Massachusetts Institute of Technology



December 8, 1971 Volume 16 Number 23

# Wick to Leave Dean's Office

After more than six years as Associate Dean for Student Affairs, Professor Emily L. Wick has asked to return to full-time teaching and research in the Department of Nutrition and Food Science. The announcement of Professor Wick's resignation was made by Dean J. Daniel Nyhart.

As Associate Dean for Student Affairs, Professor Wick had primary responsibility for women students at the Institute, across the entire area of student life. She succeeded Dr. Jacquelyn A. Mattfeld who left MIT to become Dean of Sarah Lawrence College and who is now Provost at Brown University.

In a personal letter to women students, Professor Wick said "The time has come when I must return to fulltime teaching and research if I am to maintain credibility and productivity as an active scientist."

During Professor Wick's tenure as Associate Dean, many changes have taken place in the coed's way of life. For example in 1965 all undergraduate women were required to live in McCormick Hall, the East Tower of which was yet to be built. There were only 50 girls in the freshman class and the total number of women students was only 337, about four percent of the student body.

In contrast, today's women undergraduates live both on- and off-campus, in McCormick, and in coeducational living groups in Student House, East Campus, Senior House, Burton House, Sigma Nu and the Number Six Club. There are 125 coeds in this freshman class (Continued on page 6)

Special Report

The supplement today is the Report of the Special Task Force on Education. A formal presentation of the Report will be made at the December 15 Faculty Meeting by the Chairman of the Task Force, Hartley Rogers, Jr. Faculty members are urged to save this Report and bring it to the Faculty Meeting.



# Robinson Given Certificate

Dr. Richard D. Robinson (right), senior lecturer in the Sloan School of Management, receives US Commerce Department's Certificate of Appreciation from Frank O'Connor, deputy director of the Department of Commerce's Office of Business Services in Boston. Dr. Robinson was honored for originating a graduate business course at MIT that has now become a nationwide program of the Commerce Department's Bureau of International Commerce. Known as the MBA Export Expansion Program, some 300 students working toward master's degrees in business administration at 25 universities are helping more than 200 small US business firms explore possible export markets. –Photo by Margo Foote

# New Appointments Announced for Development, ILO Offices

Vice President and Secretary of the Institute, Vincent A. Fulmer, has announced four appointments to MIT's development staff and industry liaison activities.

Leslie M. Boring succeeds Kendall B. Randolph as Special Assistant to the Vice President and to the Head of the Department of Chemical Engineering for the purpose of coordinating MIT's drive to fund new facilities for the Department of Chemical Engineering. Mr. Boring comes to his new assignment following appointments as an Industrial Liaison Officer for MIT and most recently from directing the MIT Associates Program. Both of these responsibilities have involved development and implementation of close-working relationships between the Institute and industrial firms. Mr. Boring is an MIT alumnus of the Department of Aeronautics and Astronautics where he received his Bachelor's and Master's degrees in 1964 and 1968, respectively. He has also been employed at the Draper Laboratory and with the Aeroelastic and Structures Research Laboratory at MIT. Succeeding Mr. Boring as Director of the Associates Program is Jerome J. Schaufeld. For the past two years Mr. Schaufeld has served as an Industrial Liaison Officer for MIT. Prior to that time he was associated with the Draper Laboratory, first as a representative of the Bendix Corporation and later as an employee of MIT. Mr. Schaufeld received his Bachelor's degree in Mechanical Engineering from Newark College of Engineering and the M.B.A. from Northeastern University.

Dennis J. Jedlinsky and Anne S. Hirsch have been appointed to represent MIT as Industrial Liaison Officers. Mr. Jedlinsky, who joined the staff of the Industrial Liaison Office earlier this fall, is an alumnus of MIT, having received his Bachelor of Science and Master of Sciences degrees in Aeronautics and Astronautics from the Institute in 1966 and 1967, respectively. After graduating he joined the Market Research Department of The Boeing Company as Manager of Domestic Passenger Forecasting. Mrs. Hirsch, who has won distinction as the first woman appointed as an Industrial Liaison Officer, received her Bachelor of Science degree from MIT's Department of Metallurgy and Materials Science in 1969. She will be coming to the staff of the Industrial Liaison Of-

# Apollo Data Discloses Crust, Mantle on Moon

SAN FRANCISCO, Calif., Dec. 7--A group of US scientists, including several from the Institute, using data from the Apollo program, disclosed the first geophysical evidence Tuesday that the moon has a crust and an underlying mantle-geologic structures they take to mean that the moon was once hot and molten.

The paper was presented at the annual fall meeting of the American Geophysical Union being held with more than 1,000 earth and space scientists in attendance.

Dr. Nafi Toksoz, professor of earth and planetary sciences at MIT, reported the seismic findings on behalf of a team of scientific collaborators from MIT, Columbia University, the University of Hawaii and the General Dynamics Corp. Among co-authors were Dr. Frank Press, head of the MIT Department of Earth and Planetary Sciences and one of the nation's leading seismologists, and Dr. Maurice Ewing, head of Columbia's famed Lamont-Doherty Geological Observatory. Others include Dr. Gary Latham, Dr. James Dorman and David Lammlein of Lamont. Dr. George Sutton and Fred Duennebier of Hawaii, Dr. Yosio Nakamura of General Dynamics at Fort Worth, Tex. and Kenneth Anderson of MIT. Dr. Latham is the principal investigator of all passive seismic experiments on the moon.

Seismic shock waves generated by crashing spent Apollo vehicles into the moon and recording them with the remote seismometers left on the moon by Apollo crews, Dr. Toksoz said, have permitted seismic probing of the moon's interior structure to a depth of 100 kilometers.

The seismic data, he said, shows that the moon has an outer crust of the kind that usually results from the cooling of hot materials, that the crust itself consists of two distinct layers of igneous rock, fine grained above and coarse-grained below, and that there is a more rigid mantle just below the crust.

The presence of a differentiated crust, he said, implies melting or partial melting of the lunar interior in the moon's early history. If the moon were formed cold and remained that way throughout its 4.6 billion years of history, then the materials from which it was formed would be evenly distributed at all depths, he said. result thus far from the National Aeronautics and Space Administration's program of manned exploration of the moon.

Crews of the Apollo 12 and 14 missions left siesmometers in the vicinity of the Fra Mauro crater where they landed while the more recent Apollo 15 crew left their seismometer near the Hadley Rille where they put down.

On all three missions, parts of the spacecraft were purposely crashed into predetermined locations on the moon after they had served their purpose. These included both the SIVB rockets that are used to propel the command modules as well as the lunar landing modules that are abandoned in lunar orbit. In all, there were six crashes, three SIVBs and three LMs. All were sent impacting the lunar surface in the vicinity of Fra Mauro on command from earth.

Seismic waves generated by the crashes were picked up by the seismometers then in operation and relayed back to earth where NASA's Manned Spacecraft Center at Houston, Tex., placed the data in the hands of scientists for analysis. By measuring the varying velocities of the shock waves as they pass through and reflect from the interior materials and comparing these to seismic profiles of returned lunar samples as well as known materials on earth, the scientists are able to deduce the inner lunar structure.

Dr. Toksoz said the surface of the moon is covered to a depth of one or two kilometers with a mixture of soil (known as fines), breccias (soil particles welded to-(Continued on page 7)

# Stevens Named Head of NCLIS

Charles H. Stevens, associate director for library development at Project Intrex, has been appointed the first executive director of the National Commission on Libraries and Informations Science. He will take a leave of absence from the Institute to accept this post.

In announcing the appointment, Commission Chairman Fredrick Burkhardt said, "We are fortunate indeed to find a man who is at once a librarian of acknowledged national stature and an expert on the technical aspects of information retrieval. systems. The National Commission on Libraries and Information Science was established by Congress in 1970 in response to the many problems facing library systems throughout the country. The Commission is charged with developing plans, studies and analyses with librarians and others interested in information problems existing in federal, state, and local and private library systems. The new agency is directed by the Librarian of Congress and 14 members appointed by President Nixon.

# with \$4,000

A thief snatched two money bags from the desk of a secretary at the MIT Stratton Student Center Monday and escaped with \$4,002 in weekend dining receipts.

Thief Escapes

Campus patrol officers said the secretary, Andrea Robsinson, was at her desk in the Center's mezzanine floor offices preparing weekend receipts from Lobdell and Twenty Chimneys dining rooms for bank deposit when a young man entered under the pretext that he was an employee. When he entered, he suddenly grabbed the money bags from Miss Robinson's desk and fled. Miss Robinson and another Student Center employee charged after him, but the thief disappeared somewhere inside the building.

fice from her appointment as a Teaching Assistant in the Department of Ocean Engineering from which she expects to receive the Master of Science degree next February.

The Industrial Liaison and As-(Continued on page 7) The crustal discoveries, Dr. Toksoz said, are among the most significant scientific findings to

# Inside This Week's Issue

The Institute Calendar for Wednesday, December 8, through Friday, December 17 will be found on pages 4 and 5.

Also in this issue of *Tech Talk* you will find these stories:

A survey of users finds the self-study subjects offered by the Center for Advanced Engineering Study meeting with approval, page 2.

The Institute's collection of portraits of its presidents is now complete, page 6.

# Continuing Engineering Education through Self-Study

# By John T. Fitch

This paper was prepared for the recent Northeast Electronics Research Engineering Meeting (NEREM) held in Boston. Mr. Fitch is Manager of Self-Study Subject Development at the Center for Advanced Engineering Study.

When you look at the ways a practicing engineer, industrial scientist or technical manager can continue his education today, you find he has roughly three choices: (1) he can take regularly scheduled subjects at a local university; (2) he can take similar subjects in-plant, given by staff instructors, visiting faculty or via TV from a nearby campus; or (3) he can try to make it on his own through "the literature." Each of these approaches is something less than ideal.

The trouble with the first two options – the on-campus or inplant classroom – is their inflexibility. The fixed schedule of lectures, assignments and quizzes often conflicts with job, family and civic responsibilities. Furthermore, the wide spectrum of educational backgrounds, learning rates and motivation one finds among potential students militates against the success of a lock-step pace in a standard classroom.

On the other hand, the completely self-paced study of the literature often finds the student "dropping out" for different reasons. He may find his own background mismatched with that assumed by the authors. Without the spur provided by some form of scheduling, he may never finish the material. And without carefully selected problems to work, he may never really learn the subject matter.

Recently, attention has been focused on improving the opportunities for self-study through the development of programmed texts and workbooks, audio cassettes and slides or film strips, videotaped courses, all the way up to sophisticated films using animation and designed for display in automatic Super 8 projectors.

#### The CAES Self-Study System

The Center for Advanced Engineering Study (CAES) has taken a fairly conservative approach to self-study -- what amounts to a one-to-one mapping of the traditional lecture, reading assignment and problem session into a set of films and printed material. That is, the lectures are recorded on videotape or film, and a study guide provides reading assignments, problem statements, quizzes and solutions to the homework and quizz problems. Since the "live" classroom element has been eliminated, the package of materials can be used at any pace a student or his supervisor may deem optimum. At this point, however, it might be well to point out why we have called ours a "self-study" system and not a "self-paced" system -- an equally current phrase. The reason is simply that for many well intentioned people - adults as well as younger students - the freedom of completely self-paced study may mean little or no pace at all. This, we have already pointed out, is one of the pitfalls of "reading the literature." It is too easy to put aside the important for the merely urgent.

Therefore, we urge those responsible for offering our courses to schedule the recorded lectures on a regular basis so as to provide an expected pace through the material. But, we also urge them to make these same lectures available in a "library," to be reviewed by those who find the subject matter difficult or to be seen for the first time by those who, for one reason or another, have had to miss a scheduled lecture.

#### The Lectures

The lectures for each self-study subject are recorded in a specially equipped studio-classroom using professional equipment and technical personnel. In order to condense the time span of the typical classroom presentation, the bulk of the lecturer's chalkboard material is pre-written. We have found that this technique makes for a well-organized lecture, crisply delivered -- a fact not lost on the students.

The lectures, which range in length from 15 to 50 minutes (dictated by the time required to explain a concept rather than the time between classroom bells) are in no sense merely a preview of the reading assignment. They are devoted rather to providing motivation for introducing each new topic, background information assumed by text authors but often not a part of the student's formal education, an overview of related ideas, an extra explanation of difficult concepts, and sample problems that illustrate an approach to typical homework exercises.

In using the recorded lecture technique, we were aware that a number of educators feel the lecture itself, in the classroom or out, is out-moded. (As one put it: "Why include the very thing that drove them from school in the first place?") Others feel it is simply too inefficient and expensive to put such a large block of information on film or tape. The initial response from the students who have undergone our subjects indicates that they feel lectures are really quite effective in providing insight and understanding that wouldn't have been possible with printed material alone. Figure 1 is one of a number of attitudinal responses from about half the students in the first two subjects who were asked whether they agreed or disagreed, strongly or moderately, with a series of statements about the material. It makes one wonder whether what drove the students from the classroom in the first place was lecturing or the lecturer. We certainly think it important to record the very best lecturer we can find. Figure 2 seems to indicate that even though our lecturer's effectiveness is filtered through the recording medium, his quality shows through.



"The lectures provided me with insight and understanding I probably wouldn't have gotten from written material alone."





Figure 2

#### The Study Guide

In addition to the lectures, the student is provided with a study guide which plots his path through the course. A typical unit in the study guide tells the student which lecture to see, what part of the text to read, and what problems to work.

Lecture Notes. As a set of lecture notes, the study guide includes photographs of the chalkboards made at the end of each lecture. These photographs are used during the lecture to relate what the camera is showing in detail to what the whole chalkboard contains. The lecture notes are also helpful in recalling later -perhaps before a quiz -- what a particular lecture was all about.

Reading Assignment. The next section of the study quide is usually the reading assignment. In most cases, we have adopted standard texts for those subjects, but in the case of Probability and Random Process, a text was especially written for the self-study course.

**Problems and Solutions.** The study guide also presents the exercises. And, because the student is on his own in a self-study course, we have provided him with detailed solutions – not just answers – to all of the exercises. In the case of "Calculus Revisited," the author has called many of these "learning" exercises, granting

visor from removing both quizzes and solutions and administering them as a realistic test of the student's progress.

# The Subjects

The first subjects to be "packaged" in the CAES self-study format were two which had already been developed at the Center specifically for the Fellows or our Practicing Engineer Advanced Study Progam, an on-campus, one-year program for experienced engineers and applied scientists. These were "Calculus Revisited" and "Probability." The first because the biggest block most older students stumble over is their rusty set of mathematical tools. The second because the recognition of the ubiquity of randomness in nature has resulted in the incorporation of probability courses in many undergraduate curricula. These two subjects were first offered to industry in September 1970 and are now in use by a number of companies.

Since then we have released "Calculus Revisited, Part 2"; "Random Processes," a followon to "Probability;" and "Surface Chemistry," the first of a projected four-part series on Coloid and Surface Chemistry by J.Th.G. Overbeek of the University of Utrecht.

Other subjects such as "An Introduction to Experimentation," "The Management of Engineering Computer Systems," and "Decision Making Under Uncertainty" are in discussion or development stage.



"The completion of this subject would have been more meaningful if I could have received some credit at a local college or university."

#### Figure 3

#### Credit

The question of some form of academic credit for our self-study subjects has come up in our discussions with company personnel. The assumption has always been that the carrot of college credit would be strong motivation for successfully completing a subject. Because of faculty requirements regarding faculty/student contact. we do not offer MIT credit for our self-study subjects, though that policy may change in time. It's interesting to note that students who have taken our subjects don't seem to attach the importance to credit we first assumed (Figure 3).



"Taking this self-study subject has been a worthwhile experience in terms of the time and effort it took."

# Figure 4

criteria as promotion rates or salary levels. But even these would be subject to many other variables. How then is one to judge the specific benefit to be derived from having renewed and deepened one's understanding of calculus or having learned the elements of probability theory and its ubiquitous applications? Most psychologists, I believe, would agree that one has to fall back on subjective reactions from the students. We asked our students whether they felt taking one of these subjects had been a worthwhile experience in terms of the time and effort required (and let me point out that each of our first two subjects has required well over a hundred hours of the student's time). The affirmative response indicated in Figure 4 leads us to believe we're on the right track.

# UF-UBA Total Still Increasing

The Institute's United Fund/ United Black Appeal campaign has officially ended with contributions totaling \$125,706.23. Of this total, \$106,864.99 will be sent to the United Fund and \$18,841.24 will go to the United Black Appeal. Donations were made by 4,086 members of the community.

Even though the campaign has ended, donations are still being accepted. We are very close to meeting last year's total of \$127,976, so anyone who has not yet contributed should fill out his pledge card and send it to his department solicitor or directly to Sandra Holland in Room E19-238.

# Students Warned About Buying

them almost equal status with the lectures and the text for presenting key concepts.

Quizzes. At the end of each block of six or seven units -- say a month's work at the typical rate of one-and-a-half to two units per week-the study guide provides the student with a quiz, testing his comprehension of all the material covered in the block. As in the case of the homework problems, complete solutions to the quiz problems are to be found in the back of the study guide. And, incidentally, since the study guides are bound with a so-called 'comb" binding, there is nothing to prevent a plant instructor, training director, or other super-

#### Conclusions

It is difficult to assess the sucess or failure of our self-study subjects this early in any objective way. One could presumably wait a few years and then look at such

# Term Papers

The Faculty-Student Committee on Discipline, being appraised of the availability of commercially prepared term papers, would like to remind students that

... the attempt of any student to present as his own any work which he has not performed or to pass any examinations by improper means is regarded by the Faculty as a most serious offense and renders the offender liable to immediate expulsion. The aiding and abetting of a student in any dishonesty is also held as a grave breach of conduct.

> Page 203 71-72 MIT Bulletin

# Alpha Phi Omega Promotes Service, THANK YOU FOR Friendship, Leadership in Activities CLeaning UP OUR

# By Linda Omohundro

Service, friendship, leadershipthese are the by-words of the national service fraternity Alpha Phi Omega (APO).

Explaining the underlying philosophy of the organization, Dick Fletcher '72, president of MIT's Alpha Chi Chapter of APO, says, "Service-that's what we do; friendship-APO members work together to help other people and have fun doing it; leadership--through our service projects, we learn the gentle art of making something happen." The Institute's APO chapter was

chartered in 1936 and this year has about 65 active undergraduate and graduate members. Although APO is traditionally a fraternity, the MIT chapter has been coed since the fall of 1970. The national organization does not officially recognize women "brothers," so the girls are known as "auxiliary members" of Alpha Chi.

On campus APO is readily linked with the annual Ugliest Man on Campus Contest and the student-organized Blood Drive, but their activities are much more extensive. During Residence/

Orientation Week in September, APO mans an information booth in the Student Center for incoming freshmen. On Registration Day they handle clerical work involved in processing students' registration material. Then, of course, there are the popular book exchanges in the MacLaurin Lobby at the beginning of each term.

Working with other campus-organizations, APO also supports Kaleidoscope, Open House, Parents Weekend and the Big Screw Contest, to name just a few. APO members are actively involved in the planning stages and execution of most campus-wide activities.

# Army ROTC Allows Freshmen to Enroll during Second Term

The MIT Army ROTC Program will now enroll freshmen during the second semester of the academic year rather than during only the first semester.

The policy change was brought about by a new draft law which grants MIT ROTC officials the authority to give 1-D deferments. These deferments delay military duty indefinitely in anticipation of future service, to all cadets enrolled in the program. Students who receive this deferment can finish at least their undergraduate education before being called for active duty. The same advantage also applies to individuals who do not yet have a draft number, since enrollment in the program during the first two years is purely voluntary and may be terminated at any time.

ROTC officials also indicated that juniors and graduate students can be considered for enrollment in the two-year ROTC program

# Groups to Sponsor Sales of Art Items

Attention art buffs--there are three art sales coming up next week, just in time for last-minute Christmas shopping.

First, the Committee on the Visual Arts is sponsoring its annual Christmas print sale and exhibition in the Hayden Corridor Gallery from Monday, December 13 through Monday, December 20. Various types of original graphics will be offered, including lithographs, etchings, woodcuts, silk

starting in September, 1972, with these cadets also receiving the 1-D deferment.

Completion of an ROTC Program results in a commission as a Second Lieutenant with an active duty committment of from three months to two years. Opportunities for advanced degrees are also available, since virtually all newly commissioned officers can receive active duty delays to further their educations.

# Bush to Speak at Convocation

The annual Christmas Convocation will be held next Tuesday, December 14, at 11am in Kresge Auditorium. The featured speaker, Dr. Vannevar Bush, will be joined by President Wiesner, Dr. Harold Edgerton and UAP Bob Shulte in extending holiday greetings to the community

The Brass Choir and John Cook, Institute organist, will be on hand to play traditional Christmas music. The convocation will be followed by caroling and refreshments in the lobby.

Everyone in the community is invited to attend and share in the festivities. Classes will be suspended from 11am until noon to enable students to join the celebration.

# Chekov Classic to Be Performed The MIT Community Players

will present Anton Chekov's classic drama The Sea Gull in Kresge Little Theatre Thursday through Sunday, December 9-12, and Wednesday through Saturday, December 15-18. All performances will begin at 8:30pm.

Some of APO's smaller campus projects include ushering in Kresge Auditorium, conducting surveys for the Planning Office, trick-ortreating for UNICEF on Halloween, selling refreshments at the Massachusetts State Science Fair in Rockwell Cage (Dick says, "Cotton candy is a real money-maker"), and posting the New York Times in the lobby of Building 2 every morning. APO was also involved in the recent recycling project.

Alpha Chi also extends their services beyond the confines of the MIT campus. One of their largest projects is a swimming program for Boy Scouts in the Boston and Cambridge area. Several APO members, most of whom are certified water safety instructors, conduct beginning and intermediate swimming as well as life saving lessons for more than 100 young boys. The classes are held in the Alumni Pool on Saturdays, beginning in January. Most of the Boy Scouts come to these pool sessions in hopes of passing the qualifications for merit badges in swimming.

"Saturday projects" are probably APO's most worthwhile activities. Every weekend during the school year they volunteer their services to community projects throughout the metropolitan area. They chop down trees, put new roofs on cabins and paint whatever needs a fresh look at Boy or Girl Scout camps. They roll up their sleeves and clean, paint or help refurbish rundown houses or apartment buildings. And they also do a lot of work in local hospitals.

"A few weeks ago we went to Boston City Hospital," Dick says. "They asked us to wash the walls in the ambulance garage and it took several applications of detergent and straight ammonia to get down to the paint. The next day we still smelled like ammonia." APO tackles a wide variety of projects, but tutoring is excluded. Dick explains, "We emphasize group rather than individual effort in our activities. Tutoring is a fine thing, but its effectiveness depends on a one-to-one relationship. Some APO people are involved in tutoring programs, but we do not sponsor them as a group.' Finding people who need volunteer help isn't difficult. "Some of our best customers call us and ask for help," Dick comments. "Others write to us, or we hear about places that need help. The United Community Services puts out a useful



One of the thank you cards APO recently received.

list of agencies that need volunteers.'

Although most projects are initiated by Alpha Chi, some are sponsored by the national APO. One of these is called "Architectural Barriers." Basically, this project provides helpful information for handicapped persons, particularly those confined to wheelchairs, about special ramps and other access points to buildings in a given area. APO has made a survey of the Institute and will soon publish a map indicating the locations of ramps and elevators in the campus complex. They also helped conduct a similar survey of downtown Boston for the Easter Seals Society

Most of APO's activities are work-oriented, but they would like to place more emphasis on people because, as Dick says, "Working with people is much more rewarding than painting walls." Possible projects along this line include distribution of food to welfare recipients, taking inner-city children to a camp, and helping administer new Boy Scout troops. Being a member of APO isn't all work and no play. Members get together for parties, steak fries, bike hikes, theater parties and mountain climbing trips. And once a year, usually in the spring, they descend upon Week's Dairy in Laconia, New Hampshire, for an ice cream eating contest. Dick explains, "They've got this special dish called the Mount Washington --scoops upon scoops of ice cream and lots of different sauces. Everyone orders one and then a few hearty eaters go on for more. I think the record stands at three."

--Photo by Margo Foote

In addition to letters of gratitude for their services, APO also receives "fan mail"--recently a stack of children's drawings arrived at the office from a school in Randolph. The fourth graders had been asked to draw their idea of what APO does. Some of the drawings are quite imaginative-one youngster drew a heap of trash and wrote "Thank you for cleaning up our world." Dick reports that APO plans to draw some cards of their own to send back to the children.

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Ty Rabe Business Manager

screens and some three-dimensional multiple editions.

Then, from Wednesday, December 15 through Saturday, December 18, the Student Art Association will hold its annual art sale on the second floor of the Student Center. Benefiting the individual students, the sale will feature pottery, tie dye, jewelry, prints and photographs.

And finally, an Environmental Graphics Sale will be held in the lobby of Building 10 from Wednesday, December 15 through Friday, December 17. Sponsored by the Recycling Revolution Cooperative, the sale will include original silkscreen posters selling for \$2 or less.

The Sea Gull is one of Chekhov's most interesting plays as it deals very directly with the artist. The creative instinct, the urge for self-fulfillment, and the desire for freedom from the confinement of mediocrity are intertwined with romance and basic human flaws. The result is a finely woven combination of comedy and tragedy.

Tickets are \$2.50 for all performances. Reservations may be made at the Kresge Box Office or by calling Ext. 4720.

Paul E. Johnson

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Please address all news and comment to the Editor, Room 5-111, Ext. 3277.

# THE INSTITUTE CALENDAR

December 8 through December 17

# **Events of Special Interest**

# Corporation Joint Advisory Committee (CJAC) Discussion of Simplex/Northwest Area Development. Thursday,

Discussion of Simplex/Northwest Area Development. Thursday, December 9, 7:30pm, Rm 10-105.

# Poetry Reading \*

Jean Valentine. Thursday, December 9, 8pm, Rm 14E-304. Free. Refreshments.

# Class of '74 \*

Candy Cane Day. Monday, December 13. Bldg 10 Lobby.

# Seminars and Lectures

# Wednesday, December 8

Linguistic Considerations in Text-to-Speech Conversion \* Prof. Jonathan Allen, electrical engineering. Cognitive Information Processing Group Seminar. 12n-1pm, Rm 20B-224.

# Unidirectional Solidification of Metal Composites

Prof. M.C. Flemings, metallurgy and material sciences. Ceramics Seminar. 1pm, Rm 10-105.

# Digital Synthesis of Nonlinear Filters

Prof. K.D. Senne, U.S. Air Force Academy. Decision and Control Sciences Group Seminar. 3pm, Rm 39-500.

#### Function and Mandibular Growth

Dr. Robin M. Rankow, School of Dental and Oral Surgery, Columbia University. Oral Science Seminar. 3-5pm, Rm E18-301.

## Seminar on China

Prof. Lucian W. Pye, political science and Center for International Studies. 3-5pm, Rm E52-361.

# Nuclear Reactor Safety: Emergency Core Cooling in Light Water Reactors \*

Prof. Norman C. Rasmussen, nuclear engineering. 3:30pm, Rm 9-150. Coffee, 3pm.

# **Urban Emergency Services**

Prof. Richard C. Larson, electrical engineering. Decision and Control Sciences Group Seminar. 4pm, Rm 39-500.

## **Relativistic Dirac-Flock Atomic Structure Calculations**

Dr. J.P. Desclaux, CEA (Paris) and Northwestern University. 4pm, Rm 26-414.

# Mixed Volatiles in Regional Metamorphism

Prof. Philip M. Orville, Dept of Geology and Geophysics, Yale University. Earth and Planetary Sciences Colloquia. 4pm, Rm 54-100.

# Thursday, December 9

National Policy for Local Planning in Brazil P. Schweizer. SPURS Seminar. 1-3pm, Rm 9-351.

# Future Directions of Thermodynamics \*

Panelists: Professors E.P. Gyftopoulos, G.N. Hatsopoulos, J.C. Keck, J.H. Keenan, and R.E. Stickney. Thermodynamics Seminar. 2pm, Rm 3-370.

Possibility of High Resolution Electron Optics Using Foil Lenses \* Edward H. Jacobsen, Physics Dept, University of Rochester. Electron and Ion Optics Seminar. 3pm, Rm 26-217.

## Some Directions for MIT Education \*\*

Prof. Kenneth M. Hoffman, chairman, Commission on MIT Education. Lincoln Lab Lecture. 3:30pm, Lincoln Lab Cafeteria.

# Man and Society in the Biblical Period

Prof. S. Talmon, Hebrew University and Brandeis University. Hillel Morris Burg Memorial Lecture. 7:30pm, McCormick Green Living Rm.

# Friday, December 10

Needs and Directions in MIT Education \* Prof. Hartley. Rogers, Jr., chairman, Special Task Force on Education. Education Research Center Colloquium. 12n, Rm 10-105.

The Effects of Gibbs Absorption on Marangoni Instability \* J. Ross, graduate student, chemical engineering. 2pm, Rm 10-275.

# Sugar Uptake in Yeast \*\*

**Dr. Vincent P. Cirillo**, Dept of Biology Sciences, State University of New York. General and Applied Microbiology Seminar. 3pm, Rm 16-310.

#### Enzymatic Hydrolysis of Cellulose \*

B. Van Dyke, graduate student, chemical engineering. 3pm, Rm 10-275.

# Some Remarks on the Hubbard Model \*

Dr. Elliott Lieb, mathematics. Materials Science and Engineering Colloquium. 4pm, Rm 10-105. Refreshments, 3:30pm.

# Qualitative and Quanitative Thoughts on the Relations between Science, Technology, and Society

Dr. Derrick Desolla Price, Avalon Professor of History of Science and Medicine, Yale University. Moderator: Ascher H. Shapiro, head, mechanical engineering. Respondents: Robert Cohen, professor of History of Science and dean of the College of Liberal Arts, Boston University; Prof. Donald G. Marquis, organizational psychology and management, Sloan School. Technology and Culture Seminar. 5:15pm, Rm 9-150.

# Monday, December 13

## Finite Difference Energy Models vs Finite Element Models \*

**Dr. David Bushnell**, Structural Mechanics Laboratory, Lockheed Palo Alto Research Laboratory. Aeronautics and Astronautics Special Seminar in Structural Mechanics. 3-4pm, Rm 35-225. Coffee, 2:30pm, Rm 33-206.

# Nuclear Engineering Doctoral Seminars \*

Studies on the Consequences of a Hypothetical PWR Pressure Vessel Rupture, P. Doan; Vapor Explosions in the Safety Analysis of Sodium Cooled Reactors, M. Kazimi; The Value of Recycled Plutonium in Pressurized Water Reactors, H. Spierling. 3-5pm, Rm NW12-222.

Wave Reflection and Transmission at Permeable Breakwaters Charles Sollott, research assistant, civil engineering. Water Resources Seminar. 4pm, Rm 48-316. Coffee, 3:30pm, Rm 48-410.

Magnetohydrodynamics and Rarefied Gas Dynamics \*\* Fluid Mechanics Films. 4-5pm, Rm 3-270.

#### How the Milky Way Got Bent \*

Prof. Alar Toomre, mathematics. Applied Mathematics Colloquium. 4pm, Rm 2-390.

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Tuesday, December 14

A People-Mover for Columbia Point \* Urban Laboratory in Mechanical Engineering Class. Mechanical Engineering Seminar. 12:30-2pm, Rm 1-114.

Defense Issues in the 70's and the Role of Technology \*\* Dr. Stephen J. Lukasik, director, Advanced Research Project

# Wednesday, December 15

#### Lunch-Seminar on Yugoslavia

Robin Remington, Center for International Studies. 12n-2pm, Faculty Club.

Technical and Economic Status of Nuclear Power Plants \* Prof. Manson Benedict, nuclear engineering. Electric Power Systems Engineering Laboratory Seminar. 3pm, Rm 3-133.

Combined State and Parameter Estimation for On-Line Applications Peter S. Maybeck, aeronautics and astronautics. Doctoral Thesis Seminar. 3pm, Rm 33-206.

# Mechanisms of Cleft Palate Formation

Dr. A. Carl Verrusio, Division of Developmental Biology, American Dental Association. Oral Science Seminar, 3-5pm, Rm E18-301.

Some Aspects of the Interaction of Group Theory and System Theory

Alan S. Willsky, graduate student, aeronautics and astronautics Decision and Control Sciences Group Seminar. 4pm, Rm 39-500.

# The Origin of Metal-Bearing Submarine Hydrothermal Solutions

Dr. John B. Corliss, Dept of Geology and Geophysics, Yale University. Earth and Planetary Sciences Seminar. 4pm, Rm 54-100.

#### Pulsars

Prof. Thomas Gold, Cornell University. Special Astrophysics Seminar. 4:15pm, Rm 37-252. Coffee, 4pm.

# Thursday, December 16

#### The Design of Abstract Machine Models and Their Programming Languages \*

**Prof. W.M. Waite**, University of Colorado. Project MAC Seminar 3:30pm, 545 Tech Sq, 5th floor, Conference Rm. Coffee, 3pm.

#### Parenteral Alimentation in Children \*

Dr. Robert Filler, Associate Clinical Professor of Surgery, and Dr. John Das, Lecturer in Surgery, Children's Hospital. Nutrition and Food Sciences Seminar. 4:30pm, Rm 16-134. Coffee, 4:15pm.

# The Head on the Shield of Pallas

Prof. Jerome Y. Lettvin, biology. Physics Colloquium. 4:30pm, Rm 26-100. Punch and cookies, 4pm, Rm 26-110.

## Friday, December 17

Reflections on Attica, Prison, and Justice \* Tom Wicker, associate editor, New York Times. Educationa Research Center Colloquium. 12n, Rm 10-105.

Mass Transfer with Reversible Reaction through Thin Films \* J. Meldon, chemical engineering. 2pm, Rm 10-275.

Nickel-Zinc Batteries \* O. Hammond, chemical engineering. 3pm, Rm 10-275.

# **Student Meetings**

Student Information Processing Board Meeting Every Monday, 7:30pm, Rm 39-200.

Thursday Staff Meeting \*\* Every Thursday, 8pm, 2nd floor, Walker.

Technique Staff Meeting Every Saturday, 11am, Student Center Rm 457.

# Fate of the Sympathetic Nerve Transmitter Noradrenaline

**Dr. Julius Axelrod**, chief of pharmacology, Laboratory of Clinical Science, National Institute of Mental Health, and 1970 Nobel Laureate in Medicine. Fourth Mayer Lecture in the Life Sciences. 4pm, Rm 54-100.

#### Prediction of Fluctuating Road Traffic Noise \*

Dr. Ulrich J. Kurze, senior scientist, Bolt, Beranek and Newman, Inc. Interdepartmental Acoustics Seminar. 4pm, Rm 5-134. Coffee, 3:30pm, Rm 1-114.

#### Tacit Assumptions in Fundamental Particle Physics

Dr. Maurice Goldhaber, Brookhaven National Laboratory. Physics Colloquium. 4:30pm, Rm 26-100. Tea, 4pm, Rm 26-110.

# Techniques of Modern Reliability Analysis \*

Prof. Martin L. Shooman, electrical engineering. Operations Research Center Seminar. 4pm, Rm 24-307. Refreshments following, Rm 24-219.

New Approaches to the Analysis of Connecting and Sorting Networks

Michael J. Marcus, Research Laboratory of Electronics. Communication Theory Seminar. 4-5pm, Rm 26-310.

Fluid Dynamics of Drag (Parts 1 and 2) \*\* Fluid Mechanics Films. 4-5pm, Rm 3-270. Agency. Lincoln Lecture. 3:30pm, Lincoln Lab Cafeteria.

#### The Evolution of Heterostructure Semiconductor Lasers \* Dr. M.B. Panish, Bell Telephone Laboratories. Materials Science and Engineering Lecture. 4pm, Rm 3-133. Refreshments, 3:30pm.

# Estimating a Budget Plan for a University Campus \*

Prof. Robert Oliver, operations research, University of California. Operations Research Center Seminar. 4pm, Rm 24-307. Refreshments, Rm 24-219.

# The Role of the Transportation Systems Center in the United States Department of Transportation \*

James C. Elms, director, Transportation Systems Center, U.S. Department of Transportation. Aeronautics and Astronautics Seminar. 4pm, Rm 35-225. Coffee, 3:30pm, Rm 33-206.

#### Transient Flexural Vibrations of Ship-like Structures Exposed to Underwater Explosions

**Dr. George Chertock**, Naval Ship Research and Development Center. Ocean Engineering Seminar. 4pm, Rm 3-270. Coffee, 3:30pm, Rm 5-314.

#### Galactic X-Ray Sources

Dr. Harvey Tannabaum, ASE. Astrophysics Seminar. 4:15pm, Rm 37-212. Coffee, 4pm.

# Tech Engineering News Staff Meeting

Every Sunday, 5pm, TEN Office, Student Center Rm 453.

# ERGO Staff Meeting Every Sunday, 6pm, Student Center Rm 443.

# MIT Club Notes

# Book of the Week \*

Informal discussion over dinner of *Post-Scarcity Anarchism* b Murray Bookchin. Wednesday, December 8, 5:15-7:15pm, Ashdow Dining Hall (table near door). Call James Snell, 523-1198.

#### Hellenic Student Association \*\*\*

Dinner meeting with Prof. Michael Athans. Wednesday, December 6pm, Ashdown House, Fabian Rm.

# Tech Dames \*\*\*

Arts and crafts for children. Wednesday, December 8, 8pm, Studer Center Mezzanine Lounge.

# Hobby Shop \*\*

Open weekdays, 10am-4:30pm, duPont Gym basement. Fee students, \$6/term or \$10/year; community, \$15/year. Call X434

# REPORT Of The SPECIAL TASK FORCE On EDUCATION

Massachusetts Institute of Technology December 8, 1971

# **Members:**

Anthony P. French Robert G. Gallager Frank Press Benson R. Snyder Sheila E. Widnall Robert Halfman (for CEP) Hartley Rogers, Jr., Chairman



# \*1. History

The Special Task Force on Education was appointed in March 1971 by Howard Johnson (President of M.I.T.), Jerome Wiesner (Provost of M.I.T.), W. Ted Martin (Chairman of the Faculty at M.I.T.), and Kenneth Hoffman (Chairman of the Commission on M.I.T. Education). We present our report herewith. We were asked to consider and formulate proposals regarding education at the Institute. Our appointment grew out of the work and recommendations of the M.I.T. Commission. We were asked to conduct our deliberations in the light of the Commission's report, and in the light of the response and discussion which followed the Commission's report; and we were asked to bring, ultimately, specific recommendations to be laid before the faculty. We owe a special debt to the M.I.T. Commission. Our work has been a projection and extension of the Commission's work, and we have benefited greatly from the momentum and the climate of lively interest generated by the Commission's work. Consultations with individual members of the Commission have been most helpful, and the thinking, arguments, and conclusions of the Commission's report have had direct and major influence on our work.

The specific charge given to us at the time of our appointment was as follows:

"The Commission Report has cited a variety of educational problems which strongly influence the character and quality of undergraduate education at M.I.T. It has drawn particular attention to the first and second years, citing the importance of these years as style setters for the overall quality of undergraduate education, drawing attention to the increasing importance of the high-school -- college transition, and urging that mechanisms be considered for permitting and encouraging the most effective exercise of the faculty's responsibility as a whole for these years. Subsequent discussion in faculty meetings and in the Faculty Council has highlighted a number of specific academic and administrative issues that must be addressed as the next step in the consideration of the Commission proposal. The task force is therefore charged with:

"1) Determining the need for an improved, more efficient process for dealing with these problems.

"2) Examining and evaluating explicit proposals, such as the horizontal Division and the Educational Research Division, for their potential for meeting that need.

"3) Examining explicitly how any new initiative would enhance opportunities for educational innovation and would relate to the various Departments.

"4) Formulating an action plan for any specific proposals that should result from the task force activities including motions to be brought before the faculty early in the 1971 Fall Term."

Our Task Force had, initially, six members: Anthony P. French, Professor of Physics and Associate Head of the Department of Physics; Robert G. Gallager, Professor of Electrical Engineering; Frank Press, Shrock Professor of Geophysics and Head of the Department of Earth and Planetary Sciences; Benson R. Snyder, Professor of Psychiatry and Dean for Institute Relations; Sheila E. Widnall, Associate Professor of Aeronautics and Astronautics; and Hartley Rogers, Jr., Professor of Mathematics and Chairman of the Task Force. The Task Force was joined by Robert Halfman, Professor of Aeronautics and Astronautics, Deputy Head of the Department of Aeronautics and Astronautics and Associate Chairman of the Faculty, for the purpose of liaison between the Task Force and the Faculty Committee on Educational Policy. Professor Halfman has participated throughout our work as a full member of the Task Force.

Professor Daniel S. Kemp, Professor John G. King, Professor Thomas B. King, Professor Daniel J. Kleitman, Professor Walter A. Rosenblith, Professor Edgar H. Schein, Professor Steven R. Tannenbaum, Professor Rainer Weiss, Professor Victor F. Weisskopf, Professor Jerrold R. Zacharias.

Student Advisory Committee. (as appointed, spring 1971): Stephen Cochi VII,2; Phyllis Fishman XVIII,3; George Flint XV,3; Edward Krauss VI-1,2; Peter Messeri XI,3; Kenneth Minneman 1; William Orchard 1; Stephen Reuys 1; Stanley Wiley VI-1,2; Stan Zietz XVIII,3.

Both Advisory Committees brought wide additional experience to their consultations with the Task Force. The Student Advisory Committee represented a variety of experience and viewpoints, and was fortunate to include among its members several authors of the report and commentary prepared by the Student Committee on Educational Policy (S.C.E.P.) on the report of the M.I.T. Commission. The Faculty Advisory Committee included members with extensive experience at all levels in teaching, research, and administration.

Our Task Force met intensively during March, April, and May of 1971. We held some meetings by ourselves and some meetings in which we interviewed selected members of the M.I.T. community. No attempt was made, in the limited available time, to meet with all important figures in the Institute's educational undertakings. Instead, we tried to choose appropriate representatives from a variety of intererests, experiences, and points of view. We also met with our Student and Faculty Advisory Committees. We discussed our work, and our tentative conclusions, with these groups.During the summer we met for one week in July to consider further our conclusions and our prospective report. In early October, during the Inaugural Week, we took part in a forum discussion of our tentative conclusions and recommendations with members of the community. We have also met further with our Advisory Committees and have drawn upon other experiences and resources in the M.I.T. community.

The experience of our own Task Force members at M.I.T. has included the following: membership in the M.I.T. Commission; participation in the major experimental education programs in the first two undergraduate years; experience with teaching and curriculum development in large, basic courses; participation in the Education Research Center; current membership in the Committee on Educational Policy (C.E.P.) and experience on other major standing committees of the faculty; planning for the first Independent Activities Period (January 1971); participation in the Institute's central administration; experience in the Institute's counseling services; and organization and planning of research and teaching at the departmental level.

In addition to our special debt to the M.I.T. Commission, we acknowledge other important resources in our work. These have included: the current experimental programs in the first two years (the Experimental Study Group, and the Unified Science Study Program); the Hansen committee on experimental education (under the C.E.P.); the Education Research Center (E.R.C.); the Undergraduate Research Opportunities Program (U.R.O.P.); and the S.C.E.P. We have used both written documents and direct consultations from these resources. We have also benefited from a variety of other sources, reports, organizations, and programs. We are grateful for this help as well as for the help of our own Advisory Committees.

We are happy to acknowledge material and staff support supplied to us by the M.I.T. Commission.

Our Task Force worked in conjunction with a Faculty Advisory Committee and a Student Advisory Committee. These Advisory Committees were appointed at the same time as the Task Force. Their members were as follows.

Faculty Advisory Committee. (including, exofficio, the members of the C.E.P. for 1970-71): Dean Robert A. Alberty, Professor Stanley Backer, Professor Richard L. Cartwright, Professor Richard M. Douglas, Professor Franklin M. Fisher, Professor Frederick W. Frey, Dean Paul E. Gray, Professor Leon B. Groisser, Professor Robert L. Halfman, Professor Kent F. Hansen, Professor Daniel M. Holland, Professor Vernon M. Ingram,

# \*2. Summary of Conclusions

A number of educational questions and decisions face the Institute at the present time. These include, for example, such matters as requirements, the grading system, and early admission. In our initial discussions, we took up a broad range of such questions. We soon become convinced, however, that three major problem areas take precedence over the rest, and that appropriate and successful initial steps in these three areas can help with subsequent answers in other areas. Our conclusions and recommendations are briefly summarized in the paragraphs below and are then discussed in more detail in the remaining three sections of the report.

We believe that the following three major areas of need exist at the present time.

I. A need, within the framework of the regular academic program, for a means by which students and teachers can come together, individually or in small groups, to work and learn in circumstances that provide for a higher and more genuine level of interaction than is usually possible in the conventional classroom situation. Such interactions can be conceived of in a wide variety of forms, and may be project-oriented or problem-centered in nature.

II. A need, within the Institute community, for a higher and more significant involvement on the part of the faculty, students, and administration, in the planning, evolution, content, and philosophy of the general undergraduate academic experience. More effective communication, commitment, and work in this regard are needed at all levels of the community.

III. A need for a framework within which the Institute can most effectively use and develop its existing and potential capabilities, among faculty, staff, and students, in the area of education research. Such research can be both academic and action-oriented, and can be directed at a variety of national, local and Institute needs.

We make three recommendations as first steps in meeting these three needs. These recommendations do not, in and of themselves, meet the needs. Each need has dimensions not covered by its recommendation. In our best judgment, however, each recommendation is a good first step towards establishing a situation and climate within which the need can be more fully met.

The three conclusions and recommendations can be briefly stated as follows. They are discussed in more detail in the remaining sections of the report.

I. We believe that the undergraduate curriculum should give a greater and more central emphasis to educational experiences in which students and faculty members meet and work in contexts similar to that in which a faculty member carries out his own work and that in which a student might expect to pursue a later career. We speak of such educational encounters as "seminar-research experiences." We believe that M.I.T. has the resources to provide a wide variety of such experiences, beginning in the freshman year. These experiences would be a central and notable feature of the M.I.T. undergraduate program.

II. We believe that increased diversity, current needs, and continuing innovation in the undergraduate curriculum require the establishment of a new organizational means by which, in conjunction with the faculty standing committees, the faculty can exercise its overall responsibility for the Institute's undergraduate educational program and arrive at appropriate decisions concerning this program. We recommend that M.I.T. establish an "Office for the Undergraduate Academic Program" to be headed by a new administrative officer, the "Dean for the Academic Program." This Office would help to provide administrative continuity and, most important, an intellectual focus, for the faculty's exercise of its undergraduate educational responsibility. The Office would include a faculty "Executive Committee" appointed by the President.

III. We believe that it is appropriate, at the present time, for M.I.T. to make a more formal commitment to programs in education research. Such efforts might eventually include curriculum research and development at all levels, learning research in its psychological, sociological, and neurophysiological aspects, studies of educational organization and policy, and a variety of problem-centered efforts in response to national, local, and M.I.T. needs. We recommend that M.I.T. develop an "Education Division" for the organization, coordination, and support of such programs. The Division would be a "horizontal structure" interacting at many points with the Institute's other research and educational activities. In our opinion, M.I.T. already has significant resources, both in interest and in talent, for programs in such a Division.

carry them out. In the sections which follow, we try to convey both the details and the essential spirit of our recommendations. For their success, the Institute must recognize and accept this essential spirit, and must involve individuals of the highest abilities.

# \*3.Seminar-Research Experience

We believe that the undergraduate curriculum should give a greater and more central emphasis to educational experiences in which students and faculty members meet and work in contexts similar to that in which a faculty member carries out his own work and that in which a student might expect to pursue a later career. We speak of such educational encounters as "seminar-research experiences." We believe that M.I.T. has the resources to provide a wide variety of such experiences, beginning in the freshman year. These experiences would be a central and notable feature of the M.I.T, undergraduate program.

Each seminar-research experience would involve one or more members of the faculty together with a single student or a small group of students. The seminar-research experience would be available in the student's first year at M.I.T., and in the upperclass years as well. It is expected that in some cases, a student's participation in a given seminarresearch experience might continue for several years.

A seminar-research experience would normally occupy about 25 percent of a student's time during a term in which he took it.

In the freshman year, a student working with a faculty member would normally have that faculty member as his freshman advisor. (The Task Force believes that when it is possible and convenient, a student's advisor should be drawn from among those teachers with whom he is working closely.)

The criterion for, and characteristic feature of, the seminar-research experience would be the quality of the interaction occurring between student and faculty member. We expect that this interaction could occur in a wide variety of forms, and would, in all cases, involve active participation and contribution by the student. The experience might or might not involve participation in research. It could involve joint study in an area new to both faculty member and student. In all cases, it would have a focus, a level of learning, and a quality of intellectual activity appropriate to a university.

In one form, it could be participation in the research work of a laboratory. In another form, it could be a seminar encounter similar to certain existing freshman seminars (those seminars which are more than small lecture classes, and in which continuing student-faculty interaction occurs). In still another form it could be participation in work outside the Institute (in business, government, a laboratory, or a service organization, for example). It may also center on a project conceived and initiated by the student.

A wide variety of such experiences can be described, and many examples can be found at the Institute at the present time. No brief listing can exhaust the varieties of format and style within which such experiences can occur. We believe that appropriate forms of such interaction should be sought within all schools and departments of the Institute.

Several programs now in existence at M.I.T. incorporate faculty-student interactions of the kind proposed here. Indeed, both the Freshman Seminar Program and the U.R.O.P. can in certain respects, be viewed as successful pilot programs for the present proposal. In its two years of existence, the U.R.O.P. has brought together a large number of students and faculty in a wide variety of situations. In the fall term of 1970, the number of students taking advantage of the U.R.O.P. as a source of funds, information, or academic credit, in order to set up a research experience exceeded 550. In the spring of 1971, this number exceeded 1000. In the fall of 1971, it is expected to exceed 1400. The Freshman Seminar Program has been in existence for 10 years. In the fall of 1971, there are more than 550 freshmen enrolled in this program. E.S.G., and U.S.S.P., and Project Concourse, as full-time experimental programs, are current efforts to foster closer student-faculty interactions. The growth and success of such programs as U.R.O.P. argue not only the need, but also the desirability of giving long-term recognition, support, and faculty involvement to this component of our undergraduate academic program. The development of a program of satisfactory and effective seminar-research experiences will require continuing thought, attention, and experiment. It will be, in many respects, an openended learning process for the Institute. The ultimate variety and balance of the program cannot

be fully predicted. We nevertheless believe that the potential benefits of such a program warrant its development as a central feature of the Institute's educational effort.

In such experiences, the interaction between student and faculty member will become, in some respects, more like the interaction between a graduate student and a faculty member. We emphasize, however, that important differences would remain. The program proposed here would have greater variety and less research emphasis. Moreover, the undergraduate in a seminar-research experience would not have the same degree of specific commitment as a graduate student, and the program would need to provide for easy termination or transfer by the student.

We do not expect that every student would take part in such experiences. We believe, however, that many students would wish to take part, and that the program should be encouraged for as many students as possible.

Can freshmen find room in their schedules for seminar-research experiences? Four aspects of the existing curriculum, of the proposed program, and of the student population, help to provide flexibility in this regard. (i) The new program can be administered to allow a seminar-research experience to be accepted, when appropriate, as satisfying a General Institute Requirement (for example, the laboratory requirement, or a science distribution requirement). (ii) Many students come to the Institute with substantial advanced-standing credit. (iii) The recently introduced self-paced versions of freshman mathematics and physics have given a new dimension of flexibility to the first two undergraduate years. (iv) The existing Freshman Seminar Program and the U.R.O.P. can be incorporated into the new program. Beyond these four aspects, we also believe that changes in the formal General Institute Requirements may well occur in the light of further discussion and further experience with the new program.

Does the faculty have the resources in manpower to provide a program of seminar-research experiences, and how would participation in the program affect the work and duties of a faculty member? Partial answers to these questions are given by the operation of both the U.R.O.P. and the Freshman Seminar Program. Further partial answers are suggested by the following three considerations. (i) Having teachers simultaneously serving as advisors will provide a more efficient overall use of faculty time. (ii) In cases where a student works in a laboratory the increase in total time demanded of a faculty member can be small, although the student will share substantially in the faculty member's time. (iii) We believe that many faculty members will find participation in the program especially positive and rewarding, and that this participation will, in many cases, be related to their own personal exploration of new areas and interests. Beyond these comments, we also believe that if the basic worth of the program is accepted by the departments and by the faculty, some redirection of teaching efforts will follow.

We recommend that the program of seminarresearch experiences be supervised by the Dean for the Academic Program (see \*4). The Dean's Office would actively seek proposals for various versions of the seminar-research experience in the light of general faculty and C.E.P. guidelines. It would supply special funds in support of certain seminarresearch experiences; it would provide appropriate forms of coordination and communication within the program; it would help organize the enrollment and scheduling of student and faculty participation; it would oversee the continuity of the program into the upperclass years; and it would help establish policies under which seminarresearch experiences could be used to satisfy

These three recommendations are described and discussed more fully in the sections which follow. We emphasize that they are only first steps in a process through which answers may be found to educational questions facing M.I.T. Later steps will depend upon experience gathered in these first steps. Indeed, the implementation of these recommendations must involve further discussion with faculty, students, and administration. We look forward to participating in such discussions. Our recommendations indicate directions in which M.I.T. can begin to move and develop; they do not offer an ultimate blueprint for M.I.T.'s educational efforts.

We also emphasize that the success of these recommendations will depend, in large part, upon the breadth and commitment of the individuals who certain of the General Institute Requirements.

It will be desirable, we believe, to have interaction between individuals participating in different seminar-research experiences. We therefore suggest that weekly or bi-weekly seminarconferences be part of the program (particularly in the freshman year). Meeting through the term, each conference would bring together a small number of freshmen from different seminarresearch experiences along with corresponding faculty for presentations and discussions on the interests and activities of the participating faculty and students.

What formal and administrative steps are appropriate for developing a program of seminarresearch experiences? We believe that the chief such steps would be the following: the establishment of a single special subject number in each department for seminar-research experiences; the association of an unspecified number of credit units with this subject number (normally, twelve units of credit would be given each term); discussion within each department of the possible kinds and forms of seminar-research experience that could be offered; proposals by each department to the Office for the Undergraduate Academic Program; and action on proposals for seminar-research experiences. Faculty time for the program would be covered through normal budgetary procedures, but some special-purpose supplementary funding would be available through the Dean for the Academic Program.

Development of this program will require a substantial effort, and will be, as we have already noted, a process of learning and experiment for the Institute. We expect that the program would have wide variations in form and approach from department to department and from discipline to discipline. It will also be a fundamental and new departure in M.I.T. undergraduate education, and it will set an example and have implications that reach beyond M.I.T. Within M.I.T., it has the potential for a profound eventual effect on the atmosphere and texture of our undergraduate educational program.

We note, in conclusion, the following further potential advantages. The program can help the Institute become a more efficient research and teaching mechanism by diminishing the disjunction between teaching and research responsibilities in the lives of the faculty and by correspondingly enriching the educational experience of undergraduates. It can more effectively and directly link the education offered by the Institute with the quality and distinction of the Institute's faculty, thereby giving further assurance to prospective students of the special worth of an M.I.T. education. It can provide a participating undergraduate with a physical home (and possibly even a desk) in the working world of M.I.T.

Note. In the discussion of the seminar-research experience given above, we intend "faculty member" to include both regular faculty and other teaching staff.

# \* 4. Dean for Academic Program

We believe that increased diversity, current needs and continuing innovation in the undergraduate curriculum require the establishment of a new organizational means by which, in conjunction with the faculty standing committees, the faculty can exercise its overall responsibility for the Institute's undergraduate educational program and arrive at appropriate decisions concerning this program. We recommend that M.I.T. establish an "Office for the Undergraduate Academic Program" to be headed by a new administrative officer, the "Dean for the Academic Program." This Office would help to provide administrative continuity and, most important, an intellectual focus, for the faculty's exercise of its undergraduate educational responsibility. The Office would include a faculty "Executive Committee" appointed by the President.

In recent years, the need for such an office has become more and more evident. Both students and faculty members have asked searching questions about the present overall pattern of M.I.T. education, and have sought a continuing and responsive expression of its goals. The multiplication of options and the variety of experimental programs in the first two years have placed unexpected demands on existing channels of communication and on existing means for coordination, and, most important, upon the mechanisms by which the faculty seeks to reach informed and appropriate decisions concerning the overall undergraduate program. These decisions include such matters as technological innovation in education, evaluation of educational experiments, and form and content of general requirements. The efforts of the C.E.P., of the schools, of the departments, and of individual faculty members to cope with these needs have been substantial, creditable, and intelligent. In our opinion, however, these needs cannot be met without a specialized, continuing, and full-time focus of both administrative and intellectual concern. As currently organized for meeting its overall responsibility for the form and content of the undergraduate program, the faculty is, in effect, an organization which has a board of trustees (the C.E.P. and other part-time standing committees of the faculty) but which has in one crucial area of responsibility (namely, its responsibility for the overall form of the undergraduate program) no senior management to assist in coordination, communication, and innovation and to help implement and monitor policies. Faculty committees, with strong support from the Institute administration, have done remarkably well, and the Institute has benefited from a general faculty concern with undergraduate education. Moreover, individual Deans and other academic officers have made major contributions. Nevertheless, a basic organizational need exists, and evidence of this need has, in our opinion, become more and more clear.

While our discussion and recommendations largely relate the specific duties of the Dean for the Academic Program to general responsibilities of the faculty, we hope and expect that his activities will bring about a broadly based concern, at all levels of the community, with the form and content of the undergraduate academic program. Moreover, we believe that he can assist the President of the Institute in providing significant leadership in this area, and that, for this reason, it is appropriate that he serve as an administrative officer.

The role of the Dean for the Academic Program, and of his Office, can be described in two ways: first, by an operational view from below which describes specific responsibilities and activities, and second, by an organizational view from above which describes relationships with existing groups and agencies at the Institute.

The operational view. What will the Dean do, and what resources will he have available? His activities can be grouped into six areas.

(1) He would, in collaboration with the academic deans and department heads, help provide coordination and communication within the basic program, and he would help to facilitate and support innovation in this program. In view of rapid change and the multiplication of options in the basic curriculum, we believe that this is an important present need. While most subjects would remain departmentally based, the Dean would have a major role in fostering communication and development and in providing, through his Office and Executive Committee, a central intellectual forum.

(2) He would exercise, in collaboration with the C.E.P., the faculty's overall responsibility concerning experimental educational programs. This responsibility is presently exercised by the C.E.P. and includes: approval of programs for a fixed period; financial support for certain programs; monitoring of programs; and ultimate decisions, on the basis of appropriate evaluations, as to adoption of programs into the regular curriculum. We expect that the Dean's responsibility would also extend to the initiation and organization of certain educational experiments.

(3) He would help to organize and supervise the program of seminar-research experiences described in \*3. This program would absorb the present Freshman Seminar Program and U.R.O.P. and would provide opportunities for seminarresearch experiences in both the freshman and upperclass years. The Dean would be responsible for helping to organize student and faculty participation through appropriate publicity and inquiry, for giving special-purpose financial support where needed (as indicated in \* 3), and for developing, under the C.E.P., appropriate criteria for accepting proposed versions of the seminarresearch experience.

(4) He would maintain, in collaboration with the Committee on Curricula (C.O.C.) and C.E.P., a continuing overview of the intent, form, and content of the General Institute Requirements; and he would assist these committees in the consideration of proposed alternative versions of the General Institute Requirements. He could also help to seek support for such alternatives, and, on occasion, to initiate them.

(5) He would maintain, on behalf of the C.E.P., C.O.C., and Committee on Academic Performance, a continuing overview of the undergraduate academic program. His Office would provide a variety of information and data about the program and its operation to the community, to faculty, to students, to individual teachers, and to individual students. to these committees and, on occasion, to other agencies and individuals as well. The Dean would interact with the C.E.P. on matters of educational policy, innovation, and experimentation. He would interact with both the C.E.P. and C.O.C. on matters relating to the General Institute Requirements, and in implementing and monitoring other decisions and policies of these committees.

We believe that the interaction between the Dean for the Academic Program and the academic deans and department heads would be especially constructive and fruitful. Operational responsibilities would remain in schools and departments as at present. The Dean would work cooperatively with schools and departments in areas of innovation and experiment, and he would help in formulation and expression of faculty-wide educational policies. His office would be a major intellectual resource for the schools and departments in their own educational studies and initiatives.

The Dean for the Academic Program would interact in an especially important way with the Office of the Dean for Student Affairs. This interaction would concern matters of student orientation and counseling that relate to the formal academic program; and, even more important, it would also concern the relationship of the formal curriculum to the student's extracurricular experience at M.I.T. This experience, in living-groups and in a variety of associations with contemporaries and with faculty, has been an increasingly distinctive and valuable part of education at M.I.T. The Office of the Dean for Student Affairs, and a number of other administrative offices, provide notable support for these areas of student life and help to foster a unity among the curricular and extracurricular parts of a student's experience. We believe that the Dean for the Academic Program, as an agent of faculty responsibility for the formal academic program, would work in a responsive and fruitful partnership with these offices.

The Dean for the Academic Program would be advised and assisted by a faculty Executive Committee to be appointed by the President. Its members would be expected to have a significant interest in, and sense of commitment to undergraduate education. Normally, the Executive Committee would include representatives from the C.E.P., from some of the departments teaching major basic courses, and from the Education Division (see \*5.) The Committee would meet frequently, and would also be available for individual day-to-day consultation. We believe that the Committee would provide a valuable source of ideas and sounding-board for the Dean in his work.

The C.E.P. would provide similar support for the Dean. The C.E.P., however, has wider formal concerns and a legislative as well as executive function in faculty affairs.

The Dean's chief duty would be to help the faculty in the exercise of its responsibility for the style and content of the undergraduate academic program. In addition to the above means for providing faculty help in this work, there must also be a direct means by which undergraduate students can provide response, guidance, and advice to the Dean and his Office. We therefore recommend that there be an **Undergraduate Committee** associated with the Dean's Office, this committee to have representatives from each undergraduate class. Moreover, it may be desirable to have some members of this committee also serving as members of the Exective Committee.

As we have indicated, the Dean's Office could supply certain kinds of support and data to the standing committees of the faculty. It could assist in certain routine duties and in helping to maintain on overview of certain committee activities and policy trends.

Students.

(6) He would help to provide information, at suitable levels, for promotion and tenure reviews. This information would concern the contribution of individual staff members to the undergraduate academic program, with special reference to the first two years and to non-departmental portions of the program.

The Dean would require a significant budget for his work, and especially for his responsibilities in the first three areas described above.

The organizational view. The Dean for the Academic Program would be an administrative officer of the Institute at the same level as the Deans of the six Schools. He would be responsible to the Office of the Chancellor.

He would work in conjunction with the faculty and with the standing committees of the faculty (principally the C.E.P.), and he would be concerned with the faculty's overall responsibility for the general undergraduate academic program.

The Dean for the Academic Program would have access, ex officio, to the C.E.P., the C.O.C., and to certain other faculty committees. His Office would serve as a source of information and staff support The Office of the Undergraduate Academic Program would take cognizance of the entire four-

year undergraduate academic program. Its chief concern, however, would be with the first two years and with those parts of a student's program that lie outside his major.

In our opinion, the need for a Dean for the Academic Program rests on no single one of the six responsibilities described in the operational view above. Indeed, the present academic officers and Deans have made major and imaginative contributions to general undergraduate education. Recent innovations in the School of Science have been one example of this. Our recommendation rests, rather, on the sum total of needs described above, and upon the recognition that a basic organizational need exists with respect to faculty responsibility and faculty decisions. We emphasize, moreover, that the chief contribution of the Dean, and of his Office and Executive Committee, will be an intellectual one. Given the evident resources of the M.I.T. community, the benefits that can follow from the establishment of a continuing and specialized intellectual focus of faculty responsibility are indeed great.

There is some virtue in the pluralism of our present educational program. Is there a danger that the Dean would bring about an undesirable uniformity? This is certainly not our conception of his role. We note, moreover, that initiatives and support for educational experiments can come from outside the Dean's office. Of course, ultimate policy decisions about programs would be made by the C.E.P. and the faculty, as at present, and the Dean would participate in these decisions.

Will the Dean in fact acquire the influence and effectiveness foreseen in the discussion above? This will depend on the abilities and stature of the Dean himself. Beyond this, however, the following are implicit in his position as described: budgetary resources for his responsibilities with regard to the seminar-research experience program, experimental programs, and educational innovation; access to the administration comparable to that of an academic dean; access to major faculty committees; access to the promotion and tenure process; and possible delegated powers and encouraged initiatives on behalf of faculty committees. His most important source of influence and effectiveness will derive from the focussed and continuing intellectual concern that he and his Executive and Undergraduate Committees will help to provide.

In comparison with the office of Undergraduate Planning Professor we believe that the Dean would be provided with a more natural, coherent, and inclusive pattern of responsibilities, and that his office would have significantly greater strengths and impact.

We believe that the following criteria are appropriate in the selection of an individual as Dean for the Academic Program.

(i) The Dean should be a person of outstanding accomplishment, widely respected throughout the community.

(ii) The Dean should have a major personal commitment to undergraduate education.

We believe that the Dean's appointment would be a major one for the Institute. We urge that the Institute recognize the intellectual requirement of the office, and that it obtain an individual of the highest abilities.

What specific steps are appropriate for implementing the recommendation? On the part of the administration, these steps include: establishment of the position, allocation of appropriate resources, and appointment of the person. On the part of the faculty, these steps include modification of the faculty rules to take account of the position and relationships described above.

# \* 5. The Education Division

We believe that it is appropriate, at the present time, for M.I.T. to make a more formal commitment to programs in education research. Such efforts might eventually include curriculum research and development at all levels, learning research in its sociological, and psychological, neurophysiological aspects, studies of educational organization and policy, and a variety of problem - centered efforts in response to national, local, and M.I.T. needs. We recommend that M.I.T. develop an "Education Division" for the organization, coordination, and support of such programs. The Division would be a "horizontal structure" interacting at many points with the Institute's other research and educational activities. In our opinion, M.I.T. already has significant resources, both in interest and intalent, for programs in such a Division.

Our recommendation for an Education Division

(i) There has been an increasing interest in educational questions on the part of both faculty and students, and an increasing concern with the possibilities of change and reform.

(ii) There is need for a framework within which the Institute can coordinate and support curriculum research and development at all educational levels. This work can range in emphasis from content and style of curricula to development and use of technical aids. The Institute has the skills and intellectual resources to make major contributions in such research and development.

(iii) Changing concerns and changing career patterns in the scientific and technical professions have given new importance to ways in which an improved understanding of the learning process can help provide better preparation, guidance, and assistance to individuals in times of change.

(iv) In order to obtain a better understanding of the educational and learning processes, we must study these processes in a variety of aspects, including their social, psychological, and physiological aspects.

(v) M.I.T.'s regular programs can benefit from a continuing consultative interaction with individuals and groups whose primary interests lie in research in education and learning. In particular, such persons can be a major consultative resource for the Dean for the Academic Program (see \*4).

(vi) We foresee a broadening and intensification of the Institute's efforts in non-regular education, including such areas as employee education, paraprofessional education, continuing professional education, and community education at all levels. We believe that effective efforts in these new directions require close collaboration with persons whose chief interest lies in education and learning research.

(vii) A crucial requirement for education reform, and for educational efforts in new directions, is that intellectual resources of the highest and richest kind be brought to bear. Such reform and efforts must hence be carried out in a framework which fosters a high level of intellectual interaction with the regular Institute faculty.

(viii) General questions of educational organization and policy in our society are appropriate subjects for research, and are subjects to which M.I.T. can make substantial contributions.

As a university with a special emphasis in science and technology, M.I.T. has already developed significant capabilities in education research and development. We mention, as one example of such capability, the development, some years ago, of a basic, new electrical engineering curriculum to incorporate the technology of semi-conductors. Many other such examples can be given from the Institute's regular programs in recent years. Development of new curricular material in a number of departments (such as Electrical Engineering and Physics) has had an influence far beyond M.I.T. As a somewhat different example, with wide effects outside the Institute, we mention M.I.T.'s role in the development of the P.S.S.C. high-school physics course. In recent years, the Education Research Center has been an active focus of educational experiment and of development of new curricula for use both within and without the Institute. Experimental undergraduate programs such as the Experimental Study Group and the Unified Science Study Program have also given evidence of the interest and capability of individual faculty members in areas of education reform and education research and have helped the Institute to acquire valuable experience about a variety of structured, unstructured, and projectoriented modes in undergraduate education. In the area of continuing education, the Institute has begun to develop experience and ability with such efforts as those of the Center for Advanced Engineering Studies. Finally, we mention the development of innovative and problem-centered approaches to social problems in the educational programs of such departments as Urban Studies and the vigorous and increasing concern with technological aspects of social problems in the educational programs of our engineering departments. We believe that M.I.T. has immense potential resources of skill and interest for meeting the special educational needs that we have described earlier. Moreover, we believe it vital that these resources be developed in a careful and solid plan of growth, a plan which must stress and require a high level of interaction with regular programs and regular faculty of the Institute. Only in this way can such a development both derive strength from, and provide benefits for, the regular programs of the Institute. Such a development will itself be a learning process for the Institute, and it must be carried out with care over a period of time. We therefore recommend the establishment of an Education Division. The Division would have a nucleus of its own faculty and a possibly larger

group of faculty on joint - appointment with regular departments. The Division would have graduate students of its own working for advanced degrees. It would include a number of distinct groups and interests. One of these might be a group concerned with curriculum research and development. Such a group would carry forward and enlarge upon work that is currently being done in the Education Research Center. A second group could be concerned with learning research. It would study educational and cognitive processes with reference to such matters, for example, as possible conceptual reformulations of the learning process; social, psychological and neuro - psychological factors influencing the development of cognitive styles associated with various professions and academic disciplines; and appropriate means for assessing educational innovation. A third group could serve as a research focus in areas of continuing education and would work in close collaboration with whatever operational structures the Institute establishes for the initiation and administration of wider programs of non-regular education. Indeed, some of these operational arrangements might be established within the general framework of an Education Division.

In addition to these groups, we expect that other groups would come into being. Some of these might be of an action-oriented and possibly temporary kind. We expect that all groups within the Division would communicate and interact strongly with each other as well as with the regular departments of the Institute. The Division would, of course, be of important help to the regular departments and to the Dean for the Academic Program, in a continuing reappraisal of the Institute's own educational process.

The Education Division would interact with the Dean for the Academic Program in several important ways. (i) In the area of undergraduate education, we expect that occasional initiatives and support for undergraduate educational experiments would come from the Division. In such cases, interaction with the Dean would occur at two stages: first in a request from the Division for initial approval by the Dean and C.E.P., for an educational experiment in the M.I.T. undergraduate program, and second in an ultimate evaluation by the Dean and C.E.P., and in a consequent decision on incorporation into the regular undergraduate program. In such interactions, the relation between the Dean and the Division would, in some respects, be a relation between buyer and seller. In making his decisions, however, the Dean might seek advice and consultation from sources available in the Division. (ii) In their own research efforts at the undergraduate level, members of the Division might call upon the Dean for advice and information. (iii) In both research and in operational matters, a group in the Division concerned with non-regular education might call upon the Office for the Undergraduate Academic Program for consultation, especially with regard to efforts at a level parallel to that of the M.I.T. undergraduate program.

We recommend that the Division be organized under a Director, and that this Director report to the Provost or Chancellor of the Institute. Proper development of a Division, in the present times of financial stringency, will require the obtaining of substantial new funds for this purpose.

Although the Division will be concerned with a variety of action-oriented activities, the intellectual heart of its work will rest in its permanent faculty, and the key to its eventual success will lie in the appointments made to this faculty. We believe that the highest standards must be used in appointments to this faculty. Moreover, we foresee some form of ad hoc committee procedure, with representation from outside the Institute, as a feature of sub-

rests on three main propositions. First, there exists, at the present time, a major need for studies of the educational process and for research and development with regard to this process; major benefits, both outside and within the Institute, can be derived from such education research. Second, there now exist, in a variety of forms at M.I.T., significant interest, activity, and capability in the area of education research, and there exists the potential for a major future capability in this area at the Institute. Third, education research has emerged in recent years as an appropriate, legitimate and fruitful university research activity, and as a research activity which is highly interdisciplinary in nature.

As regards Institute needs and Institute capabilities, we have been influenced, in our discussions, by the persuasive case presented in the Hansen Report (Preliminary Report on an Experimental Education Division, submitted to the C.E.P., April 8, 1971) for education research at M.I.T.

Our analysis of the needs for education research at M.I.T. includes the following considerations. sequent full-time appointments, promotions, and tenure decisions within the Division.

The Division will differ in important ways from both a school and a department. Unlike a school, it will have sub-divisions that change in time and vary considerably from each other in form, mission, and emphasis. Unlike a department, it may have a large segment of its faculty on jointappointment with other departments, and it will claim no single essential role or mission. Moreover, it will not produce graduates for professional roles that are well-established at the present time. Its flexibility will make it especially appropriate for research and teaching that are problem-centered and action-oriented, and especially hospitable to visiting faculty and to a variety of non-tenured staff.

We recommend the following as first steps in the development of an Education Division: the appointment of a continuing special committee to consider the Division in further detail and to help monitor its beginning and growth; the initiation of a search for new funds to support the Division; and, in due course, the appointment of a Director and of initial faculty and staff.

#### ting Club \*

ed skis and equipment sale. Expert ski clinic in the afternoon. ursday, December 9, 11am-7pm, Student Center Rm 407. Call

#### ok of the Week \*

ormal discussion over dinner of Deschooling Society by Ivan ch. Wednesday, December 15, 5:15-7:15pm, Ashdown Dining ll (table near door). Call James Snell, 523-1198.

ch Model Railroad \* l open house. Saturday, December 11, 2-5pm, Rm 20E-214.

ker House SPAZ Jogging Club \*\* ily, 10:45pm, Baker 2nd Floor West.

dlywinks Association \* ery Monday, 8-11:30pm, Student Center Rm 473.

o Club \*\* ery Monday, Wednesday, Friday, 5pm; every Saturday, 1pm. Pont Gym Exercise Rm. Beginners welcome.

ting Club \* ery Monday, Thursday, 5pm, Student Center Rm 473.

ssical Guitar Society \*\* assical and Flamenco guitar classes: private, Mondays, 7-9pm; oup, Thursdays, 5-8pm. All in Rm 1-136. Call 661-0297.

ncing Club \*\* ry Tuesday, 6-9pm, duPont Fencing Rm.

#### ble Tennis Club \*\*\*

eting and practice. Every Wednesday, 7:30-10pm, duPont Gym lub Lounge.

aring Association \* ound school, first Thursday every month; general meeting, third ursday every month. 7:30pm, Student Center Rm 473.

ence Fiction Society \* ery Friday, 5pm, Rm 1-236.

ian Folk Dance and Lore \*\*\* ton Indian Council, Inc. Every Friday, 7-11pm, Student Center 407.

dent Homophile League \* eting and mixer. Every Friday, 7:30pm, Mission Church, 33 vdoin St, Boston.

ege Life/Campus Crusade for Christ \*\* dership training classes, lectures, seminars. Every Friday, 30pm. Call Prof. Paul Schimmel, X6739, or Bob Williams, -6868.

#### ge Club \*

plicate bridge. Every Saturday, 1-5pm, Student Center Rm 473. mission: \$2 per term or 75 cents per session.

ess Club \*\* ery Saturday, Sunday, 1:30-5:30pm, Student Center Rm 407.

ch Model Railroad Club \*\* ery Saturday, 4pm, Rm 20E-210.

DL Duplicate Bridge Club \*\* ry Sunday, 7pm, Walker Blue Rm. Every Tuesday, 6pm, Student enter Rm 491

# lixers

ddy Charles Pub \*\*

in your friends at the Muddy Charles Pub, 110 Walker, daily 30am-7:30pm. Call X2158.

#### Donovan's Reef \*\*

Film Society. Monday, December 13, 8pm and 10pm, Rm 10-250. Tickets \$1.

# Music

**Mixed Chorus** 

Informal singing group. Every Monday, 9:30pm, McCormick. Call Sue, dorm X0990.

# Theater and Shows

## MIT Community Players \*

Anton Chekhov's classic drama, The Sea Gull. Thursday, December 9 through Sunday, December 12, and Wednesday, December 15 through Saturday, December 18, 8:30pm, Kresge Little Theatre. Call X4720.

# Dance

# Modern Dance Technique Class \*\*

Elementary/Intermediate. Every Monday, Wednesday, Friday, 5:15pm, McCormick Gym.

Tech Squares \*

Every Tuesday, 8-11pm, Rm 10-105. Call dorm X0888 or 492-5453.

#### Dance Workshop \*\*

Modern dance classes in McCormick Gym: elementary, Tuedays, Thursdays, 10am, 2pm; intermediate, Tuesdays, Thursdays, 12n; general, Thursdays, 7pm. Admission: \$2 for community, free for students. Call Cha-Rie Tang, dorm X0908.

Friday Afternoon Dance Break \*

International folk dancing on the oval lawn in front of Kresge. Every Friday, 12:30-1:30pm.

Folk Dance Club \* International folk dancing. Every Sunday, 7:30-11pm, Sala de Puerto Rico.

Folk Dance Club \* Balkan folk dancing. Every Tuesday, 7:30-11pm, Student Center Rm 407.

Folk Dance Club \* Israeli folk dancing. Every Thursday, 7:30-10pm, duPont Gym T-Club Lounge.

# **Exhibitions**

Photographs by Josh Collins \* On display in the Rotch Library through February 4.

Art LaZar Exhibition \* Creative Photography Gallery (3rd floor duPont Gym), 12n-7pm, December 10 through mid January.

Gova's "The Disasters of War" Selection of aquatints exhibited in corridors outside Hayden Gallery, through December 10.

Sculpture by Lynda Benglis \* Polyurethane foam sculpture, Hayden Gallery, through December 17.

The Art of Rigging and Buoy System for Air-Sea Studies \* Hart Nautical Museum, Bldg 5, 1st floor.

Main Corridor Exhibitions \* tents and departments. Bldgs 7, 3, 4, 8. Varsity Fencing \* Brooklyn Polytechnic Institute. Saturday, December 11, 2pm, duPont Fencing Rm.

Varsity and Freshman Squash \* Wesleyan. Saturday, December 11, 2pm, duPont Squash Courts.

Varsity Hockey \* Wesleyan. Saturday, December 11, 7pm, Skating Rink.

Freshman and Varsity Basketball \* Trinity. Saturday, December 11, freshman at 6:15pm, varsity at 8:15pm, Rockwell.

Varsity Hockey \* Rochester Institute of Technology. Monday, December 13, 7pm, Skating Rink.

Freshman and Varsity Wrestling \* University of Massachusetts. Tuesday, December 14, freshman at 6pm, varsity at 7:30pm, duPont Gym.

Scuba Club Pool Session \*\* Wednesday, December 15, 8pm, Alumni Pool.

# Religious Services and Activities

The Chapel is open for private meditation from 7am to 11pm every day.

Roman Catholic Mass: Feast of the Immaculate Conception \* Wednesday, December 8, 8am and 12:05pm, Kresge; 5:05pm, Chapel.

Hillel Religious Services \* Monday-Friday, 8am, Rm 7-102; Fridays, 7:30pm, Chapel; Saturdays, 9am, Chapel.

Christians for Dinner \* United Christian Fellowship. Every Tuesday, 6-7pm, Walker Dining Hall (under sign of the fish).

Praying, Singing, Sharing Meeting \* United Christian Fellowship. Every Tuesday, 7-8pm, East Campus Lounge.

Christian Science Organization \* Meeting includes testimony of healings. Every Tuesday, 7:15pm, Rm 8-314.

Christian Bible Discussion Group \* Every Thursday, 12:15pm, Rm 20B-031. Call Prof. Schimmel, X6739, or Ralph Burgess, X2415.

Islamic Society Prayers \* Every Friday, 1pm, Kresge Rehearsal Rm B.

Vedanta Services \* Every Friday, 5:15pm, Chapel; discussion hour, 6pm, Ashdown Dining Hall.

Roman Catholic Mass \* Every Sunday, 9:15am, 12:15pm, 5:15pm, Chapel.

#### Christian Discussion Group \*

Bible study and discussion of Christianity today. Every Sunday, 9:30-11am, McCormick Seminar Rm A. Call Ron Gamble, X6712 or 547-4279.

Christian Worship Service \* Every Sunday, 11am, Chapel.

Free Draft Counselling \* Hillel, 312 Memorial Drive, X2982. Call or visit 10am-5pm.

#### tiday Afternoon Club \*\*

sic, conversation and all the cold draft Budweiser you can drink. aturing folk singer Rich Holloway. Every Friday, 5:30pm, hdown basement Games Rm. Admission: men \$1, women free. ast be over 21.

# lovies

# light Reef

ba Club Film Night. Presented by Dr. Harold E. Edgerton on derwater timelapse photography. Wednesday, December 8, 8pm, 20E-017.

#### e Confession \*\*

C. Friday, December 10, 7pm and 10pm, Rm 26-100. Tickets 50

# estigation of a Citizen \*

Saturday, December 11, 7pm and 9:30pm, Rm 26-100. ckets 50 cents.

# Midsummer Night's Dream \*

Classics Series. Sunday, December 12, 8pm, Rm 10-250. kets 50 cents.

# Athletics

Varsity, Junior Varsity and Freshman Fencing \* Harvard. Wednesday, December 8, 7pm, duPont Fencing Rm.

Varsity Hockey \* Tufts. Wednesday, December 8, 7pm, Skating Rink.

#### Varsity Wrestling \*

University of New Hampshire. Thursday, December 9, 7pm, duPont Gvm.

#### Varsity "B" Basketball \*

Boston University (Frosh). Thursday, December 9, 7:30pm, Rockwell.

#### Varsity Squash \*

Pennsylvania. Friday, December 10, 7pm, duPont Squash Courts.

Junior Varsity and Freshman Wrestling \* Lowell Tech. Saturday, December 11, 2pm, duPont Gym.

#### **Gymnastics** \*

Lowell Tech. Saturday, December 11, 2pm, duPont Gym.

# Announcements

Washington Undergraduate Summer Internship Program First meeting. Tuesday, December 14, 7pm, Rm 53-220.

# Creative Photography 4.051

Students may sign-up from Wednesday, December 1 through Sunday, December 12, duPont Gym Rm 310. Lottery will be held Wednesday, December 15.

\* Open to the Public \*\*Open to the MIT Community Only \*\*\* Open to Members Only +Freshmen encouraged to attend.

Send notices for December 15 through December 24 to the Calendar Editor, Room 5-111, Ext. 3297, by Friday, December 10.

# Tech Aircrafters' Models Display Intricate Designs, Graceful Flights

# By Ty Rabe

DuPont Gymnasium was the scene of a display of aeronautical acrobatics on Saturday. Huge model airplanes - some with wingspans of three feet or more sored gracefully for minutes at a time and made perfect landings, all under the power of a single oversized rubber band.

The event was a regular flying session of the Tech Model Aircrafters, a group composed mainly of students under the direction of Raymond B. Harlan, of the Measurement Systems Laboratory.

"There are actually dozens of different classes of model aircraft, and about 15 or 20 indoor classes," explained Mr. Harlan. "But these big rubber-powered planes represent the ultimate in modelling."

This particular class of aircraft is the Indoor Microfilm Model, so-called after its ultrathin film cover. Its construction details are fascinating. All the flying surface frameworks are made of balsa wood strips, carefully sliced from sheets. The wing tips are tapered to lighten the structure, and braces are made of wire only onethousandth of an inch thick to reduce the craft's weight.

The fuselage consists of two hollow tubes and a motor stick strong enough to withstand the tension of the motor. The thickness of the walls averages about one tenth of an inch.

The microfilm covering (developed, incidentally, by an MIT student in the 1930's) is made by pouring a special lacquer solution in water, where it spreads out like an oil slick and dries. It is then picked up in a hoop and applied to the surface of the plane. As the water dries, the film is drawn into the pores of the wood and a weightless bond is achieved.

Through this careful attention to details, the wieight of these models is kept astoundingly low. Most tip the scales at about .035 ounce, or one gram.

The rubber power source is actually not a rubber band at all. It is a specially made material chosen for its strength\_and durability, and is many times stronger than any rubber band. Model aircrafters cut the rubber from long strips in lengths suitable to the fuselage size of their planes. Through trial and error they can adjust the cross-sectional area of the rubber so that the planes fly the maximum time within any given room. The duPont record is a flight of more than 16 minutes, but in international competition in a blimp hangar at Cardington, England a German model flew for an incredible 45 minutes using the power of one rubber motor.

While the microfilm models are the ultimate, the Tech Aircrafters welcomy all kinds of models. "We have several members interested in radio-controlled models," Mr. Harlan said. "And we usually have modellers from all over the Boston area trying out their designs during our sessions."

The club holds an annual indoor contest conforming to the specifications of the Academy of Model Aeronautics, the governing body for US competitions. There are events for many classes and age groups, with prizes going to the winners. The next contest will



Left to right: Warren Seamans, Glenn Holm, '71 and Ed Delvers, '72, with the portrait of President Crafts. The picture in the background is The picture in the background is of Dr. Rogers. -Photo by Bob Lyon

# Presidential Portraits Collection Completed

There's good news for members of the community who missed the inaugural exhibit: "Retrospect: MIT 1861-1916." It is scheduled for another-and expanded-showing during alumni activities next spring.

The exhibition in June will feature the portraits of the Institute's first eleven presidents. Many of these were unearthed during the search for "Retrospect."

"Retrospect" was collected by Professor Richard M. Douglas, head of the Department of Humanities, Professor E. Neal Hartley, Institute Archivist, Miss Eleanor Bartlett, Archives Librarian and Warren A. Seamans, administrative officer of humanities. The exhibit was based on the premise that there should be a wealth of historical material relating to the Institute's early days.

Gathering items for the exhibit frequently turned out to be an exercise in detection. Although it was known that certain objects existed-a bronze bust of founder William Barton Rogers, for example-their whereabouts was not known. Other objects, such as the marble bust of Dr. Rogers, turned up as complete surprises. "We knew that a portrait of President James Mason Crafts existed," says Warren Seamans, "and we traced it from Ashdown to Bexley to Random Hall. But after Random closed as a dormitory last summer, the portrait disappeared. "This fall we were about to send letters to all the former residents of Random Hall to see if we could locate the picture," Mr. Seamans said. "But then, the Housing Office discovered that Ed Delvers, '72, had it in Burton House. He and his roommate had taken it and preserved it during the summer.

collection of pictures of all of the Institute's presidents through Dr. Julius A. Stratton."

The exhibit next June will be expanded to include the period from 1916 to 1930 and the inauguration of Dr. Karl T. Comption as MIT's ninth president. Mr. Seamans is particularly interested in finding additional material which can be included in the next showing.

"There are nooks and crannies all over the Institute where things have been put away," Mr. Seamans remarks. "Often the people who work in the area may not even be aware that they have something of historical interest.

"We hope that people around the Institute will notice things which might date back to the earlier days of the Institute and let us know. We'd like to find and restore as much as we can."

# Errata

In the November 24 issue Tech Talk erroneously reported that Professor David R. Wones, of earth and planetary sciences and Robert J. Burns, of Lincoln Laboratory, were among principal investigators at MIT in the analysis of Apollo 15 lunar samples. Professor Wones has resigned from MIT to become a branch chief at the US Geological Survey in Washington, D.C. Professor Gene Simmons, of earth and planetary sciences, is now the principal investigator of that experiment. The principal investigator of optical absorption and specular reflectivity of the samples is not Mr. Burns, but Professor Roger G. Burns, also of earth and planetary sciences. In addition, Dr. John B. Adams, a Research Affiliate at MIT, and Professor Thomas B. McCord, of earth and planetary sciences, are also investigators in the Apollo program.



Indoor microfilm model aircraft.

# Dr. Wick Leaves Dean's Staff, Returns Full-time to Nutrition

(Continued from page 1) and the total number of women students is about 700, slightly more than nine percent of the student body.

In addition, for the past four years Professor Wick has served a

# UNICEF Cards Available at TCA

Christmas is traditionally a time of sharing, joy and happi-

growing number of students as a premedical advisor. She early foresaw the trend of growth in the numbers of students seeking to enter medical school and played an important part in developing an expanded premedical advisory board aimed at meeting the needs of this number.

Professor Wick was graduated from Mount Holyoke College. She came to MIT as a graduate student in organic chemistry in 1946, received her Ph.D. in 1951 and, after four years in industry, joined the MIT staff as a research associate. In 1959 she was appointed Assistant Professor of Food Chemistry promoted to Associate Professor in 1963 and to Professor in 1968. She was the first woman on the faculty to receive tenure, and the first to be promoted through the ranks to full professor. Dean Nyhart noted that "the gap created by Professor Wick's return to her department will be hard to fill. More women students owe more to her than they will ever realize. Our office has already begun to evaluate the needs of women students at MIT during the next five years, and will be consulting students, faculty members and others in determining how these needs can best be met."

ness. This year, why not share the spirit of the holiday season with children around the world by using UNICEF Christmas cards.

The Technology Community Association (TCA) has an assortment of unusual UNICEF cards and desk calendars on display in their office at the Student Center (Room 450). A box of 12 cards, with or without a message, sells for \$2.00. The desk calendars, which make thoughtful gifts, are \$2.50 each.

All the money collected from the sale of these cards and calendars is sent to the United Nations Children's Fund. Visit the TCA office soon to get the best selection. The office is open Monday through Friday from 9am-1pm and 2pm-5pm. be April 8, 1972, with details to be announced later.

"But our main concern\_isn't high-level competition," Mr. Harlan emphasized. "We have people on all levels and with all kinds of models attending our duPont meetings, and we are particularly interested in helping youngsters to get started. Anyone is welcome to come and participate, or just watch."

Reminder: Tec	h Talk has
new telephone	extensions.
Please use the	following
numbers:	
Editorial Office	Exts. 3277
	and 3278
Institute Calendar	Ext. 3279
Classified ads	Ext. 3270

"We're very pleased to get this portrait back," Mr. Seamans continued. "Now we have a complete



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 extension or room number. Ads may be telephoned to Ext. 3270 or mailed to Room 5-105. Th deadline is 5pm Friday.

# For Sale, Etc.

Carocell tbltop dishwash; old GE refrig; red 6X9 rug; fl length off-wh curtain for dbl window. Call 899-3137 evgs.

New fleece-lined lther vest, 42, \$25. Carl, X2843.

Plane ticket to Frankfurt, Germany, gd any time, \$100 or best. Debbie, 864-9481 evgs.

New Hart javelin skis, 210 cm, no bindings, \$135; Head master skis, 205 cm, Cubco Bindings, \$60. Allan, X105 Draper 7 or 358-7659 Wayland evgs.

Delta Snows, 8.25X15, stud mounted on 66 Ford rims, \$50. X7432 Linc.

Motorola Port TV, gd sound, needs work, best offer; 6 drawer bureau, \$15; Germ port typewriter, \$45; carved wooden 3 shelf bkcase, \$8. Call 492-2141.

Pentax Spotmatic II w/super multicoated f1.4 lens; Leika M3 w/f1.4, exc cond, best offer. Call 491-1620.

Woman's 170 cm skis, boots, 7½, poles. Anderson, 492-6210 or 492-3320 evgs.

VW snows, 7.35X15, \$20 pr. Jeff, X3815.

Electrolux vacuum cleaner, gd cond. best offer; 21" TV w6r and record player, best offer. Call 395-7265 after 3pm.

Sears coldspot refrig, exc cond, best offer. Call 776-6867.

Port Lafayette 3 sp stereo phongraph, \$20. Eng, 354-2789.

Wheels, 14", for '65-'68 Pontiacs, \$5 pr. Gross X7371.

Sears snows, used 1 season, 7.75 X15, \$156pr. X5621.

Apt size elec range, gd cond, \$35. X3213 or 354-8833.

Used law school texts and study quide, cheap. Jack X7521.

Diamond ring, 2/3 carat, \$200; mink stole, \$125; bl sweater w/ fur collar, \$15; Afgan sheepskin coat, \$45; etc. Call 661-1929.

Hockey goalie equip. George, X5849.

Movie camera, 8 mm, w/floodlamp, projector, case, \$50. Bill, X5377 Linc.

Formica dresser, \$5; metal telephone tbl, \$2; mirrored back knick-knack shelf, \$1.50. Marsha, X2342 or 734-8647 evgs.

Wh rabbit fur coat, \$50; full-length wool cape w/matching dress, 9. Terry, X5789.

IBM 1130 discpack, cheap. Kath, X7160 or 484-1576 evgs.

Free parakeets, w/cages and supplies. X3966 or 484-9151 evgs. New wedding dress. Kateri, 267-4497 Sears-Opedie dbl bed, 54"X73", w/pad and sheets, \$175. X5221 or 354-3810. Twin size mat, 39X75, \$25. Manfred X2120 or 628-5740.

Franklin hockey skates, 11, \$20. White, X5668.

Koflack Man's ski boots, 111/2N, exc cond, \$10. X1555.

Rieker ladies buckle ski boots, 7½M, \$20; rieker ladies ski boots, 6M, \$8; Hyde ladies figure skates, 7, \$10. X2250.

Postage stamps, new and used, foreign and US, ½ scott catalog price. Lenni X4215 or 486-3951 evgs.

Hyde figure skates, 2, worn once, \$6; childs dbl runner ice skates, 12, \$1. X7418 Linc or 566-8394.

Self Propelled 22" lawn mower; new snows 8.25X14 w/rims, \$40. Call 776-2468.

Snows, 6.50X13; regular tire, 6.50X13; \$15 for all. Carl X376 Draper 7.

Nordica man's buckle ski boots, 10N, \$40. Wisniewski, X5302.

Gerry Soope coat, XL, yr old. Dave, X4849.

Off '65 Mustang: 2 mounted stud snows, \$20; mounted spare, \$7; back seat, \$2; new rear shocks, etc. John X201 Bedford.

Wurlitzer electronic piano, exc cond, \$250. Irvine, X2968 6-9pm.

K tbl w/4 chrs; K tbl w/2chrs. X4540 or 899-3137 evgs.

Emerson b&w 21" good working cond, \$55; nest tables; big tbl w/4 sm ones. Gunderson, X6085 or 332-8251.

Head 720 skis, 203 cm, w/Nevada toe and heel, \$145. Frailey X4974.

Infant dressing tbl; crib; \$30 both. Miller, X7363 Linc.

BSR 610X turntbl w&dustcover, cartridge, gd cond, \$65. Kaufman, X3216 or 267-2199.

Hoover port washing machine, exccond, \$50. Call 492-2344.

Snows 8.15X15 for '68 Ford, \$20 pr. Myers, X2671 or 894-5947.

Selmer-Bundy Oboe, \$165. X2407.

Hair clipping outfit, used once, \$5. Janis X7113.

Girl's riedl figure skates, sizes 10, 1N, 2N, 3N, \$10 ea; Boy's hyde, 2, \$5. X1534 or 661-1382.

Formica tbl; 15" wire wheels; hard top for Austin Healey 3000. Call 472-7379. Br leather coat, \$40; Letterman's jacket, 36-38, \$15. Tom Dorm X8343 or 661-0169

ket, 36-38, \$15. Tom Dorm X8343 or 661-0169.
Dbl bed, gd cond, \$30, avail 12/15.

Christmas Trees, cut your own, Wood Ave, Rindge, NH, 50 min from Boston Rte 119, orange sign. Nottingham 603-899-6646.

X1851.

Lafayette LA750 stereo amp, \$60. Joe or Frank, 492-7969 evgs.

Woman's raincoat, 11-12, red vinyl w/pewter like trim, exc cond, \$15. Jennie X 35 84.

Realistic SA-700 amp, best offer. Tony, X3624 or 247-8764.

Refrig, gd cond, \$50 or best. Parsons, X3216 or 4476.

Snows, 6.50X13, w/studs on wheels for Valiant or Dodge Dart, \$30. Ezio, X2100 or 2114.

# Vehicles

'62 Buick Special, high K, exc running cond, orig owner, \$250. X583 Draper

'63 VW sedan w/sunroof, needs work, \$150 or best. Bob, X425 Draper or 667-4509 evgs.

64 Dodge, new muff, exhaust, springs, 67 eng, gd cond, \$250. John, X439 Draper or 625-8386.

'64 Fairlane std, 6 cyl, new gen, bat, tires, gd cond, \$350 or best. George Chu X4598 or Dorm 9826.

'64 TR4, 72k, 2 new tires, overall good cond, \$500 or best. Clark, 247-8355.

'64 Thunderbird, orig owner, gd cond, \$200. Call 259-9583 evgs.

'64 Ford Fairlane, stand, new bat, tires, exc cond, \$350 or best. X4598, dorm X9826 or 646-3191.

'64 Chevy, new tires, gd cond, \$275. Call 643-3903 evgs.

'64 Rambler classic, 4 dr, auto, r&h, new points, plugs, exhaust, snows, \$250 or best. Gary, X5609 or 646-0078 evgs.

'65 Mustang fastback, V8, stand, snows, many new parts, etc, \$650. Don, X1827 or 876-1785.

'65 Plymouth belvedere, pwr st, r, gd cond, \$400 or best offer. X1458.

'66 Corvair Monza, 57K, 4 sp, new clutch, \$250 or best. Marv, X7086 or 254-5348.

'66 VW 1300, cheap. Pohl, X2941.
'67 Opel Kadette 2 dr sedan, exc cond, 30K. \$450. X6650 or 354-3709 evgs.

'67 Mustang, V-8, auto, pwr str, 35K, gd bat, gd tires, snows, etc. Woodruff, X1859.

'67 Fiat 500 conv, low k, ski rack, stereo r, snows on extra rims. Call 354-0034.

'68 Opel coupe, delux mod, 18k, fac new cond, new tires, \$950. Call 354-0510 evgs.

'68 Tempest, V8, pwr st, exc cond. Joe X5323 or 267-3208.

'68 BMW r69s, wixom bags, bars signals, exc cond, \$1150. X2448 or 266-2049.

off Comwealth Ave, \$90 w/utilities. Tom, X2793.

Camb, furn, br, k, b, lr, avail 12/15-2/15, \$175. Call 661-9736 evgs.

Cannon Mt, NH, join ski chalet, free skiing. Adrian, 498-5621 or 498-5608 evgs.

Dorch, mod 2 BR, air cond, 5 closets, parking, 5 min form T, avail 12/15, \$190. Call 436-2930 evgs.

Duplex apt, 5 R, 2 BR, LV, K, H, avail 1/1. Camelia, X7287 or 354-5020.

Jay Peak, Vt, lakeside ski lodge on 200 acre, near Jay Peak, reas rent: Denny X2430 or 665-6220 evgs.

NH ski chalet w/sauna, indoor pool, etc. wkly or season. Call 353-2809.

Rochester, NY, -ski house needs 2 members, \$200, Dec-May. Jane, X4487 or 926-4367 evgs.

Winch, Irg R, 3 min walk to B & M, \$20/wk. Call 729-6899.

# Animals

Purebreed Siamese Kittens, 8 wks old, \$15 or best. Arlene, X6010.

Long hair kittens, 2 ready now, 3 more at Christmas. X2467 or 237-1350.

# Wanted

Used frost-free compact refrig. Elkin X1541.

Wd bkcase no lrgr than 84" high X 67" wide. Mrs. Hall, X2569.

Leather skis boots, size 13-2 w. Bill, X3223.

Fem for Burton House r. Dorm X0437.

Short wave r. Call 661-8744.

Filing cabinet, 2-4 drawers. X5757 Linc.

Comfortbl 2-3 br apt in Camb, Arl, Watertown, Newton area for Prof, write Dr. Roger Krohn, Joint Center for Urban Studies, 66 Church St. Camb.

Record player, stereo preferred, hi-fi not necessary. Eike, X 5710.

Used, damaged/inoperable elec piano. George, X6893.

Male Persian cat for stud, long hair essential, wl pay. X2365 or 354-6797 evgs.

Info on travel in Iran/Afghanistan. Dr. Buyan, X4244.

Male skunk for Fem skunk. Call 491-6781 evgs. Young Fem to share 4 BR apt in

Allston, 35 min from Kendall Sq, H,

01 720-2110.

Snows, 7.75X14, exc cond, \$5 ea. Call 469-0060.

Ladies bl leather boots, 7, 1<sup>3</sup>/<sub>4</sub> " heel, \$15. X7137.

Sansui model 8 stereo receiver w/warranty, exc cond, \$400. Willy, X1835 or X3161.

Holubar down parka, 36, \$40. Vi, X6824.

Bu '70 pennies shiney from the mint. \$1/roll. Vittek, X7572.

RCA 21" TV, colonial style, exc cond, \$100. Call 933-3884.

Snows, 6.50X13, gd tread, \$5. X5933 or 491-1364.

Baby jumper walker, \$5; baby scales, \$5; car bed, \$5; swing-o-matic, \$5. Call 492-5623 evgs.

Stud snows, 5.60X15 on rims, \$55. X4580 or 354-1049. Wardrobe; file cabinet; \$10 ea or \$15 both. Duensing X3161.

GE under-counter dishwasher, '61, works well, \$5. Call 491-1916.

Concord snows, mounted on rims w/studs, H70X15, \$100 firm. X630 Linc.

Shag frosted wig, \$15; human hair fall, dirty blond, \$20; bkcase, \$5; maple tbl top, \$5; etc. Liz, X6808.

Kastle CPM, 205 cm slalom, exc cond, \$125. Call 227-1624 evgs.

Synaco stereo 70 pwr amp, \$70; 30w mono' pwr amp. \$30. John, X7202 Linc.

Wh drapes, 3 pr, \$9; 2 end tbls, \$5; bkcase, unstained wood w/ 3 shelves, \$15; pole shelf w/sliding cabinet and mirror, \$20. Sandy, X 35 33.

'69 Cougar, 4 sp, am-fm, heavy duty suspension, w/warranty, exc cond, gd price. Call 625-9456 evgs.

<sup>'69</sup> Rambler Amer, stand, r, stud snows, 40k, exc cond, \$1100. X5301 or 899-5678 evgs.

'69 Sunbeam Alpine GT. Frank, X5464.

'70 Maverick, every option except air, exc cond, \$1150. Bill, X5773 Linc.

'71 Pinto, 8.5 k, r, stand, other extras. \$1700 or best. Kevin, X2280 or 566-2521.

'71 Saab Sonett III, fiberglass sport racing car, 1 month old. X3708 or 782-5861 evgs.

# Housing

Boston, apt sublet 1/1-6/1, spacious 1 br, \$275. Call 267-2019.

Brighton, apt in quiet residential area,

Pen pal for young engineering student in India. Write: Shanti Lal Agarwal, Ashok Bhawan, Pilani India.

Used Piano, cheap. Call 547-5145.

\$75. Chris, 731-0123 evgs.

Male rmmte to share 5 r apt furn, in Camb, own br, \$92.50 w/h and parking, no lease, avail 12/19 or 1/1. Bob, X6663 or 868-9167.

Skidoo olympic or nordic in exc cond. Call 862-6081 evgs.

# Miscellaneous

WI do thesis/gen typing. X5374 or X2360.

WI drive your car anywhere on west coast 12/10-12/20. Compton, X2855 or 261-3959 evgs.

Thesis/tech/gen typing on IBM Selectric, reas. Call 661-1929 or X6470 evgs. Talk would like to cover as many of these events as time and space permit. Please call the editor, Ext.3277, with any suggestions you may have. The deadline for Christmas coverage is December

Study Probes

Lunar Surface

(Continued from page 1)

gether by meteor impacts), and

broken rocks (shattered by mete-

Below this surface is the crust

To a depth of about 25 km,

Dr. Toksoz said, the crust has an

upper layer of basaltic rocks simi-

lar to those brought back to earth

by the Apollo 11 and 12 missions.

Basalt is a fine-grained igneous

Dr. Toksoz said, extends from 25

km to 65 km and "seems to be

distinctly different from the basal-

tic lunar rocks sampled from the

surface." Rock in this lower layer,

he said, appears to be seismically

similar to gabbro, coarse-grained

igneous rocks found at the low-

est levels of the earth's own crust.

mantle, Dr. Toksoz said, are more

tentative. Dr. Toksoz said there is

no way of knowing how thick the

mantle is. The Apollo seismic

studies extended down to 100 km

and the mantle was still present at

that depth. Seismic velocities in

the mantle-that is, the speed of

the shock waves as they pass

through the mantle material--are

higher than those for most earth

rocks, but are close to those seen

in magnesium-rich olivine for-

There have been earlier but

indirect evidences suggesting a

molten history for the moon.

Rock samples brought back by

astronauts as far back as the ori-

ginal Apollo 11 moon landing

have contained materials that

many geologists believed could

have resulted only from melting.

Moreoever, the fact that surface

rock samples have contained ra-

dioactive elements suggest that

the process of radioactive decay

would be a source of heat to cause

Many groups around the Insti-

tute have developed holiday cus-

toms over the years, particularly

at Christmas time. Some of these

celebrations would be of interest

to the whole community. Tech

Christmas Plans

Sought for TT

melting.

16.

mations found on earth.

Findings with respect to the

The lower layer of the crust,

or impacts).

itself.

rock

# Two Named as ILO Officers

(Continued from page 1) sociates Programs are important sources of professional contact and financial support for MIT. The new Chemical Engineering Department facility has been under consideration for several years; it is being sponsored by leading alumni and high-ranking executives in the chemical, petroleum, pharmaceutical and paper industries.

Tech Talk, December 8, 1971, Page 7

# Four Varsity Teams Score Victories

# By Peter M. Close

Tech's improved basketball team is off and running. The MIT five opened its 1971-72 schedule last week, topping Tufts 93-84 and Norwich 77-68. The Tufts game included some added extras. The Medfordites outshot MIT from the floor 111 to 68 and made 35 field goals to Tech's 27. But the margin of victory game on the free throw lines as MIT scored a record 39 out of 55 tosses to Tuft's 14 of 26. The single most outstanding performance came from junior center, Jerry Hudson, 6-4, 190 lbs., who scored 37 points, a personal high and the third best single game effort in Tech history. Jerry hit 11 of 20

# 'Women at MIT' Is Topic for IAP

During the upcoming Independent Activities Period (IAP), a series of informal meetings will be held to discuss "Women at MIT."

The discussion series will begin on Thursday, January 6, at 12 noon in the Cheney Room (Room 3-310). Successive meetings will be announced at that time, but will probably be scheduled twice a week during IAP.

Planned topics of discussion about "Women at MIT" will include: why we are at MIT; our goals as students; our professional Following the conventional comgoals; what MIT can do to help women students, staff and faculty; and other topics of interest to 895, and Boston State 830, in the participants.

field goal attempts and tied the single game free throw mark with 15 of 22. Hudson's 15 free throws match Bill Eagleson's 1963 record set against WPI. The second half of Tech's offensive punch, Harold Brown, added 27 points, to give the 6-3, Senior Co-captain forward, a career total of 1006 points--the fourth Tech hoopster to hit the thousand mark.

Against Norwich, the engineers led all the way, 36-31 at the half and coasted to an easy nine point victory 77-68. Harold Brown led all Tech scorers with 23 points and added 16 rebounds for overall game honors. Center, Jerry Hudson, added 19 points to give him a two game average of 28 points per game.

In track, junior Dave Wilson erased his own pole vault mark of 15-1 with a 15 foot 11/2 inch jump to pace MIT over Bates, 60-49, last Saturday. The Tech fieldmen led the way, outscoring Bates 27-15. Junior Brian Moore was a double winner in the shot put 49 feet 511/2 inches and the 35 pound weight, 55 feet 7 inches. Now 1-1, the track team hosts Brandeis and WPI next Saturday.

The pistol team started off with a bang last weekend. MIT 3312 defeated the Air Force Academy 3300, Newark Engineering 3213, and Boston State 2990 in conventional target competition. petition, MIT 999, defeated Air Force 974, Newark Engineering international target competition. For additional information, In conventional competition every call Mildred Dresselhaus on Ext. shooter fires 30 rounds slow, 30 6864 or Emily Wick on Ext. time and 30 rapid for a possible 900 score. In international competition, four men each shoot 30 rounds slow, at a smaller, more difficult target. All American, John Good, led all Tech shooters with an 850 conventional and 264 international.

Still on the pistol team, four Tech freshmen teamed up to set a new national Junior International slow fire record last Sunday. Competing in the monthly Olympic tryout competition, hosted by MIT, Karl Seeler, Richard McCarthy, Shannon Hill and Polachai Meesook fired a record 1677.

The Tech hockey team, although playing aggressively, has yet to find the goal. Beaten by Babson 2-0 and Trinity 3-0 last week, the engineer sextext hope to get on the winning trail against Tufts today and Wesleyan on Saturday. Both games will begin at 7pm on the Skating Rink.

First year fencing coach Eric Sollee made his debut a successful one, drubbing Brandeis 20-7 last Saturday.

Mide Asherman, 3-0 in the foil, Jon Abrahamson 2-0 in the sabre, and Marth Fraeman 2-0 in the epee, led the charge for the Tech fencers. MIT hosts perennially tough Harvard today and Brooklyn Polytech on Saturday.

The Office of the Registrar would like to remind students of the following important dates. Today, December 8, Bachelor's theses are due for the first term. Friday December 10 is the last day to change theses titles for graduate degrees. Monday, December 13, is the due date to turn in second term registration material and the last day of classes for subjects with finals



# Christmas Is Coming...

When the wreaths go up on the main entrance, Christmas is not far away. Because some people missed the earlier announcement of Christmas holidays, we are repeating it now: This year the Institute will officially observe Christmas on Friday, December 24, and New Year's Day on Friday, December 31. Accordingly, MIT's holiday pay practices will apply to these days rather than to the following Saturdays. --Photo by Margo Foote

# Living Groups, Faculty Urged to Develop Closer Relationship

An ad hoc student-faculty committee recently circulated a letter encouraging individual faculty members to develop stronger ties with individual living groups. "The key need," the letter said, "is to make it possible for a faculty member and a living group to come to know each other on an informal recurring basis.'

"So far response has been very encouraging," says Bob Eccles, 73, a member of the committee "During the January Independent Activities Period, we want to ex-

pand the idea. We hope faculty members will determine which of their students will be on campus during IAP and invite one or more of them for dinner.

"We are urging as many students and faculty members as possible to participate in the program," Bob continues. "And we also want to remind any faculty members, who have not done so, to return their living group questionnaires.

Bob can be reached for further information or questions at Ext. 3217 or 247-8048.

# SIBP Asks for Aid in Taking Computer Availability Census

The coupon below has been devised by the Student Information Processing Board (SIPB) as a means of updating the census of computers on campus.

The SIPB came together two years ago for the purpose of finding computers which could be made easily accessible to students. One of SIPB's first activities was a door-to-door census of Institute computers which took over two months to complete.

That list is now two years old;

changes which affect their availability to students.

SIPB is now in the process of compiling a new list which, they hope, will be every bit as exhaustive as the door-to-door list was. They ask everyone at MIT who owns, operates or administrates a computer to fill out the coupon below and return it through Institute mail. This should be done whether or not the computer can be made available to students.

Members of SIPB plan to have



many entries in it are obsolete and many computers have been added by the time the Independent Acwhich are not included. Other tivities Period begins on January computers have undergone policy

a preliminary census completed 5.

**Student Information Processing Board** To: Room 39-200

# **COMPUTER CENSUS FORM**

Model:

; Location:

Name of administrator in charge of machine:

Special peripherals or packages:



-Photo by Margo Foote

# Another Movie Comes to MIT...

A small group of people are being escorted across McDermott Court toward the Green Building. Nothing unusual about that --

probably some visitors touring the Institute. But look - they're all wearing color masks over their noses and mouths. An listen -- the "tour guide" is saying, "You're now entering the Ethical Suicide

Parlor." What's going on?

Last Thursday morning a camera crew from Channel 2, Boston's National Educational Television station, was on campus filming a scene for a Special NET Playhouse. Entitled "Between Time and Timbuctoo," the play is an adaptation of Kurt Vonnegut's collection of short stories, Welcome to the Monkey House.

Most of the strange-looking. people were members of the community who happened to be passing by. In exchange for playing "extras" in a mob scene, they'll see themselves on television on March 13 when the play is aired on NET stations across the country. And, of course, the Green Building will be easily recognized by all of us.