

MIT Spelers Face IAP Challenge

MIT students who think they're pretty good at spelling will have a chance to prove it during the Independent Activities Period.

Harvey M. Elentuck, a senior in mathematics and management from Jamaica, N.Y., is arranging an old-fashioned spelling bee for January 21, at 6:30pm in Kresge Auditorium.

"Many MIT professors complain that student papers, while technically competent, show a disregard for proper spelling, grammar and usage," Elentuck said. "We hope the spelling bee may dispell the spelling myth. On the other hand, it might confirm it."

Elentuck is no spelling slouch, it should be noted. He was a finalist in the New York City spelling bee a few years back.

But he won't be in the MIT competition. So that shouldn't scare any contestants away.

All full-time students are eligible to compete. Those interested in entering the contest can pick up a registration form, official rules and a practise word list in Rooms 7-133 and 14N-305, and in the MIT News Office (Room 5-111), and at the circulation desks of three libraries—the Student Center Library, the Science Library, and the Dewey Library.

The forms must be completed and returned to

any of these locations no later than 5pm on Wednesday, Jan. 8.

The contestants will compete in a series of preliminary written spelling tests, to be given shortly after Jan. 8, to determine the 50 finalists for the contest.

A pre-IAP meeting for persons interested in spelling or the spelling bee will be held Tuesday, Nov. 26, at 7pm, in the Vannevar Bush Room (10-105) at 7pm. Refreshments will be served.

Admission will be free to the spelling bee, and prizes will be given to the winners. There will be judges and all the other hoop-la associated with spelling bees.

"Our aim," Elentuck said, "is to have a lively event that is also competitive and fun. We want to show everyone that MIT students not only know their numbers, but also their letters."

And what kind of words will be used?

The practise list includes such preliminary words as "inseparable, niece and thimble"; such intermediate words as "accelerator, diphtheria, emission and sassafras," and such final words as "adminicle, crepuscular, eviscerate, fulsome, panegyric, propitiate, rhododendron and suppuration."

Good luck.

Course II Heads Gather



In the 109 years since MIT classes began, the MIT Department of Mechanical Engineering has had but 11 Heads and seven are still living.

All seven recently got together for a dinner party at MIT's Endicott House and posed for a portrait around a spiral staircase in the order of their terms of office (left to right): Dr. James C. Hunsaker (1933-47); Dr. C. Richard Soderberg (1947-54); Dr. Jacob P. Den Hartog (1954-58); Dr. Joseph H. Keenan (1958-61); Dr. H. Guyford Stever (1961-65); Dr. Ascher H. Shapiro (1965-74); and Dr. Herbert H. Richardson, who was appointed July 1.

Several of the former Heads also held other major appointments at MIT during their careers. Dr. Hunsaker is the founder and was for many years the Head of the MIT Department of Aeronautical Engineering in addition to his mechanical engineering duties. Dr. Soderberg and Dr. Stever also

formerly headed the MIT Department of Naval Architecture and Marine Engineering. Dr. Soderberg himself is a former Dean of the MIT School of Engineering. Dr. Stever, who left MIT to become President of Carnegie Mellon University, is now Director of the National Science Foundation in Washington, D.C.

The seven, along with the department itself, have acquired numerous national honors. Drs. Hunsaker, Soderberg, Stever and Shapiro are members of both the National Academy of Sciences and the National Academy of Engineering and Dr. Den Hartog is a member of the National Academy of Sciences.

As for the department, the American Council on Education has judged it to have the best graduate program and the most effective faculty among all mechanical engineering departments in US institutions of higher learning.

Rose Cites Coal Use Dangers

By BARBARA BURKE
Staff Writer

MADISON, Wis., Nov. 12—Burning coal to produce electricity is a hundred times more deadly than using nuclear power plants to produce the same amount of energy, an energy expert from MIT said here Tuesday night.

"The real villain is an has been unregulated coal burning," said Dr. David J. Rose, professor of nuclear engineering, in the annual

Julian E. Mack Lecture at the University of Wisconsin.

"The federal government has just established a Nuclear Regulatory Commission," he said. "I think it needs in addition a Fossil Regulatory Commission, established on the firm basis that burning fossil fuels can be bad for your health."

Dr. Rose said the nation must produce its electricity for the next

(Continued on page 2)

MIT Reacts to Privacy Act

(Following is a statement to the MIT community by Provost Walter A. Rosenblith concerning the Family Educational Rights and Privacy Act of 1974.)

On Tuesday, November 19, the Family Educational Rights and Privacy Act of 1974 becomes effective. This Act, sometimes called the "Buckley Amendment," is a part of the omnibus Aid to Education Bill which was signed into law last August by President Ford. In brief, the Act requires that colleges and universities

allow individual students the right to review all official records, files and data directly related to them; the right to challenge the accuracy of the contents of such records. Further, the Act generally prohibits colleges and universities from releasing personally identifiable information about students without their written consent. The Act authorizes the denial of certain funds, primarily student aid funds, to colleges and universities which do not comply with all pro-

(Continued on page 3)

Grading Report

The Report of the MIT Special Committee on Grading appears as a pullout supplement in this issue. The Report will be discussed at the regular meeting of the faculty Wednesday, Nov. 20.

International Fort Knox

Feld Foresees Chance of Nuclear Weapons Use

By CHARLES H. BALL
Staff Writer

MIT Professor Bernard T. Feld, a noted physicist and expert on arms control, thinks there is a one in three chance that a nuclear weapon will be used in a conflict before 1984 and better than a 50-50 chance for a nuclear war before the end of the century.

Professor Feld, giving the Bernal Peace Library Lecture recently in London, said the world was "entering upon perilous times—perhaps the most dangerous period in its entire history."

"Congenital optimist though I

am," he said, "I still feel it is more likely than not that nuclear weapons will again be used in my lifetime. I hope and pray that, even if this should occur, the peoples of the world and their leaders will retain enough sanity to prevent such use from escalating into a full-scale disaster, from which there could be no return—that they will recoil from the brink and then take the necessary actions to banish forever the nuclear menace."

International Control

"But I am even more convinced that there is no hope of escaping disaster short of the recognition by all men of good

will that we are facing the gravest threat to mankind's existence and that nothing short of concerted action can save us," he said.

While not dismissing the possibility of nuclear war between the great powers, Dr. Feld said a more immediate threat was "the inevitability of nuclear weapons proliferation, stemming from the widespread proliferation of peacetime fission technology and, particularly, of the fissionable materials used in nuclear energy production."

To combat this menace, he called for international control of such materials, centered in a

single international agency.

"To permit the present laissez-faire approach to continue," he said, "is to guarantee disaster." Equitable Access

"With tons of plutonium circulating randomly around the world, there are simply no safeguarding measures that can possibly prevent the diversion of the relatively small quantities required to make an atomic bomb," he said. "And, unhappily, the wishful thinking of many so-called experts notwithstanding, it is just too easy for even a relatively small group of moderately competent technicians to fashion a crude bomb out of

readily available materials."

Professor Feld said that complete international control over all nuclear activities "is simply not realistic today."

"But I do believe," he added, "that at least as regards the processing and circulation of plutonium, international control is the only acceptable solution."

"It is certainly not beyond the ingenuity of man to devise a system within which all plutonium (and possibly also highly-enriched uranium) would be separated, processed, shipped and recovered by a single international agency while, at the

(Continued on page 12)

Israeli Conductor to Visit, Lead Symphony Concert

By WILLIAM T. STRUBLE
Staff Writer

Two of the world's prominent institutions of science and technology are joining hands—not in the laboratory but on the concert stage.

The new international artistic relationship between MIT and the Technion, Haifa, Israel, will be initiated this week with the arrival at MIT of Dalia Atlas, Israeli conductor and a leader in the development of music at the Technion.

Mrs. Atlas was scheduled to arrive Wednesday, Nov. 13 at MIT where she will spend about a month in residence in preparation for her appearance as guest conductor of the MIT Symphony Orchestra in its concert Dec. 7.

The concert will be presented under the sponsorship of the Hon. Shimson Inbal, Israeli Consul General in Boston, and will feature Israeli cellist Daniel Domb and the American premiere of a prize-winning work by Israeli composer Zvi Avni.

As guest of the Institute, Mrs. Atlas will live in McCormick Hall, MIT's women's residence, so that she may share fully in the life of the community, particularly in student activities.

In addition, the Israeli consulate anticipates that Mrs. Atlas will appear in speaking engagements in the Boston area as an interpreter of current Israeli cultural affairs.

The visit by Mrs. Atlas was arranged by David Epstein, conductor of the MIT orchestra, and was initiated in 1971 when Professor Epstein was in Israel as guest conductor of the Israeli Radio Orchestra.

Professor Epstein said the musical exchange is a reflection of similarities shared by MIT and the Technion. "Although both institutions are devoted to the development of science, engineering and allied fields, both have also nurtured extensive programs in the arts, and music has been a major activity at both institutes," he said. "This exchange begins an artistic dialogue that holds promise for richer communication in the future."

The concert will provide a view of the richness of Israeli musical life, Professor Epstein said.

Dalia Atlas was born in Haifa and was trained at the three major musical institutions in Israel: The Rubin Academy of Music in Jerusalem, the Tel Aviv Academy of Music and the Haifa Conservatory. She studied conducting in Italy and Vienna and has won

prizes in international conducting competitions in New York, Liverpool, and Novara, Italy. At the Technion, Mrs. Atlas is director of the Technion Symphony Orchestra and Chorus. In addition, she is music director of the Israel Pro Musica Orchestra. She has been guest conductor of the Royal Liverpool Philharmonic, the Israel Philharmonic Orchestra, the Italian Radio Orchestra and other major orchestras in Europe and South and North America.

With the MIT Symphony, Mrs. Atlas will conduct a program consisting of the Overture to "Egmont," Op. 84, by Beethoven; the Cello Concerto in B Flat Major, by Boccherini; *Meditations on a Drama*, by Avni, and *La Mer*, by Debussy.

Daniel Domb, soloist in the Boccherini work, was born in Haifa. After studies there and in Paris, he went to New York and was selected by Leonard Bernstein as soloist with the New York Philharmonic for one of its internationally televised Young People's Concerts. He received a master's degree from the Juilliard School of Music, where he studied with Leonard Rose. Mr. Domb's concert career has included appearances with the Cleveland Orchestra and the Chicago Symphony under Seiji Ozawa and numerous other orchestras, and recitals in Europe and America. He was recently appointed principal cellist of the Toronto Symphony.

An Israeli composer of the middle generation, Zvi Avni has lived in Israel since 1935. A graduate of the Tel Aviv Academy of Music, he also studied composition in the US with Aaron Copland and Lucas Foss.

The Dec. 7 concert will be at 8:30pm in Kresge Auditorium. It will be broadcast by MIT radio station WTBS at 4pm Dec. 8. Tickets are free to the MIT community before the concert and will be \$1 at the door at concert time.

MIT pianists will have a chance to sharpen their technique next week when Peter Roggenkamp, of the Institute for Advanced Music, Darmstadt, West Germany, presents a master class from 11am-12:30pm Monday, Nov. 18, in Rehearsal Room B, Kresge Auditorium. The class will be sponsored by the MIT Music Section in collaboration with the Goethe Institute of Boston.

Presented under the title, "New Techniques in Playing the Piano," the class will include discussion of Ives' *Concord Sonata* and works of Stockhausen, Cage and Steffens.

Two films made by the BBC in England—one on Mozart and one on Schubert—will be shown at 5pm Nov. 19 in Kresge Auditorium prior to the concert by the Esterhazy Quartet. The showing is sponsored by the MIT Music Section and is free and open to the public.

A noon hour concert by a newly formed wind quintet will be held in the Chapel, Thursday, Nov. 14.

The members of the quintet are: Dana Shaul, flute; Joe Shirk, oboe; Kathie Mattasy, clarinet; Rick Yoder, bassoon; and Dale Whitman, horn.

The program will include music by Danzi, Milhaud, and Malcolm Arnold.

The concert is open to the public and admission is free.

Esterhazy Quartet To Play Here

Quartetto Esterhazy, from Amsterdam, will give a chamber music concert at MIT, 8pm, Tuesday, Nov. 19 in Kresge Auditorium.

The concert, sponsored by the MIT Music Section, is open to the public free of charge.

Featured works will be Boccherini's Quartet in E Minor, Op. 32, No 2, Haydn's Quartet in C Major, Op. 20, No 2 and Mozart's Quartet in D Major, K. 499.

The quartet, organized three years ago, consists of Jaap Schroder, violin, Alda Stuurrop, violin, Wiel Peeters, viola and Wouter Moller, cello—all noted musicians in their own right.

The ensemble performs in the string quartet style perfected in the 17th and 18th century. Playing instruments from the period—with unmodified fingerboards, lower bridges, gut strings, and original bows, the musicians have received critical praise for "the perfect homogeneity of their playing."

The quartet has performed throughout Europe and is now making its first tour in the US. In addition to concert tours, they record under the BASF label. Their records include various Haydn quartets and this year they have recorded the complete Mozart quartets.

One Act Plays In West Lounge

The Wastepaper Theatre, an experimental collaborative company of poets and actors from Brown University, will present five one-act plays, Thursday, Nov. 14, at 8pm in the Student Center West Lounge.

Sponsored by the MIT Humanities Department Visiting Writers Series, the program is open to the public free of charge.

Chosen for the company's Boston-Cambridge debut are the original plays "Fay Wray Meets King Kong" by Professor James Shevill, a playwright and poet, "Mr. Picasso, Are You a Communist?" by Professor Edwin Honig, a poet and translator of works by Lopé De Vega, "The Silver Couplet" by Keith Waldrop, a poet and nominee for the 1968 National Book Award and "A Depressing Case" by the poet Rosemarie Waldrop.

A work by the contemporary Polish playwright, Constanty Galczynski entitled "The Tragic End of Mythology" will be the concluding play and will mark the play's premiere in this country.

Health Hazards Are Linked To Fossil Fuel Power Plants

(Continued from page 1)
30 or 40 years principally by using coal or nuclear fission (the splitting of atomic nuclei).

Other fossil fuels such as oil and natural gas are too expensive or too scarce, he said, while solar energy and fusion (the combining of the nuclei of light atoms to produce energy) have yet to be harnessed as fully practicable sources of energy.

Nuclear power is clearly cheaper than coal, said Dr. Rose, citing studies by Arthur D. Little Inc., a Cambridge technical, engineering and management consulting firm. But nuclear power is under attack as unsafe.

"The question whether the US, or any other country, should use nuclear power to meet its energy demands hinges primarily on the question raised by its critics, to wit, that nuclear power is bad for your health."

Dr. Rose warned that nuclear power is hazardous, too.

"A society that is not prepared to make the effort to handle it properly shouldn't get in the game."

But critics of nuclear power have ignored or underestimated the greater dangers of mining and burning coal, he said.

A one thousand megawatt nuclear plant would cause "something like one death every two years," Dr. Rose said, citing a study by a former MIT graduate student. (Two plants that size would meet the electricity needs of the greater Boston area.)

That figure includes everything from uranium mining accidents to deaths from cancer induced by radiation.

"Other studies done by other groups, both in the Atomic Energy Commission and outside it, came up with similar numbers," he said.

By comparison, Dr. Rose said, studies by Dr. John Finklea of the US Environmental Protection Agency indicate that a coal-burning electric power plant kills from 40 to 100 persons a year, by releasing sulfur dioxide gas, which turns into corrosive sulfuric acid and especially in conjunction with tiny particulate matter "penetrates deep into lungs of people, not filtered out by the body's natural mechanisms."

"The exact numbers are uncertain, but the general trend is clear... if we continue to burn coal

approximately the way we have in the past, or aggravate the problem by increasing coal production and relaxing environmental standards, we are in for a great deal of trouble.

"The predicted total excess deaths in 1980 due to this acid sulfate cause alone vary from a few—under stringent sulfur-removal conditions—to as many as 25,000 according to one EPA estimate, or as many as about 60,000 according to a different source.

"Those numbers translate to about 40 to 100 deaths per year for each electric power plant... about 100 times those associated with all phases of nuclear power, as presently judged."

In addition, he said, there are "vast non-fatal health effects," such as acute lower respiratory disease in children, chronic respiratory disease, the aggravation of asthma, and the aggravation of heart and lung disease in the elderly.

Moreover, he said, the use of coal has entailed a "scandalous record of mining accidents" and the disabling of "tens of thousands of miners" by black lung disease.

Dr. Rose said that although he is a nuclear engineer, he began the study of the relative financial and health costs of different sources of energy with no bias towards nuclear power plants.

"While working in a nuclear engineering department, my hope was—and still is—for controllable fusion eventually, and no oath of allegiance was required toward fission power," he said. "They are even competitors in the sense that a really safe and economical breeder reactor would make controlled fusion a much smaller societal advance."

Larraga to Attend Filipino Opening

A member of the MIT community, in his capacity as president of the 2,000-member Filipino Association of Greater Boston, will attend the dedication in New York City on Thursday, Nov. 14, of the Philippine Cultural Center.

Angelo D. Larraga, a technical instructor in the Department of Physics, was invited to the dedication by Mrs. Imelda Marcos, wife of Philippine President Ferdinand Marcos. The center is located at 556 5th Avenue.

Mr. Larraga, who has been at MIT since 1964, is also a practicing lawyer. He was admitted to the Massachusetts Bar and the US Court of Military Appeals in 1973.

He is legal adviser to the Philippine Medical Association of New England, a group with about 250 physician members.

New Section

A new section, called Institute Notices, appears for the first time in this week's issue on page 11. Included in the section are UROP Listings, Graduate and Foreign Opportunities, formerly found in this space, and Announcements, Club Notes, Religious Activities and Placement Interviews which were previously included in the Institute Calendar.

Deadline for submission of material for Institute Notices is noon, Friday prior to publication—the same as for the Institute Calendar and the Classified Ads.



DOUBLE-SAFE PARKING—Dismounting the front wheel of a bike can be done in a wink so the owner of this 10-speeder locked it safely to a no-parking sign for added protection. It works—but don't plan on a fast getaway.

TECH TALK

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Electrical Generating Stations Found to be Inefficient

By DENNIS L. MEREDITH
Staff Writer

Every time you switch on a light bulb, your local electric generating plant releases about two light-bulbs-worth of heat into the environment; a night of air conditioning means two air-conditioning-nights worth of waste heat to be disposed of.

This waste occurs because the efficiency of even the most modern electrical generating stations is relatively low.

In nuclear plants, because of thermodynamic considerations, a maximum of only 53 per cent of the energy can be converted to electricity. And only 60 per cent of this maximum is usually attained because of engineering limitations, resulting in an ultimate efficiency of around 32 per cent.

To control the overall costs of energy production, engineers have resorted to building fewer, but larger plants, because large plants reduce the per-kilowatt price, due to lower construction and operating costs.

Such large plants aggravate heat disposal problems, because a larger amount of waste heat is concentrated in a smaller region, increasing the chance of environmental damage.

Intricate Processes

All commercial fossil and nuclear power stations generate electricity by passing steam through a turbine, and then removing leftover heat from the steam by continuously passing large quantities of cooling water through the steam condenser. The ultimate sink for the waste heat is outer space, via the earth's atmosphere. The transfer of the heat from the power plant condenser to the atmosphere is, however, the stage where potential environmental damage may occur. It is this stage which is receiving much attention by environmental engineers. The most appealing solution, both environmentally and economically, would be beneficial use of the waste heat. Schemes such as space heating, aquaculture, etc. have been proposed, yet studies have shown that major obstacles exist due to the low temperature and large flow rates of the waste heat and the intermittent, seasonal demand for the waste heat.

While research on beneficial use continues, engineers are working on more direct systems for waste heat disposal, namely once-through systems and closed-cycle systems.

A once-through condenser cooling system is one in which water is withdrawn from and discharged at a higher temperature into a natural body of water, such as a lake, river, estuary, or ocean. Waste heat

is then transferred to the atmosphere over a large area of the receiving water's surface.

While closed-cycle systems largely avoid problems of thermal water pollution, they have a number of significant drawbacks, including economic penalties, increased fuel requirements, and air pollution. On the other hand, the direct discharge into natural waters with a once-through system requires a careful understanding of the effect of heat on the intricate ecological processes in the water body and on engineering capability to control and predict the extent of heated water influence.

Therefore, the additional capital and operating costs of large, closed-cycle heat-dissipating systems must be balanced against possible environmental costs of once-through systems.

Learn to Adjust

To design an environmentally acceptable once-through cooling system, engineers must work backwards from established temperature criteria for the receiving water. Such criteria vary from state to state and with the type of water body. They usually consist of a maximum allowable temperature increase outside of a mixing zone where power plant water encounters receiving water. Such a mixing zone can be defined in terms of water surface area or as a percentage of a river or estuary cross section designed to allow the migration of fish.

Orchestrating the outflow of water from a power plant to dissipate the waste heat in the best way possible is the object of studies by engineers in MIT's Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics of the Department of Civil Engineering.

Under direction of Dr. Donald R. F. Harleman, professor of civil engineering and director of the Parsons Lab, the researchers use mathematical models and laboratory scale models to learn how to adjust thermal discharges to meet environmental objectives. Principal associates of Professor Harleman in these projects are Dr. Gerhard Jirka, research engineer and assistant professor of Civil Engineering Keith Stolzenbach and Stephen Moore.

A major subject of their research has been the "multiport diffuser"—a large submerged outflow pipe from which project a series of nozzles. Heated water discharged by these small jets mixes with the receiving water to achieve a rapid reduction in temperature. The jets can be arranged, aimed, and "tuned" to obtain the desired dilution, according to such factors as the depth of the receiving

water, and the nature of wind and tide-driven currents.

Field Studies Done

The MIT engineers have designed multiport diffusers for the Brown's Ferry nuclear plant of the Tennessee Valley Authority, and the Long Island Lighting Co.'s Shoreham nuclear plant and Northport fossil fuel plant outside of New York. In each case, the engineers used mathematical analyses of diffuser characteristics to predict how the heated water from the plant would diffuse into the receiving water. To confirm their analyses they then tested large, precise scale models of the plant and its surroundings in a water-filled laboratory tank simulating tidal currents and containing a hundred or more temperature sensors.

The engineers have recently completed model studies of multiport diffusers at Maine Yankee Atomic Power Station, the Wyman fossil-fuel generating plant of the Central Maine Power Co., and the Setubal fossil fuel station of the Portuguese Electric Company.

In some cases, heated water from a power plant is most effectively discharged by layering it out onto the surface of the receiving water, where it will lose its heat rapidly to the air, with little effect on bottom-dwelling organisms. Professor Harleman and his colleagues have helped design such surface discharge structures for Boston Edison's Pilgrim Nuclear Station near Plymouth, Mass. Field studies on the operating plant to determine the accuracy of their analytical predictions have been done by Professor Jerome Connor and Assistant Professor Bryan Pearce in cooperation with the MIT Sea Grant program on the environment of Massachusetts Bay and adjacent waters.

The MIT engineers are also participating in the development of an important new concept in power plant construction—offshore siting. Offshore floating nuclear plants, engineers believe, will enable release of waste heat with less environmental impact, will be less subject to earthquake damage, and will be inherently more isolated from crowded coastal areas, allowing greater safety.

Public Service Electric and Gas Co. of New Jersey is planning a 2200 million-watt, twin-unit offshore nuclear plant complex three miles off the New Jersey shore. The two floating plants will be anchored inside a single, enormous man-made breakwater, in waters averaging 40 feet deep.

Nuclear Core

Several of the MIT research projects are concerned with these offshore plants.

Professors Harleman and Stolzenbach are studying the behavior of heated water discharged outside the breakwater during normal operation. Professors Chiang C. Mei and Ole S. Madsen are investigating wave motion and mooring problems inside the breakwater.

The engineers have developed techniques to predict temperature effects of normal cooling water discharges on the ocean area. These involve statistical analyses of water current measurements, which separate periodic tidal components from net drift due to winds in the area.

In a related project, Professor Harleman and Dr. Jirka are constructing a scale model of the floating nuclear units in their laboratory to study the behavior of emergency cooling water issuing from the plant. In the unlikely event of an accident in which normal cooling water flow is lost, emergency cooling water would immediately flood the reactor vessel, carrying away heat from the nuclear core.

Interdisciplinary Group

AEC regulations require the emergency coolant system to be independent from the normal condenser cooling system, so emergency cooling water must be vented within the breakwater, and not through the normal outflow pipes outside the breakwater. The MIT engineers are performing analytical and experimental studies to predict the movement of heated water both within and out of the breakwater.

The Parsons Laboratory staff has also performed studies on heat flow in lakes, reservoirs and cooling ponds used to dissipate waste heat from power plants. Their analytical and experimental studies account for the heat transfer within the body of water and at its surface under varying meteorological conditions.

Because the solutions to waste heat problems must be wide-ranging, Professor Harleman and a number of other experts at MIT have joined to form a Waste Heat Management Group under the auspices of MIT's Energy Laboratory.

The interdisciplinary group includes civil, mechanical, nuclear engineers and meteorologists who have studied a wide range of waste heat management problems. In addition to research on once-through systems and cooling ponds, the members of the Waste Heat Management Group are investigating improved wet and dry cooling tower designs, atmospheric plumes issuing from cooling towers, environmental monitoring methods, water quality issues and economic aspects of waste heat treatment, including beneficial use and the effect on power plant siting.

MIT Reacts to Privacy Act

(Continued from page 1)

visions of the Act.

During the past several weeks, an *ad hoc* committee has been trying to understand the broad language of the Act, and has been drafting policy options and administrative procedures for use by the MIT community in complying with this law. The committee's work has been made difficult by the ambiguities in the Act itself and by the absence of congressional guidelines and executive regulations regarding the law. The committee's final recommendations will be distributed with the call to the November 20 meeting of the faculty and will be discussed at that meeting.

The following interim guidelines are effective until superseded by new policies and administrative procedures.

According to the Act, access for review of records must be provided within a reasonable period of time, but in no case longer than 45 days after the request has been made. Requests for review of specific records should be in writing. They will be accepted starting on Nov. 19, 1974, at the following offices: 1) Dean for Student Affairs; 2) Dean of the Graduate School. The requests will be recorded with the date of receipt. Students will

not be allowed to review any confidential records, files, data, etc., until the final Institute policies have been adopted.

In order to comply with certain federal and state regulations (not directly related to the Family Educational Rights and Privacy Act of 1974) MIT is required to retain some official records for specific periods of time. Until the specific guidelines are issued no official correspondence, notes, data, etc. pertaining to admissions, financial aid, medical records, academic decisions, or disciplinary sanctions should be returned to the authors, destroyed, or otherwise removed from the files.

All admissions applications, evaluation forms and other documents being issued by MIT after Nov. 19, 1974 should be clearly labelled or stamped with explicit statements to the effect that any personally identifiable information about an individual may eventually become available for review by that individual. The outgoing documents will also contain a statement that MIT will not transfer the information to third parties without the written consent of the individual to whom the material pertains.

Letters of recommendation or other evaluative comments dis-

tributed within MIT or to persons on the outside of MIT for official use may indeed be covered by the law. Written consent of the student will be required before releasing the material.

If more information or advice is needed before MIT's guidelines are finally adopted, please contact one of the following persons:

James J. Bishop, Associate Dean for Student Affairs (5-104).

Sanborn C. Brown, Associate Dean of the Graduate School (3-134).

Peter H. Richardson, Director of Admissions (3-108).

Hartley Rogers, Jr., Associate Provost (2-270).

Warren D. Wells, Registrar (E19-341).

The Faculty meeting of Nov. 20, 1974, will afford an opportunity for explanation and discussion of the Act and its effects. Faculty reaction to the proposed policy is invited.

Student Guests

The Technology Matrons are once again attempting to match students and families for the Thanksgiving holiday.

Students who would like to spend the holiday with an MIT family, and families who would like to entertain one or more students, are asked to call Mrs. J.B. Feldman at 527-1022.

IAP Guide Out Thursday

The preliminary 1975 Independent Activities Period guide will be distributed Thursday, Nov. 14, listing more than 350 activities that will be available Jan. 6-29 during the between-semesters break.

The guide includes all the activities organized by Nov. 4. A second and final guide will be issued the second week in December, incorporating all activities organized by a Nov. 27 deadline.

This year's preliminary guide contains approximately 30 more listings than last year's, according to Joan Friebely of Institute Information Services, who assembles the guides. The final guide last year listed some 500 activities.

Activity listings for the final guide can be sent to Ms. Friebely (Rm 5-133, x3-2697). General information on IAP can be obtained from her or from the office of Joel Orlen (Rm. 3-234, x3-1973), who is responsible for IAP administration.

As usual, the preliminary guide lists a variety of activities organized by students, faculty and staff—some ordinary and some rather unusual. The latter include a spelling bee (see page 1), a lecture by feminist Gloria Steinem and some activities directed at

employees, among them a series of physics and biology talks for secretaries and others in those departments.

The preliminary guide even contains an encoded activity description supplied by James H. Williams Jr., Esther and Harold E. Edgerton Associate Professor of Mechanical Engineering, who supervised last year's giant yo-yo project. Here it is:

"Xp jxkv lc vlr hkl, qeb hfa exa x oxqebo olrde qfjb arofk d lro gxxrxov pbsbkqv-clro fxm; aobxjfk d xylrq pmfkkfk d afphp xka ilkd kvilk zloap, zljmbqbiv orfkfk d efp ils b ifcb. Wihx rly il ipx mlnhmlm wb tiha ihx xpt pcm ihdxlek bkk wb wil hxelw bk Olydvmp kby xbdl ehjiw upnpwhbchcj olkbyl ylvvyhchj wb wil Wvwl. Yv qexq qfjb eb bumbzqp qefp pfjmib zlab ql yb yolhbk xka eb tfii yb xsxfixyib ql xkv pqrabkq - tel abpfobp zlkprijqxflk fk plifa jbzexkfpz lo avkxjzfp."

What's Professor Williams up to this year?

Let us know when you figure it out.

At the Arts Council Ball



Signing the register at the "Evening with the Arts at MIT" is Luis A. Ferré, former governor of the Commonwealth of Puerto Rico and current president of the MIT Alumni Association. The evening in Walker Memorial was part of the third annual meeting held Nov. 7 and 8 of the Council for the Arts at MIT.



The festive "Evening with the Arts at MIT" held last Thursday, Nov. 7, in Walker Memorial for members of the Council for the Arts at MIT included music by MIT ensembles, displays of poetry and the visual arts, and ballroom dancing for Council members and guests. Present were, left to right, MIT Provost

Walter A. Rosenblith; MIT President Jerome B. Wiesner and Mrs. Wiesner, seated; Professor Roy Lamson, special assistant to the president for the arts; and Susan C. Knight, associate director of the Council.

Photos by Calvin Campbell



A performance by a woodwind quintet of the MIT Chamber Players was one of the musical offerings at "Evening with the Arts at MIT" presented by the Council for the Arts at MIT last Thursday in Walker

Memorial in conjunction with the Council's third annual meeting. The one and a half day meeting included business sessions, visits to MIT arts facilities, and seminars with faculty members in the arts.

Gyorgy Kepes Named First Recipient of McDermott Award

Noted painter and author Gyorgy Kepes, founder and director emeritus of MIT's Center for Advanced Visual Studies, has been named first recipient of the newly established Eugene McDermott Award of the Council for the Arts at MIT.

The award "for major contributions to the arts as a means of human fulfillment" was announced at the concluding session of the Council's third annual meeting held Nov. 7 and 8 at the Institute.

Established by the Council's executive committee, the award honors the memory of the late Eugene McDermott, Life Member of the MIT Corporation and a benefactor to the Institute in education and the arts. Mr. McDermott, former president of Texas Instruments, Inc., died in August, 1973. In 1960 he and Mrs. McDermott established the Eugene and Margaret McDermott Scholarship Fund for undergraduate students and in 1966 their generosity made possible the construction of McDermott Court, with the "Great Sail" sculpture by Alexander Calder, which opened a new era in the aesthetic development of the MIT campus. Widely recognized for his contributions to the geophysical sciences, Mr. McDermott was a member of MIT's first Visiting Committee for the Arts and he and Mrs. McDermott were

instrumental in founding the MIT Art Committee, forerunner of the present Council.

The \$1,000 cash award was announced by Mrs. Ida E. Rubin, chairman of the Council's McDermott Award Committee and also of its Museum and Acquisitions Committee. James R. Killian, Jr., honorary chairman of the Corporation, accepted the award on behalf of Professor Kepes, who is spending the academic year at the American Academy in Rome.

In presenting the award, Paul Tishman, noted New York art collector and Council chairman, cited Professor Kepes for "the breadth of his concern as an artist and an educator for the role of the arts in the world and in the community of the Institute.

"In his nearly three decades here, he has given continual, practical expression to his pioneering belief that the arts and sciences are but two means to a common end: the enhancement of the human spirit and the betterment of the world."

In acceptance, Dr. Killian read a cable received from Professor Kepes.

"I am proud, moved and thankful," Professor Kepes cabled, "to be the first recipient of the Eugene McDermott Award...and consider it not a personal honor but an act of trust in the cause in which I deeply believe: the convergence of art and science in common social goals."

At the conclusion of the presentation, President Jerome B. Wies-

ner, in remarks on the Council's activities, told Council members:

"One immediate result of such work is that the arts are beginning to get more support—another has been to generate some of the expectations they will have to have if they are to develop further. Evidence of the external impact can be seen, too. The arts appear to have been an important element that helped MIT buck the trend in student applications this past year, contributing, we believe, to the fact that our applications increased 20 percent and the number of women in the freshman class increased dramatically. The Council's very existence has brought forth a corresponding committee of the faculty, spanning schools and departments, bringing together faculty and students in several areas not only for mutual support but for collaborative creative activities."

Professor Kepes, who is professor of visual design emeritus and Institute Professor emeritus, is an eminent painter and educator who has been a pioneer in recognizing the convergence of art and science.

A member of the MIT faculty for 28 years, Professor Kepes gave an early expression to this concept in his book, *The New Landscape in Arts and Science* (1951), which provided the first adequate documentation of the mutuality of science, technology and the arts.

Professor Kepes founded the Center for Advanced Visual Stud-

ies in 1967. Under his leadership, the Center since its inception has been host to 35 artists who have come to MIT to work in the Institute's special environment in which the arts in all forms are commingled with concentrated pursuits in science and engineering.

The Center's fellows have included some of the world's most innovative working artists.

Among the major cooperative ventures of the Center have been a traveling exhibition, entitled "Multiple Interaction," of works by 15 fellows of the Center which has received wide public attention in a tour of major U.S. cities; the 1970 exhibition, "Explorations," a major show presented at the National Collection of Fine Arts, Smithsonian Institution, and at MIT's Hayden Gallery; outdoor air sculpture experiments by Professor Otto Piene, new director of CAVS, and three one-man shows in Hayden Gallery of works by Vasilakis Takis, Wen-Ying Tasi, former CAVS fellows, and Friedrich St. Florian, who is currently a research fellow at the Center and visiting associate professor of architecture in the Department of Architecture.

The Center has also participated in or organized five major symposia: "Art, Science and Technology" (1968); "Artists and the Scientific Community" (1969); "Art in Civic Scale" (1971); "The Artist and the Environment" (1972); and "Arts and the University" (1974).

The Center has also concen-

trated on two extensive collaborative environmental projects: The Charles River Project, involving a combination of pollution abatement measures with artistic environmental forms along with a plan for reforestation of the Charles River banks; and the Boston Harbor Project, involving the development of environmental art as a means of reintegrating the harbor islands and the city.

As a painter, Professor Kepes has received wide recognition. His works are included in 30 permanent collections and he has had more than two dozen one-man exhibitions. His creativity has been wide-ranging. He designed a large mobile light mural for KLM airlines offices in New York City and stained-glass windows 140 feet high for a San Francisco cathedral.

He was also involved at an early date with problems of the environment. In 1950 he organized an exhibition, "The Painter and the City," in Hayden Gallery, and he was a co-director of a study of the perceptual form of the city.

In 1966, he organized an exhibition, "Light as a Creative Medium," at the Carpenter Center for Visual Arts, at Harvard, and special attention has been given at CAVS to the creative use of light.

In addition to his *New Landscape* book, Professor Kepes' *Language of Vision*, published in 1944, has gone through 14 editions and the seven volumes of his *Vision and Value* series are regarded as contemporary classics.

Piense Appointed Director of CAVS

Artist and writer Otto Piense, Professor for Environmental Art at MIT and internationally known for his large-scale sky events and dramatic constructions with light, has been appointed director of MIT's Center for Advanced Visual Studies (CAVS).

He succeeds famed painter and author Gyorgy Kepes, Professor of Visual Design emeritus, Institute Professor emeritus, and director emeritus of the Center. Professor Kepes founded CAVS in 1967 to foster a creative collaboration among artists, scientists and engineers, and the Center under his leadership has received wide acclaim in the US and abroad.

Professor Kepes, who is spending the current academic year at the American Academy in Rome, also serves as a member of CAVS advisory groups, and a Fellow of the Center.

The appointment of Professor Piense to the directorship was announced by Professor Walter A. Rosenblith, MIT Provost, who acted on recommendations of a five-member MIT selection committee. Members of the committee were Professor Donlyn Lyndon, head of the Department of Architecture, who served as chairman; Dean William L. Porter of the MIT School of Architecture and Planning; Judith Wechsler, Associate Professor of the History of Art; Richard Leacock, Professor of Cinema, and Philip Morrison, Professor of Physics and Institute Professor.

Professor Piense is energetically moving forward to increase collaboration and cooperation with various Institute units. Specifically, he hopes initially to seek closer ties with the School of Architecture and Planning, the Center for Space Research, and the Department of Electrical Engineering.

Professor Piense announced that Professor Robert Preusser of the Department of Architecture will serve also as director of education for the CAVS. Professor Preusser, he said, will stress intensified input by Center Fellows into existing CAVS subjects and will broaden their general availability as resource people, consultants and collaborators in teaching situations throughout the Institute.

Professor Piense, who has been involved in the Center almost from its inception, has worked in a broad range of disciplines, contributing to each his concepts of the interdependency of art, nature and

science and emphasizing the civic and public role of art.

He has brought his belief in "the psychic and physical economy of art" into architecture and city planning, he has developed new painting and drawing techniques, written on the basic problems of art and the potentials of environmental art, conceived light events, and programmed light sculptures and light murals for architectural commissions.

He has created monumental pneumatic sculptures, some for interior spaces, and his large-scale environmental events with wide public involvement include his *Light Satellite* sculpture and the 1,600-foot *Rainbow*, both for the 1972 Munich Olympic games, which were carried out in collaboration with two MIT colleagues, Dr. Harold E. Edgerton, Institute Professor emeritus, and Walter H.G. Lewin, professor of physics and an authority in balloon-borne x-ray astronomy.

Professor Piense was born in Germany in 1928 and studied at the Blocherer-Schule of Fine Arts, Munich, the Munich Academy of Fine Arts, and the Dusseldorf School of Fine Arts. He took the examination in Philosophy at the University of Cologne in 1957.

That same year he joined Heinz Mack as co-founder of Group Zero, an international assembly of artists interested in kinetic, environmental and elemental art, and went on to publish *ZERO* magazines and to organize and design exhibitions and the first sky events under the *ZERO* aegis.

His first one-man show, "Archaic Light Ballet," in Dusseldorf in 1959 served as a formal announcement of his concern with involving spectators in a response to the elements. "By elements," Professor Piense later wrote, "I do not only mean the classic Greek elements: fire, water, air and earth. I also mean the human elements of action, reaction, involvement, participation. Finally, I mean technology as a

latter-day element without which none of us can live."

Professor Piense was first associated with Professor Kepes and MIT as a resident fellow of CAVS from 1968-1971, a period in which he directed a number of collaborative sky events, including "Light Line Experiment" in 1968 at MIT, "Luftprojekt" at the Academy of Fine Arts, Karlsruhe, "Manned Helium Sculpture" for *The Medium is the Medium* experimental television program over WGBH-TV and the Public Broadcasting System in 1969, "A Field of Hot Air Sculptures over Fire in the Snow" at MIT in 1969, "Citything Sky Ballet" with the social, cultural and educational institutions of the City of Pittsburgh in 1970, "Washington Sky Ballet" sponsored by the Smithsonian Institution in 1970, "Sky Lei" sponsored by the Honolulu Academy of Arts in 1970, and "Charles River Rainbow" in 1971 in Boston, sponsored by the Museum of Fine Arts.

Since 1971 Professor Piense has been a non-resident fellow of CAVS. In 1972 he was appointed visiting professor for environmental art in the MIT School of Architecture and Planning. He was promoted to professor of visual design in 1974.

Professor Piense's work has been presented in numerous one-man shows in Europe and the US, and he has participated in many group exhibitions, including "Elements of Art" at the Boston Museum of Fine Arts and "Project 70" at Boston City Hall. A definitive retrospective one-man show of his work was held at the Kunstverein in Cologne, Germany, in 1973. Next spring the MIT Committee on the Visual Arts will sponsor a comprehensive profile of his multifaceted artistic career.

Among Professor Piense's writings are *More Sky 2* and *ZERO*, published last year by the MIT Press. Other publications include *Otto Piense*, published in 1973 by Josef Keller Verlag, Starnberg.

MIT to be Well Represented at ASME

Several MIT professors and researchers will speak at the 95th winter annual meeting of The American Society of Mechanical Engineers, Nov. 17-22 in New York.

Dr. Jay W. Forrester, Germeshausen Professor of Management, will give the Henry Robinson Towne Lecture Tuesday morning, Nov. 19. His speech on "The Need to Look Ahead" will be the keynote speech of the forum on conservation and resource recovery.

Dr. Robert W. Mann, Uncas A. Whitaker Professor of Biomedical Engineering, will give the keynote speech of the session on bioengineering instrumentation and simulation, Wednesday morning, Nov. 20.

Dr. Stephen H. Crandall, professor of mechanical engineering, will present a paper on "Accumulated Slip of a Friction-Controlled Mass Excited by Earthquake Motions" Friday morning, Nov. 22. Co-authors of the paper are Dr. James H. Williams, Jr., Esther and Harold E. Edgerton Associate Professor of Mechanical Engineering, and Samson S. Lee, an MIT graduate student in mechanical engineering.

Dr. David N. Wormley, associate professor of mechanical engineering, will present a paper co-authored by graduate student Arnold J. Gilchrist, on dynamics

and vibration, Thursday night, Nov. 21. Dr. Wormley also co-authored a second paper on dynamics and vibration, to be presented at the meeting.

Ira P. Krepchin, a former graduate student at MIT, will present two papers written at MIT, on mechanical properties of the mammalian vas deferens, Wednesday afternoon, Nov. 20. Co-authors of the papers are C.W. Lau, an MIT graduate student, Dr. Subhash K. Batra, research associate in mechanical engineering, Dr. William J. Shack, associate professor of mechanical engineering, and Dr. Thomas J. Lardner, a former associate professor at MIT.

Dr. Ernest G. Cravalho, associate professor of mechanical engineering, will present a paper on the thermodynamics of water transport from biological cells during freezing, Friday morning, Nov. 22. Co-authors of the paper are Otavio M. Silveiras, who will receive his doctorate from MIT in February, Charles E. Huggins, senior lecturer in mechanical engineering, and Dr. William M. Toscano, a former research associate at MIT.

Dr. Cravalho also co-authored two other papers to be presented at the meeting, one on the frozen storage of living tissue, and one on the thermodynamics of intracellular ice nucleation in the

Bonny Kellerman Named To Deans Office Position

Bonny Kellermann, who received the SB degree in political science from MIT in June, 1972, was recently appointed Assistant to the Dean for Student Affairs in the Freshman Advisory Council Office.

Following completion of the MA degree in social work at the University of Chicago last June, she worked with Kenneth C. Browning, Assistant Dean of Student Affairs, on 1974 fall term housing and freshman orientation.

In an interview last week, Ms. Kellermann said that a number of changes have occurred since she entered McCormick Hall as a first year student in 1968. "In addition to McCormick's being liberated from parietal hours, Burton House, where I served as women's orientation chairperson and room assignments co-ordinator, has integrated women throughout the building."

Also in the midst of change is the MIT women's basketball team, which Ms. Kellermann helped found. The team will compete in the first MIT Invitational Basketball Tournament in February.

A consistently innovative model for women students at MIT, Ms. Kellermann taught the first figure skating class at the Institute during IAP of her junior year. The course was continued the following year as part of MIT's regular physical education curriculum.

As an undergraduate, Ms. Kellermann played the violin in the

MIT Symphony Orchestra and the MIT Musical Theatre Guild. In her new staff role she has resumed her playing with these groups.

Drawing a comparison between her own graduate and undergraduate experiences, she said, "Support services at other universities just don't measure up to those at MIT. Here, people listen and act on a student's ideas and problems. That kind of flexibility and concern is an integral part of



Ms. Kellerman the whole college experience, and I'd like to see it continue."

At the conclusion of her first week of luncheons with faculty advisors and evaluative sessions with students' midterm progress reports, she reported that she was learning a great deal about the freshman class and planned to meet many of the students on an individual basis.

Upcoming projects she plans to initiate with the help of Peter Büttner, Associate Dean for Student Affairs, include visits to students in their individual living groups and Freshman Advisory Council open houses, where freshman can drop in to the F.A.C. Office to discuss various aspects of their first year at MIT.

Nancy Wheatley, whom Ms. Kellermann replaces, will continue to administer the Undergraduate Seminar Program while dividing the balance of her time between counseling and various aspects of the housing program connected with the Office of the Dean for Student Affairs.

Newberne Visits Thailand for WHO

Dr. Paul M. Newberne, professor of nutritional pathology in the MIT Department of Nutrition and Food Science, is in Thailand on a mission for the World Health Organization (WHO).

The Thai government has asked the WHO for advisory help in establishing a research program that will study disease stemming from nutritional and other causes.

Dr. Newberne has been asked to gather information that will be essential to the WHO in formulating its response to the Thai request.

While in Bangkok Dr. Newberne addressed a Nov. 7 dinner meeting of the American University Alumni Association which has a membership of 1,600 Thais and Americans who are alumni of American universities.

The Association's program for 1974 calls for focusing attention at each of its monthly meetings on a specific American university. It honored MIT on Nov. 7.

The Institute has 63 alumni in Thailand, among them Dr. Chao-vana NaSylvanta, recently appointed Minister of Communications. Dr. NaSylvanta received his SM in 1953, his ME in 1955 and his ScD in 1956, all in mechanical engineering.

Bake Sale Today

Thursday, Nov. 14, is the date for the first of two annual bake sales sponsored by the Technology Wives' Organization as a fund raiser for the group.

The sale will begin at 8am in the Lobby of Building 10 and continue until everything is sold out. Included will be home-baked goodies of all kinds and tasty sandwiches.

Persons wishing to donate baked goods are asked to call Camille Flores at 494-8989.

Minority Report

A new publication, the Minority Report, is being issued monthly by minority students and staff at MIT, under the auspices of the Office of the Special Assistant for Minority Affairs to the MIT President and Chancellor.

The newsletter covers issues and opinions relevant to the MIT minority community which are not regularly covered by other campus publications.

Although non-minority members of the community are often called upon for interviews, circulation of the Minority Report has been primarily among the minority community. The staff of the newsletter has now issued an invitation to all members of the community to receive the publication.

Those who would like to receive the Minority Report may leave their names and campus addresses at ext. 3-5446 or 3-5447. Back issues from September and October may also be requested at the same numbers.

THE INSTITUTE CALENDAR

November 13
through
November 24

Events of Special Interest

Bake Sale* - Sponsored by the Technology Wives Organization. Thurs, Nov 14, 8am-sellout, Bldg 10 Lobby. Those wishing to donate baked goods, etc are urged to call Camille Flores, 494-8989.

Chinese Pastry Sale* - Mon, Nov 18-Fri, Nov 22, 11am-1pm, Bldg 10 Lobby.

Barbara W. Newell** - The President of Wellesley College will speak to a combined meeting of the Association for Women Students and Women in Science and Engineering. Tues, Nov 19, 8pm, Stu Ctr West Lge. Refreshments. Men and women welcome.

Seminars and Lectures

Wednesday, November 13

Geostrophic Turbulence, Meanders and Mean Flows - Peter Rhines, Woods Hole Oceanographic Institution. Oceanography Sack Lunch Seminar. 12n, Rm 54-311. Bring lunch, coffee served.

Harvard Square Planning Workshops* - Lajos Heder, Laboratory of Architecture & Planning. Architecture & Planning Seminar. 12n, New X, Rm 7-431.

Response Matrix Method Application* - Yovan Lukic, G. Nuclear Engineering Doctoral Seminar. 3pm, NW12-222.

Lasers-The Light Fantastic* - Michael Feld, physics. Physics Faculty-Student Exchange Seminar. 3:30pm, Rm 4-149.

Color, Scope, Discourse, and New England from 500 Miles* - Charles Libby, urban studies & planning. Architecture & Planning Seminar. 4pm, Rm 3-415.

Gamma Heating in Fast Reactor Media* - M. Kalra, G. Nuclear Engineering Doctoral Seminar. 4pm, NW12-222.

The Growing Power of the Military* - Gene LaRocque, Rear Admiral, US Navy; director, Center for Defense Information. MIT-Harvard Joint Arms Control Seminar. 4pm, Harvard CFIA, Seminar Rm 1, 6 Divinity Ave.

The Buffalo Creek Disaster - Joseph Brenner, MD, associate psychiatrist-in-chief. Discussion of the medical and legal aspects. Preprofessional Advising & Education Office Seminar. 4pm, Stu Ctr West Lge.

Thursday, November 14

Data Management and Analysis in Research and Planning* - Joseph Markowitz, director, Overlap Project. Architecture & Planning Seminar. 12n, New X, Rm 7-431.

Design Earthquake Loads for Reinforced Concrete Structures* - Dr. Hiroyuki Aoyama, University of Tokyo. Civil Engineering Seminar. 3pm, Rm 1-350. Coffee 2:45pm.

Vitamin A: Transport and Metabolism* - Dr. DeWitt S. Goodman, medicine, Columbia University; College of Physicians and Surgeons, New York. Nutrition & Food Science, MIT; Nutrition, Harvard School of Public Health Joint Seminar. 3:30pm, Lecture Rm G1, Kresge Bldg, Harvard Medical School.

Citizen-Based Planning and the Student Learning Process* - Lawrence Susskind, urban studies & planning, assistant department head. Architecture & Planning Seminar. 4pm, New X, Rm 7-431.

Modeling the Injection Molding Process* - Costas Gogos, chemical engineering, Stevens Institute of Technology. MIT Industry Polymer Processing Seminar, Mechanical Engineering. 4pm, Rm 37-186. Coffee 3:45pm.

Detailed Description of Experiments to Measure the Low Wave Number Components of a Turbulent Boundary Layer* - Paul Jameson, Bolt, Beranek & Newman. Interdepartmental Acoustics Seminar. 4pm, Rm 5-234. Coffee 3:30pm, Rm 1-114.

Organic Rankine Cycles for Power Generation from Low Temperature Heat Sources* - J. Davis, Thermo Electron Corp. Thermodynamics & Fluid Dynamics Seminar. 4pm, Rm 3-343.

Nonlinear Spectroscopy of Atoms, Molecules and Crystals - Nicolaas Bloembergen, Harvard University. Physics Colloquium. 4:15pm, Rm 26-100. Refreshments 3:45pm, Rm 26-110.

Romanticism in Music and Painting* - John Buttrick, humanities; Judith Wechsler, architecture. Humanities Crossroads Lecture. 4:30pm, Rm 4-260.

Jewish Mysticism* - Danny Matt, Brandeis, will discuss a mystical text. Hillel Lecture. 7pm, Baker House Hall.

Friday, November 15

An Investigation of Mass Transfer in Packed Beds in the Presence of a Downward Concurrent Gas-Liquid Flow* - M. Van Eek, G. Chemical Engineering Doctoral Seminar. 2pm, Rm 10-105.

Flame Spread Over the Surface of Solid Fuels* - F. Wong, G. Chemical Engineering Doctoral Seminar. 3pm, Rm 10-105.

Vibration* - Jacob P. Den Hartog, mechanical engineering, emeritus. Mechanical Engineering Seminar. 3pm, Rm 3-133. Coffee 4pm, Rm 1-114.

Monte Carlo Dose Calculations for Boron Neutron Capture Therapy* - Owen Deutsch, G. Nuclear Engineering Biomedical Applications of Radiation Seminar. 3:45pm, Rm NW12-222. Coffee 3:30pm.

New Foods from Enzymatic Conversion of Sugar to Acids* - Dr. Arthur G. Rand, Jr., University of Rhode Island. Microbiology and Biochemical Engineering Seminar. 4pm, Rm 16-310.

Recent Studies in the Development of Precipitation* - Roddy R. Rogers, meteorology, McGill University, Montreal. Meteorology Seminar. 4pm, Rm 54-100. Tea 3-3:30pm.

Plasma Confinement and Heating in the Elmo Bumpy Torus - G.E. Guest, Oak Ridge National Laboratory. Plasma Dynamics Seminar. 4pm, Rm 36-261. Refreshments preceding.

Home is Where the Heart is: A Semantics for Measurement* - Richmond Thomason, University of Pittsburgh. Philosophy and Linguistics Colloquium. 4pm, Rm 14E-304.

Monday, November 18

Intense Pulsed Neutron Source and Applications to Nuclear Scattering* - Dr. David L. Price, director, Solid State Science Division, Argonne National Laboratory. Nuclear Engineering ANS Seminar. 3:30pm, Rm NW12-222. Coffee 3pm.

Fight Like Hell for the Living: Knox County, Ky; A Case Study of Rural Poverty* - James Spencer, G. Civil Engineering Water Resources & Hydrodynamics Seminar. 4pm, Rm 48-316. Coffee 3:30pm, Rm 48-410.

Semi-Classical Approximations in Quantum Field Theory - Dr. Brosl Hasslacher, Institute for Advanced Study, Princeton, NJ. Applied Mathematics Colloquium. 4pm, Rm 2-338. Coffee 3:30pm, Rm 2-349.

Reasons, Decisions and Norms* - Joseph Raz, Oxford University; visiting, Rockefeller University. Philosophy Seminar. 4pm, Rm 14E-304.

Observations of Technology in China - Robert G. Wheeler, physics, Yale University. Francis Bitter National Magnet Laboratory Seminar. 4:15pm, 2nd fl conference rm, Magnet Lab. Refreshments 4pm.

Tuesday, November 19

Plasma Ion Energy Measurement by Charge Exchange Neutral Analysis* - D. Cook, G. Nuclear Engineering Doctoral Seminar. 12n, Rm 38-166.

Symposium on Undergraduate Research in the Department of Nutrition & Food Science* - Several undergraduates presenting research findings. 2pm, Rm 9-150. Refreshments.



Spectator at the exhibition "Multiple Interaction" gazes at "Pan," a kinetic sound sculpture by Paul Earls and Michio Ihara of the Center for Advanced Visual Studies. The exhibition in the Lobby 7 which has drawn crowds for the past week, closes Friday, Nov. 15.

MIT PDP 11 Users Group Meeting* - Information Processing Services Seminar. 2:30pm, Rm 13-5002. Refreshments 2pm.

Aero/Astro General Seminar* - Speaker and topic to be announced. 4pm, Rm 35-225. Coffee 3:30pm, Rm 33-222.

The McNamara Line* - George Kistiakowsky, Abbott & James Lawrence Professor of Chemistry, Emeritus, Harvard University. CIS New Technologies and International Security Seminar. 4pm, Rm E53-482.

Thermodynamics of Irreversible Processes** - Alfred R. Cooper, Case Western Reserve University. Materials Colloquium. 4pm, Rm 6-120. Coffee 3:30pm.

The Role of Ion Pumps in the High Aerobic Glycolysis of Tumor Cells - Dr. E. Racker, Cornell University. 4:30pm, Rm 2-390. Coffee 4pm, Bldg 56 5th fl vestibule.

The Politics of Education in China* - Paul Lauter, Old Westbury College, SUNY. Literature Section Seminar. 5pm, Rm 14E-304.

Pan-Africanism* - Owusu Saduaki, former head of Malcolm X University; co-chairman, Black Solidarity Day. Community Fellows

Program Seminar. 5pm, Rm E40-200.

The Problems and Policies of Offshore Fisheries Operations* - Thomas A. Fulham, president, Suffolk University. Lowell Institute, Sea Grant Program, New England Aquarium Lecture. 8pm, Aquarium, Atlantic Ave, Boston.

A Trip to Russia: An Encounter with Soviet Jews* - Dick and Sherry Israel will discuss their trip to Russia. Hillel Lecture. 8pm, Stu Ctr Mezzanine Lge.

Wednesday, November 20

Dynamo III Seminar** - A. L. Pugh III, Pugh-Roberts Associates. Information Processing Center Seminar. 3pm, Rm 39-530.

Engineering as an Entree to Management* - Frank J. Mechura, '65, resident manager, Syracuse plant, Continental Can Co. Career Planning & Placement Seminar. 3pm, Rm 1-114.

Politics of Presidential Transition* - Clay T. Whitehead, Center for International Studies. Political Science Seminar. 3pm, Rm E53-482.

Submillimeter Spectroscopy of Weak Antiferromagnets in Magnetic Fields up to 300 kOe - Dr. E. G. Rudashevsky, Academy of Sciences of the USSR; P.N. Lebedev Physical Institute. Francis Bitter National Magnet Laboratory Seminar. 4pm, 2nd fl conference rm, Magnet Lab. Refreshments 3:45pm.

Thursday, November 21

The Skin as a Communications Transducer* - Carl E. Sherrick, Auditory Research Lab, Princeton University. Harvard-MIT Rehabilitation Engineering Center Seminar. 4pm, Rm 10-105. Coffee 3:30pm.

Oscillating Reactions and Chemical Instabilities* - John Ross, Frederick G. Keyes Professor of Chemistry. Thermodynamics and Fluid Mechanics Seminar. 4pm, Rm 3-343. Coffee.

Amorphous Semiconductors: A Case for Law and Disorder - Hellmut Fritzsche, University of Chicago. Physics Colloquium. 4:15pm, Rm 26-100. Refreshments 3:45pm, Rm 26-110.

Romanticism in Music and Painting, Part II* - Judith Wechsler, architecture; John Buttrick humanities. Humanities Crossroads Lecture. 4:30pm, Rm 4-260.

Indoor Air-Pollution Control* - Dr. Karl Raab, research chairman, Society to Overcome Pollution, Montreal. ASH Seminar/Meeting. 8pm, Stu Ctr West Lge.

Don Juan and Tantric Buddhism, the Question of Reality* - Chogyam Trungpa, Rinpoche, Tibetan Lama. Videotaped seminar, part I, sponsored by the Office of the Religious Counselors. 8pm, Rm 4-270. Tickets: \$5 Thurs & Fri, \$3/ea; order from 492-8099 or x3-5033.

Friday, November 22

Reorganizing the Northeast Railroads* - George Baker, trustee of Penn Central Railroad. Center for Transportation Studies Seminar. 12:45pm, Stu Ctr Mezzanine Lge. Buffet 12n, price \$1.

Interfacial Effects in the Displacement of Residual Oil of a Surfactant Waterflood* - John C. Slattery, Northwestern University. Chemical Engineering Seminar. 2pm, Rm 10-105.

Pattern Recognition May Resolve Treatment of Breast Cancer: Radical Mastectomy vs Limited Mastectomy* - Edward Patrick, MD, PhD, Purdue University. Center for Space Research, Man-Vehicle Laboratory Seminar. 2pm, Rm 37-187.

New Research Initiatives by the Electric Utility Industry* - Robert Bell, director of research, Consolidated Edison Company. Mechanical Engineering Seminar. 3pm, Rm 3-133. Coffee 4pm, Rm 1-114.

Nonlinear Phenomena in Tokamak Plasmas - B.V. Waddell, Institute for Advanced Study, Princeton. Plasma Dynamics Seminar. 4pm, Rm 36-261. Refreshments preceding.

Don Juan and Tantric Buddhism, the Question of Reality* - Chogyam Trungpa, Rinpoche, Tibetan Lama. Videotaped seminar, part II, sponsored by the Office of the Religious Counselors. 8pm, Rm 4-270. Tickets: \$5 Thurs & Fri, \$3/ea; order from 492-8099 or x3-5033.

Community Meetings

Wives Discussion Group - Wed, 2:15pm, Stu Ctr West Lge. Discussion leaders: Myra Rodrigues, social worker, x3-1684; Charlotte Schwartz, sociologist, x3-2916. Babysitting services available. Notes: Wed, Nov 13, topic will be "How to Use the Medical Department." Wed, Nov 20, will meet in Stu Ctr Rm 491.

AIAA** - Weekly meetings of the American Institute of Aeronautics & Astronautics. Wed, 3pm, Rm 33-222.

Physics Department Social Hour** - For undergraduate physics students and faculty. Wed, 5pm, (following Undergraduate Physics Colloquium), Rm 6-209.

MIT Club of Boston - Mortimer Zuckerman, chairman, Boston Urban Associates, will speak on the future of downtown Boston at the luncheon meeting Thurs, Nov 14, 12:15pm, Aquarium Restaurant, Boston. Reservations: Ms. Kiirats, x3-3878. Cost: \$4, payable at door.

Women's Forum** - Meetings Mon, 12n-1pm, Rm 10-105. Will meet Tues following Mon holidays. Mon, Nov 18: Captain Donna Kuha, USAF and The Reverend Constance Parvey will talk about their career choices.

Community Players - Monthly meeting Mon, Nov 18, 7:30pm, Stu Ctr Mezzanine Lge. The Winthrop Playmakers will present "Calm Down Mother," by Meganterry, a transformation for 3 women.

Noon Hour Events

MIT Chamber & Brass Ensemble* - Wed, Nov 13, 12n, Bldg 7 Lobby. Free.

Wind Quintet* - Music by Danzi, Milhaud and Malcolm Arnold. Thurs, Nov 14, 12n, Chapel. Free.

Traffic or Transit* - Environmental Film Series. Fri, Nov 15, 12n, Eng Lib Rm 10-500. Free, coffee.

REPORT OF THE MIT SPECIAL COMMITTEE ON GRADING

November 4, 1974

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Contents

	Page
1. Introduction	2
2. General Considerations:	2
2.1 Comments on the Internal Use of Grades: The Grade Report and Term Summary	2
2.2 Comments on the External Use of Grades: The Transcript	2
2.3 Problems Perceived in the Present Grading System	2
3. Conclusions	3
3.1 Should We Use the Present Type of Grading System?	3
3.2 Grade Inflation	3
3.3 Grading	3
3.3.1 Grades for Passing Work	3
3.3.2 A Mechanism for Attaching Comments to Grades	4
3.3.3 Grades for Inadequate or Incomplete Work	4
3.3.4 Second Registration for A Subject	4
3.3.5 Temporary and Other Special Grades ...	4
3.3.6 Pass/No-Credit Options	5
3.4 Numerical Cumulative Ratings	5
3.5 The Registration Procedure and Subject Drops and Adds	5
3.6 A Continuing Committee on the Grading System	6
4. Summary of the Committee's Recommendations	6

Appendices

A. Samples of Transcript, Grade Report, Term Summary and First-Year Evaluation Documents	6
B. A Statistical Analysis of Anticipated Grade Distributions	6
C. A Mechanism for Written Grade Comments	6
D. Current and Recommended Changes to the Rules and Regulations of the Faculty	7
E. Collateral Issues	7

1. Introduction

The MIT Special Committee on Grading has had as its basic charge "to study the full grading system at the Institute and, on the basis of such a study, to suggest desirable, and possibly fundamental, changes in the grading policy and practice at the Institute."¹ The notion of changing the system calls to mind the statement: "When it is not necessary to change, it is necessary not to change," quoted by John Kennedy as a definition of conservatism. Indeed, the opinion is sometimes expressed that the grading system should be left entirely in its present form. This attitude probably arises not so much from conviction of the system's present perfection as out of a concern that alternatives may be more flawed since the total results of any change are hard to predict, or that modifications could require faculty and administrative effort which would better be directed to other educational purposes. But organizations, like people, benefit from occasional self-appraisal; to provide an impetus for serious thought about the grading process can be regarded as an important function of the present Committee.

For a number of years, a range of problems have been perceived in the present grading system. Some deficiencies—as seen by individual students and faculty and by the Committee on Academic Performance (CAP)—are listed in Section 2.3. The perception of such problems formed the basis for the appointment of the present committee. It will be noted, as this report unfolds, that the committee does believe that some changes are called for. A summary of our recommendations is given in Section 4. Speaking generally, our objective has been to achieve a system which is both more self-consistent than the present system and capable of evaluations with more meaningful content and less ambiguity. The body of the report details individual aspects of the grading system, presenting a spectrum of viewpoints on each issue that we have addressed and giving the basis for each conclusion we have drawn.

It is perhaps inevitable, given a faculty as diverse as ours and a subject as pervasive as this, that some will find our suggestions for change too radical and others too conservative. On the other hand, our course as a committee has not been simply to find the middle positions between extreme views. Rather we have sought mechanisms which seem achievable and appropriate to the needs of our particular student body, to our educational aims, and to the internal and external evaluative purposes which grades serve—all within the framework of MIT's existing (but dynamic) educational structure. The committee is of the unanimous belief that the set of recommendations which it makes in this report, taken as a whole, represents a coherent and significant improvement over the present system. To facilitate consideration of the issues, however, we have made a specific attempt to present the arguments favoring different alternatives on numerous questions.

2. General Considerations

2.1 Comments on the Internal Use of Grades: The Grade Reports and Term Summary

The grading system serves important internal purposes closely related to the educational process itself. Internally, an evaluation scheme may serve the following purposes, among others:

- It provides a measure of achievement for students; a means for them to deduce their progress and level of mastery.
- It aids a teacher in sensing his/her own effectiveness.
- It provides information regarding students in potential or present academic difficulty, and (on occasion) the desirability of a student's withdrawal from the Institute; it allows assessment of a student's progress in a degree program.
- It assists a student and his/her counselors in making appropriate decisions with regard to the quantity and the content of programs of study.

The grade performance information is transmitted internally in two different types of documents. One type is the student's grade report (specimen available in Appendix A) which is distributed to the student, the faculty counselor, and the student's file. This report is the internal record of the student's academic performance, both past and present, and is used primarily as a record for counseling purposes. In addition to the grades received by the student in his/her various subjects, the grade report also reports the

student's progress toward his/her degree in terms of Institute requirements remaining to be fulfilled.

The other internal grade record is in the form of end-of-term summaries (specimen available in Appendix A). These summaries list the grades for all subjects for which each student is registered in that term. The summaries also list all previous actions taken by the CAP in the case of undergraduate students or by the Committee on Graduate School Policy (CGSP) for graduate students. The document also indicates whether the student is a candidate for a degree. The summaries are distributed to academic departments at the end of term so that departments can review the academic performance of their students. The departments then submit their recommendations for action, if any, (Warning, Negotiated Withdrawal, Disqualification) to the CAP or to the CGSP. The end of term summaries are also made available to faculty residents in the dormitories so that these faculty may identify students who may require special counseling.

In addition, for first-year students, the existing system also includes "Freshman Performance Evaluation forms." Intended to be used at mid- and end-of-term in each subject for which the student is registered, these contain space for written comments by both the student and the instructor. Each completed form includes four integral copies, one each for the student, the instructor, the advisor, and the Freshman Advisory Council (FAC).

The student grade reports, the end of term summaries, and the first-year student evaluation forms are internal documents and are not available to people outside the Institute.

2.2 Comments on the External Use of Grades: The Transcript

Whatever other purposes and side effects the grading system may have, it is clear that many persons consider it primarily in terms of its role in external evaluations and selections. Certainly the grading system would be perceived very differently by both students and faculty if it did not have that role. These external decisions are usually based on the use of a student's "transcript" (see sample available in Appendix A). The transcript is a cumulative document; it is both a partial record of positive achievements, i.e., subjects successfully mastered, requirements completed, degrees received, and a record of performance in terms of the grading system. Copies of this record are released to the external agencies only at the request (or consent) of the student.

Presumably, transcripts are requested primarily for prospective employers and graduate schools, but a wider variety of circumstances no doubt exists. The transcripts, we can assume, are subjected to varying degrees of purposeful scrutiny, ranging from simple verification of the student's enrollment at MIT to detailed analysis in very competitive situations. Some specific uses of the transcript are:

- It is used as an overall evaluation measure, based on the premise that the accumulation of individual grades in a large number of subjects, assigned by the teachers in those subjects, provides useful predictive information relevant to potential success in specific jobs or further schooling.
- It is used to verify that a student has taken specific subjects and to assess the student's performance/competence in those subjects.
- It is used to establish a student's level when he/she applies for transfer to another university.
- It is used to rank order MIT students with students from other universities for purposes of awarding fellowships, prizes, or membership in honorary societies.

It is probable that the relative importance of the transcript in these processes varies widely from user to user. The Institute, itself, has essentially no control over how the documents are used once they are sent out, nor does it provide any advice to the addressee regarding the use of the MIT transcript as evaluative data.

Because the transcript is a semi-public document, it emphasizes for the grading system the concern that always exists regarding information that is developed and collected about students and other members of the Institute: that the information be accurate and unambiguous, and that the appropriate balance be struck between the importance and need for the data and the rights of privacy.

At present the two kinds of functions which we have designated as *internal* and *external* are both served by the same basic process—grading in individual subjects—and this will likely continue. However, the internal and external applications of the information derived from grading procedures are quite different. We note, therefore, that there is no inherent reason to impose the constraint that the detailed information supplied for both purposes should be identical.

2.3 Problems Perceived in the Present Grading System

A number of deficiencies have been perceived in the present grading system. Often, such points which are raised in the grading context cannot be directly addressed by structural modifications of rules and regulations, but relate more to general attitudes and practices. This is certainly true for some of the items which we include in the list below; that is appropriate, however, since the official grading system cannot be divorced from the general educational framework or from the attitudes held by both faculty and students. It will also be noticed that some of the difficulties mentioned arise either from inadequate use of specific features of the system (e.g., Freshman Performance Evaluation forms) or from unanticipated too broad use of other features (e.g., the Incomplete grade). At the same time, it is recognized that some "misuse" of the present features results from attempts to compensate for actual inadequacies. Lastly, it should be mentioned that the items in the following list have not been primarily developed by the committee; rather the list is mostly a compendium of items expressed by others.

Problems related to high-achievement grades

It is felt that the present grade distribution, with its high percentage of A's and B's may not yield adequate differentiation among students and especially not adequate recognition of truly superior work. It has also been suggested that pass/fail grading reinforces mediocre achievement goals, since it does not distinguish excellent work from just passable.

Problems related to marginal achievement

Examples have been cited of undeserved passing grades being given in order to avoid the "damage" of an F on the student's record. This may result not only in the awarding of unwarranted credit for subjects, but also in falsely signifying satisfaction of prerequisites. Similarly, the I grade is apparently used in circumstances where a majority of the term's work remains to be done. These are but examples of uneven means of dealing with inadequate or unfinished work at end-of-term, including in addition, the grades of F, O, and OX, the student-initiated drop, the recommended drop, and the refusal to assign any grade at all.

Inadequate use of freshman evaluation forms under circumstances of marginal student performance has also been cited. This is a particular circumstance of a more broadly perceived inadequate level of student/faculty communication relative to coursework progress.

Problems associated with subject loads and commitment

The registration process, including subject drop and add procedures, does not provide an accurate view of actual student loads during the term. The late drop option may encourage unwise overloading. The increased use of the I grade when major portions of the work remain to be done results in effective but hidden overloading. (It has been said that in extreme cases, subjects are *planned* to carry over into the next academic period, with use of I grades anticipated.) The late drop option lessens commitment of students to subjects for which they enroll, and also of instructors to marginally performing students.

Problems associated with variations in grading practice

While the people and programs at MIT have changed over the years, the grading system has not been seriously reviewed (except for the freshman year). This has resulted in changing but not necessarily uniform interpretations of the grading system. There appear to be significant differences in the level of grades awarded from department to department, from term to term in a given subject, from teacher to teacher, from one size of subject to another. There may also be grading variations within a given subject, depending on the student's major department, or whether he/she is a graduate or undergraduate. This means that individual grades may have low information content without subsidiary contextual data. It may lead to a certain amount of grade game-playing and to frustration and cynicism among students.

A student does not always see the relationship between the basis for his/her grade and his/her intellectual effort; it may not be clear what he/she is supposed to achieve in a subject or whether his/her achievement in that respect is what he/she will be graded on. In addition, grades are used to measure different dimensions, such as test scores, growth, effort, interaction level, etc.

There is presently no straightforward procedure for students to question grades which they feel to be inappropriate, beyond the faculty member who assigned the grade.

It has also been pointed out that none of the variations in grading procedure are suitable for specific new types of programs, such as self-paced study.

1. April 1973 CEP memo recommending the creation of this Committee.

3. Conclusions

3.1 Should we use the Present Type of Grading System?

In the committee discussions we have only touched on consideration of a basic issue at the heart of the grading system, namely the appropriateness and relative effectiveness of teachers simultaneously serving as both teachers and evaluators. Clearly, some degree of judgement by the teacher regarding the student's ability and achievement (and vice-versa) is likely to be formed even if none were officially demanded. Nonetheless, the official grading process, coupled with the real or perceived importance of the grades certainly plays a special role in shaping the student-teacher relationship, the motivation and direction of the student, and even the structure and content of the subject as offered. Because of the grading aspects, students may perceive an educational process too much in terms of its being a mechanism for judging them and less as a means for personal growth.

In spite of that potential difficulty, we are convinced that MIT does need to continue its own evaluation of students. Techniques other than grading, such as standardized tests, external examination boards, departmental annual examinations, subject prerequisite pretests and other schemes for monitoring and evaluating competence have been only briefly considered by us. It appears that these would be less desirable or, at least, that we would need to gain a great deal of additional institutional experience with the particular methods before embarking on major changes in procedure. For clarity, we state this position, or premise, as our first recommendation: that we continue with the same basic type of grading system as presently exists, i.e., a system in which the student receives a grade in every subject for which he/she is registered and that the grade is officially assigned by the instructor in charge of the subject.

3.2 Grade Inflation

There is no doubt that there has been a push to the higher end of the grade scale, both nationally and at MIT. This phenomenon has been variously ascribed to a number of causes:

1. Students are, in fact, better prepared and/or more highly selected than their predecessors of a decade or more ago.
2. Faculty have been giving higher grades to students in order to give them a fair position in the national competition for fellowships, professional and graduate school admission, etc.
3. Some faculty members may now give higher grades because they do not believe that grading is meaningful, or because they are unwilling to give a student a low evaluation.
4. The increased tendency to publish grade statistics yields an upward push, since faculty are more likely to increase their grade levels up to the average than to lower their grades down to the average.
5. The increase in pass-type grading options as well as of no-record type options, leads to a statistical improvement in the level of actually recorded grades. At MIT, for example, it might be argued that the percentage of low grades would be higher in Institute requirement subjects (if the freshman year were graded) than in student-selected electives or departmental majors. There is also some reason to believe that the grade average for subjects dropped late in the term would be lower than the average of grades actually awarded in completed subjects.

Since the phenomenon of grade inflation is reasonably well recognized throughout the educational community we expect that there tends to be a certain amount of adjustment done in various competitive situations. In the absence of a set of acceptable national criteria and evaluation procedures, the process of selection in competitive situations must nonetheless be nearly the same as it was when the numbers in the grade-point-averages were somewhat lower. That is, one needs both to know the relative meanings of grades in the applicant's local institution and to provide weights appropriate to the given institution as a whole.

However the present situation may compare with previous years, it is reasonable to ask whether the grade distribution at a particular institution ought to have some particular form. It is clear that schools like MIT cannot give grades which would be directly transferable to a uniform national scale; on most scales broad enough to include all college students, MIT students (not to mention those from a number of other institutions) would tend to fall into a single grade slot. It is also hard to find justification for demanding a "normal" distribution of grades within MIT, even without reference to external comparisons, since the distribution curve of MIT students' abilities probably does not have a "normal" shape.

One analysis which we have done, based on the College Entrance Examination Board (CEEB) scores of the entering class in the academic year 1973, indicates that the distribution is skewed towards the high end. (See Appendix

B). The skewing is an absolute one, and not just relative to the normal population; that is, there were more test scores in the range 750-800 than 700-740; more in the range 700-740 than 650-690, etc. To a certain extent, of course, the piling-up at the high end is due to inherent limits in the tests themselves. Suppose, however, that we were to assume that it is reasonable for the distribution of the four passing grades at MIT to mirror the distribution of those scores, just considering the part of the CEEB range in which there are significant numbers of MIT students: the prediction would be 55.0% As, 29.6% B's, 11.7% C's and 3.7% D's. The actual count (excluding P and I grades) during three terms in 1972-73 was: 51.5% A's, 33.3% B's, 10.5% C's, 2.1% D's (and 2.6% F's). (It should be noted, however, that this particular "consistency" has not always been the rule; in the early 1960's the same analysis would have predicted about 49% A's, 37% B's, 15% C's and 2% D's, whereas the actual values were approximately 28%, 37%, 26% and 6%, respectively.)

Of course, such statistical enumeration cannot, in any case, in itself assert that grades are assigned with consistency or with accuracy in each of the tens of thousands of individual instances per term. Nor does it show that grades are assigned on the basis of actual achievement rather than on an accurately perceived measure of the student's "promise." By the same token, however, we do not see any obvious statistical basis for recommending a concerted institute-wide effort aimed at getting a more "normal" grade distribution.

This does not mean that other arguments do not exist for a grade redistribution. The strongest of these is probably the present lack of discrimination available at the high-achievement end, because the fraction of A grades is so large. It has been argued that greater resolution in the grading system (e.g., a system including pluses and minuses—see section 3.3.1) would over time have a mildly deflationary effect that would be beneficial in this regard. The committee believes, however, that this deficiency can be handled effectively with the recommended "comment" mechanism, presented in a later section.

There are a number of arguments against providing rules to force a specific, lower grade distribution. One, already mentioned, is that there is no clear evidence that the distribution of grades actually does differ significantly from the distribution of students' abilities to handle MIT subjects, overall. Also, that the grade distribution is determined by the individual grade assignments of the faculty (who can modify the grade distributions in their classes as they see fit), and that the faculty would regard a set of rules regarding grade assignments as oppressive. In addition, the grading practices at MIT (including the "inflation" seen in recent years) are consistent with national trends and that to lower the level of grades assigned unilaterally would place MIT students at a disadvantage in competition for graduate admissions and fellowships.

On this issue, therefore, we do not recommend that the faculty should strive to achieve a specific set of percentages for each grade, or to assign fewer or more of any specific grade than they believe to be warranted by the actual achievements of students in their classes.

At the same time, we think it is appropriate to stress the need for as common an understanding of the meaning of the different grades as we can achieve and for a consistency of application. Obvious distortions in grade assignments—represented by subjects in which it is impossible to get an A, or impossible not to get an A, or in which C grades are later represented as having been clear-cut failures—serve only to confuse students and other faculty and to engender a sense of cynicism that ultimately spills beyond the grading system to our entire educational process.

3.3 Grading

At present, the grading system includes the following grades:

- A passed with honor
- B passed with credit²
- C passed
- D barely passed
- P passed (in a pass/fail or pass/no-credit² subject)
- F failed, no credit awarded
- I incomplete, no credit awarded until completion (nominally, to be used when only a "minor" amount of work needs to be done; if work is completed, under the present scheme a final grade is assigned and included—with the I—on the transcript and internal records).
- O missed final examination (or absent during latter part of term); no credit awarded (instructor must give this grade when the circumstance occurs).
- OX missed final examination and excused by Dean's Office (instructor can then either give a final grade

2. The word "credit" is used with two different meanings in these cases, of course.

directly or give examination make-up; in either case the final grade replaces the OX grade.)

- J credit accumulated, grade will be assigned when subject (usually thesis) is completed in subsequent terms.
- S credit awarded for a subject taken at another institution (Registrar's notation).
- SA doctoral thesis successfully completed (Registrar's notation).

3.3.1 Grades for Passing Work

The second recommendation of the committee is the retention of the A, B, C, D, four-grade-slot system for the various levels of acceptable performance in a subject (plus P for "pass" type subjects). The committee also recommends retention of the four identifying phrases, "passed with honor," "passed with credit," "passed," and "barely passed" which are now associated with these four grades in the Faculty Rules and Regulations. We believe that these phrases, as simple as they are, lend themselves as well to a common understanding of the meaning of each grade as any more complicated designation scheme.

In addition to the "four slot" system on which we have settled, three other options were given major consideration:

1. a one- or two-grade-slot system (e.g., "pass" or "high pass, pass")
2. elimination of the D grade
3. formal addition of "intermediate" grades in the form of +s and/or -s (e.g., A, A-, B, B-, C, C-, D).

The arguments for reducing the number of grades to one or two are: (a) that interstudent competition is reduced and cooperative learning enhanced; (b) the inhibition of students to explore new areas educationally, induced by grade concern, is decreased; (c) undesirable student practices, aimed only at achieving better grades, are decreased. The Committee rejected that option, however, on the basis of views including the following: (a) without a more definitive grading system, some faculty avoid both evaluation and providing feedback to the student; (b) some students do not perform well academically without the "pressure" of grades or without the achievement goals which a multi-grade system provides; (c) many external users of grades would discriminate against students under such a system or rely heavily on standardized national tests; (d) such a system, in itself, does not provide adequate information for the grading system to serve its present functions.

The arguments for eliminating the D grade (the second option listed above) were (a) that it is rarely used, in any case; (b) that it is ambiguous (e.g., does it mean adequate achievement?); (c) that it is held in sufficiently low regard that a student would often prefer to receive no credit (and no record) rather than the dubious credit associated with a D grade. On the other hand, the following points seemed more persuasive in this matter: (a) that a "barely-passed" level (albeit ambiguous in terms of adequacy of achievement) is just the right notation in a number of situations (however small); (b) that there are situations where the instructor's opportunity to give that marginal grade allows a student to satisfy a requirement of secondary importance to his/her career but essential to his/her graduation; (c) that the absence of D grade would lead inexorably to a lowered perception of the achievement represented by all C grades, both internally and externally.

We also considered the following option: that the D would be a temporary, tentative-pass grade given on the basis that the student is deficient in his knowledge of a portion of the subject matter (but not a major portion) such that the instructor feels that with a relatively small additional effort the material could be mastered and demonstrated. If such mastery were demonstrated prior to the end of the following term, the grade would be changed to a C; otherwise, the student would not pass and would not receive credit for the subject. While this option did strike some of the committee members as having desirable pedagogical effects, it was felt on balance that the mechanics of the process would be overly cumbersome, leading to more ambiguity than would be removed. Unsatisfactory earlier experience with a similar application of the (now defunct) E grade was cited in this connection.

The use of formal intermediate grades (the third option listed above), was seen by some committee members as a means for accomplishing two purposes: (a) to allow recognition, among the students awarded A grades, of the smaller group who do truly superior work, especially in light of the fact that A grades are now given to a large fraction of the students, and (b) to allow realistic softening of the apparent large step between grades (e.g., A to B) commensurate with the often relatively small difference between actual individuals (e.g., between the "highest" B and the "lowest" A). The essential arguments which have been raised against that procedure are (a) that it would provide through grading resolution an unwarranted appearance of an equivalent accuracy (especially for external purposes); (b) that there would be a distinct increase in grade pressure upon the students; and (c) that

the existence of intermediate slots (especially of an A-dividing slot) is likely to have a "push down" effect on the lower grades; e.g., A- will be thought of as B, etc. [The latter difficulty could be circumvented by providing distinct numerical equivalences (e.g., A = 4.0, A- = 3.5, B = 3.0, etc.) but the solution would run counter to the committee's desire to lessen student concentration on numerical grade averages.] Most importantly, however, we think that both of the positive reasons for intermediate grades — which can be important in individual cases — are better handled by a more general procedure for attaching comments to grades — as we recommend in the next section of this report. We believe that the comment mechanism will allow the aims of the intermediate grade option to be achieved without the disadvantages which the option itself carries.

It is well recognized that each degree program has specific requirements beyond achieving passing grades in a standard number of subjects. These may involve particular subject requirements, of course. In addition, for example, the CAP, monitoring the undergraduate program, may demand certain minimum rates of progress, and graduate departments may demand minimum grade performances in specific subjects. We believe that such requirements should be stated to students in those programs. By the same token, the grade-related bases for intermediate decisions, such as progressing from a Master's degree component of a program to a Doctoral component should also be stated as explicitly as possible. It follows, in the committee's opinion, that it is inappropriate to use secret or hidden grades for such purposes.

3.3.2 A Mechanism for Attaching Comments to Grades

However many grade slots are included in the grading system, grades provide only a one-dimensional scale for measuring a multi-dimensional situation. That is, a student's grade may variously depend on his/her innate intellectual ability, on his/her prior academic preparation, on his/her interest in the subject, on the level of his/her effort, etc. Comments on these factors by the instructor can often provide useful input, relevant to the advisory and CAP or CGSP process, and to the student himself/herself. Our present system does not include a formal mechanism for such "comments." Our third recommendation is that an appropriate mechanism be established along the detailed lines spelled out in Appendix C. The mechanism would allow brief, optional written comments to be submitted to the student and his/her advisor in association with each grade. A copy of the comment would be retained in the student's file. In addition to allowing the aforementioned type of "multidimensional" input, such comments would, for example, allow explicit and detailed recognition of superior work to be made when appropriate. If he/she desires, the instructor could also use the opportunity to provide a perspective on the grading criteria used, as well as measures of relative standing, perhaps more detailed than simple pluses or minuses would allow. Beyond serving an important internal function, the existence of even a small accumulation of such comments for each student would certainly aid advisors in preparing meaningful letters of recommendation. Apart from reference to or quotes from the comments by the advisor in such letters of recommendation, the written comments would be part of the internal record only and not distributed externally, even at the student's request. We anticipate that the "comment" capability may be utilized perhaps 15 to 20% of the time and feel that that would be a satisfactory level to warrant the feature. We also recommend, however, that use of comments should be monitored and reported back to the faculty for reconsideration two or three years after inception (see recommendation fourteen).

To facilitate the operations of the CAP and the CGSP we suggest that the grading forms include a column where the instructor-in-charge can indicate that a separate "comment" is being submitted, and that this flag be included on the grade summary sheets.

3.3.3 Grades for Inadequate or Incomplete Work

In this section we treat grade notations which represent unacceptable, non-passing or incomplete work. The current F grade means that the student has failed to pass the subject, that he/she gets no credit for it, and—if it is a requirement—that he/she must take it again. At the present time, for freshmen, failures are listed internally but the registration does not appear on the external transcript. It is the opinion of the committee that this procedure should be extended to the upperclass and graduate years for the following reasons. First, without including that particular instance of non-achievement, the transcript can be regarded more clearly as a record of the student's positive academic achievements. Second, and more importantly, we believe that the F grade is the most ambiguous grade, with little value for external evaluations. In some cases, it may be of

negative value. Given the selectivity of our admissions process and the high quality of the student body we would essentially expect subject failure for intellectual reasons to be virtually non-existent,³ and would generally look for explanations in terms of other factors, and this is not properly conveyed by the use of the F grade. The ambiguity of the F grade is greatly increased, of course, by the existence of the late drop option, which—in effect—now allows a foreseen F to be replaced by a "no record of registration." However, since we believe that the drop feature (see Section 3.5) is an advantageous one of potential benefit to all students, including the best of our students, we would not advocate its removal simply to strengthen the F grade in the rare cases when it is evaluatively meaningful. In addition, there is some indication that because of the perceived harshness of the F grade on the transcript there is a tendency for faculty to assign the I grade or a passing grade when neither is warranted.

On the other side of this question the following points have been raised: (a) that it is dishonest not to include the F on the transcript; (b) that the presence of an F grade on the transcript provides a more accurate picture of the student; (c) that the external view of the entire grading system can be undermined if it appears that unfavorable information has been deleted; (d) that some students may purposely attempt to fail a subject rather than receive an anticipated low passing grade. It is, perhaps, necessary to mention that no covertness is intended relative to the transcript; if the procedure is adopted, the transcript form should indicate how subjects which the student completes without receiving credit are treated, and should also describe the late drop option. While the opposing arguments are non-trivial, the committee believes strongly that there is a sufficient degree of variation in the awarding of F grades to lead to unacceptable ambiguity for external evaluative purposes. As our fourth recommendation, therefore, we propose that in each instance in which a student completes but does not pass a subject, the grade "no-credit" (NC) shall be listed in the internal records but that the registration shall not be included on the external transcript.

The grade of O is a grade which must be assigned by the instructor when a student does not take a scheduled final examination in a subject or is absent during the latter part of a term, and was doing passing work up to that time. It may initially seem unwarranted to have a special grade (in fact two special grades, see below) to allow for this circumstance, especially in view of the fact that a majority of subjects offered do not have a scheduled final examination. On the other hand, the rule does potentially apply to a large number of student registrations since final examinations tend to be given in large subjects. We believe that the O grade should be retained. By its lack of arbitrariness it tends to make it clear that students should not attempt to put off taking an examination on the presumption that they will do better on a "make-up." In particular, we think it would be unwise to include such instances under the I grade umbrella. We believe that an adequate safeguard to the absoluteness of the O grade is provided by the right of the appropriate Dean to convert the grade to an OX grade, to allow for all actual instances of excusable absences. Consistent with our previous recommendations, therefore, we propose the following, as our fifth recommendation, regarding the temporary grades of O and OX:

In an instance in which a student does not take a scheduled final examination or is absent during the last two weeks of the term, the instructor must assign the grade of O. If the absence is not subsequently excused by the Dean for Students or the Dean of the Graduate School, the O grade should be retained on the internal record but no record of the registration shall appear on the external transcript.

If the absence is excused, the grade of O shall be changed to the grade OX, and the instructor should be informed that he/she should either award a final grade for the entire subject on the basis of (a) only the evaluation data already in hand, or (b) such data plus the results of a "make-up" examination or of a replacement evaluation procedure. This final grade will replace the OX grade.

The "incomplete" grade (I) presently affords an instructor the opportunity to hold back the assignment of a final grade, when, in his/her opinion, the student has been doing satisfactory work but has not completed a "minor" portion of the assignments. We believe that this option provides an important degree of freedom between the alternative paths of

giving credit for work not done, or
requiring the student to repeat the entire subject.

It is also clear, however, that if the I grade is to be used successfully, attention must be paid to the modifier

"minor," in two senses: 1. that the work which was not completed should not have comprised a major portion of the work which was required in the first place, and 2. that the work which remains to be done should not constitute a significant additional load in the coming term. In that context, it appears to us that the present description of the I grade in the regulations is essentially valid. However, in keeping with our previous recommendations relative to the external transcript we propose the following addenda:

- (a) the external transcript shall not include a record of subjects for which the student received an I grade and which he/she has not yet completed, since he/she has not received credit for the subject;
- (b) if the incomplete is satisfactorily completed within the next term (or later, as prescribed in the regulations for certain subjects), then the transcript entry shall be as of the term of completion and the recorded grade shall be only the final grade given.
- (c) if the incomplete is completed at a later date, then the external transcript shall include a notation to the effect that completion of the subject was significantly delayed.

[Note: Completion of an incomplete later than the fifth week of the subsequent term (except for certain laboratory subjects) presently requires specific acceptance by the instructor and (formally) acceptance of a petition to the CAP or CGSP.]

The third rule, (c) above, is clearly intended to discourage drawn-out completion of subjects, whatever the instructor's propensities. These proposals, relative to the I grade, reiterated in a form suitable for the Faculty regulations in Appendix D, comprise our sixth recommendation.

3.3.4 Second Registrations for a Subject

The recommendations that grades which we presently call F, O, OX, and I should not appear on the external transcript are entirely consistent with the fact that the student has not received credit for the relevant subject and with the belief that each of those grades is in itself of questionable value for external evaluative purposes. However, that procedure creates a potential problem in that some students who anticipate receiving marginal grades might purposely try to fail subjects, or simply not complete them, receiving no credit but gaining the opportunity to take the subject over again without having the transcript record of a first, marginal attempt. We believe it is not desirable for a grading system to contain such "inadvertent" and possibly unsound pointers. On the other hand, it does seem entirely acceptable for the system to allow, and even to encourage students to take subjects over if they have not done well the first time, particularly subjects central to their planned careers. We therefore propose as our seventh recommendation, that a student may register for any subject a second time, after credit has already been granted for that subject. If the subject is successfully completed, the second registration and grade would supplant the first on subsequent copies of the student's transcript, and no additional credit would be awarded. In view of potential technical difficulties, such as may be associated with changing subject numbers, for example, we recommend for all such re-registrations that (a) the approval of the Committee on Curricula should be required, and (b) the instructor of the subject shall be informed.

3.3.5 Temporary and Other Special Grades

The J grade is presently used for subjects, particularly thesis, which extend for two or more terms, in which the grade is not assigned until completion of the subject or project, but in which the credit is accumulated term-by-term, given evidence of satisfactory progress (and assuming ultimate satisfactory completion of the project). Our eighth recommendation is that the J grade should be retained in its present form, including entry on transcripts on a term-by-term basis.

We also recommend retention of the S and SA notations, as presently used by the Registrar. The S is used in conjunction with the awarding of MIT credit for subjects taken elsewhere, both in exchange programs⁴ and under less organized circumstances. The SA is used as a shorthand notation to indicate satisfactory completion of doctoral theses (which are not graded in greater detail).

As our tenth recommendation, we recommend the creation of a new, temporary grade, T. This grade is to provide specifically for subjects which do not conveniently fit within term boundaries or, more generally, in which the student's work is not tied to term schedules, as in self-paced subjects. For such instances, which we anticipate are going to increase in number, we propose that the in-

3. A possible exception would be certain of the Institute general requirements; however, these need ultimately to be passed with credit, in any case.

4. A current exception is the Wellesley College exchange program, in which the actual grades assigned by Wellesley instructors are recorded by MIT.

structor-in-charge of a subject should be able to petition to the CAP or to the CGSP for the right to use the T (temporary) grade at term-end, on the basis of the structure of the subject. Such a petition should, of course, include the actual scheduling of the subject, the number of credit hours, and in the case of self-paced subjects, the maximum allowed start-to-finish time period. The T grade, when given at a term-end would signify (a) satisfactory progress so far, (b) no credit awarded yet, (c) grade to be replaced by a final grade on completion of subject. We also suggest that the instructors of such subjects should use the aforementioned comment forms to provide more detailed state-of-progress information where that would be useful to the student, his/her advisor, or to the CAP/CGSP evaluation process. We propose that a T grade, like the I, would never appear on the external transcript and that an entry would be made giving the final grade only on satisfactory completion of the subject within the prescribed time limits. Nonetheless, it seems appropriate to have a separate internal grade for this quite different purpose.

3.3.6 Pass/No-Credit Grading

At present approximately one-third of all grades given are pass (P) grades, so on the average, at least, this type of grading comprises a major portion of our grading system. The large majority of those grades come from the freshman year, of course, since all subjects taken by freshmen are graded on that basis. Other instances are:

1. UROP projects
 2. specific subjects by instructor petition
 3. one elective subject per term during a student's senior year (which may not be a general or departmental degree subject requirement)
 4. special subjects and programs approved by the CEP.
- The following statements are representative of prevalent attitudes within the committee and, we believe, within the larger MIT academic community as well.
- students often do not try as hard in a pass/fail subject as in a fully graded subject
 - students feel more relaxed, less competitive and more capable of in-depth learning in a pass/fail subject
 - students tend to pay less attention to a pass/fail subject when they are also taking fully graded subjects
 - certain types of subjects, e.g., UROP projects, can be handled more effectively in a pass/fail mode
 - students are more likely to experiment with capability-stretching subjects if the "risks" are reduced through pass/fail options.

On the advisory side, the absence of detailed progress information in the freshman year makes it more difficult for the advisors and for the CAP to detect situations in which students may be having or are headed for severe academic problems. Instances can occur, for example, in which a student barely passes the majority of his/her freshman subjects, does well in a few elective subjects in his/her sophomore year and drops (or does not register for) other subjects which turn out to be more difficult. It is possible for a student to thereby achieve an apparently satisfactory average grade rating by the middle or end of his/her sophomore year, although he may be making poor progress towards a degree. It is reasonable to assume that in such cases the student is not helped by the absence of early recognition of his/her difficulties. In principle, the requisite information would be contained on the Freshman Performance Evaluation forms, if they were properly utilized. However, one problem seems to be that the forms are intended to be, and are primarily student initiated; students often do not take that initiative, especially when they know that they are not doing well in a subject. We therefore suggest that the FAC consider modifying the process so as to facilitate instructor initiation of the evaluation forms (perhaps using the "grade comment" mechanism which we have recommended earlier). We also believe that keeping track of dropped subjects on the term summaries will alleviate this general problem from the CAP's point of view (see Section 3.5).

On the administrative side, the faculty has already had a good deal of discussion concerning the later demand for grades in subjects taken on a "pass" basis. That discussion, largely centered on medical school application "requirements," has led to the present scheme in which grades are generally recoverable for first-year-student subjects. A related feature of the present system is the existence in a number of departments of dual registration options for UROP or UROP-like project subjects, one of which is fully graded and the other offered on a "pass" basis. It is fairly clear that any significant additional proliferation of, say, "elective subject" pass/no-credit options into the sophomore and junior years would lead to administrative difficulties associated with students' changes of major field. Some other schools have tried or are trying schemes in which the student can switch (after the fact) from "pass" to standard-type grading. It is the opinion of the committee that such maneuverings—often

based on the grade which will be received—will necessarily lower regard for the P grade and thereby undermine the entire concept of pass/no-credit grading, even as used in the freshman year.

On balance, the committee feels that while there are problems with pass-type grading, its value in each of the specific applications that we make of it warrants its retention. Regarding the freshman year, the present pass/no-credit system was only recently the subject of serious study by a faculty committee concentrating on the issue and the subject of lengthy discussion by the faculty. The present system has been in effect only a short time. We recommend retention of the status-quo, although—like all aspects of the grading system—the situation should be periodically reviewed. Second, we believe that the general arguments for instructor-petitioned pass-type subjects are persuasive, and that such a mechanism ought to be retained. Some faculty would prefer the procedures to be simpler, but that would probably lead to the approval becoming a mere formality with concomitant lack of consistency in use of the option. Third, we believe that in UROP projects the specifically desired quality of student/faculty relationship is more readily achieved in a pass/no-credit framework and we support retention of that type of grading in the UROP system. Regarding the present "senior-year" elective pass-grading option, we recommend a fairly small broadening, namely, that the student should be able to elect the maximum of two subjects (which can be neither Institute nor departmental requirements) during any terms in his/her third and fourth years. This does not increase the total number of pass-type gradings which a student can elect but it does increase the potential usefulness of this particular option to students, particularly those whose professional subjects are well mapped out early in their academic careers. At the same time, we recommend to the CAP that they consider very carefully petitions for changes in grading mode (after finalization of registration), so as to dissuade undesirable maneuvering. In summary, then, our eleventh recommendation is that the faculty should retain the existing pass-type grading options except that the present senior-year option should be extended to allow the two pass/no-credit subjects to be elected during the student's third or fourth years.

3.4 Numerical Cumulative Ratings

As our twelfth recommendation, we recommend that the Institute should not use cumulative numerical grade averages to determine a student's rank for either internal or external purposes. By this we mean, for example, that the cumulative numerical average should not be used as the measure of rank in class or decile position as it is now being used in some instances, and that the cumulative, without due consideration of the student's program of study, should not be used to determine academic standing. We further recommend that the term and cumulative averages no longer be included on the student's grade report, where they would erroneously imply direct official use. This recommendation represents an attempt on the part of the committee to lessen the students' concern about grades for grades' own sakes. We also recognize that the great diversity in programs and educational options available at MIT makes direct intercomparison of students' academic progress by means of a simple averaging scheme inappropriate.

It should be noted that this recommendation does not call for elimination of the cumulative calculation from the term summaries. Departments, the CAP and the CGSP use low term or cumulative averages as indicators of possibly inadequate performance, calling for a more detailed examination of the full subject registration and grade record. Retaining these averages on the term summaries therefore serves a useful practical purpose, and should be continued.

3.5 The Registration Procedure and Subject Drops and Adds

The concept of a student being registered for a subject seems an elementary one; yet within our present system a student's actual final subject registrations may deviate significantly (and even totally) from his/her initial listing. This situation, related to the freedom provided by allowing the adding and dropping of subjects late in the term, is so closely related to grading that the committee has considered it in some detail, and makes recommendations for changes in the relevant procedures.

At present the registration procedure is as follows:

1. **Pre-registration:** Before the term, students submit registration forms. This serves a number of functions, including allowing scheduling of sections prior to the beginning of the term.
2. **Registration day:** The day before the beginning of classes is set aside to allow contacts and consultation between students and advisors and between students

and potential instructors. This is nominally the day on which final registration decisions are made.

3. **Roll card distribution:** The student gives a roll card to the instructor in each subject for which he/she has registered. The instructor makes up a class roll from the collection of roll cards and sends the cards to the Registrar.
4. **Status of Registration:** Periodically throughout the term the Registrar informs students of their subject registration, based on the initial registration and Add and Drop actions.
5. **Adds and drops:** At any time up to the second week before the end of the term (drop date) a student (with his/her advisor's consent) may drop any subject, which removes it completely from registration status.⁵ Information about dropped subjects is not now included on the term summary sheets, for example. Until the last day of classes, any subject may be added with the consent of the instructor and advisor.
6. **Petitions:** After the drop date, subjects may be dropped only by petition to the CAP, which allows the petition only in usual circumstances.

One critical aspect of the system relates to the notion of the "late" drops. This option allows a significant degree of freedom to students to adjust their workload downwards at the end of the term (but not without cost, since they receive no credit for dropped subjects). The late drop option is not regarded with uniform favor by all faculty. While many, perhaps most, are sympathetic to the basic purpose, at least four difficulties⁶ are perceived:

- (a) Students may drop subjects in which they are not doing well, thereby shortcircuiting the grading evaluation system,
- (b) Students tend not to develop a full commitment to a subject, since they know then can always drop it,
- (c) The system, overall, [with nominal registration before the term actually starts, but final registration (through drops and adds) occurring until the end of the term] tends to cause students to believe that decisions which ought to be made early in the term (e.g., "what subjects am I really taking?") can be put off till the end of the term.
- (d) Some faculty feel a diminished sense of responsibility towards the poorer students in their class, since these students can always drop the subject.

On balance, nonetheless, the committee strongly favors the retention of a "late drop" option. Providing a reasonable mechanism for a student to recover from an unwise overloading (and even from an uneven maintenance of pace during the term) seems to us a sounder procedure than forcing a completion in each subject, with the possible degeneration of achievement in all. This is especially true since in many subjects much of the student effort is required towards the end of the term—a situation which is hard to assess earlier. The late drop appears to be functioning as a needed and legitimate pressure-release valve. Furthermore it does not seem feasible to provide an adequate set of ground rules to the CAP so that drops could be handled by petition only. Rather, it does seem an appropriate decision for the student (and his/her advisor) to make. Some students do take advantage of the opportunity simply to avoid bad grades. We doubt that this seriously perturbs the usefulness of the transcript as an evaluative device; the effect of dropping many subjects will show up as a lack of achievement unless the student is carrying equally large overloads.

On the other hand, we are concerned that the present system does appear to be fostering a great deal of confusion about the reality of registration, and in some cases a damaging lack of commitment to individual subjects. It is also troublesome that a drop (even as late as the drop date) is still thought of formally as a registration correction, so the information is not readily available for internal processes—such as those of the CAP/CGSP—for which the data might be quite relevant. For these reasons, we believe it important to develop a registration procedure which—while retaining the late drop option—will accomplish the following: (a) stress the idea that subject selection and "finalization" of registration is a process that should be completed fairly early in the term; (b) clearly separate the early correction of registration errors and changes of mind regarding subject selection from late drops; and (c) retain in the internal record system the late drop data which may be relevant to the CAP/CGSP procedures and to the advisory process (including allowing considerations of the effectiveness of the advisory process

5. This applies only to undergraduates. Graduate students can presently drop subjects at any time.
6. We recognize that quite often in the grading system context, points perceived to be difficulties by some are not so regarded by others; this depends somewhat, of course, on one's model for how an educational system functions best.

in minimizing unwise overloading). To these ends, we recommend the following registration and subject drop procedures:

1. Pre-registration (as now).
2. Students meet on registration day with their advisors (as now). Variations from pre-registration are submitted to the Registrar.
3. Students hand in name cards (and pictures) in subjects, to identify themselves for class rolls.
4. By the end of the third week of the term, the Registrar sends out a "status of registration" summary to each student and advisor. Any changes in that registration must be made prior to the end of fifth week.
5. Before the end of the fifth week, the student meets with his/her advisor to confirm or modify registration. Correction forms must be returned to the Registrar by the end of the fifth week. Registration is finalized as of that date. Official class rolls are then sent to subject instructors.
6. After the end of the fifth week, no subjects may be added to registration (except those for which the instructor-in-charge states that it is appropriate to begin at the effective date, and with the advisor's approval).
7. Subjects may be dropped until a date (drop date) three weeks⁷ before the end of the term (with advisor's approval); a record of the registration will be kept on the current term's grade report and on term summaries, and indicated as a drop (DR) with the effective date. Dropped subjects will not be entered on the transcript.

A formal statement of these rules, appropriate for inclusion in the faculty Rules and Regulations will be given in Appendix D.

3.6.A Continuing Committee on the Grading System

The educational process at MIT is a dynamic situation in which changes are continually being made in an effort to maintain the high quality of our programs. While the committee has made every effort to determine the impact of its recommendations within this changing environment, there undoubtedly will be ramifications that could not be foreseen. Our fourteenth recommendation, therefore, is that there should be an Ad Hoc Committee, appointed by the President and including students as well as faculty, to implement the foregoing proposals, to monitor the results and to recommend changes as deemed necessary. One task of this committee, for example, will be to select (with the Registrar) a design for the "comment" forms, and to determine, on the basis of initial usage, which comments—if any—appear with sufficient frequency to warrant supplying shorthand notations for them on the forms. The committee should be appointed for three years and should report to the faculty at least once a year. In addition to its concern with the specific proposals made in this report, the committee to be appointed should consider its charge in the broader context of the Faculty's continuing need to understand the operation and effects of the grading system. In the past, data which might have been useful has not been readily available, but the situation is being altered as the Registrar's data base becomes more accessible through computers. We therefore believe that the committee should concern itself in a continuing way with the grading system per se, of which only some aspects are specifically relevant to the present proposals. There are, for example, three specific points which the present committee presents as suggestions for faculty procedures (rather than as recommended Rules or Regulations) which an ongoing committee could help to develop: (a) there should be periodic reviews at the departmental level of grading practices, (b) there should be a visible process at the departmental level through which students could question grades felt to be inappropriate, (c) instructors should explain at the outset of the term the basis that they will use for grading.

We realize that the charge to the recommended Ad Hoc Committee falls within the realms of interest and responsibility of the CAP and CGSP. It is not our intent, however, to suggest a lessening of their responsibility towards the grading system in general. Rather, our recommendation is based on the premise that the day-to-day activities of the CAP and CGSP are sufficiently heavy that assistance in the form recommended is desirable. We trust that an appropriate working liaison between the committees will be established.

4. Summary of the Committee's Recommendations

Recommendation 1: That the faculty should retain a grading system of the same essential form as it presently uses. (See Section 3.1).

Recommendation 2: That the passing grades A, B, C, D and P presently used should be retained with their present definitions. (See Section 3.3.1).

Recommendation 3: That a mechanism should be provided to allow optional, written comments to be submitted by instructors with grades, and that such comments should be sent to the student and his/her advisor and copies maintained with the student's internal records. (See Section 3.3.2).

Recommendation 4: That subjects which a student does not pass should, like dropped subjects, be recorded in the internal records, but not entered in the external transcript. (See Section 3.3.3).

Recommendation 5: That the grades O and OX should retain their present definition with respect to the internal records, but that such subjects should not be entered in the external transcript unless and until another, credit-carrying grade is assigned for an OX subject. (See Section 3.3.3).

Recommendation 6: That the grade of I should retain essentially its present definition with respect to the internal records, but that such subjects should not be entered in the external transcript unless and until another, credit-carrying grade is assigned. (See Section 3.3.3).

Recommendation 7: That a student may register for a subject for which he/she has already received credit, a second time, in which circumstance (if the student passes) only the second registration and grade shall be recorded on the external transcript and credit shall be awarded only once. (See Section 3.3.4).

Recommendation 8: That the grade of J should retain its present definition and usage. (See Section 3.3.5).

Recommendation 9: That the Registrar's notations S and SA should retain their present definition and usage. (See Section 3.3.5).

Recommendation 10: That a new temporary grade (T) should be created for internal record use in subjects whose schedules do not match term boundaries but that such subjects should not be entered in the external transcript unless and until another, credit-carrying grade is assigned. (See Section 3.3.5).

Recommendation 11: That the present pass-type grading options should be retained, except that the "senior-year" two-elective-subject option should be extended to allow the two subjects to be elected at any time in the student's third and fourth years. (See Section 3.3.6).

Recommendation 12: That term and cumulative numerical averages should no longer be included in the student's grade report, and that they should not be used to report the student's academic rank. (See Section 3.4).

Recommendation 13: That the registration procedures should be modified to include the following new aspects: (a) eliminate roll cards, (b) third week of term notification of currently recorded registrations; (c) fifth week confirmation of registration; (d) no adding of subject registrations after the fifth week, (e) dropping of subjects (with advisor's consent) allowed up to three weeks prior to end of term (f) record of dropped subjects retained in the internal records (grade report and term summary sheets), but not entered in the external transcript. (See Section 3.5).

Recommendation 14: That an Ad Hoc Committee should be appointed by the President for three years to help to implement these (or other) grading recommendations voted by the faculty, to monitor the effect of those changes, and to provide a continuing overview of the relationships between the grading system and other aspects of the educational process. (See Section 3.6).

Appendix A

(Copies are available in the Information Center, Rm. 7-111, and will be distributed at the Faculty Meeting, Wednesday, Nov. 20.)

Appendix B

A Statistical Analysis of Anticipated Grade Distribution

The CEEB test scores of the students in the 1973 entering class are summarized in Table I (from Profile of the Entering Class 1973, MIT Office of Admissions)

Table I

Range of Scores	Test:*	Number of Scores						
		A	B	C	D	E	F	G
750-800		58	438	119	251	417	259	206
700-740		193	285	182	153	110	136	117
650-690		250	134	242	71	47	93	55
600-640		187	25	143	25	8	54	41
550-590		123	14	113	6	1	13	21
500-540		44	2	53	4	1	7	4
< 500		43	0	41	0	0	3	5
		898	898	893	510	584	565	449

* A: Verbal Aptitude; B: Math Aptitude; C: English Composition or History; D: Math Level I; E: Math Level II; F: Chemistry; G: Physics

To obtain a coarse average, independent of test subject, we simply sum the number of scores in each score range (including all tests); these totals are shown in Table II.

Table II

Range of Scores	Total Number of Scores in all tests	Fraction of Scores
750-800	1748	.365
700-740	1176	.245
650-690	892	.185
600-640	483	.101
550-590	291	.061
500-540	115	.024
< 500	92	.019
	4797	1.000

To exclude the portion of the available score range which seems irrelevant for the MIT student body, we take the lowest meaningful score to be 450. If the distribution of abilities given by these CEEB test scores were mirrored linearly in the grade distribution, the "grade slot" width (for four grades) on the score scale would be $(800-450)/4=87.5$. Table III gives the derived percentage of each grade that would be anticipated in a four passing-grade system, on the presumption that the distribution of CEEB average scores does represent statistically the distribution of ability within the student body to handle MIT subjects.

Table III

Score Range	Label	Percent of Scores
712.5-800	A	55.0
625-712.5	B	29.6
537.5-625	C	11.7
450-537.5	D	3.7

Appendix C A Mechanism for Written Grade Comments

The purpose of recommendation three in this report is to include within the grading system a mechanism to allow optional, written comments to be submitted by instructors in addition to grades, with copies of such comments being given to the student and to his/her advisor and maintained with the students' internal records.

In this appendix we describe the characteristics and use of a multi-part form which might be used to implement the recommended option in an acceptable yet economical manner.

In this matter we have accepted a number of constraints:

- (a) that the amount of effort required of the instructor, beyond writing the comment itself, be minimal;
- (b) that privacy be maintained during the transference of the comment from the instructor to the student and advisor;
- (c) that a permanent, accurate copy of the comment be available for the student file;
- (d) that the costs of the procedure be minimized.

⁷ The recommended change in the drop date from two to three weeks before the end of the term is at the Registrar's request, to allow him time to provide accurate grade report forms to instructors before the end of classes. We leave it to the Ad Hoc Committee, recommended later in this report, to adjust the date back to two weeks if and when the Registrar's procedures permit it; this may be done prior to the first effective term for these recommendations, if appropriate.

- (e) that the procedure not include potential error-introducing steps, such as key-punching of handwritten comments.

It appears feasible to use a three part paper form, using multiple copy paper. The instructor would (a) write the student's name, the comment, the subject number, his own name, rank and instructional role in the subject, and a delivery address on the form; (b) tear off one copy for his own records; (c) remove an adhesive-protection strip from one edge of the form, and fold the form over to enclose and seal the two remaining copies of the written comment, with the student's name and the delivery address being on the exposed side.

It is intended that the completed forms be delivered to the advisors and that students will obtain their copies from the advisors, as is now done with the Freshman Evaluations. Ideally, the grade reporting forms in the instructor's possession at term end would include the student's advisor's address. In the absence of that data the forms would be addressed to the student's department headquarters, the FAC, or an undesignated sophomore office, which would subsequently redistribute them to advisors. Allowance for this additional step is necessitated by the dynamically varying assignments within our advisory system.

Appendix D

Current and recommended changes to the Rules and Regulations of the Faculty. (To be prepared for distribution with the Call to the appropriate Faculty Meeting.)

Appendix E Collateral Issues

Although we feel that the report addresses the major problems perceived in the present MIT grading system, it may be useful to list here, in addition, some collateral issues which were raised in the course of our work. These items are presented in no particular order. In some cases they represent ideas which most of the Committee felt it not worthwhile to pursue; other points proved to be primarily of a philosophical nature, or otherwise beyond the bounds of our charter. It is conceivable that future study groups may choose to explore some of these issues further. The points expressed in this Appendix reflect some of the questions we have considered, but are not intended to represent the view of the Committee or of its members.

Grading Criteria

As part of the general discussion of what grades mean, it became apparent that different teachers use different grading criteria. For example, some grade by distribution (rank ordering the students according to their test scores and giving A's to the top group) while some grade by matching students to objective standards. Is one method better than the other? If so, should the Institute attempt to enforce a standard for assigning grades?

Nonuniform Grading?

It is not possible in large classes for an instructor to know all the students well enough to give detailed evaluations and still perform her/his teaching duties adequately. Therefore, one important function fulfilled by an A, B, C, ... grading system may be to limit the amount of information the instructor needs to furnish about each student. If this is true, then attempts to increase the evaluative information flow to students by requiring teachers to provide more information may be counterproductive. Perhaps we ought to consider other ways of evaluating students and/or devise a system in which students get different types of evaluations in different size classes.

Context of Grades

An individual grade, considered alone, can be misleading

since there are a number of contextual parameters (e.g., student population, teacher, size of class) which can play a role. Our grading system makes no note of these distinctions which can be important in affecting apparent performance, but ways might be found to illuminate the context in which the grade was given to allow external users to make more realistic appraisals.

Midterm Uncertainty

Students have expressed their concern that grades are not available until the end of the term. By that time, it is too late to correct any deficiencies which they may indicate. Since, in many subjects, most of the graded tests and papers occur late in the term, and since few teachers make explicit the guidelines under which they grade, an uncertainty about one's progress and performance is engendered at midterm. Is it feasible to clarify the expectations and grading criteria and to provide more on-going evaluation?

Partial Records for External Use

Just as a resume contains selected references and achievements, persons may prefer to use a certified but partial record of their MIT academic ventures (but including all requirements for degrees granted). Is this reasonable and feasible?

Competition versus Cooperation

Probably a majority of MIT students, even those under pass-type grading, feel themselves to be part of a highly competitive situation. Indeed, it might be unreasonable to expect them to approach MIT in any other way since their presence here attests to their having successfully competed against their peers at prior stages in their lives. There have been sociological studies, however, which indicate that people learn faster under circumstances of cooperative ventures than when they feel themselves to be in direct competition with their colleagues. Many people feel much better about themselves and their lives when they do not have to compete. There are a number of world level problems, also, which seem to require cooperative rather than competitive approaches. Should we try to shift our educational "style" and student evaluation schemes to alter the balance between cooperation and competition?

Bread & Puppet Theatre* - Mon, Nov 18, 12n, Bldg 7 Lobby. Children are especially invited.

Sidewalk Sam* - Sidewalk chalk drawing by Robert Guillemin. Tues, Nov 19, 12n, Bldg 7 Lobby. (He's really coming this time!)

Nothing So Hidden: Apollo 16* - AIAA Space Exploration Film Series. Tues, Nov 19, 12n & 1pm, Rm 3-133.

Composer's Ensemble of New York* - Playing their own compositions. Thurs, Nov 21, 12n, Chapel. Free.

Through the Mill Once More* - Environmental Film Series. Fri, Nov 22, 12n, Eng Lib Rm 10-500. Free. Coffee.

Wellesley Events

National Security and Civil Liberties in the United States* - Morton Halperin, The Twentieth Century Fund, Washington, DC. Wellesley College Barnette Miller Lecture Series on International Politics. Tues, Nov 19, 8pm, Jewett Arts Center Auditorium, Wellesley College. Free.



The Quartetto Esterhazy from The Netherlands, left to right, Alda Stuurop, violin; Wiel Peeters, viola; Jaap Schroder, violin, and Wouter Moller, cello.

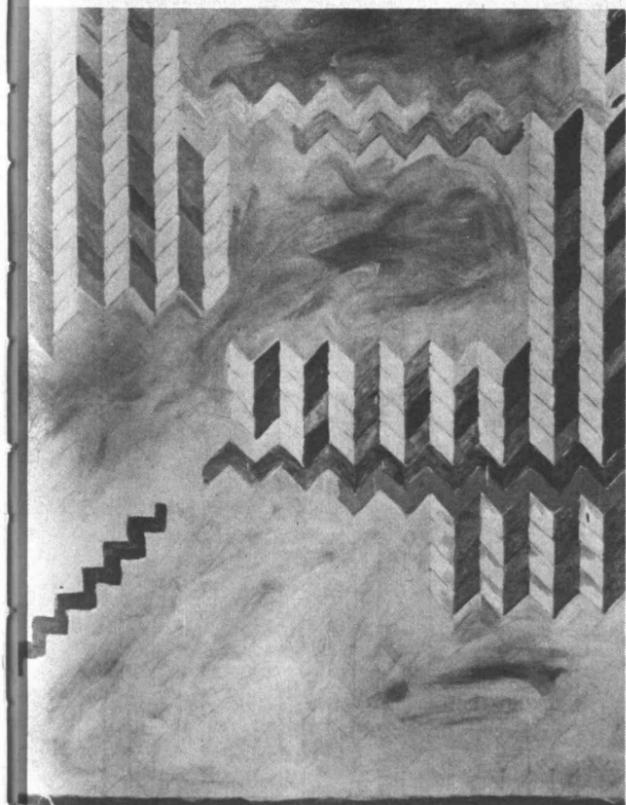
Social Events

Hillel Party** - Co-sponsored with Simmons College. Music throughout the 20th century, ragtime thru the '60's. Sat, Nov 16, 8pm, Senior Hse crafts lge, 1st fl. Ice cream and toppings.

Hillel Brunch* - Eugene Stanley, physics, Hermann von Helmholtz Associate Professor of Health Sciences & Technology, will speak. Sun, Nov 16, 11am, Rm 10-105. Bagels, etc, including cream cheese and smoked fish.

Strat's Rat (Stratton Rathskeller) - Dance to WTBS music and drink light or dark beer. 16 oz for 25 cents. Sat, Nov 23, 8:30pm, Sala. Free, college ID required.

24 Hour Coffeehouse* - Enjoy relaxing conversation, piano playing, games, inexpensive food, candy & drinks. Open 24 hours per day, 7 days per week, Stu Ctr 2nd fl lge.



Katherine Porter's painting, "And," which will be included in the exhibition of her work opening November 22 in Hayden Gallery.

Movies

Pete & Johnny; Mooney vs. Fowle* - Film Section. Wed, Nov 13, 7pm, Rm E21-010. Free.

Electra* - Humanities Film. Wed, Nov 13, 7pm, Rm 14N-0615. Free.

Traffic or Transit* - Environmental Film Series. Thurs, Nov 14, 5pm, Eng Lib Rm 10-500. Free, coffee.

Artistic Computer Generated Films - Selections from the first international festival of computer-generated films. Thurs, Nov 14, 7pm, Rm E21-010.

Technical-Scientific Computer Films - Selections from the first international festival of computer-generated films. Fri, Nov 15, 2:30pm, Rm E21-010.

Serpico** - LSC. Fri, Nov 15, 7 & 10pm, Rm 26-100. Admission 50 cents, ID required.

The Cranes are Flying (Kalatozov) - Film Society. Fri, Nov 15, 7:30 & 9:30pm, Rm 6-120. Admission \$1.

To Die in Madrid* - ISA film. Fri, Nov 15, 8 & 10pm, Rm 1-309. Admission \$1.50.

Spartacus** - Midnite Movie Series. Fri, Nov 15, 12m, Sala. Free, ID required. Bring your own blanket.

Sex Madness** - LSC. Sat, Nov 16, 7 & 9:30pm, Rm 26-100. Admission 50 cents, ID required.

To Die in Madrid* - ISA film. Sat, Nov 16, 8 & 10pm, Rm 1-309. Admission \$1.50.

The Wrong Box - LSC. Sun, Nov 17, 3 & 7pm, Rm 10-250. Admission 50 cents.

Three Faces of Eve* - Humanities Film. Sun, Nov 17, 7pm, Rm 14N-0615. Free.

The Hand* - Chinese Science Club. Modern Chinese movie with English subtitles. Sun, Nov 17, 8pm, Kresge. Admission \$1.25, at door.

Jojolo; Three Domestics; A Forty Dollar Misunderstanding* - Humanities Films. Tues, Nov 19, 4:30 & 7:30pm, Rm 14N-0615. Free.

To Die Today (Kubler-Ross); Death; How Could I Not Be Among You* - Urban Studies Films. Tues, Nov 19, 7pm, Rm 3-415.

Romeo & Juliet* - Humanities Film. Tues, Nov 19, 7pm, Rm 10-250. Free.

Black Natchez; Chester Grimes* - Film Section. Tues, Nov 19, 7pm, Rm E21-010. Free.

Billy Liar* - Humanities Film. Wed, Nov 20, 3pm, Rm 4-370. Free.

Marlene; Monterrey Pop* - Film Section. Wed, Nov 20, 7pm, Rm E21-010. Free.

Fidelio* - Humanities Film. Wed, Nov 20, 7pm, Rm 10-250. Free.

The Birth of Soviet Cinema; Potemkin* - Humanities Film. Wed, Nov 20, 7pm, Rm 14N-0615. Free.

Magical Death; Gurka Country* - Humanities Film. Thurs, Nov 21, 4:30 & 7:30pm, Rm 4-370. Free.

Through the Mill Once More* - Environmental Film Series. Thurs, Nov 21, 5pm, Eng Lib Rm 10-500. Free. Coffee.

Who's Afraid of Virginia Wolf* - Humanities Film. Thurs, Nov 21, 7pm, Rm 10-250. Free.

Executive Action** - LSC. Fri, Nov 22, 7 & 9:30pm, Kresge. Admission 50 cents, ID required.

The Lady with the Dog (Heifitz) - Film Society. Fri, Nov 22, 7:30 & 9:30pm, Rm 6-120. Admission \$1.

Becket** - Midnite Movie Series. Fri, Nov 22, 12m, Sala. Free, ID required. Bring your own blanket.

Save the Tiger** - LSC. Sat, Nov 23, 7 & 9:30pm, Rm 26-100. Admission 50 cents, ID required.

Murder in the Cathedral - LSC. Sun, Nov 24, 3 & 7pm, Rm 10-250. Admission 50 cents.

Music

Chamber Music Society Concert* - Wed, Nov 13, 5:15pm, Music Library. Free.

Music by Schumann's Friends* - James Sykes, pianist. Recital of little heard piano works by Clara Wieck, Niels Gade and William Sterndale Bennett. Thurs, Nov 14, 5:15pm, Music Library. Free.

Esterhazy Quartet, Amsterdam* - Program of Boccherini, Haydn, & Mozart. Music Section. Tues, Nov 19, 8pm, Kresge. Free.

MIT Concert Band* - John Corley, director. Program includes works by Aaron Copland, Vaclav Nehlybel, Gordon Jacob, Gregory Tucker and Igor Stravinsky, with soloist Mike Moritz. Sat, Nov 23, 8:30pm, Kresge. Free.

MIT Glee Club - With the Smith College Choir. Program includes pieces by Ives & Handel. Sun, Nov 24, 3pm, Kresge. Free with MIT ID.

An Evening of Chinese Music* - Chinese Choral Society with soloists: Albert Gaw, tenor; Jing Ling, soprano; Juanita Tsu, piano. Traditional and contemporary Chinese music. Sun, Nov 24, 8pm, Kresge Little Theatre. Free. Refreshments.

Theatre and Shows

My Fair Lady* - Musical Theatre Guild production. Thurs-Sat, Nov 14-16, 8pm; Kresge. Admission: \$3.50, \$2.50 with ID; Reservations: x3-6294.

The Wastepaper Theatre* - Experimental poet's theatre in a performance inaugurating the MIT Writing Program. Five theatrical pieces and a vaudeville interlude. Thurs, Nov 14, 8pm, Stu Ctr Mezzanine lge. Free.

An Evening of Music and Video* - Live Video Workshop, sponsored by the Student Art Association. Sat, Nov 16, Fri & Sat, Nov 22 & 23, 8pm, Sala. Admission: \$1 with student ID, \$2 others.

An Evening of One Act Plays* - MIT Dramashop presents "Ruffian on the Stair" by Joe Orton and "This is the Rill Speaking" by Lanford Wilson. Fri & Sat, Nov 22 & 23, 8:30pm, Kresge Little Theatre. Free.

Dance

Folkdancing - International: Sun, 7:30-11pm, Sala. Balkan: Tues, 7:30-11pm, Stu Ctr Rm 491. Israeli: Thurs, 7:15-10:30pm, Sala. Noon-dancing: Fri, 12n-1:30pm, Kresge Oval in good weather, otherwise Bldg 7 Lobby. Learn & practice more difficult dances Fri, 1:30-3 or 4pm, Stu Ctr 491.

Exhibitions

Multiple Interaction* - Sculptures by the Fellows at the Center for Advanced Visual Studies. Thurs, Nov 7-Fri, Nov 15, Bldg 7 Lobby.

The Eye of Paris By Brassai* - Photographs by the renowned Hungarian artist. Thru Sat, Nov 16, Hayden Gallery. Hours: daily 10am-4pm, Tues evg, 6-9pm, Free.

Alper Exhibit* - Selection of drawings by Boston artist Natalie Alper. Thru Sat, Nov 16, Hayden Corridor Gallery. Sponsored by the Committee on the Visual Arts.

One-Man Show* - Photographs by Diana Schoenfeld. Fri, Nov 1-Fri, Nov 22, 10am-6pm, Creative Photography Gallery.

Color Etchings* - Etchings experimenting with viscosity by Meg Dawson. Nov, Rotch Library, during regular library hours.

Exhibition of Photographs* - Travel and still life photographs by the noted author, Alice Curtis Desmond. Fri, Nov 1-Sat, Nov 30, Faculty Club.

Katherine Porter Exhibit* - New paintings, drawings and prints by the young Boston artist. Fri, Nov 22-Sat, Dec 21, Hayden Gallery. Hours: 10am-4pm daily, Tues evg 6-9pm. Free.

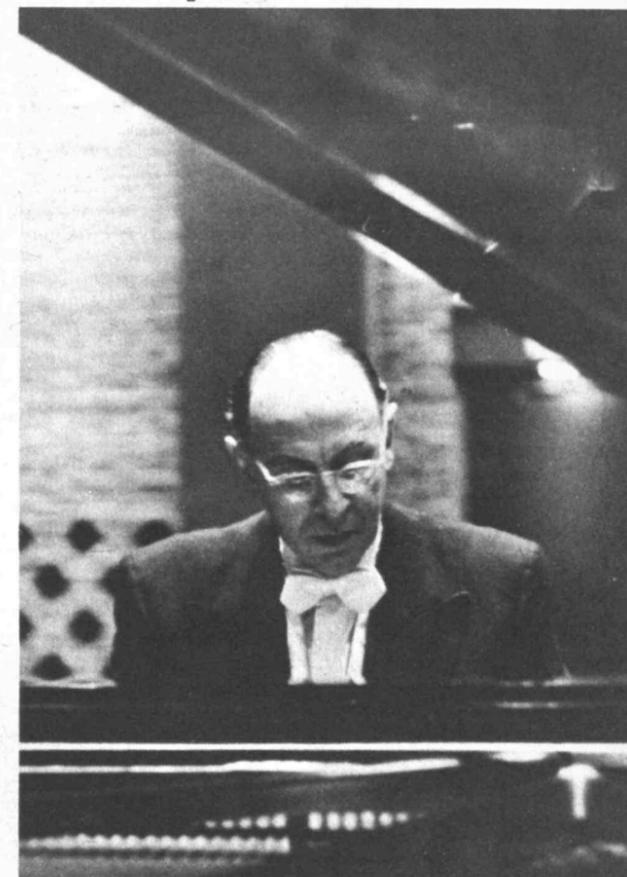
Hart Nautical Museum* - Permanent exhibit of rigged merchant and naval ship models, half models of yachts and engine models. Open daily in Bldg 5, 1st floor.

Freshman are encouraged to attend departmental lectures and seminars. Even when these are highly technical they provide students one means to learn more about professional work in a department and field.

*Open to the public
**Open to the MIT community only
***Open to members only

Send notices for November 20 through December 1 to the Calendar Editor, Room 5-111, Ext. 3-3279, before noon Friday, November 15.

Pianist Sykes to Perform



Professor Sykes

James Sykes, concert pianist, professor of music at Dartmouth College and an international authority on Robert Schumann, will present a piano recital entitled "Music by Schumann's Friends" at MIT at 5:15pm, Thursday, Nov. 14 in MIT's Music Library.

The program includes little known works by Clara Wieck (Schumann), William Sterndale Bennett and Niels Gade. Clara Schumann was a virtuoso pianist, composer and Robert Schumann's wife. Gade and Bennett, Schumann contemporaries, were Scandinavian and English composers whose works were familiar to Schumann.

Also included in the program is a Chopin waltz, which was a favorite of Schumann's.

A "musical ambassador" for the US, Professor Sykes has conducted five concert tours for the US Information Agency, performing in Europe, Central and South America and the Far and Near East. He was also the first western scholar since World War II to be permitted access to Schumann's writing and manuscripts in East Germany.

Professor Sykes studied at the Delacroze School of Eurhythmics and the Austro-American Conservatory before receiving his master's degree from the Eastman School of Music at the University of Rochester.

Professor Sykes, a Dartmouth professor since 1953, has directed the college's Handel Society for almost 20 years and has organized music festivals at the college since 1958.

The recital is open to the public free of charge.

CLASSIFIED ADS

Ads are limited to one per person per issue and may not be repeated in successive issues. All ads must be accompanied by full name and Institute extension. Only Institute extensions may be listed. Members of the community who have no extensions may submit ads by coming in person to the Tech Talk office, Room 5-111, and presenting Institute identification. Ads may be telephoned to Ext. 3-3270 or mailed to room 5-105. Please submit all ads before noon, Friday, November 15.

For Sale, Etc.

Lafayette 20 stereo amp, Criterion 50A spkrs, Garrard 40 B trntbl, lk nw, \$175 or best; Rollicord 2 1/2x2 1/4 camera, Schneider lenses, orig Grmn mdl, \$50. Whitney, x3-6105.

Ski equip: Riker bckl boots, \$15; Kneissel Redstar 205cm skis, \$50; 50" poles, \$5. Call, 864-5272.

Uphol 9' Deacon's bench, \$35. x3-2235.

BSR 810 trntbl, lk nw, \$100 or best. Derry, x8720 Dorm.

Ballantine 310A VTVM from 100 micro to 100 V, freq range to over 3 MHz, lk nw, \$50. Melvin Alpert, x3-4192.

Lg sz maxi coat, fit m or f, hand embroidered, made in Turkey, v warm. Terry, x3-5788.

Contemp desk, wjnt veneer, 27x54 w/2 file drws & ctr drwr, exc, used 2 mos, \$250 or best. x3-5881.

Stud snows, 3, B78x14, \$35; 2 Ford rims, \$12; all \$40. x3-5618.

Gold 12x16 carpet, exc cond, \$50; KLH 26 stereo w/2 KLH 32 spkrs, orig \$260, \$165. Joe, x3-1732.

Office refrig, 2.5 cu ft, perf cond, \$65 or best. Demitris, x3-5557.

Attachment legs for Hollywood bed, 6, \$5. Call, 782-2373.

F 3 spd 26" bike. Nancy, x3-6325.

Sansui 350A rcvr, 20 W RMS/ch, list \$240, \$150. Ralph, 266-2968.

Sears amfm pshbtt car radio, nw, was \$70, \$45; Penske timing lite, was \$27, b nw, \$20; Penske Swell tachometer, was \$50, nw in box, \$25. Don, x8-3333 Draper.

Bristol 29 sloop, mint cond, superbly equip for cruising, \$13,500. Call, 862-9462.

RCA 18" b&w TV, 1 1/2 yrs, exc cond, simulated wjnt casing, \$110. Jack, x3-4688.

Elton John tkts for Nov 20, exc seats. Call, 494-8440, evgs.

Wl exch Canon camera for tape cassette, gd cond. x9719 Dorm.

Living French, compl 4 rcrd course w/dictionary & conversation manual, exc cond, \$4.50. x3-1996.

Nw 10 spd Fuji racer, \$150. Gene, x7734 Linc.

Semperit radial stud snows, 4, 1.85x15, \$70/pr. x3-5548.

B nw, nvr used Rossignol Cobra skis, 170 cm, w/Saloman 404 bndgs, \$70; Humatic f bckl ski boots, sz 8, gd cond, \$15; free nw poles w/skis. Call, 661-9654, aft 6.

VW whl & tire, \$10. Tom, x8126 Dorm.

F wht Riedell figure skates, sz 4N, \$15; 2 nw prs f flat shoes, navy, bone, sz 7 1/2, \$5/ea. Call, 862-1935.

Akai X-150 D r-to-r tape deck, Cross Ried head, \$150 or best. Janis, x0453 Dorm, or lve msg East Campus desk.

RCA b&w 9" TV w/amfm, digital clock, \$70; GE color 13" port, \$175. Call, 494-8752.

Crib, gd cond, \$15. Arnaldo, x3-4210.

Anscomatic slide proj w/12 mags & cases, \$55; 40x40 lenticular & 50x50

leaded screens, \$15/ea; 4-6" zoom lens for Kodak carousel, \$25; Polaroid color pack II w/case, \$15. Mr. Mayer, x5545 Linc.

Zenith port stereo; Panasonic port b&w TV; Mayfair stereo tape plyr/clk radio; all exc cond, reas. Cara, x3-4606.

Castro conv sofbed, mod wjnt & grn/turq blu tweed, 7' long, dbl bed, exc cond, cost over \$400, nw, best. Call, 354-8694, aft.

Pr sz 9 med weight Fabiano Alps hiking boots, roughout, worn 4x, too big, were \$40, \$25. 2 Gdyr stud snows, exc cond, ww, 6.50x13, \$35. Call, 492-3837, evgs.

MIT Symp member wishes to sell full sz handmade Italian violin, \$215. Call, 742-8466.

Lg solid wd desk, \$25; DR tbl, 42x36x30, \$20; mtl bksc, \$5. Robin, x3-7121.

Baby crib; carriage; stroller & hichr; b&w TV; shelves. Call, 494-8259.

Early Amer slp sofa & mtch chr, best. Lloyd, x3-7220.

Michelin tires, 4, w/tubes, 7.60x15, 3 tires v gd cond, 1 worn, tubes exc cond, \$60. Call, 527-7059.

Teac 4010 SU stereo tape deck, auto rev, sol controls, Advent 101 dolby, reduces sn/ns 10 db, Memorex & Ampex low noise/hi output tape. Eric, 247-0732, evgs.

Semperit radial snows, 4, 155x15, fit VW, Saab, other imports, used less 1 K, ask \$110. Gunnar, x3-6996.

PE3012 trntbl, man & auto, dust-cover, wjnt base, Empire 999 AE/X-II crtrdg, 4 mos, rarely used, \$90 or best. Call, 776-5100, evgs.

Lowa med weight hiking boots, gd cond, sz 9, \$15 (cheap). Call, 524-0293, evgs.

Miranda Sensorex w/fl.9 50 mm & f2.8 135 mm lenses, cases, \$200 or best. x3-6616.

Delta Supreme 110 tires, 2, 4 ply, load range B, 6.50x13, exc cond, used 1 seas, \$20/ea or best. Call, 864-3929.

Ampex stereo tape cassette w/amp, 50 W, peak power, exc cond, \$75; 4 poster dbl bed frame, all wd, \$30. Call, 491-5144, evgs.

Red 14" bike, boy-girl conv w/coaster brakes, removable training whls, kick std, bell & bskt, gd cond, ages 3-6, \$20. Call, 862-3728, evgs.

Dual trntbl 1228, b nw, w/Pickering XV-15-400 crtrdg, wjnt base, dust-cover, ask only \$160. Call, 232-9448.

M Reiker ski boots, sz 11, lk nw, \$20. Mark, x3-4549.

Coca-Cola mach, 2, gd cond, lg holds 7 cases, sm holds 3, nego. George Wallace, x3-5854.

Full sz crib w/matt. Call, 625-1064, aft 5.

Lg Frigidaire refrig, \$80. Ronda, x3-7271.

Olympia SM9 man typwrtr, gd cond, \$50. Steven, x3-7315.

Free surplus electronics equip that must be given away. Peg, x3-7787.

Lenses for Retina III-S or reflex-S, nrly 1/2 pr: Tele-Xenar 135 mm f4, nw \$87.50; Kurtagon wide angle 35 mm f2.8, nw \$86.50. Moor, x3-6759.

BSR 510X auto trntbl w/base, dust-cover, nw Shure M91ED crtrdg, yr old, exc cond, best over \$50. x3-7311.

Stud ww snows, 7.75x14, used 1 mo, \$40 or best; m Lang ski boots, sz 9, bckl, \$25 or best. Cathy, x3-5803.

Std tire, 1, 7.00x13, v little used, best. x3-4872.

Washer & dryer, Frigidaire elec, 5 yrs, v gd cond, \$85/ea. x8-1193 Draper.

Rieker bckl boots, sz 9, gd cond; ski jckt. Call, 868-2047, evgs.

Alum storm/screen door, 36"x6'8", \$25. Richard Phillips, x8-1340 Draper.

Football hlmt, MacGregor prof mdl w/faceguard, sz 7 1/8, nds chin strap, \$13. George, x8-4204 Draper.

Stud snows, 2 exc, 7.00x13 (E70x13), mtd, \$40; 2 snows, F70x14, \$20, rims avail; mtrcycl hlmt w/shield, \$25. Hank, 494-8868.

Mechanics tools, Craftsman, guarnty for life, 100 pc, \$75. Steve, x3-2211, 9-4.

Bkshlvs, 2 metal, 1 wd, \$6-\$8; McGraw Hill Hndbks: EE, physics, orig \$35-\$38, \$25/ea; MIT Press 3 vol math set, \$5. Ken, 484-2510, aft 6.

F gray suede pant coat, sz 5, imported from Turkey, hand embr, wool trim,

nvr worn, \$50 or best. Donna, x3-4271.

RCA b&w 23" console TV, nds minor repair, \$25. x3-7138.

Hcky skates, sz 2, \$7; goalie catching glove for small boy, \$4. Bill, x8-3546 Draper.

Hams: must sell Heathkit SB303 80-10 meter SSB-AM rcvr w/am, cw, crystal, fltrs, \$250 firm, great buy. John, x9283 Dorm.

Atala record prof frame 531DB, campy headset, 22 1/2". Steve, x8-1586 Draper.

Mtd snows, 2, F78x15, \$35 or best/pr. Bob, x3-1670.

Stereo equip: Dynaco PAT-4, \$60; pr Janszen Z-410 Electrostatic ldsprks, \$250. x0253 Dorm, kp try.

Coors beer, \$12/case. x3-2629.

Wd indoor shutter sets, some painted, some unfin, all moveable louvres, var szes, offer. Tony, x3-5717.

Sears Craftsman mechanics tool set, 89 pc, guaranteed, gift, nw, nvr used, was \$90, \$60 or best. x3-6669.

Antifreeze, \$3/gal. Bill, x3-2453.

French horn for beginner, \$75. x314 Linc.

Pr stud snows, exc cond, fit Volvo, \$27. Dorrian, x3-2656.

Numero Uno nw Spaulding Sideral skis w/wrnty, 195 cm, org, \$90, list \$180. Dan, 232-0205, evgs.

Lvg Eastgate apt 27D, selling furn, baby things, bikes, etc. Call, 494-8261.

Teac A-1200 stereo tape deck, gd cond, \$175 or best; Scotch recording tape, \$4/reel; Koss pro 4A hdphones, \$20. Dave, x3-7915.

BSR 310X trntbl, perf cond, 3 yrs but used v little, orig box, manual, etc, \$35 firm. x3-6049.

Mtl wardrobes, 1 & r, 66" h X20" d X 21" w, \$28/pr or \$15/ea; Hart std 210 cm skis w/bndgs, \$10; nw Hamilton-Bch 14 spd mixer, \$42; nw 52 gal elec wtr htr, \$50; Dennis, x8-3333 Draper.

Vehicles

'65 Ply Fury, runs well, some rust. Frances, x395 Linc.

'66 VW fstbk, rebilt eng, 6K, body exc, luggage & bike racks, \$550 or best. Call, 232-3258, evgs.

'67 Ford Cntry Sq Wgn, runs well, snows, \$500 or best. Call, 332-5365, aft 6pm.

'67 Saab, 2 stroke, Monte Carlo eng, sunrf, classic, nds some body work & brakes, has nw clutch, transmission, ask \$550. Call, 926-2398.

'67 VW camper, deluxe cstm int, amfm, full length roof rack, snows, well maintained, \$950. Tom, x8-1510 Draper.

'67 VW Karmann Ghia, rebilt eng, nw front brakes, radials, \$600 nego. Sue, x3-1366.

'67 Checker, baby blu, jump seats, gd cond, 70 K, nvr a taxi, \$600. Call, 491-2126.

'68 Mustang hrtdp, std, sm V8, p st & br, gd cond, lvg cntry, \$800. Adam, x3-3708.

'69 VW bug, lo miles, immaculate inside & out, nw valve job, tires, clutch, outstanding transp, \$1,150. Call, 247-1930, evgs.

'70 Datsun 1600 roadster, 50K, Michelin steel radials, nw clutch, elec sys, \$1,250 or best. Margaret, x3-3680.

'71 Ford Cntry Sed Wgn, repossessed by Credit Union, pls send sealed bids. Credit Union, E19-601, x3-2844.

'71 Toyota land cruiser wgn, 4x4, locking hubs, 9 gd tires, eng just rebilt, \$2,600, Ed, x3-1607.

'73 VW superbeetle, lo mileage, 14.5 K, \$2,000. Call, 494-8384.

'73 Honda Civic, desperate to sell, 4 spd, radials, amfm, rust proofed, 10K careful mi, make offer around \$2,300. A. Goldfinch, x3-5317.

'74 LeMans, 2 dr htdp, amfm 8 trk stereo, p st & br, ww, 10K, \$3,300. Robin, x8-4566 Draper.

'73 Norton Commando 750, clip-ons, rearsets, full fairing, Boyer-Bransden elec ignition, gd run cond, too lg for ownr, \$1,250. Peter Kolk, x3-6465.

'74 Yamaha RD350, 900 mi, perf cond, wrnty thru 3/75, luggage rack, hlmts, many xtras, best. Manny, 247-8355.

'74 Yamaha RD350, 900 mi, perf cond, wrnty thru 3/75, luggage rack, hlmts, many xtras, best. Manny, 247-8355.

'74 Yamaha RD350, 900 mi, perf cond, wrnty thru 3/75, luggage rack, hlmts, many xtras, best. Manny, 247-8355.

'74 Yamaha RD350, 900 mi, perf cond, wrnty thru 3/75, luggage rack, hlmts, many xtras, best. Manny, 247-8355.

'74 Yamaha RD350, 900 mi, perf cond, wrnty thru 3/75, luggage rack, hlmts, many xtras, best. Manny, 247-8355.

Housing

Camb stu 3 blks Tech Sq, b nw int, ac, part furn, \$175 + util. Bill, x8-2871 Draper.

Camb, 3 lg, 1 sm rms, Kette, B, 0.7 mi MIT, \$240 incl util, x3-3072.

Everett-Revere line, 3 rms, exc loc, rugs, patio yd, no pets, ref & sec dept, \$150 + util. Angelo, x5713 Linc.

Littleton, MA, 3 BR 2 B, fam rm, LR, K, washer/dryer, dw, frpl, exc nbrhd, \$295 + util. Ron, x7458 Linc.

Newton, classic Victorian 4 BR, study/sit rm, B, LR, DR, K, pantry, 2 unfin rms 3rd fl, nw ht system, partly restored w/out impacting orig design, takeover psbl, lo 50's. Call, 965-0361, evgs.

Som, sub 2 BR 12/22-8/30, crnr Kirkland & Beac, huge B, all mod K, \$186 incl ht, h wtr, Prof Henize, x3-4938.

N Haverhill, NH line, 3 BR chalet, responsible bachelors or fam only, \$150/mo + util. Eva, x3-5742.

Family ski-club in heart of 93 area, fam mbrshp \$350/seas. Dave, x7794 Linc.

Spaces are available in Tang Residence Hall for single students. Any MIT-affiliated person may qualify. Two-bedroom apartments are coming up in married student housing. For further information, call the Housing Office, x3-5148, or visit E18-307.

Animals

Rare breed Tibetan spaniel pups, Nepalese import by Eng champ, sm, intelligent, \$150. Call, 491-4873, evgs.

Pups, 3 m gldn rtrvrs, 8 wks, champ parents, \$175. x3-4639.

Pls give my dog a gd home: 4 yr old spayed f shp, frndly, loves chldrn, landlord won't allow. Diane, x3-5764.

Wirehaired f fox terrier, AKC, \$100 or best. W. Krusell, x3-5319.

St Bernard pups (Loki's), born Oct 26, ready bef Christmas, m & f, AKC. Joan F, x3-2697.

AKC poodle pups, 1 ea blk, slvr, choc, apricot, make gd hse pets, \$50-\$75. Bob Jamieson, x8-4191 Draper.

Free puppies, half poodle, half chihuahua, to gd homes, 6 wks. Sheila, x8-4101 Draper.

Pretty kitty, grey & wht, frndly, litter-trained, nds gd home. Helen, x3-2174.

Found: set of keys w/inscription "Georgiana", outside vcty E19, nr firehse. Jim, x3-6350.

Found at Thilly's: blk cape, 3 bandannas, nurse's cap, 2 rugby socks. x3-1469.

Lost and Found

Lost: grn leath wallet w/ID cards, reward. x3-4461.

Lost: pad wht lined paper w/lecture notes in back, left in Rm 16-134, 11pm Tues, Nov 5. Michael, x3-6430.

Lost: blu wndbreaker w/"Cardinal Spellman V Football, 64, Adolph" written on it, I have another blu wndbreaker, possible accidental switch, pls rtn. Call, 354-3713.

Found: set of keys w/inscription "Georgiana", outside vcty E19, nr firehse. Jim, x3-6350.

Found at Thilly's: blk cape, 3 bandannas, nurse's cap, 2 rugby socks. x3-1469.

Found at Thilly's: blk cape, 3 bandannas, nurse's cap, 2 rugby socks. x3-1469.

Wanted

Sm refrig, 20-24" under counter type. Dorothy, x3-5645.

Balalaika player for lessons, or info leading to one. Irene, x3-4931.

Good old violin. David, x3-4157.

Rnd wd tbl w/pedestal base; dbl brass bed, hd & ft brd. Rivalyn, x3-4876.

Pr tkts (pref \$8.50) to Elton John concert 11/25, wl pay gd \$. John 247-8764.

Membership in ski lodge, Vt or NH area. David, x8-1264 Draper.

Hsesitter for Natick 4 BR Victorian, 12/21-1/24, pay util only. Earl, x3-1976.

Filing cab, 4 drwr letter sz, w/locks. Call, 491-4243.

I'm doing E-4 run around 11/15, nd few more to complete run, if have Ekta-chrome (pref 135, 120) U want done, sign list outside Technique Dkrm (Stu Ctr 4th fl) or lve msg x3-2980.

Morn work wanted, hsehold, baby care, or willing to learn something else. Call, 427-2110.

Ride desperately nded to Syracuse, NY, or close by, lvg 11/15. Nick, x3-2843.

Pr 8.55x15 or 8.85x15 snows, fit Ford. Henrique, x3-7557.

Back issues of JACM, since '69. Mike, x3-6035.

Stu nded for psych exper, wl pay. Pls lve name & phone no. w/Shirley, x3-6047.

Subj w/perfect pitch nded for psych exper, wl pay. Pls lve name & phone no. w/Shirley, x3-6047.

Ride to Long Island for 2, lve Fri, Nov 22, 12n or later. Call, 247-0846, aft 5pm.

Carpenter to bld sturdy stand for glass top tbl; also nd humidifier. x3-7301.

AR trntbl, in gd cond. Call, 661-0733.

All blk m kitten. x8-1185 Draper.

Ride to NYC Thanksgiving, wl share exp, can lve Wed nite or Thurs, rtn Sun. Diane, x3-3871.

Btchrbk tbl to seat 4-6; 1-4 Thonet-Cesca chrs; reas. Call, 262-6153, aft 6pm.

Gd stereo preamp, trntbl, tuner, reas. Phil Mandel, x3-3161, lve msg.

Someone to silk-screen T shirts for a gd cause. Harvey, x9296 Dorm.

I wd like to switch from McGregor to East Campus aft this term, sgl rm. x9212 Dorm.

Short & long bksc, about 2'x4', or wd to make one, (about 12' of 16"x1" brd, or fraction), cheap. x0572 Dorm, evgs.

Gd stereo preamp, trntbl, tuner, reas. Phil Mandel, x3-3161, lve msg.

Someone to silk-screen T shirts for a gd cause. Harvey, x9296 Dorm.

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POSITIONS AVAILABLE

This list includes all non-academic jobs currently available on the MIT campus. Duplicate lists are posted each Tuesday preceding Tech Talk publication date on the women's kiosk in Building 7, outside the Office of Minority Affairs, 10-211, and in the Personnel office E19-239, on the day of Tech Talk publication. Personnel interviewers will refer any qualified applicants on all biweekly jobs Grades I-IV as soon as possible after their receipt in Personnel.

Persons who are not MIT employees should call the Personnel Office on extension 3-4251.

Employees at the Institute should continue to contact their Personnel Officers to apply for positions for which they feel they qualify.

Virginia Bishop 3-1591
Mike Parr 3-4266
Philip Knight 3-4267
(secretary - Joy Dukowitz)

Sally Hansen 3-4275
Jack Newcomb 3-4269
Evelyn Perez 3-2928
(secretary - Mary Ann Foti)

Dick Higham 3-4278
Pat Williams 3-1594
Claudia Liebesny 3-1595
(secretary - Dixie Chin)

Academic Staff, Administrative Officer in Psychology will manage academic department on behalf of department head in areas relating to personnel, business, student-related and other administrative matters, assist in implementation of academic and/or student-related activities and in development of grant and contract proposals; hire, train, evaluate and administer salaries for non-academic personnel; identify and assist in resolving operational problems relating to large volume of laboratory research. Bachelors degree, or equivalent, and 3-5 years experience in administration of research operation required. 74-1358-R (11/6).

Administrative Staff, EDP Internal Auditor, will perform EDP auditing, reviews of systems development; evaluate internal controls of system, post-audit of computer system; develop audit programs, questionnaires; write and present reports. Bachelor's degree in business administration, accounting major, or equivalent combination of education and experience, graduate work in computer science and experience in computer systems analysis and programming required. 74-1366-R (11/6).

DSR Staff Research Biochemist or Bioengineering in National Magnet Lab will analyze magnetocardiograms and magnetoencephalograms using computer techniques; interpret experimental data from normal and abnormal subjects; develop and analyze theoretical models of electrical and magnetic activity of heart and brain. PhD in Physics or biomedical engineering, strong background in electromagnetism theory and computer programming and experience in computer-aided analysis of electro- and magneto-cardiograms required. 74-1348-A (11/6).

Administrative Staff, Assistant Auditor will develop audit programs and questionnaires, perform audits, supervise staff, write and present reports. Two years of diversified experience in public accounting or internal auditing required. Degree preferred. 74-1365-R (11/6).

Admin. Staff Assistant Director for MIT Associates program which provides member industrial firms direct and convenient access to Institute's educational and research programs, and the Institute with unrestricted financial assistance and professional relationships. Liaison function between MIT faculty and research staff and company representatives. MIT degree (relevant MIT work experience considered), approximately 2 years of technical experience (preferably engineering), management perspective, and ability to deal with executives of small to medium sized corporations required. MBA preferred. 74-1316-A (10/23).

DSR Staff in Artificial Intelligence Lab will be responsible for maintenance and repair of PDP 11/45 computer and its peripheral equipment, debug software problems, recognize and correct hardware faults. Programming experience on PDP 11/45 computer and time sharing systems required. Some circuit design experience desirable. 74-1306-A (10/23).

DSR Staff, Optical Physicist, will conceive, design and execute experiments in nonlinear optics. Candidates should have several years' experience in innovative, experimental research including work in high-power, solid-state lasers from near ultraviolet to near infrared, and knowledge of nonlinear, optical materials. PhD required. 74-1318-R (10/23).

DSR Staff Inorganic Chemist in Nuclear Engineering will assist in development of short-lived radio-nuclide generator for medical applications, conduct methods study for rapid separation of Ir (III) from Os (IV) using resin and inorganic ion exchangers and biological distribution studies of the generator eluant in animals. Graduate degree in inorganic chemistry, ability to conduct innovative, independent research, two years postdoctoral experience and experience with column chromatographic methods essential. 74-1302-A (10/23).

DSR Staff Experimental Optical Physicist, in Research Laboratory of Electronics will identify, formulate and implement key experiments on communications in low visibility atmospheres, develop general experimental capability in and formulate new directions for optical communications research. PhD in Engineering or physics required. 74-1301-A (10/23).

DSR Staff, Computer Programmer part-time in Economics will design user-oriented simulation and linear programming packages for general equilibrium urban location model, write small Fortran programs and read tapes. Familiarity with economic models, linear programming and numerical methods for solving non-linear equations required. 20 hrs/wk. Please submit resume. 74-1311-R (10/23).

DSR Staff in Center for Cancer Research will conduct experiments in lab studying genetics of animal cells in tissue culture, including maintenance and diverse manipulation of cells, use of radioisotopes for physiological and biochemical characterization. Will assume increasing responsibility for standard lab operation and independent work. BA or MS in biological science and some lab experience required. Tissue culture and/or radioisotope experience desirable. 74-1289-A (10/16).

Admin. Staff, Journals Manager at the MIT Press will be responsible for overall direction of Journals operation: budget, fiscal control, departmental workflow, staff supervision, production and subscription aspects, editor contact, assessment, acquisition and development of new journals. (Division currently publishes 4 quarterly and one monthly journal). Experience with business/financial aspects of publishing and/or scholarly journals publishing. 74-1273-14 (10/9).

DSR Staff Programmer at Project MAC will perform system analysis and system programming on a research version of the Multics operating system. SM or EE degree required; 2-3 years programming experience as the supervisor of some advanced operating system required. Ability to contribute to research and work with students important. 73-1234-A (10/2).

DSR Staff Programmer Analyst in the Electronic Systems Laboratory will participate in analytical and experimental research project on networking of information-retrieval systems, programming, designing and evaluating computer interfaces to interconnect interactive information systems. PL/1 experience, BS or equivalent experience required. Knowledge of Multics, 370/168 (TSO), ARPANET or TYMNET desirable. 74-1199-R (9/25).

DSR Staff Engineer in Earth and Planetary Science will be responsible for development and construction of astronomical instrumentation for use of telescopes. Experience in analog and digital circuit design and construction, EE degree and/or training required. Please submit resume. 74-1207-A (9/25).

DSR Staff in Earth and Planetary Sciences will analyze oceanographic samples by atomic absorption spectroscopy, mass spectroscopy and wet chemistry. One month of appointment may be spent at sea for sample collection. Background in lab chemistry required. BS in Chem. preferred. 74-1177-A (9/25).

DSR Staff, Programmer in the Laboratory for Nuclear Science will maintain and develop computer-based acquisition system comprised of large mini-computer (PDP-11/45). Comac instrumentation and in-house electronics. EE or Physics degree, or equivalent required. Experience in systems development on mini computer preferred. Work sites include MIT, BNL, Fermi Nat'l Lab. 74-1183-R (9/25).

Administrative Staff, Assistant Director of Finance in the Office of the VP for Financial Operations will work on fiscal planning and budgeting, emphasizing short and long range strategies for fiscal balance. Extensive knowledge of academic programs, university finances, management ac-

counting techniques required. MBA desirable. Submit resume. 74-1204-R (9/25).

DSR Staff at the Haystack Observatory in Westford, MA, will guide and participate in development, design and implementation of electronic instrumentation and computer software for interferometer (UBLI) experiments, which will measure tectonic plate motion; assist in analysis of data. Physics & EE background with Ph.D. research experience in radio astronomy. Computer programming, ability to work with radiometers and other radio astronomy instrumentation required as well as previous experience with very long baseline interferometry. 74-1161-R (9/18).

Administrative Staff Industrial Liaison Officer will provide interface among MIT faculty, staff and representatives of member companies of the Program, major industrial firms in USA. Masters degree, preferably MBA or SM, Ind. Management, with BS in science or engineering required. Ability to communicate effectively with corporate executives as well as technical staff of companies is needed. 74-1168-R (9/18), 74-1373-R (11/13).

DSR Staff-Temporary for the Joint Center for Urban Studies will supervise the work of graduate research assistants working on topics related to public sector labor relations in Boston: Ph.D. or work toward advanced degrees required. Experience with research on municipal employee labor relations, and as a supervisor important. Job duration, approximately 6 months. 74-1126-A (9/11).

DSR Staff at the National Magnet Laboratory will work on the Alcator thermonuclear experiment. Conceive, design, and carry out plasma diagnostic experiments using neutron, X-ray, optical, electrical, magnetic and microwave techniques. Will aid in the analysis and assessment of data. Ph.D. in plasma physics or related area required; familiarity with tokamak devices desirable. 74-1136-A (9/11).

DSR Staff-Physical Chemist in the Research Laboratory of Electronics must be experienced in molecular beam techniques and surface science to conduct experiments on semiconductors and related materials. Ph.D. in Physical Chemistry required. 74-1110-A (9/4).

DSR Staff-Scientific Programmer in Earth and Planetary Sciences will work on analysis of celestial mechanics data from Mariner 9, MVM, Viking, Pioneer Venus Probes and other space related projects. Design, write, modify and run FORTRAN data-analysis program. Advanced knowledge of FORTRAN and minimum of 1 year professional programming experience required. Background in math, physics, engineering; knowledge of IBM/360/JCL and assembler useful. Submit resume. 74-1267-A (10/9).

Technical Assistant-Academic Staff in Nutrition and Food Science will perform specialized and routine chemical analyses on body fluids; responsible for operation and maintenance of mass spectrometer. A college degree in Chemistry or Biology required. Laboratory experience preferred. 74-1047-R (8/28).

DSR Staff in Energy Laboratory will design, build, and operate large scale heat transfer apparatus. Graduate degree in heat transfer; extensive experience in designing, instrumenting, and conducting laboratory tests in heat transfer experiments with a minimum of supervision required. 74-858a-A (7/31).

Biomedical Engineer-DSR Staff in the Mechanical Engineering Department will join MIT researchers and Children's Hospital medical staff to work on the conception of diagnostic and therapeutic devices and processes for human rehabilitation. Supervise technicians, participate in the supervision of theses and student projects. Education in biomedical engineering required. Mechanical and/or electrical engineering, experience in engineering-physician collaboration very desirable. Innovation, creativity, ability to co-research essential. Possibility of lecturer appointment in Mechanical Engineering. 74-869-R (7/31).

DSR Staff Economic Advisor at the Joint Center for Urban Studies will advise the Presidents of MIT and Harvard on the state of the economy and labor force of Cambridge, and prospects for future economic development; evaluate proposals in fields of health, education, housing, transportation, and community development in view of their impact on the advisory committee of faculty and administration members from both institutions. Doctoral degree or equivalent experience in urban economics, manpower, community development required. Ability to work effectively with local government and university officials. Ability to plan and conduct research. 74-753-A (7/17).

Technical Assistant-Academic Staff in Biology will work on a project concerned with the analysis of macro molecular changes in differentiating

myoblasts. Will use cell and tissue culture techniques, electrophoresis, labeling with radioactive isotopes and general biochemical methods. Minimum BS degree in Biology, Biochemistry or related fields; laboratory experience essential. Previous tissue culture experience preferred. 74-759-R (7/10).

DSR Staff in the Energy Lab must have minimum of 5 yrs experience in defining, securing, organizing and supervising research in heat transfer related to energy production and utilization. Familiarity with MIT; experience in supervising student theses research and staff; PhD in Mechanical Engineering required. 74-359-A (5/1).

Administrative Assistant, Exempt in Chemistry Department will assist administrative officer in management of several accounting functions: reconcile monthly statements, administer payrolls in several employment categories; train secretaries in accounting procedures; monitor expenses for student-related programs such as UROP, CWSP; supervise and maintain records on grants and contracts; approve requisitions for materials, services, and travel; interpret specialized accounting procedures to department members. Familiarity with MIT accounting/OSP procedures required. Accounting experience preferred. 74-1364-R (11/13).

Engineering Assistant, Exempt in Earth and Planetary Science will work under supervision in the design, construction, debugging, testing and evaluating experimental CCD camera project; evaluate instruments on optical telescope and experience with electronic imaging devices desirable. 74-1346-A (11/6).

Engineering Assistant-Exempt in the National Magnet Laboratory will set up experiments and take measurements of magnetic fields produced by humans and animals. Will work with hospital medical groups. Experience in biomedical research; strong experience in low-frequency electronics; knowledge of magnetics and cryogenics required. Flexible schedule necessary for occasional evening or weekend work. 74-1033-R (8/28).

Infirmiry Staff Nurse-Exempt, Bedside nurse in MIT Infirmiry. Must be capable of administering first-aid and emergency treatment. Mass. Registered nurse with 1 1/2 yrs experience preferably in medical/surgical unit. Emergency Room or ICU experience desirable. 11pm-7am, weekend rotation. 74-1278 (10/9).

Food-Production Supervisor-Exempt in Food Service will be responsible for all operations of the kitchen and its food production personnel: daily production, inventory control, quality control and sanitation. Assist in menu planning and estimating food quantities. Manage administrative details in areas of personnel, payroll, budgeting, purchasing. Degree or experience in food production, menu planning, and operation of a food production facility required. Ability to train personnel important. Hours 6am-3pm, 2nd opening: Irregular hours and weekends. 74-837-A (7/24).

Area Food Supervisor-Exempt in Food Service will be responsible for the unit serving areas: flow of food and utensils during meal periods; portion controls, sanitation. Will train and supervise pantry employees. Technical knowledge of food production; ability to work under pressure, irregular hours and weekends required. 74-835-A 74-836-A (7/24).

Technical Assistant IV, part-time in the Research Laboratory of the Electronics will set up, carry out and analyze experiments in the field of letter recognition, including complicated statistical analyses. May direct others involved in the project. BA in Psychology, experience in letter recognition experimentation and knowledge of parametric and non-parametric statistics required. 15-20 hrs/wk. 74-1255-A (10/9).

Administrative Assistant V in Civil Engineering Constructed Facilities Division will assist Division Head and other faculty in all matters relating to operation of the Division: maintain and monitor budget, space assignment and coordination of moves, schedule and publicize seminars, publication distribution, library maintenance, inventory; student-related functions such as admissions, maintenance of records, administration of fellowships; other duties related to Division's research programs. May do occasional typing. Strong ability to deal with figures and sensitive information, organization skill required. Experience in MIT sponsored research administration highly desirable. 74-1313-A (10/23).

Secretary IV to administrator and several researchers in Energy Lab. involved in assessment of international energy options: will be involved in extensive telephone and telegraph communication; organize international meetings; arrange travel and appointments; handle financial transactions, coordinate publication and distribution of reports. Excellent typing, shorthand/speedwriting and dictation equipment skill, organizational ability, poise in dealing with prominent persons, and willingness to work overtime required.

MIT experience desirable. 74-1378-A (11/13).

Secretary IV in Sloan School, Systems Dynamic Group, will work with faculty member and a group of researchers concerned with national economic issues: type correspondence, manuscripts (some technical), from drafts and dictation equipment; answer phones, arrange appointments and travel; some graphic work involved. Excellent typing, command of English language, minimum of 3 years experience, or equivalent, required. 74-1377-A (11/13).

Secretary IV to Associate Director of Planning Office will perform general secretarial duties including arranging meetings, answering phones, light accounting, extensive typing using CPT and/or terminal (training will be provided). Person will also provide secretarial support for others in group. Three years secretarial experience, excellent typing, organization skill and ability to work independently required. Familiarity with computer terminology helpful. 74-1361-R (11/6).

Secretary IV will handle standard secretarial duties for a group of Mechanical Engineering professors. Schedule travel, appointments, seminars; type correspondence, monitor accounts; secretarial training or experience, shorthand/dictaphone, technical typing skills required. Ability to communicate and to deal with students and staff important. These positions are available for "job-sharing." 74-950-R, 74-951-R (8/14), 74-1344-R (11/16).

Secretary IV to an Associate Director of the Alumni Fund will formulate and maintain consolidated file for major gift development, compose some correspondence independently, do statistical work, make travel arrangements, assist other secretaries. Good typing, shorthand, speedwriting and some college training required. Flair for writing and financial public relations background helpful. 74-1329-R (10/30).

Secretary IV to Director and Admissions subcommittee of the Harvard-MIT Program in Health Sciences and Technology will handle general secretarial duties including minute-taking, meeting arrangements, and assist in the admissions process through statistical record-keeping, application distribution, scheduling of interviews, attending Committee meetings. Position involves much contact with MIT and Harvard students, faculty. Typing, shorthand/speedwriting, ability to work with minimal supervision required. MIT or Harvard experience helpful. 40 hr work week. 74-1330-R (10/30).

Secretary IV in Aeronautics/Astronautics Innovation Center will perform varied secretarial duties for Center Director and other faculty and staff: type, answer phones, make travel arrangements and handle routine correspondence. Good typing, shorthand, command of English language and organization skill required. 74-1327-R (10/30).

Secretary IV to three faculty members and several research staff in Laboratory for Nuclear Science will type reports and papers including technical material, answer phones, make appointments and travel arrangements, file and handle other standard secretarial duties. Excellent typing and dictaphone skills required. 74-1307-R (10/23).

Secretary IV to professor and research staff in Aeronautics and Astronautics will handle a variety of duties including typing reports and class material (much technical), independently answering correspondence, composing letters from verbal instructions, maintaining files and accounting records, making travel arrangements. Technical typing ability required. Knowledge of MIT procedures preferred. 74-1290-R (10/16).

Secretary III-IV for two Metallurgy and Materials Science professors will type correspondence from dictaphone; type technical papers, manuscripts, class notes. Maintain files, monitor accounts. Excellent typing, proof reading skills, good command of English language required. MIT experience preferred. 74-1169-R (9/18).

Secretary IV to several Mechanical Engineering professors will handle correspondence, travel arrangements. Shorthand/dictaphone skills, knowledge of bookkeeping required. Technical typing ability and secretarial schooling or experience preferred. This position is available for "job-sharing." 74-1031-R (8/28).

Secretary IV for Mechanical Engineering will handle general secretarial duties for several professors in thermodynamics. Type technical reports and manuscripts; maintain accounts. Excellent typing required, technical typist preferred; knowledge of office pro-

(Continued on page 10)

Positions Available

(Continued from page 9)

cedures, ability to organize, set priorities important. 74-256-R (6/5).

Secretary IV to the Institute Secretary for Foundations will be responsible for budget accounting, file maintenance; research in reference materials, maintain communications and smooth relations with top level offices of the Institute. Excellent secretarial skills, ability to organize and use discretion required. Knowledge of MIT desirable. 74-332-R (4/24).

Secretary III-IV in Mechanical Engineering will work with staff members and students in research concerned with development and evaluation of techniques and devices responsive to the needs of the handicapped. Primary duties are secretarial, including transcribing machine dictation, making travel arrangements, handling petty cash. The ability to edit and proofread is desirable. Typing skills and maturity are required. 74-1368-R (11/13).

Secretary III-IV in Project MAC will handle general secretarial duties for faculty member and research associate, maintain special files and manage document distribution. Excellent secretarial skills including typing and ability to use dictating equipment, willingness to learn computer use and to work independently required. 74-1097-R (10/30).

Secretary III-IV to senior faculty member in Electrical Engineering will type course notes, reports and proposals, schedule appointments and arrange travel. Initiative, technical typing skill and ability to work without supervision required. 74-1336-R (10/30).

Secretary III-IV to an Associate Director of the Alumni Fund. Will develop and maintain consolidated file for major gift development, compose some correspondence independently, arrange meetings, luncheons, do some statistical work. Good typing, shorthand/speedwriting, and some college training required. Flair for writing and financial public relations background helpful. Will be trained to use IBM Auto Typist. 74-1245-R (10/2).

Secretary III-IV will work for one professor in Metallurgy and Materials Science. Type from machine or direct dictation, including some technical; maintain files, monitor OSP accounts, schedule travel; conduct moderate library research. Excellent typing, good command of English required. MIT experience, shorthand or speedwriting desirable. 74-1181-R (9/25).

Secretary III-IV in the MIT Associates Program will handle general secretarial duties for one staff member servicing industrial firms' participation in the Program in their dealings with MIT. Excellent office, shorthand and typing skills required. Secretarial or business school background and previous experience desired. 74-1165-R (9/18).

Secretary III-IV for two Metallurgy and Materials Science professors will type correspondence from dictaphone; type technical papers, manuscripts, research proposals, student reports, class notes. Maintain files, monitor accounts. Excellent typing, proofreading skills, good command of English language required. MIT experience preferred. 74-1169-R (9/18).

Secretary III-IV in Nuclear Engineering will handle general secretarial duties for several faculty and staff; type class materials, correspondence, manuscripts, reports from handwritten notes, transcription and dictaphone. Schedule travel, appointments, meetings. Good typing, organizational skills required; experience with dictaphone, technical typing, shorthand desired. 74-959-A (8/14).

Secretary III, part-time, in Metallurgy and Materials Science will type correspondence, technical reports and manuscripts, file, answer phones, monitor accounts. Technical typing skill and some secretarial experience required. Shorthand or speedwriting helpful. Hours: 9am-1pm, M-F. Temporary position through June, 1975. 74-1376-A (11/13).

Secretary III in Economics headquarters will assist two other secretaries in providing clerical services to three professors: answer phones, type correspondence and class material, file; assist in graduate admissions and registration process. Good typing required. Moderate shorthand skill helpful. 74-1374-R (11/13).

Secretary III in Sloan School to three faculty members. Will handle general secretarial duties in one-person office, some manuscript typing and preparation of class material. Ability to organize work, keep track of details and deadlines very important. Excellent typing with emphasis on accuracy and grammatical skills required. Shorthand or speedwriting desirable. 74-1371-R (11/13).

Secretary III in Aeronautics and Astronautics Flight Transportation Lab will work with other secretary to provide secretarial services to Director and five faculty members; type correspondence and technical reports from rough drafts, answer phones, make travel arrangements, handle petty cash account. Ability to make decisions and establish priorities required. Office experience helpful. 74-1339-R (11/6).

Secretary III in Physical Plant, Superintendent's Office will provide secretarial services for Support Services Group; type correspondence and reports, answer phones, handle general inquiries. Ability to work with minimum supervision and excellent typing required. Shorthand or speedwriting desirable. 74-1362-R, 74-1363-R (11/6).

Secretary III in the Center for Space Research Man-Vehicle Laboratory will perform standard secretarial duties for faculty and staff. Excellent typing and dictaphone skills required. Familiarity with medical terminology desirable. 74-1296-R (10/6).

Secretary III, part-time in Law-Related Studies Office. Will type, maintain several accounts, answer phone in busy office. Good typing, ability with figures required. Much internal liaison with staff and students. 1 1/2 hrs/wk. 74-1236-R (10/2).

Secretary III, part-time in Sloan School will work with one professor in field of Economics, perform standard secretarial duties. Excellent typing, command of English grammar, and willingness to learn technical typing required. 20/25 hrs/wk, preferably evenings. 74-1150-R (10/2).

Secretary III to several staff members of the Center for Theoretical Physics. Excellent typing needed for technical reports, manuscripts and correspondence (technical typing skills helpful); ability to work effectively with students, guests, and faculty important. 74-883-R (8/7).

Secretary III to faculty and research group in Research Lab of Electronics will type manuscripts including technical material, make appointments, independently reply to correspondence and compose replies from oral instruction. Shorthand skill and excellent typing ability required. 74-1174-R (9/25).

Secretary III in Chemical Engineering will type quizzes, reports, technical manuscripts, proposals for three faculty members. Will arrange appointments, maintain student records, act as receptionist for the office. Dictation from tapes; technical typing experience preferred. Prompt, dependable individual with ability to follow through on details desired. 74-1105-R (9/4).

General Library Assistant III, part-time, at Project MAC Reading Room will assist users in finding entries in card catalogue, check books in and out, keep circulation records, shelve books and perform clerical duties. Ability to work independently; some library experience required. 20 hr/wk. 3pm-7pm. 74-1259-R (10/9).

Sr. Library Asst. IV in Catalogue Dept. will be responsible for descriptive cataloguing of MIT theses including second copies and continuations, and the input of master entry for theses and technical report literature on the ACLC 100 computer terminal. Will perform other cataloguing assignments as required. College degree preferred. Ability to interpret complex directions for computer terminal, excellent typing required. Library experience desirable. 74-1341-R (11/6).

Architectural Draftsman/woman (Design) will develop architectural plans, elevations and details for remodeling and alteration projects. Ability to develop a job from preliminary estimating through design and drafting, within budget limitations; occasional field supervision. Technical school graduate with 5-10 years experience in architectural field. Ability to work with minimum supervision required. Knowledge of electrical, mechanical systems and experience in institutional remodeling helpful. 74-1349-A (11/16).

Clerk Typist III in the Alumni Fund will handle a variety of clerical and statistical duties; compose some correspondence independently, type, compile statistical data. Typing skill, ability to organize and perform work with minimum supervision, command of English language required. 74-1370-A (11/13).

Senior Clerk III-IV in the Alumni Fund will record and process donor gifts and pledges; account for daily receipts, identify matching gift companies, prepare acknowledgement cards. Proficiency with figures and adding machine and some typing ability required. Accounting knowledge helpful. 74-1347-R (11/6).

Clerk Typist III in planning office will operate IBM Mag Card equipment, or equivalent, type reports, other correspondence, some charts and tables from hand-written and dictated copy. Superior typing skills, knowledge and/

or experience with word-processing equipment, or willingness to learn through self-administered instruction program, required. Position is temporary through June, 1975. 74-1303-R (10/23).

Technical Typist III will assist in the production of the Neurosciences Research Program Bulletin through use of IBM/MTST composer system. Type manuscripts; adapt format, scientific symbols, tabulations, etc. to style of the Bulletin; proofread copy; check bibliographic format. Good typing skills essential; knowledge of publications procedures. Applicant can be trained on MTST. Off-campus location (Brookline); own transportation desirable. 74-985-R (8/28).

Clerk-Typist III, Temporary, 6 months, in the Alumni Ass'n will type corrections to Alumni records from handwritten questionnaires. Extremely accurate typing and ability to learn quickly required. 74-1211-A 74-1214-A (9/25).

Technical Typist III in Chemical Engineering will type large volumes of reports, manuscripts and proposals from rough drafts using a magnetic tape typewriter. Excellent typing skills required; ability to handle equations and chemical symbols, punctuation and paragraphing necessary. 74-741-R (7/10).

Clerk Typist II in Office of Lab Supplies will type purchase orders, price requisitions, file and do other general office work. High school graduate, or equivalent, adding machine or calculator experience and ability to operate a 32 NCR cash register bookkeeping machine required. 74-1367-R (11/13).

Messenger I, part-time, for the Physics Department will deliver vials to the Mass. Eye and Ear Infirmary at 7:30am and 3:00pm, approximately 2-3 days a week. Payment will be on a per trip basis. 74-1343-R (11/6).

Cook's Helper in MacGregor Kitchen will prepare salads and dressings, prepare and cook vegetables, clean work area and perform other tasks as required. Experience in cooking and salad preparation, neatness and ability to follow written recipe instructions required. 40 hr week, 10am to 7pm. 74-1305-R (10/23).

2nd Class Engineer must have a Mass second class Engineer's license or higher. Individual must be willing to work on any shift. 74-182-R (11/24).

3rd Class Engineer at the Power Plant may work any and all shifts and do all kinds of work, consistent with self sufficiency of the Plant. Mass. Third Class Stationary Engineer's license or a license of a higher grade required. Experience on high pressure boilers, oil and gas fired with automatic combustion controls, turbine driven auxiliaries: AC and DC generation, switchboard, and fed water control required. Some experience on turbine-driven refrigeration equipment is desirable. 74-422-A (5/29).

3rd Class Engineer at the Power Plant may work any and all shifts and do all kinds of work, consistent with self sufficiency of the Plant. Mass. Third Class Stationary Engineer's license or a license of a higher grade required. Experience on high pressure boilers, oil and gas fired with automatic combustion controls, turbine driven auxiliaries: AC and DC generation, switchboard, and fed water control required. Some experience on turbine-driven refrigeration equipment is desirable. 74-422-A (5/29).

Waitress/Waiter part-time Waitresses at the Faculty Club will set up silver and china on dining room tables. Take member orders; serve food and beverages. Clear, clean and reset tables. Experience helpful, but not necessary. Shifts: M-F 11am-3pm. All positions may require weekend work. 74-1059-R (8/28).

The following positions have been FILLED since the last issue of *Tech Talk*:

74-1082-R	DSR Staff
74-293-R	Secretary IV
74-1271-R	Admin. Staff
74-1237-R	Admin. Staff
74-1293-R	Clerk-Typ. II
74-978-R	Grounds person
74-1332-R	Tech. Asst. IV
74-1333-R	Tech. Asst. IV-V
74-1309-R	Secretary IV
74-922-R	Tech. A
74-1213-A	Clerk-Typ. III
74-1326-R	Matron
74-998-A	Counterperson
74-1282-R	DSR Staff
74-634-R	Secretary III

The following positions are on HOLD pending final decision:

74-1304-R	Nurse
74-1280-R	Admin. Staff
74-1328-R	Secretary IV
74-1340-R	Secretary III
74-1315-R	Secretary IV
74-1345-R	Sr. Clerk III

Porter Paintings to be Shown

A major exhibition of paintings by Boston artist Katherine Porter will be held at MIT's Hayden Gallery from November 23 to December 21.

Organized by Wayne Andersen, Professor of the History of Art at MIT, and sponsored by the MIT Committee on the Visual Arts, the show will have a public preview, with the artist present, on Friday Nov. 22 from 8-10pm.

Born in Iowa in 1941, Katherine Porter attended Colorado University before she moved to Boston in the early 1960s. She has shown annually at Parker 470 Gallery, as well as at other Boston galleries; and she was represented at the Whitney Museum of American Art, New York in 1969 and 1973 and the "Boston Collects Boston" show at the Boston Museum of Fine Arts in 1973.

In a commentary on the exhibition, Professor Andersen said:

"MIT's Hayden Gallery has a long-standing commitment to foster the flourishing of a creative climate in Boston by offering exhibitions to important artists in the area, and Katherine Porter's recent works clearly establish her contribution to the viability of the Boston art scene.

"The exhibition presents a critical survey of a selected group of works from 1969 to the present exploring the changes that have evolved in Porter's continued dialectic between geometric structures and emotive brushwork. 'I use the grid as a structure to work within, but my paintings are about what I am,' Porter says. Her interest in a grid-system has precedence in recent American art in the work of Jasper Johns and Frank Stella.

"Porter differs from her predecessors in that she is not using the grid as schematic imposition on perception as Johns did, or as a purely topological system as was the case with Stella's early paintings. Rather she works both within the grid and in opposition to it. One must accept the dialectic as the meaning of her work, just as one accepts, say, in a Greek metope relief the struggle of a

Lapith with a Centaur as an equivalent to the rational in a co-equal struggle with the instinctual. Each equation arbitrates between the structure of a schematic reality and the subjective experience of self. In exercising the equation, Porter's paintings come into being as equivalents to a state of visual consciousness in which the integers of the equation define each other. They are, therefore and ultimately, about herself, about seeing, about what it is to be a painter in touch with the reality of art.

"In the short time since her first solo show in 1971 at the Parker 470 Gallery, and earlier group exposure including the 1970 *Six Artists* exhibition at Hayden Gallery, Katherine Porter increasingly has become one of the leading painters to develop in the Boston area. Carl

Belz, Director of the Rose Art Museum at Brandeis University, wrote in *Art in America* recently: 'Each of Porter's exhibitions has demonstrated not only her eminence within the local scene, but her ability to challenge the best abstract painting being produced anywhere.'"

A color-illustrated catalogue with a critical essay by Professor Andersen will be on sale at Hayden Gallery.

Altshuler, King To Give Seminar

From End to Beginning in Mass Politics will be the subject of a seminar to be presented by Alan A. Altshuler, Secretary of Transportation in Massachusetts, and State Rep. Melvin H. King, associate director of the MIT Community Fellows Program, from noon to 2pm Friday, Nov. 15, in Rm. E53-482.

Mr. Altshuler, formerly a professor of political science at MIT, and Mr. King will present an analysis of the recent election and the issues of education and transportation in Massachusetts.

Dr. Lorenzo Morris, assistant professor of political science, will be the moderator. The seminar is sponsored by the Department of Political Science.

Obituaries

Martin Duran

Martin Duran, 71, of Woburn, a former technician at the Lincoln Laboratory from 1960 to 1970, died on Friday, Oct. 25. Mr. Duran leaves a sister, Mrs. Charles Hagerty of Woburn.

Herbert R. Fottler

Herbert R. Fottler, 78, of Marshfield, who retired in 1962 as a purchasing agent in the Purchasing Office, died Tuesday, Sept. 10.

Mr. Fottler who joined the Institute in 1950, is survived by his wife Helen, and a son, Peter, of Brookline, N.H.

Raymond L. McLean

Raymond L. McLean, 73, of Billerica, who retired in 1968 as a guard at Lincoln Laboratory, died Tuesday, Oct. 15.

Mr. McLean who had worked at the Laboratory for 15 years, is survived by his wife, Melissa, a son, Ralph L. McLean of Waltham and a daughter, Mrs. Evelyn McDonnell of Billerica.

C. P. Navedonsky

Charles P. Navedonsky, 57, of Maynard, who was a drafting room foreman in the Research Laboratory of Electronics, died

suddenly on Wednesday, Oct. 30.

Mr. Navedonsky, who first came to the Institute in 1942, is survived by his wife Eleanor, three children Roberta Gunn, of Indianapolis, Ind., Paula Macklin, of Grafton, Pa., and Charles P. Navedonsky, III, of Marlboro, Mass., eight grandchildren and two sisters.

Doris E. Peabody

Doris E. Peabody, 82, of Groton, who was a founding member of the MIT Silver Club and the first chairman of the Club, died Monday, Oct. 21.

The Club, formed in 1946, comprises employees who have worked at the Institute for over 25 years. Miss Peabody served as club chairman until 1951. The Silver Club has in recent months joined its male counterpart organization the Quarter Century Club.

Miss Peabody, who retired in 1957 as a secretary in the Alumni Office after 41 years at the Institute, is survived by her sister, Mrs. John B. Warner, of Sterling.

John L. Sargeant

John L. Sargeant, 71, of North Reading, who retired as a purchasing agent in the Laboratory of Nuclear Science in 1971, died on Thursday, Nov. 7.

An Institute employee for 27 years, Mr. Sargeant leaves a wife, Jean and son John M. Sargeant of Norwood.

INSTITUTE NOTICES

Announcements

Preprofessional Meetings—Thurs, Nov 14—University of Massachusetts Medical School: Dr. Joel Feinblatt, assistant dean for admissions, group meeting 12n, Rm 4-145; Franklin Pierce College Law Center: Joseph Dickinson, assistant professor, group meeting 4pm, Rm 10-236. Tues. Nov 19—University of California, San Diego, Medical School: Dr. Charles Spooner, assistant dean for admissions, group meeting 12n, Rm 4-145, interviews 9am-12n & 2:30-5pm. Wed, Nov 20—Dr. Ronald Arky, chief of medicine, Mt. Auburn Hospital, will discuss opportunities for observing hospital activities during IAP, 4pm, Rm 3-133. Make appointments at Preprofessional Advising & Education Office, Rm 10-186, x3-4158.

Challah Baking—Want to learn how to bake Jewish bread? Hillel is sponsoring lessons in Challah baking. Thurs, Nov 21, 7pm, 312 Mem Drive.

'78 Picturebooks—Back by popular demand, limited time only. TCA office, Stu Ctr Rm 450.

Oxfam-Sponsored Fast for a World Harvest—Co-sponsored by the MIT Chaplaincy. Reconsider your priorities: fast 1 day and give what you save to Oxfam, which sponsors self-help anti-hunger campaigns in hungry nations. Info: Helen, x3-2174, Rm 3-258; Steve Murphy, x3-2981.

Foreign Study Office—The office has moved from Rm 7-133 to temporary quarters in Rm 5-108. The telephone number remains x3-5243.

Tech Student Travel—Provides discount air fares & complete bus service. Mon-Thurs, 4-10pm; Sat, 1-4pm, TCA Office, Stu Ctr Rm 450, x3-5433.

Student Discount Tickets—Tickets are available for the Associate Artists Opera Co (Nov 15 & 16) at the TCA office, Stu Ctr Rm 450, 11am-3pm, x3-4885.

BSO—Discount tickets for Wed, Nov 13 open rehearsal are now available in the TCA office, Stu Ctr Rm 450, 11am-3pm, x3-4885.

UNICEF Cards for Sale—Many styles, including calendars. After 11am, TCA office, Stu Ctr Rm 450. x3-4885.

New UROP Listings

For more detailed information on UROP opportunities listed, MIT undergraduates should call or visit the Undergraduate Research Opportunities Program Office, Room 20B-141, Ext. 3-5049 or 3-4849 unless otherwise specified in the listing. Undergraduates are also urged to check with the UROP bulletin board in the main corridor of the Institute.

Tufts Medical School Boston, Mass. It is assumed that the action of estrogens on the chick oviduct are responsible for the specific synthesis of mRNAs that translate protein (like ovalbumin) that are included in the egg. Very little attention has been given to the possible effect of pituitary hormones. Preliminary experiments will be centered on the overall effect of estrogens in castrated and in hypophysectomized chicken. A second project would concern the overall problem of hormone, cytosol and nuclear specificity for the estrogen metabolic response (synthesis of estrogen-dependent RNAs and proteins) which can be approached by defining the association between the estrogens, the EBP and chromatin (all portions of it).

Boston Biomedical Research Institute In order to learn more about the underlying mechanism of muscle contraction, physiologists recently have found it necessary to measure mechanical properties of muscle (both skeletal and cardiac) with a higher degree of precision than was previously thought attainable. So far, the most successful devices have been designed so that the force being measured alters the spacing between the plates of a capacitor. It then remains to convert the capacitance changes to dc voltage changes, and that is the goal of this project. It would be up to the student to

overcome the difficulties of radio frequency circuit design and construction and provide a working device.

Center for Cancer Research The application of the DNA analogue bromodeoxyuridine (BUdR) to certain types of growing mouse cells results in the induction and appearance of new tumor virus particles. These endogenous leukemia particles derive from previously inactive genomes whose transcription is initiated by the presence of BUdR. Research is underway to characterize the molecular mechanisms which cause this BUdR-mediated virus induction. Prof. Robert Weinberg, Rm. 16-435, x3-6417.

National Magnet Laboratory An opportunity exists for an undergraduate, preferably in physics or electrical engineering, to participate in experimental research involving high energy CO₂ lasers and solid state difference frequency generating crystals. Prefer a sophomore or junior who may eventually want to develop the project into a senior thesis. Credit only. Michael Rosenbluh, Rm. NW14-4119, x3-5562 or x3-5594.

Graduate Studies

The following brief descriptions of selected graduate fellowships have been received recently by the Graduate School Office. More complete descriptions are available in the office, Rm. 3-136.

Federal Deposit Insurance Corporation Graduate Fellowships The Federal Deposit Insurance Corporation offers fellowships to graduate students about to begin their doctoral dissertations in the areas of banking, finance, and economics. Applicants must be US citizens and must have completed all requirements for the PhD except the dissertation by October 1, 1975. Awards are for a period of 12-15 months and provide tuition and fees, a stipend of \$400 a month and other miscellaneous fees and expenses. Applications are available in the Graduate School Office. Deadline: January 17, 1975.

Howard Pyle Safety Research Fellowship The National Safety Council announces the Howard Pyle Fellowship Award for graduate students who wish to pursue a doctorate and subsequent career in safety research. Applicants must have had at least one year of graduate study. Priority will be given to citizens of the US, then resident aliens. Fellowships are for a single academic year but may be renewed for up to three years. The fellowship provides tuition and fees, a stipend of \$2,500 and a total allowance of \$450 for dependent children. Deadline: February 28, 1975.

Foreign Studies

Saint Andrew's Society of the State of New York Offers graduate scholarships to promote cultural interchange between Scotland and the US. Awards are made on a competitive basis to US citizens from any accredited college or university in the States. Men and women are equally eligible. The basis of selection includes the applicant's record of academic achievement, participation in other activities, responsible leadership, financial need and employment, evidence of Scottish descent and statement of applicant's personal objectives. Scholarships provide stipends of \$3,750 to cover transportation, tuition, and living expenses. Applicants who are not awarded a scholarship from this Society may be considered for an award of a similar grant from the Grandfather Mountain Highland Games scholarship fund, or an award of a scholarship in a lesser amount from the Saint Andrew's Society of the District of Columbia. Application forms may be obtained from the Secretary of the Society, St. Andrew's Society of the State of New York, 281 Park Avenue South, New York, New York 10010. Deadline: February 1, 1975. Foreign Study Office, Rm. 5-108, x3-5243.

American Academy in Rome 1975-76 Rome Prize Fellowships Fellowships offered in the following fields: architecture, classical studies, environmental design, history of art, landscape architecture, musical composition, painting, post-classical humanistic studies, sculpture. Fellowships provide a monthly stipend, a flat sum for roundtrip transportation, an allowance for travel abroad, an allowance for working supplies, living quarters at the Academy, a liberally subsidized mess, and use of the Library and other Academy facilities. There are no courses of instruction and there is no formal teaching staff. Distinguished artists and scholars in residence are available to the fellows. Fellowships are open to all citizens of the US. Each fellowship is offered for a period of two years. There is no age limit for applicants although the Academy is

especially interested in young candidates of outstanding promise. Application forms may be obtained from the American Academy in Rome, 101 Park Avenue, New York, New York 10017. Deadline: December 31, 1974. Foreign Study Office, Rm. 5-108, x3-5243.

The Foundation of Economics and Statistics in Porto Alegre, Brazil The Foundation is looking for students who intend to write their doctoral dissertation on a subject related to topics of concern to the State of Rio Grande Do Sul. Topics of concern are the following: crop forecasting-sampling methods with the use of aerial photos; development of an integrated system of information storage and retrieval; economic conjuncture analysis; long range planning for the state (economic, land use); identification of priority areas for economic development; analysis of local or regional clusters of social concern; quality analysis of statistical data for planning; demographic studies to measure regional migrations and produce better population studies for public utilities; economic studies related to consumer protection. The Foundation will provide the following: a working place and auxiliary services; basic data and some support for field research; official contacts with local Universities and organizations; financial support to pay for rent; and limited free computer time. Applicant must have a basic knowledge of Portuguese or Spanish. Upon conclusion of thesis the Foundation will expect delivery of data and findings for governmental use. Additional information: Fundacao de Economia e Estatistica, Caixa Postal 2355, 90000 Porto Alegre (RS), Brazil, See the Foreign Study Office, Rm. 5-108, x3-5243 for further details.

Placement Interviews

The following companies will be interviewing Wed, Nov 13-Fri, Nov 22. Those interested may sign up in the Career Planning and Placement Office Mon-Fri, 9am-3pm, Rm 10-140, x3-4733.

Wednesday, November 13—Armco Steel Corp; Conoco Coal Development Co; Federal Communications Commission; Rand Corp; Sikorsky Aircraft; TRW Systems Group; Western Electric Co.

Thursday, November 14—Rand Corp; TRW Systems Group; Air Products & Chemicals, Inc; Celanese Corp; Naval Ordnance Lab; Pratt & Whitney Aircraft; The Analytic Sciences Corp; US Steel Corp; Westinghouse Elec Corp.

Friday, November 15—Pratt & Whitney Aircraft; The Analytic Sciences Corp; Westinghouse Electric Corp; Bolt, Beranek & Newman, Inc; Lubrizol Corp; Merck & Co. Inc; Univ of Michigan, Grad School of Bus Admin; NYU Grad School of Arts & Sciences.

Monday, November 18—3M Co.

Tuesday, November 19—3M Co; Exxon Corp & US Affiliates; Lulejian & Assoc, Inc; Worthington Pump, Inc.

Wednesday, November 20—Lulejian & Assoc, Inc.; Asiatic Petroleum Corp; JT Baker Chemical Co; Consolidated Edison Co of New York, Inc; Crawford & Russell, Inc; Dictaphone Corp; Stone & Webster Engineering Corp.

Thursday, November 21—The Badger Co, Inc; Dow Chemical Co, Eastern Research Lab; Grummam Aerospace Corp; PRD Electronics, Inc.

Friday, November 22—Uniroyal, Inc, Chemical Division.

Graduate Study at UCLA—Dean Robert S. Kinsman will discuss graduate programs in the arts & sciences, engineering, and management, on Wed, Nov 13. Schedule an appointment in Career Planning & Placement Office, Rm 10-140.

MIT Club Notes

Bridge Club*—ACBL Duplicate Bridge. Open Matchpoint pairs Thurs, 7-10:30pm; non-masters (less than 20 master points) Fri, 10pm-12m; all Stu Ctr Rm 473. Jeff, 864-5571.

MIT/DL Bridge Club*—ACBL Duplicate Bridge. Tues, 6pm Stu Ctr Rm 473. Jeff, 864-5571.

Chess club*—Meeting Sat, 12n-5pm, Stu Ctr Rm 407.

Chinese Choral Society*—Singing Sun, 3pm, Stu Ctr Rm 473.

Division of Academic Projects—Staff meeting Sun, Nov 17, 3pm Rm 8-105.

Goju Karate Club*—Classes Mon, Wed, 7-9pm; Fri, 7-10pm; Stu Ctr Rm 491. Dues \$10/semester. Terry Gibbs, 524-1251; Shawn, x3-2018.

Graduate Student Council—Upcoming committee meetings in Walker Memorial: activities, Wed, Nov 13, 6pm, Silver Rm; executive, Thurs, Nov 14, 5:30pm, Silver Rm; GSC dinner meeting, Thurs, Nov 21, 5:30pm, Blue Rm. Note: please give your name to the cashier in Walker Dining Hall.

Hobby Shop*—Mon-Fri, 10am-6pm, Rm W31-031. Fees: \$10/term for students, \$15/term for community. Info. x3-4343.

Israeli Student Club—Lectures Tues, 6pm, Stu Ctr Mezzanine Lge.

MIT Karate Club*—Shotokan style. Classes Mon, Wed, 8-10pm, duPont Wrestling Rm. Beginners welcome.

MIT Kung Fu Club*—Instruction in the art of Chinese boxing, Northern Praying Mantis style. Tues, Thurs, 7pm, Stu Ctr Rm 407.

MITV News—Fri, Bldg 7 Lobby. If you would like to work on it or know of news that should receive attention, call Dave Neuberger, 247-8355, or John Krout, 494-9820. Don't forget to watch the show!

MIT Outing Club*—Mon & Thurs, 5-6pm, Stu Ctr Rm 461.

Recorder Players Unite!*—Anyone interested in playing ensemble music is welcome & we have plenty of music. Tues, 7pm, ESG, 6th fl Bldg 24. Daniel Dreyfus, x3-7787.

MIT Schola Cantorum*—Rehearsals Tues, 7:30pm, Kresge.

Science Fiction Society*—World's largest SF lending library, now located in Stu Ctr Rm 421 & 423. Open evgs, irregular hours, call ahead to x9144 Dorm. Society meets Fri, 5pm, Rm 1-236.

MIT Scuba Club—Compressor hours Mon & Fri, 4-6pm, Alumni Pool.

Soaring Association—Ground school for private license: Part 3, Wed, Nov 13; part 4, Wed, Nov 20; 7pm, Rm 18-491. John Cross, x3-1836.

Strategic Games Society*—Offers opponents and discounts on merchandise to members plus gaming and periodical library. Sat, 1pm-1am, Walker Rm 318. Info, Kevin Slimak, 491-8568. Robert Sacks, 494-8889.

Student Committee on Educational Policy—Amendment of bylaws, election of secretary, organizational meeting. Mon, Nov 18, 7:30pm, Stu Ctr Rm 400.

Student Homophile League*—Meetings 1st & 3rd Sun of every month, 4pm, Rm 1-132. For info, talk, help in coming out call Jim at the Hotline, x3-5440. Party at Harvard Fri evg, Nov 22. Dinner party Sat, Nov 23. Call Hotline for details. Come out, come out, wherever you are!

Student Information Processing Board*—Freshmen especially welcome. Mon, 7:30pm, Rm 39-200.

MIT Tae Kwon Do Blue Club*—Beginner and advanced classes. Tues, Thurs, 5:30-7pm, duPont T-Club lge.

Tech Engineering News*—Office hours for MIT's undergraduate professional journal: 12n-1pm, Stu Ctr Rm 453, x3-2989.

Tech Model Aircrafters*—Flying in duPont Gym Sat, Nov 16, 6-10pm.

Tech Model Railroad Club*—Business meeting. Sat, 4pm, Rm 20E-210.

Technique*—MIT's yearbook welcomes writers, photographers and hackers. Sat, Stu Ctr Rm 451. Info, x3-2980.

Tiddlywinks Association*—Meetings Wed, 8-11:30pm, Stu Ctr Rm 473.

MIT UHF Repeater Association*—Monthly meeting Thurs, Nov 21, 9:15pm, MacGregor A entry lge. Equipment demo and refreshments. New members welcome.

Unicycle Club*—Sun, 1pm, in front of Stu Ctr. Learn to ride a unicycle!

Volleyball Club*—High level instructional program designed to form intercollegiate and AAU teams in November. Sun, 2-4pm, court 3, duPont Armory.

MIT Wheelmen*—Meetings Tues, 7:30pm, Rm 1-203.

White Water Club*—Pool sessions. Tues, Nov 19, 8-10pm, Alumni Pool.

MIT Women's Chorale*—Thurs, 8pm, Rm 10-342. Open to non-student women.

Zero Population Growth*—Meeting 2nd Wed each month, 7:30pm, bsmnt Stu Ctr. Info, x3-7922, x0433 Dorm.

Religious Activities

The Chapel is open for private meditation 7am-11pm daily.

Baha'i Discussion Group*—Discussion Thurs, 7pm, Rm 8-105.

Campus Crusade for Christ/College Life*—Family time, singing, prayer, teaching from God's word. Fri, 7:30pm, Rm 37-252.

Christian Science Organization*—Weekly meetings, including testimonies of healing. Tues, 7:15pm, Rm 8-314.

Divine Light Club*—Informal discussion, with music, on practical experience of what's real as revealed by Guru Maharaj Ji. Mon, Nov 18, 7:30pm, Rm 54-100.

Eastgate Bible Study*—Discussing Book of John, Thurs, 8pm, Eastgate Apt 24C. Info, Ed Fielding, x3-3638.

Hillel Services*—Fri: Traditional 7pm, Rm 16-134; non-Traditional 8:30pm, Chapel. Sat: Traditional 9am, Chapel. Mon-Fri, Minyan 7:30am, Rm 7-102.

MIT Islamic Society*—Congregational prayers Fri, 2:15pm, Kresge rehearsal Rm B; discussion session Sat, 4:30-6:30pm, International Stu Lge (2nd fl Walker); Quranic Tafseer session Wed, 8-10pm, Rm 14N-313.

Roman Catholic Mass*—Sun, 9:15am, 12:15pm & 5:15pm; Tues & Thurs, 5:05pm; Fri, 12:05pm; Chapel.

United Christian Fellowship*—Meet for teaching, singing, sharing and prayer with the Lord. Tues, 6pm, Rm 8-105. Preceded by dinner at Walker, 5pm.

United Christian Worship Service*—Sun, 10:45am, Chapel.

United Christian Fellowship*—Sunday school and nursery for infants and children during United Christian Workshop Service. Sun, 10:45-12n, Stu Ctr Mezzanine Lge.

Vedanta Society*—Services Fri, 5:15pm, Chapel. Swami Sarvagatananda will give a discourse on Bhagavat Gita.

Westgate Bible Study*—Wed, 8pm, Westgate Apt 1210. Info, 494-8778.

Lobby 7 Events

Puppet shows, a demonstration in the art of sidewalk chalk drawing and a gospel concert by the MIT Gospel Choir will fill the roster of noon hour events in the Lobby 7 next week.

The Puppet Cooperative Theatre from Vermont will give four shows in the Lobby, Monday, Nov. 18 beginning shortly before noon, and at 1pm, 2pm and 5pm.

Performing with hand puppets, the company will present the traditional Punch and Judy skit, an original work and paper movies.

"Sidewalk Sam" who has revived the street art of chalk drawing in Boston in recent months, will be working all day in the Lobby, Tuesday, Nov. 19, creating a "sidewalk masterpiece." His chalk drawings are usually five by six foot copies of well known works of the old masters.

Sam, whose real name is Robert Guillemin, has established a reputation as a "sidewalk artist extraordinaire," according to the *Wall Street Journal*. He is also known for his original works in oil and watercolor.

The 35-member Gospel Choir which has been performing at MIT and various local churches for three years will present a program of black gospels in the Lobby, Wednesday, Nov. 20 at noon.

Geotechnical Forum

A forum on geotechnical engineering, sponsored by the Boston section of the American Society of Civil Engineers, will be held in Room 54-100 at 6:30pm Dec. 10. Speakers, primarily from industry, will discuss soil mechanics and foundations. The meeting will be open to the MIT community and a small charge will be made for refreshments.

Two Promoted In Libraries

Margaret Otto, Assistant Director for Library Services at MIT, has been appointed Associate Director in that post, effective November 1.

As Associate Director for Library Services she will work more closely with Director Natalie Nicholson and will be in charge in her absence.

Miss Otto, who came to MIT in 1963 as Assistant Science Librarian was Lindgren Librarian in 1964 and Acting Science Librarian in 1968. In 1970 she was promoted to Assistant Director for Reader Services and to her former position in 1972.

A graduate of Boston University, she holds master's degrees from Simmons College in library science and English literature.

Also effective Nov. 1 was the appointment of Suanne Muehlner to Assistant Director for Personnel Services. Formerly Lindgren Librarian, and Personnel Librarian, Ms. Muehlner will, in addition to her personnel responsibilities, coordinate on-going operational activities in the Divisional Libraries and lead some special assignments for the Associate Director during the rest of the academic year.

She graduated from the University of California at Berkeley and holds a master's degree in library science from Simmons. Joining the MIT libraries staff in 1965 as an intern, she became Assistant Engineering Librarian in 1968 and Acting Lindgren Librarian in 1969. After two years in that post, she took a year's leave of absence at the Technical University of Berlin where she helped establish a new branch library in earth sciences.

In 1971 she returned to MIT as Lindgren Librarian and in 1973 was appointed Personnel Librarian.



During the pleasant fall weather recently, MIT Chancellor Paul E. Gray found a quiet place on the Student Center plaza to polish up some remarks he was about to deliver.

Photo by Calvin Campbell

Three from MIT to Read Poetry

Patricia Cumming, assistant professor of literature, and Elizabeth Sholl, instructor, in the Department of Humanities at MIT are scheduled in upcoming weeks to conduct open readings of their poetry both in Cambridge and Somerville.

In a joint presentation with Professor Cumming Sunday, Nov. 24 at 8pm in Somerville's New Words Book Store, Ms. Sholl will read from her book, *Changing Faces*.

They will be joined by MIT alumnus Lee Rudolph (PhD '74) December 9 at the Blacksmith Shop of the Cambridge Center for Adult Education, where Rudolph's soon to be published book *Curses, Songs and Poems* will be featured. Rudolph's highly acclaimed poem "The Laser" was recently displayed with other works by Professor Cumming at the MIT Arts

Council gala November 7.

Professor Cumming is the author of *Afterwards*, published this year by Alice James Books, Inc.

Alumni Group To Hear Thurow

Dr. Lester C. Thurow, professor of Economics and management at MIT, will discuss the causes and beneficiaries of inflation in a talk on "Our National Economy: Inflation, Recession or Depression," before the Alumni Advisory Council at the MIT Faculty Club Monday night, Nov. 25.

An internationally known economist, Dr. Thurow serves as economic commentator on "Evening Compass" on Channel 2. He has also served as staff economist and consultant to the President's Council of Economic Advisers.

Technology for Newspapers To be Seminar Subjects

The first in a series of MIT seminars on how technology can be applied to the newspaper industry will be held at MIT Nov. 19.

"Newspaper Transmission Via Satellites" is the subject of the initial seminar. The speakers will be Dr. Burton Edelson, Assistant Vice President, Communications Satellite Corp., and Director COMSAT Laboratories, Clarksburg, Md., and William L. Dunn, Business Manager, Dow Jones & Co., Inc., Princeton, N.J.

The seminar will begin at 4pm in Rm. 10-250 and is sponsored by the Electronic Systems Laboratory and the Department of Electrical Engineering.

The seminar series is part of a three-year educational program undertaken by MIT under a \$125,000 grant from the Frank E. Gannett Newspaper Foundation, Inc., to develop technologists in the newspaper business. Professor J. Francis Reintjes is directing the program.

Other components of the MIT program are an MIT Gannett Foundation Graduate Fellowship Program and a major conference on Newspaper Technology and Journalism.

The program has several aims: 1) to encourage young technologists to consider newspaper careers; 2) to make practicing engineers aware of what the newspaper industry needs in the way of more advanced technology; 3) to make newspaper professionals aware of the impact technology is having on their careers; 4) to meet the increasing need of newspaper companies and their equipment suppliers for engineers and technologists.

Several groups at MIT are presently engaged in newspaper-related research in such areas as computer and communications

technology for the benefit of the production and editorial functions of the business, the development of integrated computerized information management systems as a means of increasing the productivity of the circulation and distribution departments, and the digitizing, processing and transmission of gray-level pictorial information.

The seminar program will provide a forum at which the MIT community and newspaper professionals can discuss technological issues relating to the newspaper business in an academic setting.

Two seminars will be offered each semester during the three-year period of the grant.

The third component of the program, the Conference on Newspaper Technology and Journalism, is planned for the summer of 1976.

Hardy Receives APHA Award

The American Public Health Association awarded Dr. Harriet Louise Hardy, former assistant medical director of the Medical Department in charge of environmental medical service 1950-1971, the 1974 Edward Browning Award at its recent annual meeting.

Dr. Hardy who is known for her pioneering work in the field of occupational health medicine was cited for her "outstanding contribution in the prevention of disease."

While at MIT she served as a lecturer in the Department of Civil Engineering and also helped to establish the occupational medical service which became the environmental medical service in 1970.

Feld Foresees Chance of Nuclear Weapons Use

(Continued from page 1) same time, guaranteeing equitable access to the supply for all responsible users.

Pessimism Reinforced

"If the US, that bastion of free enterprise, was able for years to insure control over its gold supply by locking it up at Fort Knox," he said, "we must surely be capable of devising an international Fort Knox solution for the far more valuable and dangerous plutonium stocks."

Professor Feld, who is on leave from MIT to serve as secretary general of the Pugwash Conference on Science and World Affairs and as visiting professor at the Imperial College of Science and Technology in London, said his pessimism regarding the possibility of nuclear weapon use or a nuclear war in the 26 years remaining in this century had been reinforced by events of the past year. He listed these developments:

"The Yom Kippur War in the Sinai has demonstrated the fragility of Russo-American detente and the extreme vulnerability of the rest of the world to the Arab oil weapon.

"The continued development and testing of nuclear weapons by the five senior nuclear nations—all of which have conducted tests in the past year.

Nuclear Dependence

"The entry of India into the nuclear club.

"The race of the technological-

ly advanced nations into widespread dependence on nuclear fission power, coupled with their willingness to spread its technology into the third world in return for scarce raw materials or political influence.

"The well-publicized shift of the nuclear super powers from a strategic doctrine of deterrence (or nuclear weapons for use in a retaliatory second-strike only) towards a doctrine of counterforce or offensive first-strike, exemplified by the development and the deployment of so-called mini-nukes in the European theater.

"And, finally, the debacle of this summer's Moscow summit meeting, which postponed until 1984 the promised further nuclear arms limitations beyond the slow start of 1972 and, to add insult to injury, which responded to the world-wide demands for a total end to nuclear weapons testing by suggesting that only those underground tests be banned that exceed a threshold power of 150,000 tons of TNT equivalent—10 times the strength of the Hiroshima bomb—and that not to take effect until 1976."

Clear Understanding Evaporated

Professor Feld said these developments had so eroded confidence in the nuclear Non-Proliferation Treaty that there "is grave question whether it can survive its scheduled review conference in 1975."

Professor Feld said that a

"clear understanding" appeared at one time to have grown "out of the horrors of Hiroshima and Nagasaki—that nuclear weapons must never again be used."

But this "seems in grave danger of evaporating from human consciousness," he said.

"Without effective means of preventing the independent development of nuclear weapons by capable nations, and without effective safeguards against the diversion of nuclear weapons materials, now being produced in astronomical amounts for peaceful power applications," he said, "it will be impossible to prevent nuclear weapons from falling into irresponsible hands, either of governments or non-government groups.

Critical of SALT Results

"And in a world beset by economic tensions, by vast inequities, mass deprivation and starvation—where the have-nots are increasingly refusing to accept their place in a disintegrating order—nuclear weapons in the hands of desperate or irresponsible groups will mean nuclear weapons used," he said.

Professor Feld also was critical of the results of the Strategic Arms Limitation Talks (SALT) to date, saying they "add up to a large step backwards.

One of the greatest problems, he said, was the "failure of SALT-I to come to grips with the problem of curbing new technological advances in nuclear weaponry."

He said this had been taken as a signal "by the military weaponeers on both sides to go full-steam ahead on every new weapons scheme that is not explicitly prohibited by the agreement."

Reduce Number of Weapons

He said this had served "to initiate a new phase of nuclear arms competition, in which both sides are moving steadily, from their earlier posture of reliance on nuclear weapons for the sole purpose of deterring a first-strike by the other side, towards postures that can only be interpreted as preparations for use of these weapons in any conflict against any kind of target, regardless of the actions of the other side."

"Such an erosion of the inhibitions against any possible first-use of nuclear weapons—so painfully constructed over 25 post-World War II years—unless reversed, can only lead to unmitigated disaster," he said.

"Unfortunately," he added, "the first law of socio-dynamics seems to be—whatever is technically possible must be developed; and the second law—whatever is developed must be used. It may well be that the survival of the human race depends on our ability to repeal these laws."

Atomic Pioneer

Among the steps Professor Feld said should be taken to avert nuclear war would be a reduction of the total number of

nuclear weapons and their carriers, "not by mere percentages but by factors of two, three, 10"; the imposition of controls over new technological developments, and a pledge by all nuclear nations to a policy of no-first-use of nuclear weapons.

Professor Feld was involved in the development of the first atomic bomb.

From 1942 to 1944, he was a group leader at the metallurgy laboratory at the University of Chicago, where the first chain reaction was achieved. In 1944, he went with Dr. Enrico Fermi to Oak Ridge to set into operation the atomic reactor there, and then to Los Alamos, N.M., where he worked on the physics measurements for the design of the first atomic bomb.

Since World War II, he has been involved in many studies of arms control and disarmament. He has attended almost all of the international "Pugwash" conferences since 1958.

Pugwash is a name given to unofficial but influential organizations of leading scientists, disarmament experts and others concerned about the dangers of nuclear technology. The name comes from Pugwash, Nova Scotia, where East-West conferences on science and world affairs began 17 years ago.

During his two-year term as secretary general of the Pugwash group, Professor Feld is living in London, where it has its headquarters.