often soon after hiring or promotion. Each year a department head is told the average increase in salary that the school can afford.

If everyone is given, year after year, the average increase, the differences among faculty on different tracks steadily increases. If individual members of the faculty are not informed of their positions in relation to their cohorts, they are being given, in effect, "hidden grades" that some faculty find disturbing (unless, I suppose, they find that they have been given "A"s).

A related aspect of the salary question is that of tenure. Department heads often ask young untenured faculty members to take on demanding tasks such as being IAP coordinators. Young eager people throw themselves into these activities believing that, if they do a good job, they will be rewarded. The exiguous evidence available points, however, in the opposite direction: a good performance at these tasks generally leads to a lower likelihood of tenure being granted, and probably to a lower salary track.

These and other salary questions would benefit from more openness: not complete nudity, but a modest degree of information being made available to the faculty, so that it might take the opportunity, if it wishes, of modifying policy. There is also a thorny question: do department heads have too much power?

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Psychic Income

(Continued From Page 7)

while he was certainly aware of it, was I aware that you couldn't put a down payment on a house in Cambridge with it. And there in a nutshell, I think, is the tension that many of us now are experiencing about being at MIT. Twenty-seven years ago, when I first started teaching, I was paid $10,000 a year and I bought a house for $30,000. Today that house is worth ten times the starting salary of a young faculty member, thus making the buying of a home much more difficult now than it was when I was in the market.

So, on the one hand, there is the tremendous feeling of self-worth that comes from being a part of this community, while on the other hand there are the hard economic facts about buying into the community outside of MIT, and these two kinds of income are presently at war with one another.

So, on the one hand, there is the tremendous feeling of self-worth...while on the other hand there are the hard economic facts about buying into the community outside of MIT....

In a recent IAP talk Walter Lewin spoke about the dreams and nightmares of being at MIT. The dreams involved his work and the nightmares involved the reality of supporting his work through the constant pressure to find grant support. It was noteworthy that in his talk he spent roughly 61 minutes on the dreams and 12 minutes on the nightmares. That is a rough measure of the ratio of psychic to real income at MIT. The challenge for the rest of this century is to ensure that the nightmares don't overwhelm the dreams.

Retirement Plans at MIT

(Continued From Page 6)

- until the Federal government put a stop to such practices. Few professors, or instructors, knew what was going on. Harried MIT treasurers, faced with a deficit, lived with the compromise.

I mention such a historical point for this reason. If MIT were part of the general stream of pension provisions, our faculty and administrators could leave it to national decision makers to devise and follow best practice. But if we run our own system, and nobody much is watching and worrying, then there is a danger of drifting in non-optimal directions.

Are you against demon rum? Foul tobacco? Defense contractors? Polluting and gender-discriminating corporations? Firms with South African interests? At Harvard you will be able to channel your pension dollars into an ethical CREF fund. At MIT all you can do is demonstrate under the Dome.

Let me be specific. Are you against demon rum? Foul tobacco? Defense contractors? Polluting and gender-discriminating corporations? Firms with South African interests? At Harvard you will be able to channel your pension dollars into an ethical CREF fund. At MIT all you can do is demonstrate under the Dome. At the University of Texas you can choose from a menu of a hundred different mutual funds. At MIT the menu has two options on it. (As a knowledgeable economist, I expect quite a few Texans will get into trouble; but zealots on personal freedom will tell me to get lost.)

When you retire, do you want generous lump-sum payments - to buy a yacht? to invest on your own in profitable snake oil ventures? Many universities will now let you have all the rope you can use or misuse. MIT safeguards against the embarrassment of ancient professors who panhandle in Central Square.

When single male and female professors retire from MIT at 70, each with identical earning profiles, by recent law they must receive the same monthly pension check - even though women on the average will live more months than men will. At Smith College, where more than half the faculty are females, it pays to belong to TIAA-CREF. At MIT, where relatively few engineers and scientists are female, a fund could pay out higher monthly checks to all and still not go broke. This is an argument - a petty one - for having a separate inhouse system.

In conclusion, the elderly have been faring exceptionally well recently in comparison with past history. Many professors, at 70, begin with more cash receipts than they have hitherto known, once social security and other supplements are reckoned in. Surveys show surprising contentment among retirees. The future, particularly for the baby-boom generation and for epochs when stock and bond markets will not be booming, has a more guarded prognosis. The bell that tolls, tolls also for MIT.

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Dinosaurs, Geniuses, Admissions

(Continued From Page 10)

engineering? Not at all. MIT undergraduates spend at least one quarter of their time on humanities and social science courses. Some of them even major in these fields. MIT has always stood for a well-rounded education in both the sciences and liberal arts, as the Lewis Report recommended forty years ago. Specialization has its merits, but extreme specialization has no evolutionary advantage, in biology or education. Dinosaurs and woolly mammoths were well-adapted to their environments, but they died out when the world changed, to be replaced by that mediocre physical specimen, **homo sapiens**, who had only her generalist mind to keep her alive.

Broadening the education of engineers will never turn MIT into a second-rate Harvard. MIT will always be excellent at whatever it chooses to do.

As Confucius put it, "The superior person is not a tool." On an interdependent, multicultural, rapidly changing globe, people with only one device in their intellectual toolbox will not prosper. Broadening the education of engineers will never turn MIT into a second-rate Harvard. MIT will always be excellent at whatever it chooses to do. The faculty, admissions staff, students, and future president of MIT have the opportunity to educate the scientifically literate citizens of the next century. Today, more than ever, MIT needs to attract, and admit, those rare young people who show great talent, dedication, and curiosity about **both** science and human affairs.

Admissions Practices Show Change

(Continued From Page 10)

applicants in each range (%offers). Table 2 shows similar data for 1988, when we had 5999 applicants, and offered admission to 1622 (27%). The groups in Table 2 are arranged on the current 0-5 numerical index scale.

This comparison must be viewed with care, because a new admissions system changed the way that both the numerical index and the non-numerical index were computed between 1978 and 1988. Nevertheless, the difference is striking. In 1978, about half of all our offers went to applicants below the top quarter on the numerical index scale. In 1988, when we had many more applicants and were much more selective, it was still the case that half of all our offers went to applicants below the top quarter. In particular, our greater overall selectivity resulted in a much higher rejection rate for applicants at the top of the numerical index scale. In 1978 we made offers to 95% of the applicants in the top 5%. In 1988 we made offers to only 58% of the applicants in the top 2%.

Table 3 summarizes 1988 admissions decisions for applicants in the top quarter of the numerical index scale, sorted by non-numerical index (NNI). Column A shows (O/A/%) - the number of applications received, the number of offers made, and the percentage acceptance rate for students with numerical index 5 (the 98% and above range of applicants). The rows sort applicants by the 0 through 5 non-numerical index scale. I've also indicated the level (L) among all 1988 applicants that this index represents. For example, 8% of all 1988 applicants had a non-numerical index of 3.5 or above, while 27% had an index of 3 or above. Column B shows the same information for students with numerical index 4.5 (the 88% thru 98% range of numerical indices). Column C shows the same information for students with numerical index 4 (74% through 88% range).

There are some notable aspects to this data. First of all, even among students with the same non-numerical index, having a numerical index in the 88-100% range did not give one better chances of admission than having a numerical index in the 74-87% range. Secondly, only about 5% of this top-quarter numerical index group have non-numerical index below 2. More generally, the non-numerical index is a poor discriminator: for 56% of the total applicant pool, the non-numerical index is between 2.5 and 3.5.

It is important to appreciate that applicants with non-numerical index between 2.5 and 3.5 are not blatantly one-sided, nor are they Prof. Kistiakowsky's "students who have never demonstrated any sign of individuality or creativity." For example, in the personal attributes component of the non-numerical index, a level 3 is described as "Very good: substantial evidence of strong qualities; participates well with others; is often described as a team player." In the personal accomplishments component of the component of the non-numerical index (which explicitly excludes academic accomplishments), a level 3 is "Very good: Impressive accomplishments and/or important contributions with recognition generally within school or community."

In other words, applicants in this range are average to very good students when measured on non-academic criteria. In 1988, we rejected 182 of the 458 among them whose numerical index put them in the top 12% of the pool academically. In the same year, by the way, we offered admission to 127 applicants whose numerical index put them in the bottom quarter of the pool; and, among these offers, 88 were to applicants with a non-numerical index of 3 or lower.

It is dangerous to draw conclusions from small numbers and selected data, and I urge interested faculty to obtain complete admissions data for recent years and form their own opinions. Perhaps what these numbers show best is that admissions decisions, both the assignment of non-numerical indices and their interpretation at round-up, is a highly subjective process. The same issue of the *MIT Faculty Newsletter* that contained the remarks by Professors Emanuel and Kistiakowsky also brought us the information that only 3% of MIT faculty participated in the undergraduate admissions process last year. This, I suggest, should be our real concern about MIT admissions.

Table 1

1978 Admissions by NI

1802 of 4102 (44%) offered admission

NI	%pool	%adm	%off
90-99	5	95	11
80-89	9	89	18
70-79	13	82	24
	27%		**53%**
60-69	13	74	22
50-59	11	40	10
40-49	12	24	6
30-39	10	11	2
20-29	8	11	2
0-19	15	7	2
no index	5	2	2

Table 2

1988 Admissions by NI

1622 of 5999 (27%) offered admission

NI	%pool	%adm	%off
5	2	58	5
4.5	10	59	21
4	14	48	25
	26%		**51%**
3.5	16	33	20
3	17	22	14
2.5	14	15	8
2	13	10	5
1.5	8	9	3
1	6	3	1

Table 3

1988 Admissions of top quarter NI group

sorted by NNI

		A NI=5 (98-100% NI)	B NI=4.5 (88-97% NI)	C NI=4 (74-87% NI)
NNI	L	O/A/%	O/A/%	O/A/%
4.5	99.95%	0/0	1/1/100%	0/0
4-4.5	99%	5/5/100%	17/17/100%	9/12/75%
3.5-4	92%	26/28/92%	77/83/92%	82/90/91%
3-3.5	73%	31/43/72%	154/195/79%	180/249/72%
2.5-3	41%	13/44/29%	78/176/44%	119/278/42%
2-2.5	17%	5/17/29%	8/79/10%	21/180/11%
1.5-2	3%	0/2	0/18	1/47/2%
1-1.5	0.3%	0/0	0/2	0/5

Who Controls Intellectual Property?

(Continued From Page 15)

provide a framework in which students can think and develop inventive solutions to project stumbling blocks. Part of my role in any project, therefore, is to keep open a communication channel which is resilient enough to encourage structural and methodological discussion and also allow for exchange about sometimes emotional concerns regarding recognition and incentives on a particular project. With each successive project, my look-ahead agent becomes more honed. Simultaneously, my conviction that the methodology and ethics we apply in recognizing and disclosing new ideas are viewed as models for future ventures is reinforced by conversations with past and present students.

Since my initiation into the intricacies of property rights as I see them and as the Institute sees them, I have been approached as a sounding board by several students who were feeling uncomfortable about some aspects of their rights relative to the Institute and/or in relation to their advisor. This has lead me to explore a more universal perspective on ownership.

Basically, we have two strategic models for ownership of intellectual property. On the one hand we have an employer/employee model in which the employer owns all tangible property in perpetuity and uses the legal mechanism of licensing as a means for distributing (usually with economic gain) the property. At the other extreme we have a collegial model: the case of sole author can be viewed as a special case of a partnership of two or more authors; decisions about dissemination and profits are made by the isolated individual or by the partnership. These two approaches frequently piggyback on each other as when two members of an institution co-author an invention.

In the course of setting a policy the issue of fairness is likely to arise, particularly in cases where there is a single author, but other beneficiaries, including sponsors, must be given certain privileges. Swings of the policy pendulum - from less patriarchal to more patriarchal - will inevitably generate controversy. Most arguable perhaps is how the general policy affects incentives. On the one hand, the incentives must encourage student and faculty authors to give their all to invent at MIT today, even while they may dream about their role in the world tomorrow; on the other hand, the incentives must attract sponsors to the Institute, without whom we jeopardize the future of the community and the collective quest for knowledge.

# #

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Think It Should Change? - Help Us to Change It.

The *MIT Faculty Newsletter* is produced by MIT faculty for MIT faculty. It is mailed to all faculty members, professors emeriti, deans, and Corporation members.

The *Faculty Newsletter* is supervised by a volunteer Editorial Board whose membership is intended to be representative of the faculty. Each issue is the responsibility of a subset of the Board, an Editorial Committee. Members of the Board typically serve on one or two Editorial Committees a year. The Editorial Committees develop themes for each issue, solicit input and generally oversee the production of individual issues. The actual work of layout, assembly, copy editing, and production is carried out by the Production Editor, David Lewis. The production and distribution costs are assumed by the Institute.

The next several years will be exciting and important. The *Newsletter* can play a role as **our** instrument of discussion and advocacy. It won't be much work and you'll get even less credit but this is an important collegial responsibility. Please join us.

Either fold and mail this page (if you can't figure out how to do it so your label is included, perhaps you might not want to apply) or leave a message at extension 3-7303. We'll get back to you.

Top Ten Salaries at MIT
1988

Name	Title	Compensation
Paul E. Gray	President	$226,000
W. E. Morrow	Laboratory Director	179,250
David S. Saxon	Chairman	179,000
John M. Deutch	Provost	171,500
Glen P. Strehle	Treasurer	169,000
G. L. Wilson	Dean/School of Engineering	157,500
Jonathan Allen	Laboratory Director	149,000
D. L. Maclellan	Laboratory Director	141,500
A. N. Weinberg	Medical Director	141,500
Constantine B. Simonides	Secretary	127,000

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