The MIT Faculty Newsletter

Government Support of Research... A Changing Picture

Charles M. Vest

It speaks well for our institution that the president is invited to write in the *Faculty Newsletter.* I appreciate the opportunity. Because there is such intense and timely interest in the matter of indirect costs of research and the current status of our audit reports, I have chosen to communicate with you very specifically on this topic. If so invited, I would like to return to this forum to comment on some broader academic matters in a future issue.

Who would have thought that the arcane topic of indirect cost accounting would not only be in the forefront of faculty minds, but on the front pages of the nation's newspapers as well? Yet a variety of social, fiscal, and political forces have riveted much attention on these matters. There are two issues – the basic policy issue of which research costs should be borne by federal grants and contracts, and the procedural issues of accuracy and integrity in the implementation of detailed accounting guidelines.

It was probably inevitable that these issues would become critically important – given the fact that indirect costs are now very substantial, having for over a decade comprised approximately 30 percent of research expenditures in U.S. universities. Beyond that, of course, is the general, and quite appropriate, increased public concern about accountability and integrity following a decade of excesses in many segments of our society.

What Are Indirect Costs?

All expenditures within a university fall into one of three categories: instruction, research, and activities that support both instruction and research. Each year, MIT and government auditors examine all of our expenses to determine how much we spend on instruction, how

> **Just prior to publication, MIT received notice of the withdrawal of the audit reports by DCAA. Nonetheless, the issues discussed here will undoubtedly be of continuing importance.**

Editorial

Who Steers the Intellectual Course of MIT?

*Dwight D. Eisenhower, in addressing the faculty shortly after taking office as president of Columbia University, remarked that he was pleased to greet the employees of the university. A senior member of the faculty rose in response: "General, we **are** the University."*

When Jerry Wiesner was president of the Institute he once responded to a query about his duties that 90% of his time was spent trying to discover the interests of the faculty. Traditionally, the MIT faculty have played the major role in charting the intellectual course of the university. The role of the administration has been to respond to faculty initiatives, establish priorities, allocate resources to facilitate programs, and ultimately to raise the money necessary both to fund individual programs and to preserve the talent pool of individuals who choose to do their scholarly research here.

Are these traditions being honored today and should or can they be? To what extent do external pressures interfere with the ability of both the

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Editorial

Who Steers the Intellectual Course of MIT?

(Continued from Page 1)

faculty and the administration to accomplish their goals? Who really runs MIT? We examine these questions in this month's editorial, and next month we shall address the related issues of what the goals of the Institute should be and how well they are being pursued.

Many of the key administrative positions at MIT have changed hands within the past year or so. Several new people have brought with them an agenda of goals, and in this issue of the *Newsletter* the deans of the Schools of Engineering, Science, Humanities and Social Science, and Management discuss their individual views. The agenda of President Vest was published in these pages about one year ago and the present issue follows up with a series of questions and answers dealing with a variety of items on the menu. Of interest, is the extent to which the deans, as well as the president, provost, and other officers of the administration, have consulted with the faculty before formulating their agendas.

Some members of the current administration have the laudable practice of meeting with individual faculty to "take their pulse," thereby ensuring that faculty concerns receive a fair hearing. By what mechanism do other administrators meet this objective? The former dean of engineering initiated and President Vest spearheaded action to address the deficiencies of K-12 education. Is faculty initiative the sustaining force? And to what extent do

forces outside MIT dictate administrative agenda items?

The Institute is now under intense scrutiny from previously unfamiliar quarters. These include, but are not limited to, congressmen who are concerned that technology funded with American dollars is being exported abroad, members of the executive branch who want to alter the way in which graduate tuition is recovered from government grants, and investigatory committees and regulatory agencies that mandate the expenditure of valuable

administrative and faculty time to establish procedures to deal, for example, with scientific integrity and misconduct. Partly in response to these events a Faculty Workshop on University Science and the Federal Government has been convened to examine the issues and, no doubt ultimately, issue a report.

Apart from the administration, the next most prominent force that channels the intellectual energies of the Institute are groups of faculty involved in collaborative arrangements or projects that affect a large cross-section of the community. The Energy Laboratory represents a defining example of such a consortium, which was founded in response to the oil shortage crisis of the early 1970's. Other examples include many specialized laboratories at the

Institute, each of which required considerable human and financial resources to establish, but not all of which are able to sustain their initial momentum. The Francis Bitter National Magnet Laboratory is an obvious case. Once such a consortium is formed and funded, usually from external forces, it becomes part of the culture and a consumer of intellectual energy, money, and space. As such it could deprive those members of the Institute who are not participants of assets necessary to pursue their own favorite research and teaching activities.

Where in the fabric of MIT's intellectual activities is room left for the contributions of the lone scholar? Some years ago, a senior faculty member was heard to remark that one of the wonderful rewards of being a professor at MIT is that the Institute leaves you alone. By this statement one might conclude that space, time, and resources are provided to allow the lone researcher to pursue his or her intellectual interests without undue external influence. Can we say that this situation still exists today? Given the notion that administrators, government regulators, and coteries of faculty entrepreneurs who manage large cooperative projects consume MIT's resources, what is left for the lone scholar? A minimum requirement would seem to be a good laboratory and/or library, as well as support from the department head.

> **Major changes in the administration of MIT put us in an ideal position to forge a new agenda. We call upon the faculty to voice an opinion by means of letters or articles that we can print in the next issue and which can serve as a forum on the intellectual direction to be taken at the Institute in the near future.**

Who Steers the Intellectual Course of MIT?
(From preceding page)

There are many parallels between MIT at the end of World War II and at the present time. As the second world war ended, a new social order was created in Europe that had a profound influence on academic institutions in the United States. At MIT, a commission chaired by Warren Lewis proposed many initiatives that set the course of education and research on this campus for several decades. Today we are witness to the end of the Cold War, the collapse of the Soviet Union, and a different world order, where European nationalism is being replaced by a multinational collective and economic conflict with Japan. Major changes in the administration of MIT put us in an ideal position to forge a new agenda.

We call upon the faculty to voice an opinion by means of letters or articles that we can print in the next issue and which can serve as a forum on the intellectual direction to be taken at the Institute in the near future. One issue that might be addressed is the current question of MIT's role as an international university. Should we actively be seeking support for academic and research programs from other government and business sources outside of the United States?

To pursue intellectual goals of choice requires freedom from financial dependency on special interest groups that dictate the course of teaching and research. Equipped with such freedom, fundamental research interests such as molecular-based devices, theoretical particle physics, oncogene function, or options theory afford the potential for solutions to problems that are multinational in scope. The payback could come with the answer to issues of the preservation and remediation of the environment, provision of food supplies worldwide, moderation of demographic change, and control of life-threatening diseases, as well as response to other major health issues.

Who then will steer the intellectual course of MIT? Only the faculty can answer this question.

Editorial Committee

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Next Issue

The next issue of the *Faculty Newsletter* will include a discussion on innovative teaching techniques and a piece on classroom space at the Institute.

We also hope to publish responses to this month's editorial request, as well as the second part of our discussion on the intellectual direction of MIT.

We welcome articles or letters on any topic of interest to the MIT community. Please address all submissions to: ***MIT Faculty Newsletter*, 38-160;** or by E-Mail at **FNL@ZEISS.MIT.EDU.**✤

Faculty Meeting
February 19, 1992
Tentative Agenda

Recommendation of Degree Candidates
— Professor Koster (CAP) and Dean Perkins (CGSP)

Review of New Appointments to Academic Council
— Provost Wrighton

Report from the Committee Concerned with ROTC Discrimination Issues
— Provost Wrighton

Remarks by President Vest

From The Faculty Chair

Current Events: Government Relations, Review of the General Institute Requirements and the Academic Calendar

J. Kim Vandiver

One of the responsibilities of the Chair is to represent the faculty in the discussions and deliberations of the administration. This year these discussions have focused, to an extraordinary degree, on issues which I will broadly categorize as government relations. These include the overlap-antitrust suit, indirect costs, and remission of graduate student tuition from the employee benefit pool.

We at MIT are certainly not alone in defending our indirect costs and employee benefit charges. However, it is my understanding that the problems at Stanford were worsened by serious divisions between the faculty and the administration over indirect cost issues. From time to time faculty at MIT have had complaints and legitimate questions regarding such issues. It is my hope that the new committee on indirect costs will provide a significant faculty voice in future decisions on matters of indirect costs and employee benefit charges, such as tuition for graduate student assistants.

As to the handling of the government relations matters this year, I have been quite comfortable with the honest, forthright, and principled way the MIT administration has faced these challenges. The combined efforts of our news office, government relations, and financial operations staff, not to mention the offices of the chairman, president, and provost, have required enormous expenditures of time and energy. In my role as Chair, the president has specifically included me in discussions concerning government relations issues and has demonstrated concern for keeping the faculty informed.

It seems to me that we at MIT, the faculty and administration, are fortunate to share a strong sense of a common cause. For example, our decision to fight the antitrust suit regarding the financial aid overlap meetings was the result of a shared desire to preserve need-blind admissions policies, thereby protecting access to MIT for the most economically disadvantaged students.

I suspect that we also share a common frustration with respect to the challenges of indirect costs and employee benefit policies which are being directed at MIT. The frustration arises from the apparent inability or unwillingness of individuals in the federal government to evaluate issues, such as graduate student tuition payments, on the basis of the long-term interests of the country, rather than such narrow desires as uniform accounting procedures. Likewise, the indirect cost issues should be seen from the long-term view of the contribution research universities make to the productivity and competitiveness of the United States. The recent retraction of a key government audit suggests that perhaps some of these arguments are beginning to be heard in Washington. The situation is very fluid and unpredictable. Therefore, the last item on the tentative faculty meeting agenda for February [Page 4] is presented simply as "Remarks by the President," and is intended to give him an opportunity to update us on the current situation.

The Review of the Academic Calendar and the General Institute Requirements

Closer to our academic concerns is the review of the undergraduate curriculum mandated by a vote of the faculty last May. A calendar committee is at work, and the development of the charge for a committee to review the General Institute Requirements (GIRs) has been initiated by the Committee on the Undergraduate Program (CUP). On January 16th, the CUP hosted about thirty faculty and staff for a day-long discussion of the most important issues. The discussion included the broad subjects of 1) the freshman year, 2) the scope, content, and appropriateness of the GIR's, and 3) issues of concern to the School of Engineering. It is too soon to announce new directions, but it is appropriate to reflect on the thoughts and words of MIT faculty who have contemplated these issues in the past. I will close with a few quotes of historical significance drawn from our required reading for the January CUP meeting, excerpted from the 1949 Report of The Committee on Educational Survey, chaired by Professor Warren K. Lewis. The headings are mine, and the gender bias in some of the quotes reflects practices of an earlier time.

The Rogers Plan

"Rogers had three main principles in mind when he founded the Massachusetts Institute of Technology.

"First, he believed in the educational value of useful knowledge. He felt that in an industrial society science and technology were legitimate foundations of higher education and that a place must be made for the young man who wished to apply the fruits of scientific discovery to the satisfaction of human wants.

"Second, he believed in learning by doing, that is, education through first-hand experience with real situations.

"Third, he believed in introducing professional education at the undergraduate level, and in combining with it the basic elements of a liberal education. The development of technical

Perspectives on the Future of MIT

Issues in the School of Science: Excellence in Education and Research, Diversity, Civility and, as always, Financial Stability
Robert J. Birgeneau

I would like to begin this article by thanking the editorial staff of the *Faculty Newsletter* for providing me with a forum for expressing my views on various issues of importance to the School of Science and to MIT as a whole. I think that Derek Bok defined the role of the administration most succinctly in his departing address as president of Harvard. He stated that he had made it his highest priority to attract and support the most outstanding faculty possible, because the quality of the faculty defines the institution. It is my intention in the School of Science to follow this dictum as closely as possible. I am not a great believer in hiring this year's expert in this area or that area simply to meet some perceived short term need. Rather we must ensure that we hire and promote only the highest quality educators and scholars. These faculty will then tell us, the administration, which research and educational issues are most important.

In terms of priorities we must recognize that first and foremost, MIT is an educational institution. In spite of concerns expressed at the recent Colloquium on Education, I believe that our classroom teaching is generally of quite high quality. We have many dedicated and skilled educators in every department in the School of Science. Several of our departments have particular responsibilities vis-a-vis the core courses including the upcoming biology initiative. We intend to monitor carefully the teaching of those courses to ensure that they are of the highest quality. We also are implementing various teaching enhancement programs including videotaping and preparatory teaching-skills courses. Certain structural changes will occur including, quite possibly, the introduction of the option of a minor in Science for undergraduates. A very direct way in which education can be enhanced is through the reward structure. Accordingly, teaching involvement and accomplishment both in the classroom and in the laboratory, will become an increasingly important part of the promotion, tenure, and salary determination processes in the School of Science. I also intend to provide significant resources for innovative educational experiments. Education, like research, requires continuous experimentation and creative development.

In Science, excellence in research cannot be administrated from above. All the administrator can do is to help provide optimal conditions for creative endeavors. All of the departments in the School of Science are among the best in the

School of Humanities and Social Science: Its Current Health and Emerging Role in MIT's Internationalization
Philip S. Khoury

The School of Humanities and Social Science is today healthier, more secure in its identity, and better connected to the rest of MIT than ever before. The quality of its faculty and curriculum has steadily improved over the past decade. Its major departments continue to be among the world's leaders in research and graduate training and are attracting larger numbers of undergraduates into their programs. Its Humanities units have recruited some of the most talented scholars and teachers in the United States and are developing programs around these faculty. A new interdisciplinary Ph.D. program in the History and Social Study of Science and Technology is already emerging as a national leader at the pre-eminent institution of science and technology.

Language programs are in a rebuilding mode, employing the latest technologies in interactive video; students are flocking to Japanese; and this year Chinese has been added to the curriculum. Teaching and research in the area of international studies is flowering across the School. And our faculty has taken the lead in undergraduate curriculum reform, by reinvigorating the HASS-Distribution system, introducing popular new minor programs, and strengthening existing majors in the Humanities.

Leadership has been a crucial component in the improved state of the School, and my immediate predecessor deserves special recognition in this regard. Nan Friedlaender strengthened the faculty appointment process, helped to recruit and retain faculty in the humanities with academic profiles consistent with those in the social sciences and in the rest of the Institute, and identified and put into place the next generation of departmental leaders. With the late Margaret MacVicar, she led the charge that produced the curriculum reforms in HASS. Historians who become deans (and I'm not the first) are naturally predisposed to reflect on the past, so permit me to state categorically that I assumed the deanship in particularly fortunate circumstances owing to Nan Friedlaender's achievements.

There is still considerable room for improvement and innovation, and here I would echo for my School much of what the new dean of Science, Bob Birgeneau, has written in these same pages: we must continue to attract to MIT the highest quality educators and scholars; we must continue to improve the quality of our educational programs and promote

Future Directions of the School of Engineering: Post-Modern Engineering
Joel Moses

I have been asked to give some of my thoughts regarding the future directions of the School of Engineering. The School conducted a major long range planning exercise in 1988-89, and I believe that my comments here are consistent with the positions developed during that planning exercise. It should be understood that I am discussing here an important but narrow segment of the initiatives currently underway in the School.

Modern engineering began during World War II. During the war engineers worked closely with scientists and mathematicians, and realized that their approaches had much to teach engineers. In the decade following the war engineering curricula changed radically to reflect that lesson. Thus arose engineering science, the dominant approach to engineering education and research today. Engineering science has been extremely effective in creating a better foundation for the various engineering disciplines, based on science and mathematics. On the other hand, it has become increasingly clear that the engineering science approach, which we call here modern engineering, has been far less effective in certain areas, such as manufacturing, the design and management of large scale technical systems, and in coping with environmental changes. Post-modern engineering represents an attempt to broaden the concerns of engineering to deal with such issues.

Post-modern engineering is not simply concerned with a broader educational and research agenda. Rather, it involves a fundamental change in attitudes about the nature of engineering and the relationship of engineers and their projects to the overall competitiveness of their firms as well as to society. For example, modern engineering lends itself very well to a local optimization view of engineering projects. Post-modern engineering recognizes the importance of a broader, more holistic and integrative view of the engineering enterprise.

The shift from engineering as taught and practiced prior to the war to modern engineering was often a radical one. In the EE Department one is often reminded of the day that Gordon Brown, then head of the department, decided to remove the electric power machinery in Building 10. In contrast, the shift from modern to post-modern engineering is evolutionary in nature. In fact, one would expect that most of the education and research in the School would remain squarely in the engineering science mold.

The Sloan School of Management: Agenda for the Next Decade
Lester C. Thurow

Three issues spring to the fore if you think about the next decade from a management school perspective.

Global management is the name of the game since everyone will be operating in a global economy even if they never physically leave the United States. Sloan wants to be a world leader in understanding and practicing global management.

For Americans, it will be a more competitive decade technologically, since for the first time in half a century, America will have a number of competitors who are its economic equal and can afford to invest as much in technology. Being located at MIT, Sloan wants to be the world's leader in understanding how to manage product and process technologies efficiently.

Change: Management is the art of persuading human beings that they must change before they fail – not after they fail. Given a new economy and intensified technological competition, change is going to be required to a far greater degree in the future than it has in the past. Sloan wants to be the leader in understanding and teaching people how to manage change.

To implement these strategic goals, a number of developments are now underway.

The best way to efficiently work with people from other areas of the globe is to first have the experience of learning with them. This means a substantial number of foreign students (about one-third) in the student body and an active effort to get American students into the rest of the world. Here, short-term trips such as those to Asia and Europe in the spring and longer experiences like the MIT-Japan Program play a key role. To internationalize the faculty and its research, a number of collaborative activities have been organized with Singapore, Italy, Japan, and Taiwan. Other possible activities are now under active discussion.

Learning to manage technology better means the Leaders for Manufacturing Program, but it also means a Management of Technology Research Center to complement our Management of Technology Masters Program. These are then supplemented with industry specific technology-management research projects such as that on the pharmaceutical industry or studies such as those now under discussion on the financial services industry in the International Financial Research Center.

Information Systems at MIT

James D. Bruce

MIT's Information Systems (IS) group consists of six service departments – Academic Computing Services, Administrative Systems Development, Computing Support Services, Distributed Computing and Network Services, Operations and Systems, and Telecommunications Systems. The central focus for all of Information Systems is to lead MIT's efforts to make optimal use of information technology in its education, research, and business activities. Throughout its work, Information Systems takes its responsibility to support the faculty seriously.

The newest department within IS, Academic Computing Services (ACS), was formed at the time of the merger of IS and Project Athena. ACS coordinates computing for education and for scholarly interaction at MIT. With other IS departments, it ensures the maintenance and renewal of the Athena Computing Environment, and the availability of consultants to help faculty and students. ACS brings computer-based teaching innovations to the attention of faculty members who might use them, and assists faculty members who want to use computers in their teaching. Please contact the ACS faculty liaisons (x3-0115, f_1@mit.edu) to obtain advice and assistance.

ACS also provides informational materials, conducts demonstrations in its multimedia Visitors Center, and responds to inquiries from within MIT and from colleges, universities, companies, and other organizations throughout the world (x3-0194, jdaly@mit.edu). In collaboration with other MIT offices, ACS plans and implements new facilities for educational computing, such as the state-of-the-art classroom in Room 1-115 inaugurated in January 1992.

The educational activities and effects originated by Project Athena continue today. About 100 MIT subjects use Athena. The pace of new courseware development has slowed, but in its stead there is increasing attention to making tools and software developed elsewhere available to MIT faculty and students. Virtually all freshmen have Athena accounts within a few weeks of arrival. About half of them take 3.091, which uses the Athena Online Teaching Assistant (OLTA) system, in their first term. Having once begun to use Athena, our undergraduate students continue to use this computing environment throughout their stay at the Institute. With a majority of graduate students also using Athena, the level of computer use in MIT education is extraordinarily high.

MIT's educational computing achievements continue to be recognized nationally. "A la rencontre de Philippe," from Foreign Languages and Literatures, won a special award in EDUCOM '91's annual software competition. The Joe Wyatt Challenge, which sought success stories in undergraduate educational computing, cited four Athena programs and activities, including OLTA and its relatives, plus Project Athena itself – the only institution-wide effort so recognized.

On January 1st a new director of Academic Computing, Dr. Gregory Jackson, assumed leadership of ACS. "Our challenge is simple," said Jackson when the appointment was announced. "We need to understand how technology can help improve MIT education, and then make sure that the right technology is available and accessible to faculty and students. We need to study our own past successes and failures, to learn from experiments at other colleges and universities, to manage our technological

resources effectively, and to increase faculty understanding of their capabilities and shortcomings. All of this will require collaboration – within Information Systems, to be sure, but especially with faculty members, and departments. I want especially to ensure that MIT's core educational experiences – the General Institute Requirements, and the defining subjects of the larger Courses – benefit from what Project Athena taught us about effective educational change."

Faculty interact with IS through its other departments as well. Three obvious areas of interaction are the telephone, the computer network, and the acquisition of computer hardware and software. In fiscal 1989 MIT made a major change in its telephone system by installing an on-site AT&T 5ESS digital switching system to provide service to both our offices and laboratories as well as a large fraction of the on-campus student community. As this system has matured we have seen fewer daily trouble reports with shorter times to repair, and we have been able to install new lines more rapidly. Rates for basic telephone service for the current year have continued at the fiscal 1991 level and we are proposing no increase for fiscal 1993. In addition, we have entered into strategic partnerships with AT&T within the past few months under which MIT will avoid $500,000 annually in costs for long distance and other services. We have also participated in state regulatory activities which have resulted in an additional annual cost avoidance of $500,000 for local calls. The preponderance of these cost avoidances will accrue to the budgets of academic departments and to faculty research contracts.

Today, the campus computer network connects some 4,500 computers throughout the campus. Over the past

Information Systems
at MIT
(Bruce, from preceding page)

calendar year, IS has renewed its central network infrastructure, replacing older, essentially home-grown technology with a 100 megabits per second fiber optic based network using commercially available systems. As a result data rates today are a factor of ten higher than a year ago and the network reliability, maintainability, and manageability are all significantly improved. Network service is available in essentially all of the campus' education and research buildings. Planning is underway to extend network service to on-campus student residences.

MIT also played a leadership role in establishing NEARnet, the regional computer network for New England which provides our connectivity to the world-wide Internet. Late last year, the U. S. Congress passed and the President signed the High Performance Computing and Communication Act of 1991. This bill mandates construction of a new National Research and Education

network with new services made possible by much higher data rates by the mid-1990's. The availability of this network as well as increased interest in networks from all segments of our society, and particularly from information providers, makes it clear that all of us are likely to use national and international networks much more intensively in the future as we do our scholarly work.

Also of significant interest to faculty is the MIT Computer Connection (MCC) located in the Student Center. The MCC sells computer hardware, software, and maintenance services to the Institute community, both the Institute as a corporate entity and its faculty, students, and staff as private individuals. Last fiscal year, the MCC sold some 2,500 personal computers and workstations, an increase of about 25% over the previous year. In addition, the MCC provided contracts for DEC and Sun hardware maintenance and for their system software update services to some

600 machines on-campus at significant price discounts. During the coming year, more and more of the MCC's business will focus on workstations and workstation products, and we foresee the MCC becoming as important on the campus in the workstation marketplace as it is today for personal computers.

Information Systems is a service organization. Service to our customers – the Institute's faculty, students, and staff – is a high priority for the entire organization. Quality customer service means that we listen to our customers and that we work to deliver with innovative products and services to satisfy their requirements. Please contact me (x3-3103, jdb@mit.edu), Greg Jackson (x3-3712, gjackson@mit.edu), or any of the Information Systems staff to let us know how we can better serve you.

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Current Events
(Vandiver, from Page 5)

proficiency was not enough; higher education ought to enable a man to participate effectively in what Rogers called 'the humane culture of the community.'

"He urged that the principles of science rather than the details of their application be cultivated in our undergraduate curricula, and he believed strongly that the accumulation of facts about science and technology is secondary to the mastery of a scientific method of thinking."

General Education and Social Responsibility

"Education in science and engineering can provide certain attributes useful throughout life, namely, the ability to

use elementary logic, the critical faculty including the faculty of self-criticism, the spirit of free inquiry, personal integrity, and professional responsibility.

"As a scientific and technological institution, MIT has obvious and challenging opportunities in this area: the opportunity to make a larger contribution to the solution of urgent social problems, the opportunity to help prospective scientists and engineers to understand better the forces that are molding contemporary society, and the opportunity to give students of the social sciences and the humanities a better insight into the meanings and implications of science and technology."

The Engineering Profession

"Even in the absence of complete information, it is necessary for the engineer to make decisions with respect to the merits of several alternative possibilities. It is through this ability to make critical judgments that the engineer's professional competence often finds its highest expression.

"It is essential that the modern engineer be able to organize and direct men. His success depends as much upon his understanding of human relations and his skill in handling men as upon his technical competence. Full achievement in his profession requires that he be a man of broad culture with a deep sense of social responsibility." ❖

Issues in the School of Science
(Birgeneau, from Page 6)

world in their respective fields. It is our responsibility to help maintain this pre-eminence. There is currently a number of exciting new initiatives on the table including, for example, the Human Genome Project, Global Change, and LIGO-the laser interferometer gravitational wave observatory. We intend to play a leading role in all of these. I do, however, have one concern

much of its strength derives from this diversity. MIT is, in effect, a national university and we must reflect the diversity of the nation we serve. Our undergraduate admissions office has done an admirable job in broadening our undergraduate body. Unfortunately, we have done less well at the graduate level. Further, we must admit that we have failed at the faculty and research and

and cares deeply about them.

Unfortunately, the reality of contemporary academic life is that few of the above goals will be achieved unless we have an adequate financial base. Relative to our sister institutions we are grossly under-endowed. We are just coming to the end of the highly successful "Campaign for the future" which has greatly ameliorated the situation. The School of Science, however, did not do as well as one would have liked in the Campaign. We still have inadequate numbers of graduate fellowships, chairs, and endowed research funds for junior faculty. Further, we are desperately short of funds for "bricks and mortar." Our great Biology Department will finally have facilities which will enable it to maintain its leadership position into the next millennium. However, similar needs exist in other School of Science departments. I hope that, with the appointment of a development officer for our School, we will be more successful in fund-raising in the post-campaign era. This will require active and enthusiastic participation by all of the School of Science faculty as well as the administration.

> **I do, however, have one concern about research at MIT. Too few really novel, apparently serendipitous, discoveries seem to occur here. I fear that our system militates against the kind of person who is driven to pursue exotic, low probability ideas. Basically, except in rare cases, such people would not survive our tenure system.**

about research at MIT. Too few really novel, apparently serendipitous, discoveries seem to occur here. I fear that our system militates against the kind of person who is driven to pursue exotic, low probability ideas. Basically, except in rare cases, such people would not survive our tenure system. I would welcome input on this issue.

I would now like to switch from research and educational matters to communal issues. The most important of these is diversity. Unlike some MIT faculty, I do not believe that one can measure the quality of potential scientists and engineers solely by their SAT or GRE scores. Human beings are multidimensional and they must be evaluated on the basis of many different criteria. The United States is a remarkably diverse nation and, indeed,

administrative staff levels. For the latter categories, leadership must be provided by the department heads and the academic deans. I will be very disappointed if, after my term as dean of Science is completed, we have not increased significantly the number of women and minorities among our graduate students, faculty, research staff and, for minorities especially, our administrative staff. I hope, in addition, that by then we will have all learned to behave in a civil, empathetic manner towards each other and that harassment workshops will be unnecessary. Many of us feel that the general level of civility at all levels has declined at MIT over the last decade and we must reverse this trend. Generally, the upper administration spends significant amounts of time on such human issues

I would like to conclude by saying that I consider it both an honor and a privilege to be named dean of Science at MIT, especially in an administration as dynamic and exciting as that provided by Chuck Vest and Mark Wrighton. My immediate predecessors, Bob Alberty, John Deutch, and Gene Brown have created and nurtured an exemplary School of Science. I hope, with the support of the faculty, to do my part in maintaining and, if possible, enhancing our pre-eminence. My door is always open and I welcome input from all members of the community. ❧

School of Humanities and Social Science
(Khoury, from Page 6)

innovative educational experiments; we must do our utmost to reflect the changing demographic trends and growing diversity of our nation and of our student body by strengthening our commitment to the recruitment of women and members of underrepresented minorities to our faculty; and we must continue to build MIT's financial base to ensure that the exceptionally high quality of our students, faculty, staff, and educational and research programs is maintained, and indeed enhanced, over the long-run.

The School of Humanities and Social Science is in the process of defining new initiatives for the coming decade and beyond. One of these is to establish a central role for the School in fostering MIT's "internationalization;" it is an initiative that matches existing faculty strength and interest. Suzanne Berger, head of Political Science, has recently written that "by internationalization we mean introducing changes into the educational program and research structure that will teach our students and ourselves to be life-long learners in university, laboratory, company, and social settings outside the United States and to be able to bring home knowledge in ways that will contribute to American life." The aim is to evolve over the next decade a variety of programs that offer MIT students cross-cultural and international learning experiences to prepare them for leadership roles in education and research, industry, and government in the United States and abroad. Our increasingly interdependent world in which economic, scientific, and technological influence is no longer an American monopoly suggests that internationalization should become one of the Institute's top priorities.

To achieve this goal, the School of Humanities and Social Science, with the assistance of faculty in the other Schools, has begun to take several concrete steps

and is considering others.

(1) Faculty are designing new HASS Minor programs in regional studies that focus on the New Europe, East Asia, Latin America, the Middle East, and Africa. These Minors will offer integrated programs of study in the history, cultures, politics, and economics of these regions and, most importantly, will require a minimum of two years of intensive language training. It is expected

> **Our increasingly inter-dependent world in which economic, scientific, and technological influence is no longer an American monopoly suggests that internationalization should become one of the Institute's top priorities**.

that regional minors will be in place by September 1992.

(2) Faculty are designing new undergraduate and graduate subjects that examine comparative industrial performance, environmental policies, and other large-scale organizational problems within the framework of cross-cultural and cross-national analysis. These subjects will encourage learning about domestic as well as European, Japanese, and other technologies, organizational models, and work styles.

(3) Faculty are systematically exploring the possibilities of establishing study-abroad programs that will enable MIT undergraduates to pursue credit-bearing course work outside the United States not only in the humanities, arts, and social sciences, but also in technical and scientific fields.

(4) Faculty are examining the possibility of establishing summer and

full-year internships in European laboratories and companies for students that have completed their undergraduate degrees in science and engineering. Having pursued on-campus programs (e.g. the proposed HASS Minor in European Studies) that combine training in a European language with subjects in history, culture, politics, and economics, interns will be able to participate as full colleagues in laboratories and companies with entry-level European engineers and scientists. The model for this MIT-Europe Program is the highly successful MIT-Japan Program, a flagship of the School of Humanities and Social Science.

Our approach to internationalization is one in which students are taught to be life-long learners in new cross-cultural and international settings, first on campus, and then abroad in various regions of our increasingly interdependent world. This undertaking will at first introduce small, incremental changes at the margins of the MIT educational enterprise, and it can be achieved with current faculty resources and modest administrative support. It will require combining faculty in new ways that provide added value for education and for productive cross-national research on an inter-school basis. In the long run, it will help to broaden and enrich MIT's scientific and technical culture, by improving the framework within which our scientists and engineers integrate their knowledge. The process will be slow and evolutionary because changing any culture, especially one that is as dominant and pervasive as our own, requires perseverance and patience. But the challenge is one that the School of Humanities and Social Science welcomes. The opportunity to participate in charting MIT's future is something my colleagues and I would not wish to miss.   ❖

Future Directions of the School of Engineering
(Moses, from Page 7)

The School has been shifting to a post-modern view for a number of years. Its Technology and Policy Program is an SM program intended for students who have been out for 3-5 years and who are interested in issues, such as the environment, that are at the intersection of technology and policy. The Leaders for Manufacturing Program (LFM) is a

> **Post-modern engineering is not simply concerned with a broader educational and research agenda. Rather, it involves a fundamental change in attitudes about the nature of engineering and the relationship of engineers and their projects to the overall competitiveness of their firms as well as to society.**

joint program between the Sloan School and the Engineering School leading to a master's degree in each. This program is also intended for students who have been out for 3-5 years. These examples hint at the fact that it has been easier to implement educational programs for post-modern engineering at the graduate professional level than at the undergraduate level. Nevertheless, we ought to continue trying to integrate such ideas into undergraduate engineering education. For example, one of the goals of the NSF-funded EXCEL coalition, which MIT has joined, is to introduce design throughout the undergraduate engineering curriculum. On the other hand, it has been difficult to find the time for a required subject specifically devoted to post-modern ideas. Five Year First Professional Degree programs are being actively discussed in the EECS and Aero and Astro departments. It remains to be seen whether these programs will generate a 'free' slot since these programs add the requirements for a master's degree to the those of a bachelor's.

In the past year a number of new

initiatives that are post-modern in character have been discussed in the School. The Program for Environmental Engineering Education and Research (PEEER) will be announced early in 1992. The goal of this program is to define a coherent agenda in education and research for the many faculty in the School who are interested in the environment. PEEER will interact with the Provost's Council on Global Environment. We also hope to announce early in 1992 a new Program on Technology, Management and Policy that will coordinate and enhance the various educational and research activities in the School in these areas.

The School's Committee on Large Scale Systems has been discussing a number of initiatives that relate to post-modern engineering. One is a program similar to LFM that might be called Leaders for Engineering. LFE would emphasize techniques for the design of large scale engineering systems (e.g., cars, planes, large software systems). A second initiative under discussion would build on the experience in the Technology and Policy Program and create subjects or even a new program in the technology and policy area intended for a broad audience of engineering students.

I expect that all these initiatives will place the School in a position of leadership in the post-modern engineering era similar to that which it has traditionally enjoyed in the era of engineering science. ♣

The Sloan School of Management
(Thurow, from Page 7)

The interaction of technology and change are the focus of the Coordination Sciences Research Center. Change means strong faculty research interest in human resource development and its management. Here the industry specific projects such as those in automobiles or pharmaceuticals can often provide a good lab for experimentation. In the end marketing ideas and products are not all that different.

But the management of change also means being willing to change at MIT. For we are among those that must change before we fail. This means thinking out what TQM (Total Quality Management) might mean in a university context and practicing as well as teaching continuous improvement. Teaching materials have to lead practice rather than follow practice. TQM is one area where business schools lagged practice and where business schools are now playing catch-up. Our goal would be to have no such areas in the 1990's at MIT.

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M.I.T. Numbers

Academic and Research Space Allocations
(000's of N.A.S.F.*)

	FY 1970	FY 1975	FY 1980	FY 1985	FY 1990
Engineering	720	801	797	773	744
Science	648	723	866	829	723
Other Labs & Centers	718	413	441	700	681
Classrooms	140	135	143	152	144
Architecture & Planning	75	102	110	161	184
Humanities & Social Science	72	93	109	145	132
Management	49	55	61	83	74
Whitaker & HST					149
TOTAL	2,422	2,322	2,527	2,843	2,831
Academic & Research Space per Faculty Member	2.4	2.6	2.8	2.8	2.9

*Net Assignable Square Feet
Note: Academic and research space decreased between 1970 and 1975 due to the divestment of Draper Laboratories (approximately 350,000 square feet).

FY 1970

FY 1990

Legend:
- Engineering
- Science
- Other Labs
- Classrooms
- Architecture
- Humanities
- Management
- Whitaker
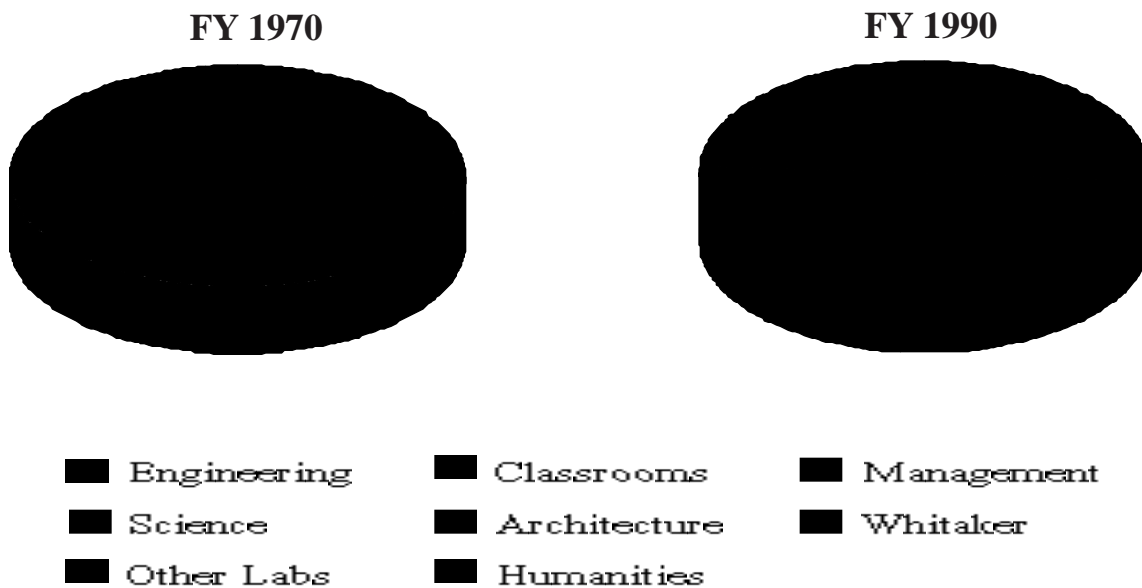
Source: **MIT Factbook**, Prepared by the Planning Office, June 1991.

Government Support of Research
(Vest, from Page 1)

much on research, and then determine what portion of our support activities serves the research program and what portion supports the instructional activities.

In research accounting at MIT and other universities, direct costs are those salaries and benefits, equipment purchases, materials and services that are directly attributable to particular research projects. Indirect costs of research represent the relevant portion of activities such as heat, light, libraries, administration, and debt service on new facilities that are not attributable to a specific project, but that do support the research activities in general. These are real costs. If they are not recovered from research sponsors, they must be paid either from tuition revenues or from endowment and gift support.

The policy guidelines for determining the indirect costs of research are spelled out in a document designated as Office of Management and Budget Circular A-21. The procedures and protocols through which these policies are implemented for all federally sponsored research at MIT have been developed and modified over decades – fully audited by the Defense Contract Auditing Agency (DCAA), and approved by our oversight agency, the Office of Naval Research (ONR). We maintain good and effective working relations with these agencies, despite occasional differences over methodology.

Recent Audits

Nonetheless, the most recent DCAA audit recommends significant departures from past practice and dramatic changes in the process by which we allocate support costs to research and to instruction. Such changes, if put into practice, could impinge severely on the ability of MIT to remain at the forefront of science and technology and,

specifically, on our ability to attract and support graduate students.

Both the DCAA audit report and our response to it were submitted to the ONR, which has sent them to each of the agencies with whom we interact, asking for their comments by the end of January. Also at the end of January, the House Energy Subcommittee on Oversight and

> Since 1983, acting under a Memorandum of Understanding with the government, MIT has treated graduate student tuition remission as an employee benefit, and has included these costs in the employee benefit rate for the entire Institute, including Lincoln Laboratory.

Investigation is planning to hold another hearing on the general matter of indirect costs of research, during which reference to MIT is likely.

The key issues in these audits include the following:

Reimbursed Costs

Following a joint review of accounts with DCAA, we reimbursed the government for $778,000 of unallowable costs – out of $480 million in indirect costs and $2.7 billion in direct costs that we received during the period 1986-1990. About half of this amount resulted from inadvertent accounting errors in a tiny fraction of the millions of entries that were processed over this period, and the other half are allocations that we willingly agreed to treat as inappropriate, despite the fact that they previously had been approved by the government.

Memoranda of Understanding

While most of our indirect research

costs have been handled according to the OMB A21 guidelines, over the years we have negotiated 10 Memoranda of Understanding (MOUs) that govern the handling of certain costs – such as library costs – in ways that are more appropriate for MIT. This year, the DCAA has challenged 8 of these longstanding MOUs. While we are always prepared to discuss reasonable revisions to these agreements on a prospective basis, we would strongly object to any DCAA recommendation to retroactively alter these contractual agreements that were negotiated in good faith.

The $22 Million Challenge

The audit that was conducted in order to establish MIT's 1992 indirect cost rate and employee benefit rate has challenged $22 million out of $130 million of annual indirect costs. About half of the $22 million in contested costs comes in the areas of campus and central administration and in the libraries – costs that we believe are fully justified and that were identified on the basis of longstanding agreements with the government. Most of the remainder is composed of anticipated costs which did not materialize (and thus will be withdrawn as a matter of course) or allowable costs associated with post-retirement benefits which we plan to handle in a different manner.

Graduate Student Research Assistants

A critical issue affecting graduate education and research results from a challenge to the way the costs of research assistant tuition remission is handled. Since 1983, under a Memorandum of Understanding with the government, MIT has treated graduate student tuition remission as an employee benefit, and has included these costs in the employee benefit rate for the entire Institute,

Government Support of Research
(Vest, from preceding page)

including Lincoln Laboratory.

By spreading these costs across the entire Institute, this procedure has held down the cost of research assistants to grants – with the result that, since 1983, there has been a 40 percent increase in the number of graduate student research assistants.

The DCAA is now saying that these costs should be included only in the on-campus research base. This recommendation would raise the employee benefit rate for on-campus research to a prohibitively high 75 percent. Were that to occur, it is likely that faculty – in order to compete successfully for research grants – would have to employ post-doctoral scholars or research staff instead of graduate students on research grants. Such a situation would likely result in a substantial decline in MIT's PhDs – and could have a similar impact on other universities that use this method of

encouraging graduate students' participation in research.

This recommendation represents a sudden and dramatic restructuring of the allocations between costs incurred at Lincoln Laboratory and on the campus. This proposed restructuring effectively abrogates the 40-year history of the government's desire to have Lincoln Laboratory operate as an integral part of MIT – an arrangement that has benefitted both the Laboratory and the rest of MIT.

The Office of Naval Research and the Office of Management and Budget have granted a waiver on this issue while the subject is being reviewed.

Committee on Indirect Costs and Graduate Student Tuition

Provost Wrighton has recently appointed an ad hoc faculty-administration committee on indirect costs and graduate student tuition – chaired by Professor Robert Weinberg. We are looking for a first report from the

committee by the end of March.

We have asked the committee not only to seek faculty views on the way in which we support our graduate research assistants, but to develop a clearer picture of faculty priorities related to the topic of indirect costs and to get their ideas on ways we might improve the quality and the cost-effectiveness of our support activities. We have also asked the committee to talk with staff in the support services to get their ideas on how better to respond to the research community.

With this help from the faculty, I believe that the Institute's position on these matters will accurately reflect the opinion of those whose work is most directly affected by any changes in the agreements that govern the support of research at MIT. Beyond that, such participation can only improve the overall education and research enterprise at MIT.

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An Honor Code For MIT?
Charles M. Vest

Having written in this issue on the topic of indirect costs, which I felt a responsibility to do, I have requested additional space for a topic that I want to introduce.

I believe that MIT should seriously consider establishing a student honor code and system. The nation needs leadership in establishing moral and ethical norms in professional practice. Where better to begin than with an important group of tomorrow's leaders

– the students drawn to MIT?

Our efforts to renew our commitment to academic responsibility in the conduct of research and scholarship – highlighted in the work of the Widnall Committee – are part of a continuum that begins within the framework of the classroom experience.

An honor code and system crafted by our students and faculty, and designed to operate in our environment, can build trust and community, can couple

responsibility with the privilege and freedom accorded to MIT students, and can help to clarify the standards of honesty we expect in the performance of assignments, examinations, and other academic pursuits.

I am encouraging the student body and its councils, the faculty, the Committee on Discipline and other parties to examine this possibility in detail during the spring term. ♣