

February 15, 1989
Volume 33 Number 22

Gray memo

A memorandum on educational costs, tuition and student financial aid by President Paul E. Gray appears on page 8 today. The memorandum was prepared as background for a meeting the President will have with students on Thursday, Feb. 23, at 4pm in Rm 54-100. Accompanying the President's memorandum is an article concerning the financial outlook for MIT.

Faculty meeting

A regular meeting of the faculty will be held today (Wednesday, Feb. 15) at 3:15pm in Huntington Hall (Rm 10-250). Agenda items include:

—Comments on pending changes in the Institute Retirement Plans from the Faculty Administration Committee by Professor Ruina.

—A motion to recommend a change to Course XXI degree designation by Dean Friedlaender.

—Working group reports from the Committee on the Undergraduate Program by Dean MacVicar, Professor Wormley and Dean Kerrebrock.

Alternative jobs

An alternative jobs fair featuring recruiters from small, nondefense oriented high tech and consulting firms, nonprofit organizations and government agencies will be held Friday, Feb. 24, 10am-4pm in the Sala de Puerto Rico.

To launch the annual event, Ben Cohen, cofounder of Ben & Jerry's Ice Cream, will speak on "Careers in Peach, Politics and Ice Cream" Wednesday, Feb. 22, at 2pm in Huntington Hall (Rm 10-250).

There will also be two speakers during the jobs fair. Paul Rosier, vice president of Career Concepts will discuss "Alternative Jobs in the Software Industry" at 11am and Chuck Coldert and Anna Aurolio of Mass PIRG will address "What is Public Interest Science?" at 2pm in the West Lounge. All events are open to the public.

League talk

Jeanne Melvin of the Arthritis and Health Resource Center in Wellesley will give a talk today, (Wednesday, Feb. 15) at noon in the Emma Rogers Room (10-340) on Fibromyalgia, a stress-related syndrome that is widespread among women.

The talk is part of an ongoing series on Women's Health Issues sponsored by the Women's League.

CU reminder

Tickets for the annual banquet of the Credit Union will be on sale Friday, Feb. 17. Tickets are \$10 per person and limited to two per member. They can be bought as follows: On campus, E18 Lobby, 11:30am-2pm; at Lincoln, Rm A-263, noon-1pm, and at Draper, Rm 2112, noon-2pm. The banquet will be held Saturday, March 11, at Caruso's Diplomat in Saugus.

Faculty to resume consideration of undergraduate education

By CHARLES H. BALL
Staff Writer

The faculty at its monthly meeting today (Wednesday, Feb. 15) will begin consideration of reports by two ad hoc committees, one bearing on the science component of the General Institute Requirements and the other on certain aspects of the freshman year, including the pass/no record grading system.

The reports move the Institute's reassessment of its undergraduate program into a new phase.

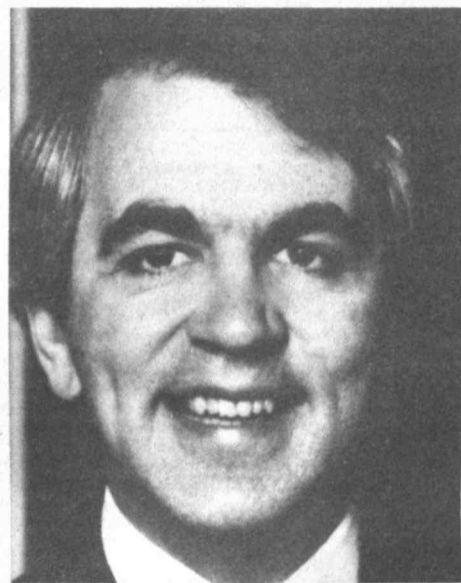
In considering what the nature and character of the overall four-year bachelor's degree program should be to prepare graduates suitably for the 21st century, both the

core program and the relationship of departmental programs to it are under consideration. Within the core, work is turning now to the science area.

As the result of actions already taken in 1987, the School of Humanities and Social Science is in the process of implementing a reformulated HASS distribution requirement and a new HASS minor option. At today's faculty meeting, degree designations for majors in humanities disciplines will be offered to complete the HASS phase of the undergraduate academic program review.

Professor Margaret L.A. MacVicar, dean for undergraduate education, recently dis-

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Mr. Tsongas

Paul Tsongas to be speaker at graduation

Former Massachusetts Senator Paul Tsongas, the newly appointed chairman of the state Board of Regents of Higher Education, will be the MIT commencement speaker on June 5, MIT President Paul E. Gray announced Tuesday.

Dr. Gray said Mr. Tsongas' new position, along with his interest in the relationship between education, economic development and societal well-being, "make it wonderfully appropriate for him to address this particular academic community."

"MIT has been concerned with those same issues for more than 128 years and is credited with contributing widely to economic development generally and to the Commonwealth in particular," Dr. Gray noted.

Mr. Tsongas, who is a partner in the Boston law firm of Foley Hoag and Eliot, was named to the unpaid state post in January by Governor Michael Dukakis, who termed him "one of the most able and respected citizens of Massachusetts." The Board of Regents sets policy for the state's 29 colleges and universities, which enroll some 180,000 students.

In accepting the position, Mr. Tsongas linked the status of public higher education to the future of the United States as a major economic power. "I want to raise the question of whether this state wants quality first-class higher education or doesn't it," Tsongas said at the time. "This country is

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Nakasone to address US-Pacific relations

Former Japanese Prime Minister Yasuhiro Nakasone will speak at MIT as a Compton Lecturer on Wednesday, March 1, at 4pm in Kresge Auditorium. The title of his talk will be "United States and the Future of the West Pacific."

A long-time leader of the Liberal Democratic Party of Japan, Mr. Nakasone served as Prime Minister of the country from 1982-87. President Paul E. Gray will introduce Mr. Nakasone at the lecture.

The Compton Lecture was established in 1957 to bring persons who have made important contributions to modern thought to the campus. The Lecture, which is open to the MIT community, is presented from time to time. It was established in honor of the late Karl Taylor Compton, president of MIT from 1930-48 and chairman of the MIT Corporation from 1948-54.



Members of MIT's Gospel Choir performing at the Martin Luther King observance last week. From left they are: Charles Robinson, Lytore Taylor, Clint Grimes, Felicia Washington, Mark Dunzo and Linda Lifsey. Directing the choir (back to camera) is Crystal Lawson. See story on page 3.

—Photo by Donna Coveney

Outage caused little damage

By ROBERT C. Di IORIO
Staff Writer

The extensive power outage that hit Cambridge between 5 and 10pm on Saturday, Feb. 11, caused a variety of problems on the campus and hit at a time when the main MIT emergency generator was off line for repairs and maintenance.

Athena crashed, but was 80 to 90 percent restored by Monday morning, said Professor Earll M. Murman, Athena director. There appeared to be minimal data loss, he said.

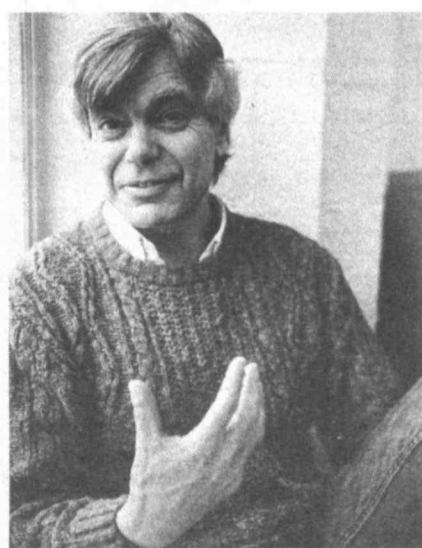
The Institute's new digital phone system handled the situation well, said Morton Berlan, director of telecommunications systems. The main switching centers shifted automatically to their eight-hour batteries and the voice mail system stayed up. Analog phones were not affected. Individual digital phones remained in use for about an hour, powered by battery clusters in various phone closets.

Some lab experiments were lost. For example, in Professor William Thilly's Center for Environmental Health Sciences in E18, stirrers turning very dense cell mixtures stopped. The cells died in minutes because the lack of stirring caused oxygen depletion. Other researchers in E18 and in other buildings had similar experiences.

Some people were stuck in elevators in a few buildings for a time. Stephen C. Miscowski, electrical supervisor for Physi-

cal Plant, who returned to the campus to coordinate emergency electrical operations, said elevator technicians from a company

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The appointment of Alan Brody as Professor of Theater Arts has been announced by Professor Ann F. Friedlaender, dean of the School of Humanities and Social Science. Former chairman of the Department of Theater at Skidmore College, Dr. Brody has published and produced two novels and five plays. See an account of his first major Dramashop production on Page 7, the Arts Page.

A call to celebrate differences marks MIT King observance

The MIT community honored the late Dr. Martin Luther King Jr. on Friday, February 10, with critical self-appraisal as well as prayer and song.

President Paul E. Gray, in introducing the keynoter, graduate student and Jesuit seminarian Gregory C. Chisholm, said "a colonial attitude" on the part of MIT is one of the reasons the Institute hasn't made more progress in enrolling minority students and attracting minority faculty members.

"We—the powers that be, so to speak—have seen it as our responsibility to help the underprivileged, to be compassionate, to create opportunities for those who have had less than we have. We have tended to look at our equal opportunity programs as doing the right thing for someone else—doing a favor to others by opening up our doors. No wonder we've not made much progress. It hasn't occurred to many of us that we have something to gain, culturally and intellectually: and that is the vitality and richness that comes from incorporating and learning from differences."

Mr. Chisholm, the man Dr. Gray introduced, provided in his address a view of MIT from the perspective of an African-American student who arrived in 1969 and who, in his own words, has rarely left. It was a view uniquely informed by Mr. Chisholm's unusual background: an engineer with two—soon to be three—degrees from MIT who is studying for the Roman Catholic priesthood. He was the first keynote speaker from MIT in the 15-year history of the Martin Luther King observances here.

Mr. Chisholm fascinated his audience of about 400 people with an insider's view of MIT, at one point suddenly reciting the famous Tech cheer, which includes the lines "cosine, secant, tangent, sine, 3 point 14159, square root, integral, u dv, slip stick, slide rule, MIT."

In remarks titled "In Behalf of Justice," Mr. Chisholm issued challenges on behalf of justice to MIT the institution, to white men and women at MIT, and to black men and women at MIT.

"Can MIT buck the national trend and stand uniquely among its great peers as an institution where any man or woman on Earth can find encouragement and support in pursuit of an education? Can you see that true greatness lies in incorporating the unique gifts of many diverse people? We are diminished when any group is marginalized."

He challenged white men and women at MIT to make their offices, labs, classrooms and living groups places where all races can grow.

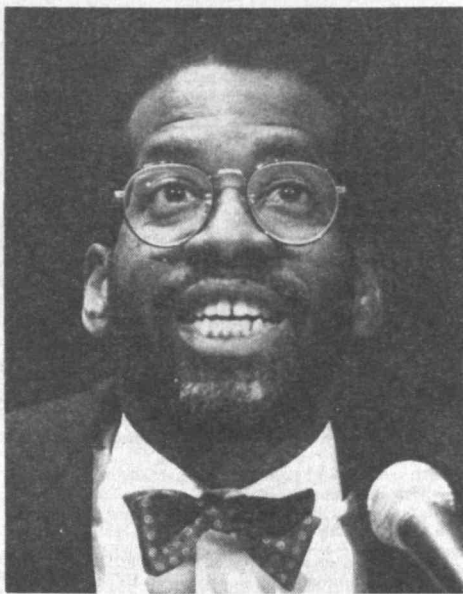
To black men and women at MIT he said: "I challenge you on behalf of justice as I challenge myself. Is there an area of concern in which you are uniquely qualified to lend assistance to our needy community, whether in education, business, day care, drug rehabilitation, athletics, or jobs: Can you teach your children with pride about their African ancestors, their journey through slavery, the fight against Jim Crow, Martin Luther King's dream, and love of self?"

His remarks drew a prolonged period of standing applause.

President Gray, in his introduction of Mr. Chisholm, said MIT has gathered for 15 years to "rededicate ourselves to the shining principles of freedom and justice that invested Dr. King's life and vision." Recalling the practice of using the King commemoration as a time for taking stock, Dr. Gray said he is concerned about a "me first" attitude and the "what's-in-it-for-me" question that pervades so many decisions in business, education, government or personal life.

"We have strayed from the idea of common cause. . . Perhaps it was easier, in earlier times, to have a shared national vision—when social values and goals were defined by a clear majority, when simple patriotism was a universal value, and patriotism was indeed simple. But in many ways that consensus was illusory, because it did not take into account—did not value—the differences among us."

MIT, he said, has tended to regard differences as stumbling blocks, "rather than seeing them as sources of complementary



Gregory Chisholm speaking at the Martin Luther King observance.

strengths—resources to be tapped for the common good, for the development of a richer, more vigorous intellectual and social community.

"Until we can regard each other as partners in our own evolution. . . we won't succeed in developing policies and programs that really do make a difference—at MIT, or in the society as a whole."

Dr. King, he said, captured this thought eloquently when he said that we are all "caught in an inescapable network of mutuality, tied in a single garment of destiny." This single garment of destiny is a coat of many colors—providing comfort, stimulation, beauty and hope to all who seek its folds. I believe that if each of us takes just one step toward embracing and learning from the differences among us, we will be forging a partnership that will strengthen and enrich the quality of all of our lives, even as we fulfill that common destiny."

The audience gathered first at Lobby 7, where there were musical selections, and then silently marched across Massachusetts Avenue to Kresge Auditorium.

A small group of students who accuse MIT of racism were present in Lobby 7 and at Kresge, where they gathered in the orchestra pit, holding signs. They climbed onto the stage when Dr. Gray began his talk. At one point, when the small group began to chant "divest now," Dr. Gray departed from his text and addressed the small group of students. "If you have a bone to pick with me, don't pick it now, at this event." There were no further comments from the group. —Robert C. Di Iorio

HSSP announces spring schedule

Do you know any students in grades 7 through 12 who'd be interested in taking a course on bicycle repair, reviewing for the SAT, or computer programming?

These and many other creative academic and nonacademic classes will be taught by MIT students and area professionals in the spring 1989 term of the MIT High School Studies Program (HSSP).

Classes meet for nine Saturdays from March 11 through May 6 in three class periods between 10am and 5pm. Students can take up to three courses for a total cost of \$25.

Registration for the spring term will be Saturday, March 4, 10am-noon in Lobby 7.

For more information call Steve Worley, Class of 1990 and director of HSSP, at x3-4882, or write to HSSP, Rm W20-467.

ACM conference seeks student papers

Undergraduates are encouraged to submit short papers on computer science by this Friday, Feb. 17, for the first MIT-ACM (Association for Computing Machinery) Undergraduate Computer Science Conference.

The author of the best paper will receive \$1,000. Authors of the ten best papers will present their works at the April 8 conference, which was developed to recognize and display research done by MIT undergraduates.

Possible sources of papers include term projects for classes (e.g., 6.111 or 6.036),

Writing competition opens

The 1988-89 Writing Prize Competition, sponsored by the Writing Program, is accepting manuscripts from undergraduates through April 13. The 24 prizes carry cash awards and are given to students whose essays, plays, poetry, short stories and technical papers are judged to be of the highest quality by a committee of faculty and staff members.

Thomas Simmons, assistant professor in the Writing Program and this year's competition chairman, hopes all interested students will submit their best efforts to the competition. He is also encouraging faculty members who receive outstanding undergraduate papers to urge the student writers to enter the competition.

The prizes are:

—The Ellen King Prize for Freshman Writing—for writing in all categories (fiction, short story, essay, drama). First prize, \$150; second, \$75; honorable mention, \$25.

—The Robert A. Boit Writing Prize—for undergraduates in the categories of essay, poetry and short story, with prizes in each category. First prize, \$200; second, \$100; honorable mention, \$50.

—The Boit Manuscript Prize—for under-

graduate work in fiction, poetry, drama or essay of substantial length, completed or in progress. This prize is for longer works or collections that give evidence of publishable quality. First prize, \$300; second, \$150; honorable mention, \$75.

—The S. Klein Prize—for outstanding interpretive writing on scientific and technological subjects by undergraduate and graduate students. Entries should be specifically intended for a nonspecialized, but educated audience. First prize, \$300; second, \$150; honorable mention, \$50.

—The DeWitt Wallace Prize for Science Writing for the Public—writing by undergraduates for lay audiences on issues and developments in science, medicine or engineering. First prize, \$300; second, \$150; honorable mention, \$75.

The Writing Program Prize for Engineering Writing—undergraduate writing on any topic of professional interest to engineers. First prize, \$200; second, \$100; honorable mention, \$50.

For more information, visit The Writing Program office, Rm 14E-303, where applications and prize guidelines are available.

Stress management sessions offered

The Medical Department's five-week stress management workshop will begin Wednesday, Feb. 22, noon-1:30pm in Rm E23-297. The leader will be Scott Borrelli, PhD, a licensed psychologist who has a private practice and teaches at Boston University. Participants will learn to recognize stress warning signals, to be aware of their body's response to stress, and to use relaxation techniques that work best for them. Group members will be challenged to look at how they may be creating stress for themselves and how their attitudes may affect their quality of life. Relaxation methods will be taught and practiced.

The fee is \$45; \$35 for students and MIT Health Plan members. A workbook and relaxation tape are included in the fee.

Advance registration is required. Call or visit the Health Education Service, x3-1316, Rm E23-205.

Annoying mail, calls? Here's who to call

There has been an upswing in the number of complaints to the Campus Police concerning annoying telephone calls and unwanted mail during the past year, Chief Anne P. Glavin reports.

The community should know, she said, that it is a violation of the laws of the Commonwealth to make annoyance calls. It is a violation of Federal law to make obscene or harassing calls in interstate or foreign communications. It is also a Federal offense to send obscene mail.

For those being bothered, help is available from the following sources:

—MIT Campus Police, x3-1212.

—Telecommunications Office, x3-3654.

—Special Assistants to the President, Mary Rowe, x3-5921; Clarence Williams, x3-5546.

—Office of the Dean for Student Affairs, x3-4051.

Departmental administrative officers can also advise on how to handle annoying or obscene calls or deal with annoying mail.

Diamond to hold MacDonald Chair

Dr. Peter A. Diamond, professor of economics, has been named as the first holder of the John and Jennie S. MacDonald Professorship, effective January 1, the provost, Dr. John M. Deutch, has announced.

The professorship was established by a gift from Edmund MacDonald, a 1921 graduate of MIT, in memory of his parents.

Professor Diamond, who was head of the Department of Economics in 1985-86 and associate head before that for a number of years, is an authority on taxation, social security and uncertainty theory. He is beginning to work in macroeconomics.

He received a BA in mathematics from Yale University in 1960 and the PhD in economics from MIT in 1963. He began his teaching career as an assistant professor of economics at the University of California, Berkeley, in 1963-65 and was acting associate professor there in 1965-66. He came to MIT as an associate professor in 1966 and was promoted to professor in 1970.

He has held visiting appointments at Churchill College, Cambridge; University College, Nairobi; Hebrew University, Jerusalem; Nuffield College, Oxford; Balliol College, Oxford; and Harvard University.

He is a member of the National Academy of Sciences, and a fellow of both the Econometric Society and the American Academy of Arts and Sciences. He served as vice president of the American Economic Association and currently is second vice president of the Econometric Society. He has twice been a Guggenheim Fellow and he received the Mahalanobis Memorial Award in 1980. He is the author of more than 65 papers and he has been co-editor of the Journal of Public Economics since 1986.

Indian educator to speak Thursday

Norbert S. Hill, executive director of the American Indian Science and Engineering Society (AISES), will give a lecture Thursday, Feb. 16, from 7:30-9pm in the Bush Room (10-105).

Mr. Hill will address American Indian education, how it has improved and how it affects economic conditions on reservations. He will also talk about AISES, what it is, its major functions and what the organization hopes to accomplish.

Mr. Hill has been active in the development and administration of educational programs for American Indians for more than 15 years. He is an Oneida Indian, and was raised on a tribal reservation in Wisconsin.

The lecture is free and open to the public.



THE ARTS

Brody's first big play

Students improvise to create *AHA!*

Playwright Alan Brody has directed his first major production at MIT, *Aha!*, a theatrical piece created by students to explore and express some of the ways they feel about love.

The performance, which plays about 90 minutes without intermission, arose out of Dramashop's IAP program. "The idea was to help the students find out as a group what they really cared about. It turned out to be love," Professor Brody said.

The actors told stories, brought in well-loved scenes or monologues, and developed improvisations. From that Aaron McPherson '89 wrote the script. *Aha!*'s subjects are as diverse as schoolyard romance, the love of God, the effect of advertising, the first kiss, a Jackie Collins scenario — even the love of physics, McPherson said.

Over three weeks the seven performers learned through an exercise called a "river" how to follow the single feeling that made each story important. In the river, McPherson said, "you fix a single feeling, or intention, in your mind. You begin to move and make sound. Through the river you become free to express what it is

about the story that is important to you. The object is to follow natural impulses, without the censoring influence of cautious thought," he said.

At a certain point the play is opened up so the actors can improvise from stories of love told by audience members.

The last three performances begin tomorrow, Feb. 16-18, in Kresge Little Theater (3-2877).

In drama students here, Professor Brody said, "I've found a raw energy and a brilliance. I want to create a structure in which they can clarify their own goals and find their own voices. I want to support and encourage as many thoughts about theater as I can," he said.

Following are other thoughts from Professor Brody, beginning with comments on challenges inherent in his new position as director of theater arts at MIT. "For the first time I have been given an opportunity to build a program in the context of science and technology. If I can figure out where theater belongs in this context — and in the particular microcosm that is MIT — it seems to me I can figure out where it belongs in America. . .

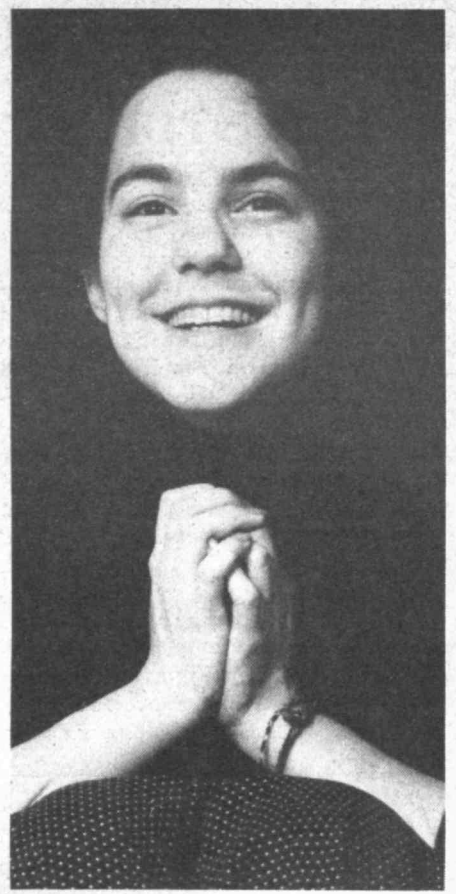
"What happened here in the past has been splendid. Through the work of (Dramashop Director) Bob Scanlan, there has been a true nurturing: of theater literature, of a way to respect the traditions of theater and a way to develop a genuinely fine critical sense among the students.

"With all of that in place already I hope we will develop the kind of academic program that will make it possible for students to be able to minor in theater soon. . .

"There are so many misconceptions about the theater. People often go for status or because they think it might be good for them. The theater has served society as a diversion — which is mostly passive — or an entertainment — which is more active. But it can also be a conscience, a spiritual source, a source of wonder — even a new way of thinking, a new way of understanding."

— China Altman

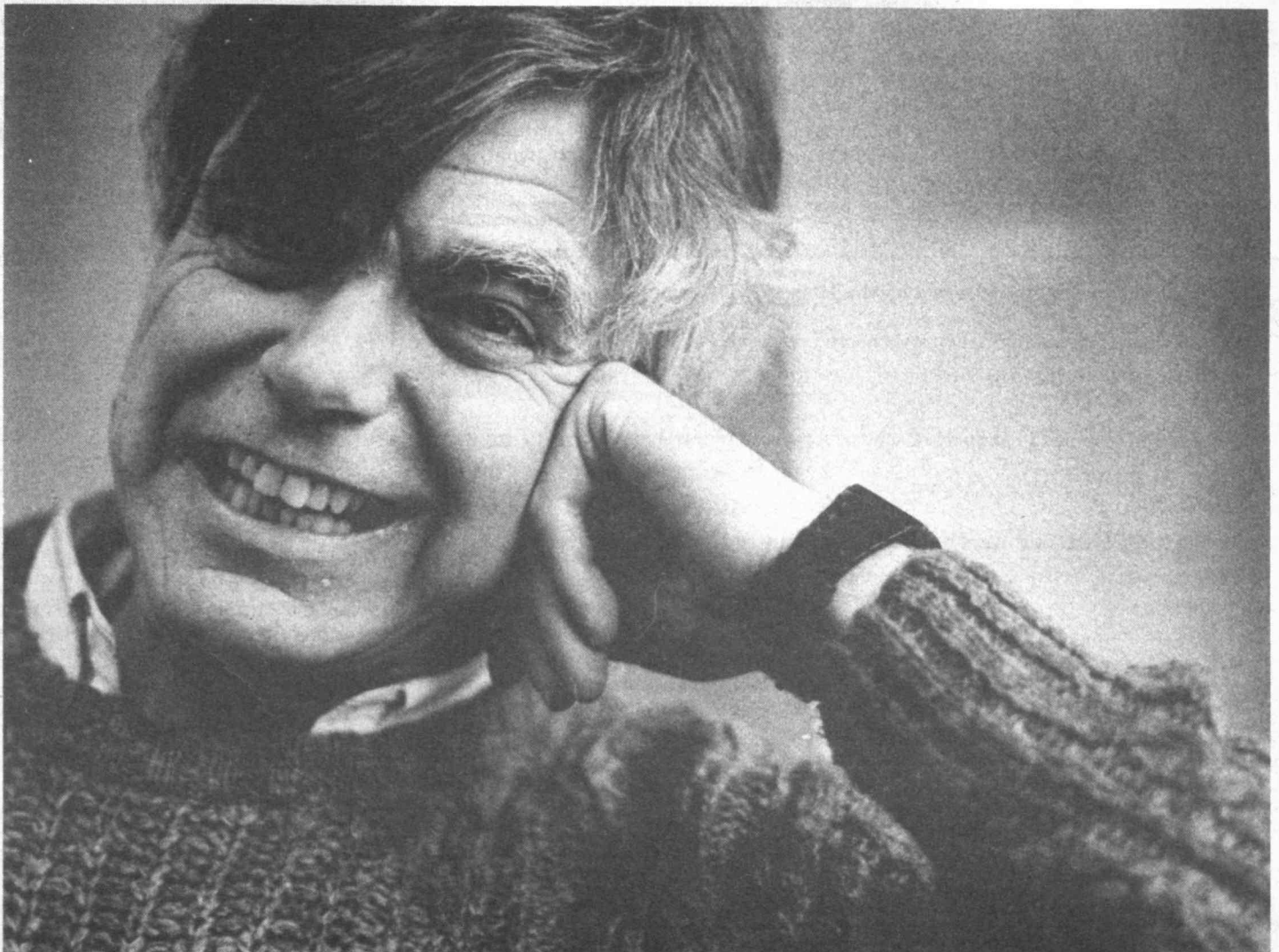
Alan Brody, below. Cast members of *Aha!*, counterclockwise, are: George Madrid '91, Derek Clark '89, Ian Dowell '86, Kelly Marold '91, and A.J. Babineau '90. Photos by Donna Coveney



The artist has a vision of what it's like to be alive and an impulse to share that. . .

The theater can serve as a conscience, a spiritual source, a source of wonder — even a new way of thinking, a new way of understanding.

—Alan Brody



EDUCATIONAL COSTS, TUITION, AND STUDENT AID AT M.I.T.

Paul E. Gray
President

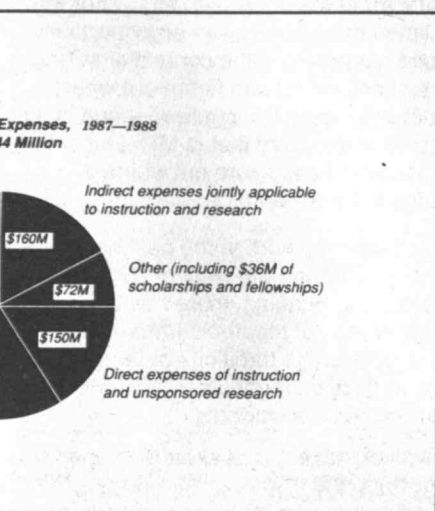
This memorandum describes the financial elements at MIT that bear on tuition and affect financial aid. The numbers illustrating these matters are for the 1987-1988 academic year, which is described in full financial detail in the most recently published Report of the Treasurer. While these numbers are, in some sense, out of date, they illustrate the essential features of the relation between educational costs, tuition, and financial aid.

The Institute has a dual mission—education and research—the expenses of which are illustrated in Figure 1, which displays the principal components of the operating expenses for 1987-1988.

With this caution about the coupled character of education and research in mind, it is possible to estimate the cost of education at MIT and relate it to the price of education, as reflected by tuition charges.

THE COST OF EDUCATION

In addition to the \$150 million in direct costs for education and unsponsored research, there are \$160 million in indirect expenses for services that support both instruction and research. This \$160-million total includes the costs of plant operation and maintenance, fiscal, personnel, and other Institute-wide services, administration, general expenses, the libraries, medi-



The direct expenses of instruction and unsponsored research (\$150 million) are comprised principally of the appropriate fractions of salaries and benefits of faculty, other academic staff, teaching assistants, and support and service staff directly engaged in the educational programs of the Institute. Also included are the costs of equipment, materials, and supplies, used in the educational programs. Similarly, the direct expenses of sponsored research reflect the costs of faculty, research staff, research administrative staff, and others directly engaged in programs of sponsored research, as well as the associated costs of equipment and operations.

While a division of expenses in these categories is necessary for management purposes (and for establishment of the total cost of sponsored research for reimbursement by the sponsors), this categorization is somewhat artificial in that it does not reflect the integrated and synergistic nature of the academic enterprise, particularly on the campus. Both undergraduate and graduate education are dependent on the research programs conducted on the campus, and these research programs benefit from the participation of students. For the faculty, the activities of education and research are interwoven and inseparable.

cal services, and student services. About \$65 million of these indirect expenses can be attributed to instruction, and \$95 million to research. This apportionment is the result of detailed negotiation with the federal audit agency, which represents the financial interests of federal research sponsors.

A third element in the cost of education is the amount spent on scholarships and fellowships for undergraduate and graduate students. A total of \$36 million was spent for these purposes in 1987-88, \$26 million in funds generated by endowment or received from outside sources, and about \$10 million in unrestricted Institute funds.

THE PRICE OF EDUCATION

During the 1987-1988 year, the tuition rate was \$12,500, and the total tuition and related income was \$125 million. Thus, tuition charges covered about 55 percent of educational costs at MIT in 1987-1988. This relationship has held true here for many years. From 1930 (which is as far back as the analysis has been pushed) to the present, tuition charges have covered from 45 percent to 65 percent of educational costs at the Institute. The circumstances at other private research universities are similar.

On the basis of this analysis, the cost of education at MIT is approximated as follows:

Direct expenses of instruction and unsponsored research	\$150 million
Allocable indirect costs	\$65 million
Unrestricted funds used in support of scholarships and fellowships	\$10 million
Total	\$225 million

During the 1987-1988 year, there were 9,100 full-time graduate and undergraduate students enrolled. Consequently, that year the cost of education per full-time student was about \$24,000.*

* This per-student estimate takes no account of summer session enrollment or of the fact that some portion of the \$225 million of educational expenses is incurred in the summer. One may also argue that the \$225-million total overstates the cost of education at MIT because it includes some faculty effort devoted to unsponsored research rather than to instruction and because no allowance has been made for the portion of the shared indirect costs, which, in fact, supports other MIT activities, including the Association of MIT Alumni and Alumnae, the MIT Press, the housing system, and Dining Services. While precise estimates of these offsets are difficult to establish, the associated reduction in the cost of the education figure is, in my judgment, certainly less than 10 percent. When these factors are taken into account, the cost of education drops to about \$203 million, and the per-student cost drops to about \$22,000.

MAKING UP THE DIFFERENCE

What sources of revenues are used, year after year, to make up the difference (about \$100 million in 1987-1988) between tuition revenues and the cost of education? There are only three such sources: a portion of the income derived from the Institute's endowment, short-term investment income earned on a portion of working capital, and a portion of the annual flow of gifts, grants, and bequests. In each of the three sources, only that portion of the income not specifically designated for other purposes may be used.

If these sources of revenue are insufficient to make up the gap and cover the costs of education, the Institute must either draw on nonrecurring capital resources to balance the budget (as we did in 1987-1988 in the amount of \$3 million) or run a deficit (as we are likely to do in the present year), which requires a similar drawdown of non-recurring capital funds (e.g., endowment principal or reserves) to close the books at year end.

Our objective in financial planning and budgeting is to achieve balance without using nonrecurring capital resources to meet recurring expenses. This objective has been achieved in seven of the past ten years. The cumulative net surplus in these ten years was approximately \$6 million, which was added to the principal of endowment or otherwise used for capital purposes, such as the purchase of property for academic purposes. In addition, during that ten-year interval, \$26 million of unrestricted bequests were added to the endowment.

WHAT DRIVES TUITION?

The tuition rate increases from year to year, as the cost of education at the Institute increases. About 74 percent of this cost reflects salaries and benefits. About 80 percent of faculty payroll costs appear as educational costs. These costs have increased strongly in the past five years, both because of the need to restore, to some degree, purchasing power lost by individuals in the high-inflation years of 1975 to 1981 and because of the overriding need to preserve salary competitiveness in the context of other front-rank research universities.

The most rapidly growing element of educational costs is the demand for unrestricted funds in support of undergraduate scholarships. About 60 percent of MIT undergraduates are needy and receive aid. This year the average need is about \$13,000, which is about two-thirds of this year's typical student budget. The average needy student assumes a self-help burden (loan and/or term-time employment) of \$4,900 and receives a grant or scholarship of about \$8,000 to cover the balance. In 1987-1988 scholarship aid to undergraduates totaled \$18 million, of which \$4.5 million came from outside sources, \$6.5 million from MIT

sources restricted for scholarships, and \$7 million from unrestricted or general funds.

This latter amount, \$7 million, has increased by a factor of 4.5 since the 1980-1981 academic year. This increase is primarily a reflection of changing federal priorities toward student aid. While the aggregate need for student aid has risen steadily, federal scholarship programs have remained essentially flat in real-dollar terms—loans have made up the difference.

Finally, in recent years, we have intentionally decreased enrollments by almost 300. This was done to reduce crowding in the undergraduate houses and to relieve pressures on graduate student thesis supervisors in several departments, particularly those in the School of Engineering. This reduction has placed additional pressure on the tuition rate, since there have been no directly offsetting reductions in educational expenses.

TUITION AND SELF-HELP FOR NEXT YEAR

While the process of budget making for the 1989-1990 academic year will not be complete until mid-spring, the principal features of that budget are now reasonably clear—albeit, not fixed. The considerations described above, together with this year's budget imbalance, which must be corrected within two years' time, will require a tuition increase of about 8 percent, which is larger than any during the last five years.

Considerations of undergraduate student aid are closely coupled to tuition setting. The self-help level has been held at \$4,900 for four years, and all of the annual increases in aggregate need have been met by increases in scholarship awards, much of which has been supported by general funds. Next year the self-help level will increase, probably by \$400, and afterwards is likely to follow a pattern of annual increases, in which increases in need are shared between the individual needy student (in the form of increased self-help) and the Institute (in the form of general funds in support of scholarships).

This is not to say that the Institute is relying solely on tuition increases to reduce the projected budget imbalance. Other measures to increase revenues and cut costs are being taken. These include such measures as: moderating projected salary increases for faculty and staff, deferring new program initiatives, unless their costs can be offset by reductions in ongoing programs, considering a modest increase in enrollment, and raising endowed funds for faculty and student support. These measures, taken together, should keep MIT on a sound financial footing, which, in turn, supports the Institute's ability to provide the best possible education for undergraduate and graduate students alike.

Deficit-control measures set

By KENNETH D. CAMPBELL
Staff Writer

Since last fall, a group of senior officers and staff, led by Provost John M. Deutch, have worked with the academic deans and vice presidents to develop a plan to bring the Institute's budget into balance within three years.

The budget problem appeared last year, and it appeared that in fiscal year 1989 there would be a \$6 million deficit on an operating budget of about \$1 billion. At the beginning of the fall term, President Paul E. Gray asked the provost to convene a group to consider various ways to eliminate the deficit. In addition to Professor Deutch, this budget advisory group consists of Kenneth A. Smith, Associate Provost and Vice President for Research, William R. Dickson, Senior Vice President, James J. Culliton, Vice President for Financial Operations, Doreen Morris, Assistant to the Provost and the Senior Vice President, and John A. Currie, Director of Finance.

Among the major factors placing pressure on the budget are:

- slower than anticipated growth in research support,
- pressure to keep salaries (particularly for faculty) competitive with

other research universities,

- desire to keep increases in tuition and self-help rates as modest as possible,
- commitment to maintaining the policy of need-blind admissions, and

- development of new initiatives in education and research.

The budget advisory group, working with the Academic Council, has developed a three-year budget control program. Among the steps being proposed are:

- moderating anticipated salary increases,
- increasing tuition and self-help at somewhat higher rates than in previous years (self help is the amount a student is expected to provide from term-time work and/or loans before receiving scholarship aid),
- modestly increasing student enrollments,
- holding program budgets level or offsetting increases by decreases in other areas,
- using income generated by the Campaign for the future, particularly income from funds raised for faculty support.

Professor Deutch said that these (continued on page 6)