



Mike Lichstein, a graduate student in economics, demonstrates how to use the tactical map of MIT.

—Photo by Marc PoKempner

Novel Map to Aid Blind MIT Students

by Joanne Miller

A 17-by-47-inch plastic sheet will open the doors of MIT to blind people.

It is a revolutionary tactual map of the campus devised by two graduate students as a thesis project in the Department of Architecture. The map is the first of its kind to be commercially produced using polyvinyl chloride (PVC).

The top of the two-sided map shows the geography of the campus in various types of embossing. The bottom gives additional information about what appears immediately above in braille and other symbols. For example, the top of the map shows the major entrances to all buildings. Directly beneath the entrance symbol is information on whether the door is electric, revolving or swinging.

Auditory signals which the blind

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Athabasca to Taurus-Littrow

SEP: A 'Look' Into the Moon

by Peter Spackman

Using radio waves in a way that would not work on earth, Apollo 17 astronauts will perform on the moon next month an experiment that will allow scientists to "see" beneath the lunar surface for a distance of a mile or so.

The experiment, one of 12 the astronauts will perform during their scheduled 75 hours on the moon, is called the Surface Electrical Properties (SEP) experiment. It will not only measure the electrical properties of the lunar material, but "see" down into the moon to discover layering in the lunar sub surface, large buried rock masses, and possibly even water, although sub surface water is not expected to be found.

The experiment was conceived and developed at MIT by a team of scientists headed by Gene Simmons, professor of geophysics at MIT and principal investigator for the SEP experiment. The hardware for the experiment, a radio transmitter the astronauts will place on the moon's surface and a receiver that will be mounted on the rear of the Lunar Roving Vehicle, was built by the

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MIT Gives City \$345,000 Payment In Lieu of Taxes

MIT just completed payments of \$345,000 to Cambridge—more than the city expected—as the university's 1972 contribution to the city in lieu of taxes on MIT's tax-exempt campus properties.

All told, the contribution brings to \$8,911,000 the amount of money MIT has paid to Cambridge over the last five years in taxes and in payments in lieu of taxes.

MIT has made payments in lieu of taxes on educational properties to Cambridge since 1928. Over the last five years, these in lieu payments alone have amounted to \$1,433,000.

Earlier this year the university paid the city \$1,874,000 in property taxes for the year on non-exempt property which the university owns. The five-year total of taxes on non-exempt properties is \$7,478,000.

Cambridge had requested of MIT a payment in lieu of taxes for 1972 based on the relationship of the tax-exempt land owned by the Institute to the total land area of the city. MIT President Jerome B. Wiesner said that, without regard to any method of measure, the amount suggested by the city seemed essentially fair. Indeed, MIT chose to contribute more than the city asked for—but arrived at that number on the basis of the past level of MIT contributions in lieu of taxes and upon other considerations relevant to the needs of the city in 1972.

"The question of arriving at a fair level of in lieu of tax contributions is complex and difficult," President Wiesner said.

"In making this year's contribution freely and voluntarily, MIT reasserts its belief in the principle of tax exemption for educational institution. It is convinced that this policy is wise and of great benefit to society.

"While determined to protect and maintain its lawful tax exemption, the Institute also accepts—as it has for many years—its civic obligation to make an in lieu of tax contribution to Cambridge."

Taxes and payments in lieu of taxes on exempt properties are not the only ways in which MIT contributes to the city, President Wiesner pointed out.

For example, MIT currently is the non-profit sponsor in Cambridge of the largest turnkey housing development in the country. This large development, presently under construction at three different sites in the city, will provide the Cambridge Housing Authority with 684 new units of low-income housing for the elderly. The cost of the development, which will be purchased and owned by the CHA, is in excess of \$17 million.

MIT also was the principal sponsor of the Technology Square development in eastern Cambridge which, although not yet fully developed, has already become one of the largest sources of property tax revenues for the city. Tech Square has also helped

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Apollo 17 to Carry Gravimeter

When Apollo 17 leaves earth for the Taurus-Littrow region of the moon, it will be carrying a new instrument—called a traverse gravimeter—designed, developed and built at the Charles Stark Draper Laboratory of MIT for the National Aeronautics and Space Administration's Manned Spacecraft Center at Houston, Texas.

The instrument will be the first piece of equipment actually made at the Cambridge laboratory to go to the moon. The laboratory over the past decade has designed, developed, tested and programmed the on-board guidance, navigation and control systems used in the Apollo command and lunar modules, but the actual systems themselves are manufactured and assembled by industrial contractors elsewhere.

The traverse gravimeter, however, was made at the Laboratory in cooperation with the principal investigator for the gravity experiment, Dr. Manik Talwani of the Lamont-Doherty Geophysical Laboratories at Columbia University. At the Draper Laboratory, the design and development of the instrument was led by John B. Harper of Rockport, program manager, and Sheldon W. Buck of Brookline, technical director.

The instrument was field tested near Blackhawk, California, over terrain similar to that expected at Taurus-Littrow. Buck, who took part in field tests along with NASA engineers, will be at Mission Control Center, Houston, with other Draper engineers to provide real-time support for the astronauts while they are using the instrument on the moon.

The gravimeter will be used on the moon by astronaut Eugene A. Cernan, making his third space flight, and by astrogeologist Dr. Harrison H. (Jack) Schmitt, the first scientist-astronaut to go into space. Transported in the lunar module descent stage, the trav-

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REMINDER: Beginning Friday, December 1, the Institute's emergency closing telephone number will be 243-7669. For an easy way to remember it, think 253-SNOW.

Space Engineers Ready for Apollo Standby

When the seventh—and final—lunar landing mission, Apollo 17, leaves for the moon in a night launch December 6, veteran space engineers at the Charles Stark Draper Laboratory again will be manning special telephone lines, to Houston, Texas, providing real time support for the astronauts in flight.

The Draper Laboratory, an independent division of MIT, is the prime contractor for the design and development of the on-board guidance, navigation and control systems used both in the Apollo command module and the Apollo lunar module.

In addition, the Laboratory has developed—and verified by simulation using mockups of the CM and LM—the detailed step-by-step programs that are wired into the computer portions of the guidance systems. Astronauts use the guidance systems—and the computers and computer programs—via keyboard displays which have become

familiar items of space hardware seen by television viewers the world over.

During each Apollo mission to the moon and back, Draper Laboratory engineers, scientists and programmers specializing in all aspects of the guidance system hardware and software are on standby call 24 hours a day in case they are needed by the astronauts in space.

The nerve center of the Laboratory during a mission is a classroom on the second floor of the Apollo building, 75 Cambridge Parkway, where small teams working around the clock in shifts remain in constant voice contact with the Mission Control Center at the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, via closed telephone circuits.

The Cambridge engineers also receive telemetered data from the spacecraft having to do with guidance system function and perfor-

mance and they are able to monitor voice transmissions between Houston and the astronauts. The shift teams know at all times where specialists from the Laboratory can be reached and can call any number of them in at a moment's notice. Other Draper teams work in shifts at the MCC in Houston and, prior to launch, at the space center in Florida.

The Draper Laboratory support system has proved valuable on virtually every mission to the moon and back so far. Perhaps the most dramatic came during Apollo 14 when a faulty abort button in the LM main control panel began sending spurious signals to the LM guidance computer just before the lunar landing maneuver was to commence. The problem was relayed to Cambridge on the closed telephone circuit where Draper computer specialists, quickly worked out—and verified by simulation—a computer keyboard sequence for

the astronauts to use which caused the computer to ignore the spurious signal. Apollo 14 went on to a successful landing.

The Draper guidance system has performed flawlessly through all Apollo flights to date for a total of almost 6 million miles of space flight and although Apollo is ending, the guidance system is not destined to become a space relic. An Apollo command and service module—with Draper guidance system—will be used to carry crews back and forth to the manned SKYLAB workshop, which will begin orbiting in the spring of 1973. Certain modifications to the digital autopilot in the on-board guidance computer will enable the SKYLAB CSM guidance system to maneuver the docked configuration of the CSM and the workshop. In addition, the Draper system will be the primary guidance system during the critical rendezvous and entry phases for SKYLAB.

Similarly, in mid-1975 it will be an Apollo command and service module with a Draper Laboratory guidance system which will take the active role in the historic docking maneuver with a Soviet Soyuz spacecraft.

The recently announced space shuttle program with a reusable booster and a reusable entry vehicle signifies a large step in the maturity of the national space program. The Draper Laboratory team which has been involved in a series of small but significant studies expect to maintain continued interest in this program and is looking forward to the challenges involved.

Two leaders of the Draper Laboratory's Apollo team—both of whom have been with the moon effort since its earliest beginnings in 1960—have just been selected by the American Institute of Aeronautics and Astronautics as recipients of the 1972 Louis W. Hill Space Transportation Award for their "leadership in the hardware and software design of the Apollo spacecraft primary control, guidance and navigation system. They are David G. Hoag of Medfield, Apollo program director of the Laboratory, and Dr. Richard H. Battin of Lexington, the Laboratory's Apollo mission development director. They will receive certificates of appreciation and an honorarium of \$5,000 each at the AIAA's Honors Banquet in Washington, D.C., January 10.

The Draper Laboratory is headed by Dr. Charles Stark Draper, of Newton, father of inertial guidance, navigation and control systems for ships, submarines, airplanes, missiles, satellites and spaceships and Institute Professor Emeritus and former head of the Department of Aeronautics and Astronautics at MIT. Ralph R. Ragan of Lincoln, is deputy director in charge of all NASA programs at the Laboratory.

Dr. Draper's Laboratory, because of its long record of successes in dealing with complex guidance, navigation and control problems, received its first formal contract for the Apollo program in August of 1960 and thus became the first of the Apollo prime contractors to be selected.

Apollo 17 To Carry Gravimeter

(Continued from page 1)

erse gravimeter will be first deployed on the lunar surface in the vicinity of the lunar module and will then be mounted on the lunar rover vehicle. When the lunar rover is stopped for geological examinations the gravimeter can either remain on the vehicle or be removed to the lunar surface while the astronaut makes gravitational measurements.

The semi-automatic, self-leveling, traverse gravimeter is capable of providing a gravity measurement in either an upright (normal) or an inverted (bias) orientation approximately three minutes after the measurement process is initiated. The instrument has five modes of operation: "STANDBY," "ON," "GRAVITY," "BIAS" and "DISPLAY." In order to minimize power dissipation, the gravimeter will remain in the "STANDBY" position during translunar flight until deployment, at which time the astronaut will change the toggle switch to the "ON" position for taking and displaying gravity readings. The gravimeter will be maintained in the "ON" mode for the duration of the lunar excursion so when the "GRAVITY" pushbutton is depressed, power is distributed to all the circuitry and automatic leveling begins. Once the gravity reading is taken, the measurement data are stored and the instrument automatically reverts to the "ON" mode of operation.

The results of each gravity measurement and additional data about the status of the gravimeter temperature are displayed to the astronaut who will send the coded information to earth by voice communication. The lunar excursion will last about six hours. Scientists hope the astronauts will obtain at least five measurements during each of three traverses. The gravity profile will be used to develop information concerning density variations in the moon's surface.

The traverse gravimeter consists of an instrument package and a battery pack assembly both enclosed in a multilayer insulating blanket which provides thermal protection. The instrument is lightweight, completely self-contained and essentially auto-



Astronaut Eugene Cernan checks out the traverse gravimeter, a new instrument designed and developed by the Draper Laboratory. The gravimeter will be used on the Apollo 17 Mission to obtain information for a lunar gravity profile.

matic in operation, requiring no external power, recording devices or telemetry. The gravimeter is cylindrical in shape with a flat surface at the rear. It stands 20 inches high, 11 inches wide and 9.75 inches deep, and weight approximately 28 pounds. A folding handle at the top of the instrument is used for hand carrying and for latching the instrument to the iso-frame assembly while three footpads at the base enable lunar surface operations. A radiator at the top provides the primary means for heat expulsion and is protected from the lunar environment by hinged plastic insulating covers.

The inner structure consists of a two-axis gimbal system which contains a vibrating-string accelerometer (VSA) housed in a thermally protected and evacuated two-stage oven assembly. The oven assembly is enclosed in an electronic frame assembly of similar structural design which is pivoted about its axis and supported by a middle gimbal assembly. The middle gimbal controls the vertical positioning of the

inner gimbal over a 30-degree range and the middle gimbal assembly is attached through bearings to the base housing, with capacity to rotate through 210 degrees. Stepper motors and a gear train provide the drive and positioning of the gimbal assemblies, the motors reacting to signals from pendulums which work as level sensors. Heat for thermal protection of the inner (precision) oven is supplied by a controlled temperature system while the intermediate oven is thermally protected by a preset on-off thermostatically controlled, electrical heater system.

The vibrating-string accelerometer employed as a gravity sensor is an off-the-shelf item manufactured by the American Bosch Arma Co. VSAs have been previously used in sea gravimeters and several types of inertial systems in space and aircraft applications. Low power, small size, accuracy and the excellent results obtained in gyrocompassing and navigational modes of operation made the vi-

Book Tells All About Apollo 17

"Everything You Ever Wanted to Know About Apollo 17" (* But Didn't Know Enough to Ask) could be * (*but isn't) the title of the third in a series of guidebooks for the Apollo lunar missions written for the public by Gene Simmons, MIT professor of geophysics, and published by the National Aeronautics and Space Administration. Professor Simmons, who has worked on the scientific aspects of the Apollo Program since 1965 and was Chief Scientist at NASA's Manned Spacecraft Center in Houston for two years, is principal investigator of one of the Apollo 17 experiments, the Surface Electrical Properties experiment, which will use radio waves to probe beneath the lunar surface. "On the Moon with Apollo 17—A Guidebook to Taurus-Littorw"—the real title of Professor Simmons' 111-page booklet—is the third detailed account of where on the moon the astronauts will go

(Continued on page 3)

brating-string accelerometer an ideal candidate for use in a lunar gravimeter. The VSA must be temperature controlled in order to obtain accuracy; therefore, it is mounted in a precision oven enclosed by an outer oven which forms part of the inner gimbal.

When the base of the traverse gravimeter is within ± 15 degrees of the horizontal, the control logic can level the system and permit measurement of the VSA difference frequency which is stored until the astronaut commands a visual readout. The display consists of nine digits, the first seven indicating the gravity reading and the last two showing the oven temperature and the status of the temperature alarm.

The traverse gravimeter is noted for its almost completely automatic modes of operation and the use of an accurate low-power vibrating-string accelerometer as the gravity sensor. A quantization in excess of 0.03 milligal is obtained on a visual readout with an overall expected accuracy better than 0.5 milligal. This new, self-contained instrument, powered by an internal 7.5-volt battery providing up to 375 watt hours for all modes of operation over a fifteen day period, is designed to be lightweight, reliable and simple to operate.

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Editor
Joanne Miller

Staff
Ellen Burbank
Robert M. Byers
Peter M. Close
Bob McLean
Linda Omohundro
Michael Seif
Peter Spackman
William T. Struble

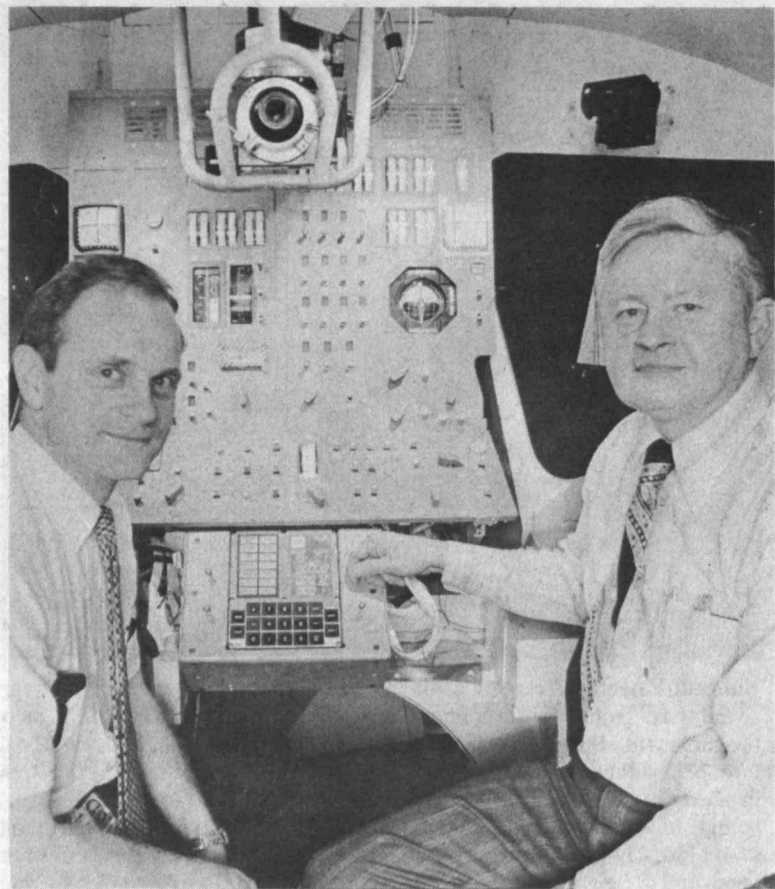
Business Manager
Paul E. Johnson

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Guidance Lab Leaders Share \$10,000 Space Flight Award



David Hoag, left, and Richard Battin pose in front of the lunar module simulator at the Draper Laboratory Apollo Building. —Draper Lab photo

All About the Moon Mission

(Continued from page 2)

and what they will do there that Professor Simmons has written. He prepared similar accounts for Apollo 15 and 16.

In the booklet's preface, Professor Simmons points out that the Apollo missions have been the vehicle for millions of people to become involved in scientific discoveries.

"Science and scientists have been exposed to the public eye throughout the progress of the lunar experiments in a way never before seen," he writes. "We have had an ever growing responsibility to explain more about our science. This booklet is intended to meet a part of that responsibility."

The booklet contains maps and

sketches of the Taurus-Littrow landing site, a valley nestled between two large lunar mountains; descriptions and pictures of the twelve major surface experiments the astronauts will perform; descriptions of the seven lunar orbital experiments to be undertaken from the Command Module; an introduction to the Apollo 17 crew; a brief summary of what has been learned about the moon so far; and a handy list of Apollo acronyms that will let the reader distinguish between an LDD (Lunar Dust Detector) and a SCB (Sample Collection Bag).

Copies of "On The Moon with Apollo 17" may be had at \$1 apiece, from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Two Boston area men who directed development of the on-board guidance system used for steering Apollo astronauts to the moon and back have just been selected to share the \$10,000 American Institute of Aeronautics and Astronautics' Louis W. Hill Space Transportation Award for 1972.

They are David G. Hoag, 47, of Medway, Apollo technical director since 1961 when the moon effort began at the Charles Stark Draper Laboratory and the Lab's Apollo program director since 1966, and Dr. Richard H. Battin, 47, of Lexington, Apollo mission development director for the Laboratory whose Apollo association also dates back to those earliest days.

They were informed of their selection for the AIAA's top space transportation award virtually on the eve of the final mission to the moon—Apollo 17—due to leave Cape Kennedy the night of December 6.

The award, to be presented to them at the AIAA's Honors Banquet in Washington, D.C., January 10, is for "significant contributions indicative of American enterprise and ingenuity in the art and science of space flight." The specific award for Mr. Hoag and Dr. Battin cites them for "leadership in the hardware and software design of the Apollo primary control, guidance and navigation system which first demonstrated the feasibility of on-board autonomous space navigation during the historic flight of Apollo 8."

Mr. Hoag, a Boston native and son of a Boston newspaper editor, has been director of the Lab's Apollo guidance, navigation and control program since 1966, and

previously was technical director for Apollo since 1961. Before the Apollo program he was technical director for the Lab's Polaris missile inertial guidance system. After receiving his S.B. degree from MIT in 1946, he became a staff member at the Laboratory working on the test and evaluation of the Gunar anti-aircraft fire control systems and the gyroscope and computing components for these systems.

After receiving an S.M. degree from MIT in instrumentation in 1950, he worked at the Draper Laboratory on the design and development of the Navy X-1 anti-aircraft gunfire control system and the Tarter and Terrier anti-aircraft missile fire control systems.

He became technical director for Polaris in 1956. In April, 1969, he was named by MIT President Howard Johnson to serve on the Review Panel on Special Laboratories to examine the relationship between MIT and its two Special Laboratories—Draper and the Lincoln Laboratory at Lexington. Subsequently, in October, 1969, President Johnson appointed him as the Draper Laboratory member on the MIT Standing Committee on the Special Laboratories.

After the Apollo 8 first manned flight to the moon during Christmas 1968, he was cited by the Manned Spacecraft Center in recognition for his contribution to Apollo. Following the first manned lunar landing in July, 1969, NASA Administrator Dr. Thomas O. Paine presented him NASA's Public Service Award. He also received the Thurlow Award of the Institute of Navigation for 1969.

Dr. Battin, as director of mission development, has been

responsible for trajectories, guidance concepts and programming of the guidance computers for Apollo. After receiving his S.B. degree in Electrical Engineering at MIT in 1945, he served for a year in the Navy as a Supply Corps Officer. He returned to MIT in 1946 as an instructor in the Mathematics Department and a research assistant in the Meteorology Department. After receiving his Ph.D. in 1951 he joined the Draper Laboratory as a research mathematician to work in the area of fire control and inertial navigation systems. Later he was responsible for the Computing Devices Group and a Missile Guidance Study Program.

In 1956 he joined the Operations Research Group of Arthur D. Little, Inc., as a senior staff member to work on digital data processing for business and industrial research. Returning to the Draper Laboratory in 1958, he has been primarily engaged in research in the area of interplanetary navigation. Dr. Battin is author of the book *Astronautical Guidance* and co-author of *Random Processes in Automatic Control*. He has published a number of papers in the fields of meteorology, analog and digital computer techniques, stochastic processes and interplanetary trajectories and navigation. He is a member of Sigma Xi, a fellow of the American Institute of Aeronautics and Astronautics and a member of the International Academy of Astronautics.

Mr. Hoag is married, has five children and lives at Winthrop Street, Medway. Dr. Battin is married, has three children and lives at 15 Paul Revere Road, Lexington.

More from SEP?

Lunar Surprises Are 'The Excitement of Science'

(Continued from page 1)

Raytheon Company's Equipment Division in Sudbury, under the direction of program manager Joseph Urner.

The SEP experiment has four important aims. First, by measuring the electrical properties of the moon's outer few kilometers of rock and soil in place for the first time, SEP will help interpret observations already made with radar. Second, SEP will provide data needed to interpret the observations made with an Apollo 17 orbital experiment, the Lunar Sounder. This experiment will measure the times required for radio waves to penetrate the moon, be reflected, and return to the lunar surface. The real interest of scientists, however, is not the times taken by radio waves to penetrate the moon but rather the depths they reach, which is readily determined by multiplying their travel times by their speed. And SEP measures the speed with which radio waves travel in the moon.

The third aim of SEP is to provide background data that scientists expect to be useful for years in the exploration of other planets, which will most likely be done remotely with radio waves. Finally, SEP will provide valuable information about the Apollo 17 landing site, a valley between two lunar mountains known as the Taurus-Littrow region. Visual observation, made both by the astronauts themselves and by camera, are of course limited to the moon's surface, while SEP can "see" below the surface to pick out features hidden to view.

Here's how the experiment will work. SEP is scheduled to be carried on each traverse made by the astronauts during their second and third EVAs (Extra Vehicular Activity). Astronaut Gene Cernan will set up the compact SEP transmitter, equipped with solar power panels, on the lunar surface and lay out its dipole antenna on the ground in the form of a cross that measures more than 75 feet from tip to tip.

Placing the SEP antenna on the lunar surface at the interface between the moon's soil and space allows the transmitter's radio waves to travel in three distinct ways: some will travel through space just above the lunar surface, some will travel through the moon's soil

just below the surface, and some will travel down into the moon. If there are layers within the moon, rock strata or even moisture bearing materials, part of the deep penetrating radio waves will be reflected back to the surface.

These radio waves will travel at different speeds—at the speed of light through vacuum and more slowly just below the surface—to the SEP receiver, which will be mounted on the Lunar Rover and thus be traveling away from the transmitter. The basic principle of SEP is interferometry, which involves the interference of two or more waves to produce a "synthetic wave" or interference pattern. An interference pattern in everyday life, for example, is created when a small object is dropped into a bathtub by the combination of the original waves and those reflected back from one side of the tub.

By detecting and measuring the properties of the interference pattern picked up with the SEP receiver, scientists will be able to determine the speed of radio waves in the moon and the ease with which they propagate in the lunar material. Superimposed on the interference pattern caused by the first two waves will be another pattern if waves are reflected back from deeper within the moon. These waves could present a relatively simple picture, if there are well defined sub surface layers whose electrical properties differ significantly from the surface material, or a rather complex one, if radio waves are scattered by a proliferation of large buried objects, such as rock masses. All the data received from the transmitter will be recorded on magnetic tape and brought back to earth by the astronauts for analysis and interpretation.

The SEP experiment is entirely new. While it is expected to work extremely well on the moon, it is not a useful technique for studying the earth. The reason for this is that the moon is an excellent electrical insulator, comparable to the best ceramics, while the earth's rocks near the surface have high water content and are fairly good conductors. Thus radio waves that would travel only a few meters into the earth can travel to depths of several kilometers in the moon.

Because the method of the SEP experiment had not been developed for earth studies, Professor Simmons and his colleagues conducted an exhaustive series of tests of both the equipment and the experimental technique over a period of the past four years. There are only two geological environments on earth that are as dry, and hence as electrically lossless, as the moon: large salt deposits, which were ruled out because of their geometry, and glaciers. Solid ice is a mineral whose dielectric constant is very close to that of most lunar material.

In 1968 Professor Simmons' team conducted the first tests of the experiment on the Gornier glacier in Switzerland. "We used very simple and inexpensive equipment," he said. "We recorded data by hand. We moved equipment literally on our backs. Daily progress on the glacier was very slow. But we proved unequivocally that the experimental concept was valid and we could then proceed with our experiment."

Subsequent field testing of increasingly more sophisticated equipment on the Athabasca glacier in Alberta, Canada (in 1970 and 1971), and in the Juneau, Alaska, ice fields (in 1972) allowed completion of the design of the lunar experiment. Describing data from the Athabasca tests, Professor Simmons said: "The thickness of the glacier estimated from the SEP interference pattern matches very closely the thickness as determined seismically and actually measured by others in boreholes. Such excellent correspondence between the results obtained with our SEP equipment and those obtained by other investigators with entirely different methods has given us great confidence in our equipment and techniques."

In a pamphlet describing the SEP experiment, Professor Simmons concludes: "The scientific exploration of the moon in the Apollo Program has led to surprise after surprise. We shall be disappointed if the SEP experiment does not uncover several more surprises. Their correct interpretation is likely to be far more valuable than the routine verification of the expected. Such surprises are the excitement of Science."

Berger, Steinberg Are First W. R. Kenan Award Recipients

Dr. Walter A. Rosenblith, MIT Provost, announced today that Suzanne Berger and Arthur Steinberg, Associate Professors in the Departments of Political Science and Humanities, respectively, have been selected as the first recipients of William R. Kenan, Jr. Career Development Awards.

For a term of two years, 1972-74, they will hold appointments as William R. Kenan, Jr. Associate Professors. During the same period, a special grant will be placed at the disposal of each designee for the advancement of his or her scholarly and educational activities.

These awards have been made possible by a grant from the William R. Kenan, Jr. Charitable Trust. In making their generous gift, the Trustees expressed the desire that it be used to support scholar-teachers of distinction "whose enthusiasm for learning,

In Lieu Payment

(Continued from page 1)

attract new businesses to Cambridge and its work force numbers about 2,000. MIT hopes to initiate or sponsor comparable developments in Cambridge, which could add significantly to tax revenues and employment opportunities in Cambridge, according to MIT officials.

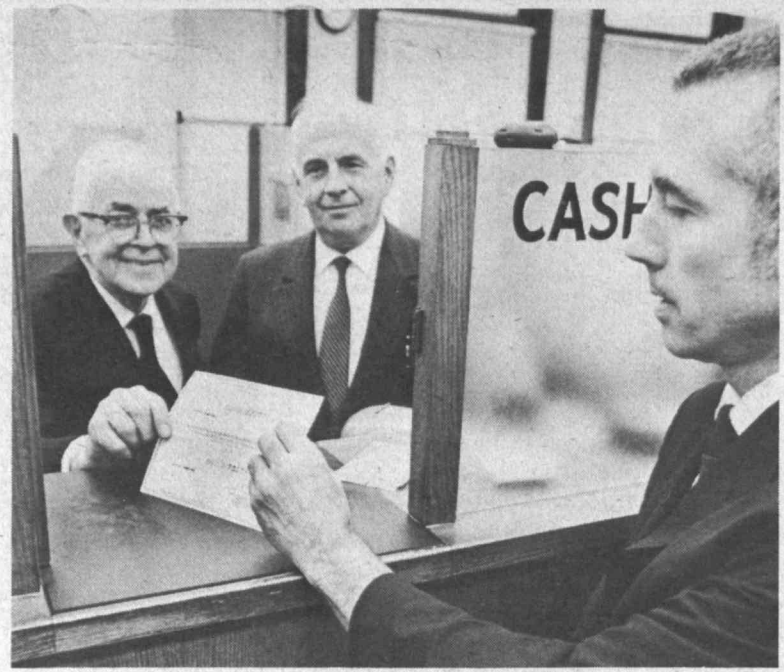
MIT and its people also have helped organize, conduct and support community and school programs in such areas as recreation, health and educational enrichment for Cambridge neighborhoods, particularly those near the MIT campus.

commitment to teaching and interest in students will make a notable contribution to the undergraduate community." In making the announcement Dr. Rosenblith said, "In the opinion of their students and their colleagues Professors Berger and Steinberg have both been unusually dedicated and imaginative teachers. Their awards reflect not only the excellence of their contributions but also the Institute's desire to encourage the kind of devotion to the welfare of undergraduates that they have shown."

Professor Eugene B. Skolnikoff, Head of the Department of Political Science, has said of Professor Berger: "In her five years at MIT, she has made impressive contributions to the teaching and research programs of the Department of Political Science. She is best known as a student of French society and politics, and as author of the distinguished book *Peasants Against Politics: Rural Organization in Brittany, 1911-1967*. Professor Berger has increasingly focussed her teaching and research on comparative approaches to the study of advanced industrial societies. She is a superb teacher of both undergraduates and graduates, with a rare gift for arousing the interest and enthusiasm of her students by her knowledge and her ability to find fresh perspective on old issues. She has contributed generously and effectively to departmental activities, particularly those related to strengthening the course offerings and advisory system for undergraduates. She has also served the Institute with distinction as a member of the Com-

mittee on Educational Policy and other bodies."

Concerning Professor Steinberg, Professor Richard M. Douglas, Head of the Department of Humanities, has written: "Currently in his ninth year at MIT, with training in classics and classical archaeology, including field work in the Near East, Italy and Greece, Arthur Steinberg showed himself from the beginning to be an imaginative and inventive teacher, responsive both to the intellectual climate of MIT and to the interests of its undergraduates. Since his own research had already taken him to the laboratory to learn techniques of metallurgical analysis for his work on ancient bronzes, and since he was already proficient in classical literature and art history, he was able from the start to teach with a double literacy and competence, while contributing significantly to the formation of a fresh kind of archaeological scholarship. He has served on two major committees at MIT, including the Committee on Educational Policy (1967-69) and the Commission on MIT Education (1969-70); he has worked on curriculum development in secondary schools; and he was a major figure in securing the introduction of a combined program in anthropology and archaeology at MIT which combines the perspectives of archaeological technology with social anthropology and linguistics. In sum, he is a scholar-teacher who has broken new paths to humanistic understanding informed by the perspectives of scientific analysis."



Kimball Valentine (right), Assistant to the MIT Treasurer, turns over two checks to city of Cambridge officials completing MIT's 1972 payments in lieu of taxes to the city. Checks totalled more than \$201,108. All told, MIT paid the city \$345,000 this year in lieu of taxes and \$1,874,000 in property taxes. Over the last five years, MIT's in lieu payments to Cambridge have amounted to \$1,433,000 and its tax payments have been \$7,478,000. The five-year grand total which MIT has paid Cambridge in taxes and in lieu of taxes is \$8,911,000. Frederick J. Reardon, Cambridge collector of taxes, (left), and John H. Corcoran, Cambridge city manager, (center), are shown accepting the checks.

—Photo by Margo Foote

Law School Visits Match Students' Swelling Interests

An unprecedented number of law school representatives visited the Institute this fall—matching a swelling interest on the part of MIT students in the profession, according to Professor Daniel Nyhart, Chairman of the Pre-Law Advisory Council.

In the past four years there has been a dramatic increase in the number of undergraduates considering a career in law. In 1969, 30 seniors took the law school admissions test. Last spring, 92 members of the graduating class took the test.

"We are trying to get information to students interested in law," Professor Nyhart explained. "Our objective in bringing law school representatives to campus is three fold. By talking with these visitors, students get a general idea about law school admissions

but such visits also give the visitors a feel for MIT and tell us more about their school."

Eleven law schools from across the country have sent representatives to campus so far this fall. The visits are coordinated by the Pre-professional Advising and Education Office and the Office of Career Planning and Placement.

The University of Chicago Law School is sending its chairman of admissions, Professor Stanley Katz, to campus next Monday, December 4. He will meet with students at 4pm in Room 4-146.

In addition, Harvard Law School will have a representative on campus Tuesday, December 5 who will meet with students in Room 3-133 at 4pm.

Graphic Arts Drops Prices for Copying

Lower Xerox copy prices go into effect Monday, December 4, at the two Graphic Arts Quick Copy Centers in Rooms 3-003 and E52-442.

Under the new pricing schedule it will cost three cents for the first ten copies, two cents for the 11th through the 30th copies and one cent for the 31st through the 100th copies of each original. The old rate is 5-3-2 cents.

"We trust these low prices will make using our facilities more attractive," explained James Coleman, Director of Graphic Arts. He said that it was possible to lower prices because of a continued increase in volume and new, more efficient equipment.

Mr. Coleman said he hoped that customers who need a small number of copies made quickly will switch from the smaller copying machines scattered around the campus to the Quick Copy Centers. Eventually he said expended Quick Copy facilities might allow for the elimination of some of the more expensive, smaller copy machines.

Quick Copy facilities are available to all members of the Institute community. Either cash or charge will be accepted for copy services. Prices include collating.



These workmen spent long hours flooding the skating rink which opened for the season last week.

—Photo by Marc PoKempner

Athletic Department Announces Skating Lessons and Rink Hours

Skating classes for children of MIT faculty and staff are being offered again this year by the Athletic Department.

A series of eight beginning and advanced skating lessons for children ages six and older will be held at the MIT Skating Rink on Saturdays at 10am and 11am beginning December 2.

An MIT athletic card is required for enrollment. In addition, a \$15 instruction fee will be charged for each child and should be paid at the time of registration. Children should also have their own single

blade skates.

The application deadline is Friday, December 1. Classes are limited to 30 children so sign up early. Registration forms are available from the Athletic Department, Room W32-109.

All members of the community who hold 1972-73 athletic cards may use the Skating Rink during the following hours:

Sunday, 1:15 to 4:45pm.
Monday, 10am to 12:45pm.
Tuesday, 1 to 2pm.
Wednesday, 10am to 3pm.
Thursday, 1 to 2pm.

Friday, 10am to 12:45pm and 8:15 to 11:15pm.

Saturday, 12:15 to 4:15pm and 7:15 to 11pm.

The Athletic Department reminds skaters that the general skating hours are subject to change because of ice conditions and intercollegiate hockey matches. The rink will be closed Christmas Day, December 25, and New Year's Day, January 1. A separate schedule will be posted in the Athletic Department for Christmas vacation and the Independent Activities Period.

News Study Group Checks Campaign Coverage on TV

Videotape monitoring of television evening news broadcasts has shown great diversity between networks in presidential campaign coverage from September 14 through Election Day, according to the MIT Network News Study Group.

The research group, funded by the John and Mary B. Markle Foundation, includes faculty members of the Department of Political Science and students from MIT and Wellesley.

Preliminary results, the group said, indicate that the CBS Evening News spent far more time covering the Watergate Case and

the sale of wheat to the Soviet Union. This coverage was presented in detailed special reports included in the evening broadcasts. In a two part special, Walter Cronkite spent 25 minutes exploring the events that led up to the Watergate Case, according to figures released by the group. After public questions were raised about the propriety of the wheat sale, Cronkite presented an account of the details in a three part special.

Other major differences in news format noted by the group included the coverage of Henry Kissinger's news conference of Thursday, October 25, when he an-

nounced that "Peace is at hand." The announcement itself, worldwide reaction and its effect on the presidential campaign commanded the first 15 minutes of the ABC and CBS broadcasts that night. NBC went even further, devoting its entire NBC Nightly News broadcast to the events related to Kissinger's announcement. The one NBC item not totally related that evening was the nightly reporting of the Dow Jones averages, though John Chancellor did connect the market's performance with Kissinger's statement.

As Election Day approached, the CBS Evening News continued to be the evening news program devoting large segments to detailed election coverage, according to the group's survey. In the days preceding the election, the videotapes show, CBS ended its nightly broadcast with a summary of each candidate's stand on such issues as defense, the economy and bussing. The CBS presentations consisted of film of the two candidates' speeches, which had the effect, or at least the appearance, of allowing the candidate to present his own views, according to the group.

"The differences in coverage between the networks are such that there seems to be conscious decisions involved here," according to Richard Parker of Brookline, a student member of the Network News Study Group.

Differences such as time devoted to stories and format of stories are being studied as the Network News Study Group continues its analysis of the seven weeks before Election Day.

The research is being conducted by Edwin Diamond, a practicing journalist and a lecturer in political science, Professor Ithiel De Sola Pool and a group of 15 students. Among the student leaders are Parker, a junior majoring in biology, Norman Sandler of Fairfield, Iowa, a sophomore majoring in political science; and Paul Schindler of Portland, Oregon, a junior majoring in management.

The first phase of the project was videotaping of the news broadcasts and the development of a computer-aided system for verbal and non-verbal analysis. The system will make it possible to determine, for example, how much time the candidates and their supporters received on each network's news program, which issues were covered, which speeches were covered and how the network presented the news.

In judging television news, the MIT group believes it is necessary to study not just the transcripts of the broadcasts but also the film, the background slides, the placement of the story, the nature of the anchorman's and the reporter's commentaries, together with any non-verbal communications accompanying the report.

A series of photographs of the anchormen is presently being compiled. These photographs, a set of stills taken from videotapes, show the various images that accompany the spoken report each night. Each of these stills is receiving a code and as the project enters the second phase every broadcast will be studied and the expressions coded.

The purpose of phase two of the project, now being planned, is to implement the computer-based system and attempt to discern differences in coverage and their significance.

Sheila Widnall Wins AIAA Sperry Award

Professor Sheila E. Widnall will be the first woman to receive the Lawrence Sperry Award from the American Institute of Aeronautics and Astronautics.

The award, which consists of a certificate and a \$500 honorarium will be presented at the honors ceremony at the annual meeting of the AIAA to be held in January in Washington, D.C. Professor Widnall was selected because of her "contributions to the understanding of vortex flows in wing wakes, aerodynamic noise and lifting surface theory."

Being the "first woman" is nothing new for Professor Widnall. As an undergraduate at MIT she was the first woman to be elected to the national engineering honorary society Tau Beta Pi. Later she became the first alumna to be appointed to the engineering faculty after receiving her Sc.D. degree in 1964. At the same time she also became the first female Ford Post Doctoral Fellow.

The AIAA Lawrence Sperry Award was established in 1935 to

honor a young man or woman for a notable contribution to the advancement of aeronautics.



Professor Widnall.

Eyes Will Do the Walking Across New, Lighted Maps

Plans are underway to install a large illuminated map and directory of the MIT campus in the lobby of Building 7, according to Suzanne Weinberg, a member of the Building 7 Lobby Committee.

The 8 foot by 3 foot rendered base map will be located on the wall between the Information Center in Room 7-111 and the Registry of Guests in Room 7-121. At the present time there is no easily accessible map to guide visitors on campus.

Using a 100th scale, the map will include the area extending from Eastgate to Westgate and from Technology Square to the Charles River. All MIT buildings will be numbered and major departments, laboratories, centers, and administrative offices will be listed in the directory.

A second, more detailed, map will be located just outside the Information Center. This 3 foot by 3 foot illuminated map will show a detailed floor plan of Buildings 7, 3 and 5. Of particular interest to campus visitors, the color-coded map will point out locations of telephones, elevators, stairways, laboratories, mail boxes and transportation.

Both maps will be constructed of mylar mounted between two layers of plexiglass. They will be

backlit and framed in chrome and wood.

Miss Weinberg expects the maps to be ready for installation before the end of the year.

Student Accounts Changes Planned Next February

The comptrollers office has announced that effective with the awarding of degrees in February, 1973 the following procedures are being implemented as indicated last spring in connection with financial requirements.

The Registrar's Office will notify the Student Accounts Office of those students who are candidates for a degree.

A review of each student's term financial account will be made and students will be notified in writing that satisfactory arrangements to resolve any balance due must be made before their names are placed on the degree list.

Students with outstanding long term student loans will also be requested in writing to come to the Student Loan Office, E19-225 for an exit interview before approval to place their names on the degree list can be given.



Madonna, a lithograph made by Norwegian artist Edvard Munch in 1895, is one of the 150 prints of women in "Images of the Feminine in the Belle Epoque," an exhibit of late 19th century works that will be on display in Hayden Gallery from December 1, 1972 through January 6, 1973. *Madonna* is on loan to the Committee on the Visual Arts from The Sterling and Francine Clark Art Institute in Williamstown. "Images of the Feminine in the Belle Epoque" is one of six exhibits which will be held in Boston area museums in December as part of a Toulouse-Lautrec Festival.

Hayden Exhibit

Images of La Belle In the Belle Epoque

Woman—as domestic being, seductress, slave, vampire, and visual and erotic spectacle—is the subject of an exhibition of some 150 original prints that will be on display in Hayden Gallery from December 1 through January 6.

In addition to the exhibit, entitled "Images of the Feminine in the Belle Epoque," two lectures will explore the attitudes towards women of late 19th century artists such as Toulouse-Lautrec, Gauguin and Whistler. One lecture, "Polarization: Mary Cassatt and Edvard Munch," will be presented by Whitney Chadwick, visiting lecturer of art history at MIT, December 6 at 8pm in Room 9-150. The second, "Sublimations of Erotic Imagery," will be given by Wayne Andersen, professor of art history at MIT, on December 8 at 8pm in Room 3-133.

The events are being sponsored by the Committee on the Visual Arts and organized by the Office of Exhibitions in conjunction with a month-long Boston-area Toulouse-Lautrec Festival. The festival is composed of art exhibitions, lectures and poetry readings in honor of Henri de Toulouse-Lautrec, and will be presented in December by MIT, The Boston Museum of Fine Arts, The Boston Public Library, Boston University, and Harvard University's Fogg Art Museum and Houghton Library.

MIT has assembled the show with loans from The Boston Museum of Fine Arts, The Boston Public Library, Harvard University's Fogg Art Museum and Busch-Reisinger Museum, The Sterling and Francine Clark Art Institute of Williamstown, Mass., The Metropolitan Museum of Art, The Museum of Modern Art, The

Philadelphia Museum, The Worcester Art Museum and The Gropper Gallery.

There will be a public preview in Hayden Gallery December 1, from 8 until 10pm. Hayden Gallery is open from 10am until 4pm Mondays through Saturdays and is closed on Sundays and holidays.

Weinberg Wins U. of Miami Physics Prize

Professor Steven Weinberg of the Physics Department will receive the J. Robert Oppenheimer Memorial Prize from the Center for Theoretical Studies of the University of Miami, it was announced last week.

The award, to be given in January, will be presented to Professor Weinberg for his contributions "to symmetry principles and to weak and electromagnetic interactions." Included as the award are a gold medal, a citation and \$1000.

Professor Weinberg, who has been widely published on elementary particles, quantum field theory and cosmology, was elected to membership in the National Academy of Sciences this summer. He came to the Institute in 1967 as a visiting professor and was appointed professor of physics in 1969.

Past recipients of the Oppenheimer award include Nobel Prize winning English physicist Paul A. M. Dirac, Columbia University Professor of Physics Robert Serber and physicist Freeman J. Dyson.

Chemical Engineering 10.991 Seminars
 Prof. Lam, "Glow Discharge Polymerization," 2pm; D. Aldrich, "Pyrolysis of Solid Waste," 3pm. Rm 10-105.

Optical Mixing*
 Prof. Yuen-Ron Shen, Dept of Physics, University of California at Berkeley. Materials Science Colloquium. 4pm, Rm 9-150. Refreshments, 3:30pm.

Nuclear Reactor Safety
 Prof. Henry W. Kendall, physics. Mechanical Engineering Seminar. 4pm, Rm 3-270. Coffee, 4pm, Rm 1-114.

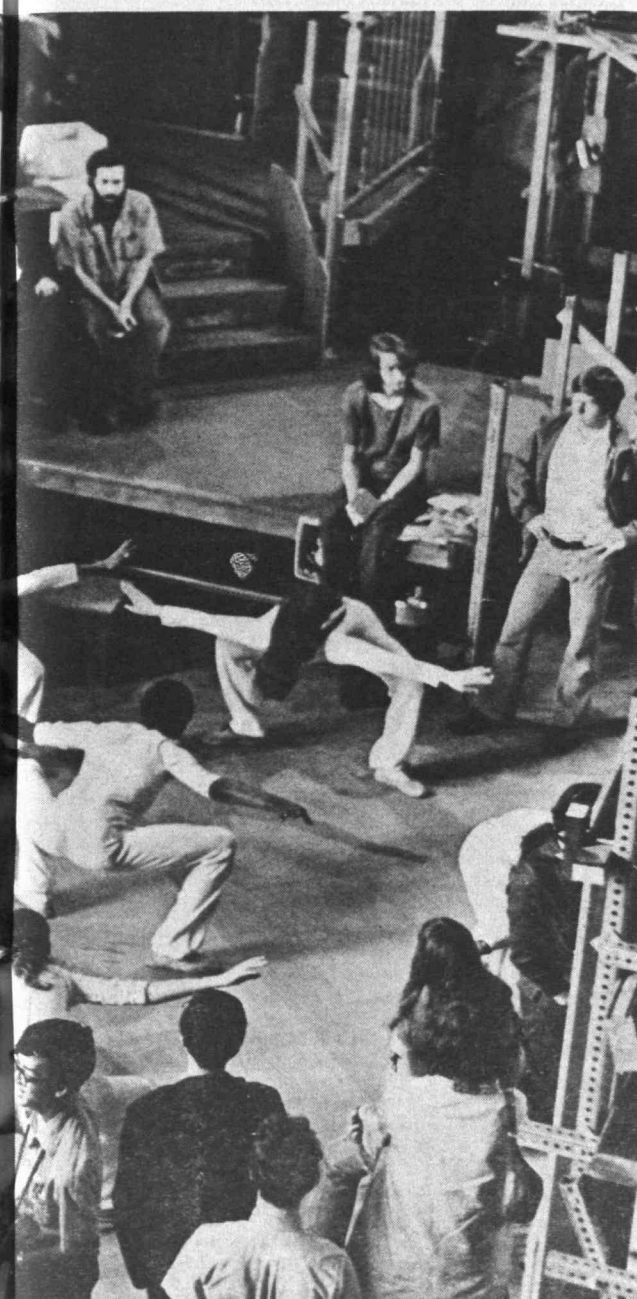
Pliminations of Erotic Imagery*
 Prof. Wayne V. Andersen, art history. Toulouse-Lautrec Festival Seminar. 8pm, Rm 10-105.

Community Meetings

Concerts, dance performances, theatrical presentations and scientific demonstrations are scheduled to take place in the Bldg. 7 Lobby almost every day from noon to 2pm, so drop by and see what is happening.

Ecology Action
 Meeting of all those who have volunteered to distribute waste baskets for the Institute-wide recycling program. Wednesday, November 29, 5:15pm, Student Center Rm --2. Call Fred Gross, X3-7922.

Women's Forum*
 Reva Poor, Sloan School alumna, editor of 4-day work week newsletter, author of "Not to Throw Away the Ring." Monday, December 4, 12n, Rm 10-105.



Here the New York dance troupe is shown during one of their performances last spring. —Photo by Margo Foote

MIT Club Notes and Meetings

Alpha Phi Omega
 Chapter meeting. Wednesday, December 6, 7:30pm, Student Center Rm 407.

Bridge Club*
 Duplicate bridge. Every Thursday, 6:45pm, Student Center Rm 473.

Chess Club**
 Every Saturday and Sunday, 1:30-5:30pm, Student Center Rm 473 (unless otherwise noted).

Chinese Students Club
 Execom meeting. Saturday, December 2, 10am-2pm, Student Center Rm 400.

Classical Guitar Society**
 Classical guitar lessons, group and private. Wednesdays and Thursdays, 5-8pm, Rms 1-132, 1-134, 1-136. Call Vo Ta Han, 494-8353.

Fencing Club*
 Every Wednesday, 7:30pm, duPont Gym Fencing Rm.

Glee Club**
 Rehearsals. Every Tuesday, Wednesday and Thursday, 5pm, Kresge.

Hobby Shop**
 Open weekdays, 10am-4:30pm, duPont Gym basement. Fees: students \$6/term, community \$10/term. Call X3-4343.

Judo Club**
 Every Monday, Wednesday, Friday, 5pm; every Saturday, 1pm. duPont Gym Exercise Rm. Beginners welcome.

Logarithms
 Meetings and rehearsals every Wednesday, 7:30pm, and every Sunday, 4pm, Student Center 4th floor. Call dorm X9628 for information.

MIT/DL Duplicate Bridge Club**
 Every Sunday, 2:30pm, Walker Blue Rm. Every Tuesday, 6pm, Student Center Rm 491.

Outing Club*
 Meeting on winter safety. Wednesday, November 29, 8pm, Student Center Rm 473. Regular meetings: Monday, Thursday, 5pm, Student Center Rm 473.

Rugby Club
 Rugby practice. Every Tuesday and Thursday, 5pm, Briggs Field.

Russian Table**
 Conversational Russian during lunch. Every Thursday, 1pm, Walker Dining Hall.

Science Fiction Society*
 Every Friday, 5pm, Rm 1-236.

Scuba Club
 Compressor hours: Tuesday, 9-11am, Friday, 3-5pm, Alumni Pool. Pool session: Wednesday, November 29, 8pm, Alumni Pool.

Soaring Association**
 Meeting on third Tuesday of each month, 7:30pm, Student Center West Lounge.

Strategic Games Society*
 Saturdays, 1pm, Walker Rm 318. Club offers opponents and discounts on merchandise to members plus gaming periodicals library. Kevin Slimak, dorm X0389.

Student Art Association Open House
 Every Thursday, 4-5pm, Student Center Rm 429. Coffee served.

Student Committee on Educational Policy (SCEP)**
 General meeting. Wednesday, November 29, 7:30pm, Student Center Rm 407.

Meeting on Experimental Programs—ESG, Concourse, etc. Wednesday, December 6, 7:30pm, Student Center Rm 450.

Student Homophile League*
 Meeting and mixer. Every Thursday, 8pm, St. John's Church, 33 Bowdoin St, Boston. For gay help (anonymous) at MIT, call the student gay tutor, 492-7871, anytime.

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

Tech Engineering News**
 Stop by to work or learn. Every Sunday, 5pm, Student Center Rm 453. For more information, call dorm X8376.

Tech Model Railroad Club*
 Meetings every Saturday, 4pm, Rm 20E-214.

Technique
 Staff meetings. Every Saturday, 11am, Student Center Rm 451.

Tiddlywinks Association*
 Every Wednesday, 8pm, Student Center Rm 491. Tiddlywinks Competition. Saturday and Sunday, December 2-3, 9am-6pm, Student Center Mezzanine Lounge and Sala de Puerto Rico.

Tuesday Night Venture
 Student Art Association. Slides, museum trips and workshops. Every Tuesday, 7:30pm, Student Center Rm 429. Admission: 50 cents, wine served.

Unicycle Club*
 Meetings every Sunday, beginner's session at 1pm, other activities at 2pm, Walker Gym.

Wheelmen Bicycling Club**
 Every Thursday, 7:30pm, Rm 1-203. New members welcome. All phases of bicycling discussed, including touring, racing, Bike Shop.

White Water Club***
 Pool session. Tuesday, December 5, 8-10pm, Alumni Pool.

Social Events

Muddy Charles Pub**
 Join your friends at the Muddy Charles Pub, 110 Walker, daily 11:30am-2pm, 4:30pm and on. Note: The Pub is being redecorated. Artists and others interested are welcome to submit ideas and work for display. Call GSC, X3-2195.

Friday Afternoon Club**
 Music, conversation and all the cold draft Budweiser you can drink. Every Friday, 6pm, the Thirsty Ear in Ashdown basement. Admission: men \$1, women 50 cents. Must be over 21.

SCC: Pot Luck Coffeehouse*
 Live entertainment every Friday and Saturday, 8:30pm to 12m. Student Center Mezzanine Lounge. Free coffee, cider, doughnuts. Sponsored by Student Center Committee. Volunteers to perform or otherwise help out, call Paul Mailman, dorm X9626, or Doug Fried, dorm X8767.

Movies

Dada and Surrealist Film Program*
 Leger's *Ballet Mecanique*, Duchamp's *Anemic Cinema*, Rene Clair's *Entr' Acte*, Man Ray's *L'Etoile de Mer* and *The Seashell and the Clergyman*, based on Antonin Artaud's screenplay. Sponsored by Dept of Architecture and organized by Whitney Chadwick, visiting lecturer of art history. Wednesday, November 29, 7:30pm, Rm 10-250. Free.

Rheological Behavior of Fluids and Cavitation
 Fluid Mechanics Films. Thursday, November 30, 4-5pm, Rm 3-270.

Together**
 LSC. Friday, December 1, 7pm and 9:30pm, Rm 26-100. Tickets, 50 cents. Must show ID.

The Burmese Harp
 Film Society. Friday, December 1, 7:30pm and 9:30pm, Student Center Rm 407. Tickets \$1.

SCC: Bullit**
 Student Center Committee Midnight Movie Series. Friday, December 1, 12m, Sala de Puerto Rico. Free. Must show ID.

Who Is Harry Kellerman...**
 LSC. Saturday, December 2, 7pm and 9:30pm, Rm 26-100. Tickets 50 cents. Must show ID.

Grand Hotel*
 LSC. Sunday, December 3, 8pm, Rm 10-250. Tickets 50 cents.

Zero for Conduct and IF...
 Humanities 21.284 Movies. Monday, December 4, 7pm, Rm 10-250. Free and open to those interested.

Waves in Fluids and Generation and Propagation of Sound
 Fluid Mechanics Films. Monday, December 4, and Thursday, December 7, 4-5pm, Rm 3-270.

End of a Revolution
 Humanities 21.05 Movie. Tuesday, December 5, 7pm, Rm 10-250. Free and open to those interested.

The Grand Illusion
 Humanities 21.418 Movie. Tuesday, December 5, 8pm, Rm 10-250. Free and open to those interested.

La Dolce Vita
 Humanities 21.490 Movie. Wednesday, December 6, 7pm, Rm 26-100. Free and open to those interested.

Sacco and Vanzetti
 Humanities 21.017 Movie. Wednesday, December 6, 7pm, Rm 10-250. Free and open to those interested.

The President's Analyst
 Humanities 21.922 Movie. Thursday, December 7, 7pm, Rm 14N-0615. Free and open to those interested.

La Grande Gurrera
 Humanities 21.418 Movie. Thursday, December 7, 7pm, Rm 10-250. Free and open to those interested.

Baccanale**
 LSC. Friday, December 8, 7pm and 9:30pm, Rm 26-100. Tickets 50 cents. Must show ID.

The Love of Jean Hey*
 Film Society. Friday, December 8, 7:30pm and 9:30pm, Student Center Rm 407. Tickets \$1.

SCC: Whatever Happened to Baby Jane?*
 Student Center Committee Midnight Movie Series. Friday, December 8, 12m, Sala de Puerto Rico. Free. Must show ID.

Music

Noonhour Concert*
 Mordor String Quartet will present works by Beethoven and Schubert. Thursday, November 30, 12n, Chapel. Free.

Fall Jazz Concert*
 Festival Jazz Ensemble, Concert Jazz Band, and Jazz Quintet performing many original compositions and arrangements ranging from swing to jazz-rock. Friday, December 1, 8pm, Kresge. Tickets: free to community, Bldg 10 Lobby; \$1 at door.

Symphony Orchestra Concert*
 Program includes Hindemith's "Neues vom Tage," Schumann's "Symphony No. 3 in E Flat Major," and Rachmaninoff's "Rhapsody on a Theme of Paganini," with David Epstein, conductor, and Valerie Tryon, pianist. Saturday, December 2, 8:30pm, Kresge. Tickets \$1. Free tickets available, Bldg 10 Lobby.

Theater and Shows

The Rivals*
 Wellesley College Theater production. Friday-Sunday, December 1-3, 8pm, Alumnae Hall, Wellesley. Tickets: \$1.50 general public; 50 cents, high school students.

Arthur Miller's "After the Fall"*
 Community Players. Thursday-Saturday, December 7-9, and Wednesday-Saturday, December 13-16, 8pm, Little Theatre. Tickets: \$2.50 for general public; student discount on advanced sales only, \$2 with ID, Bldg 10 Lobby; reservations, X3-4720.

(Continued on page 8)

UROP: 'Almost Anything is Possible'

A study of the mechanics of cell differentiation is one of several hundred undergraduate research projects being carried out this term under the auspices of the Undergraduate Research Opportunities Program (UROP).

Chemistry major Bob Nance, a junior from Miami, Florida, has been studying the mechanics of cell differentiation by isolating messenger RNA (ribonucleic acid) from muscle tissue since last January. Like other undergraduates interested in first hand experience in the laboratory, Bob turned to UROP for guidance.

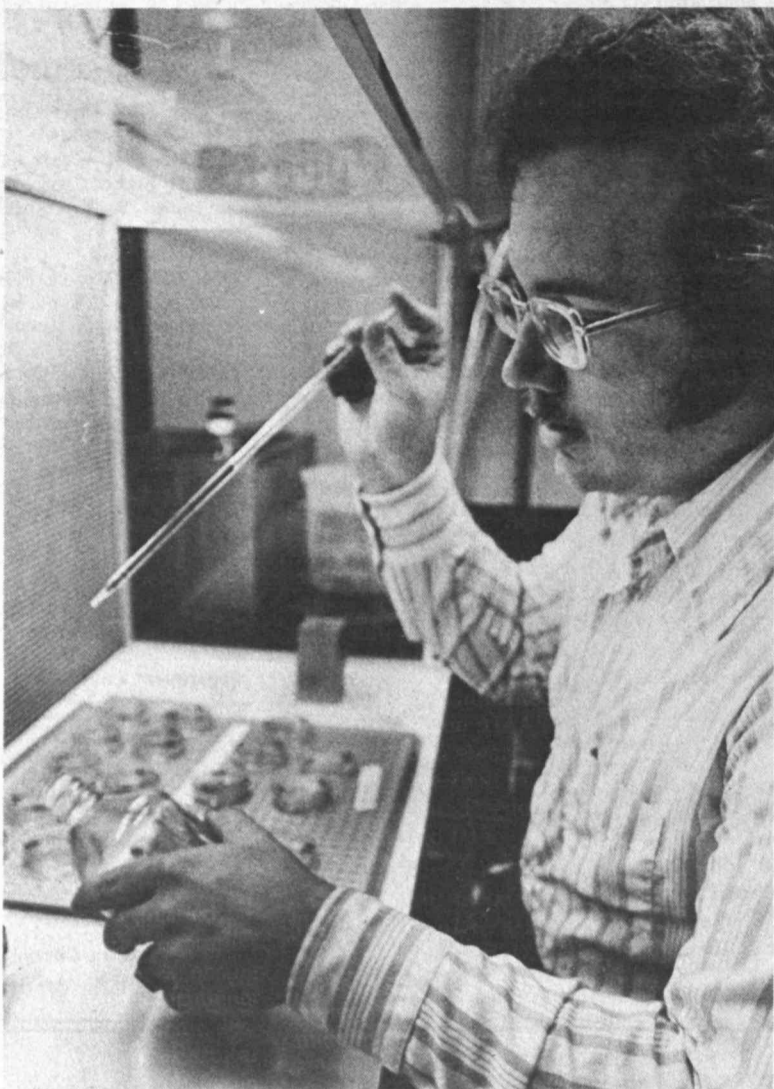
Now is its fourth year, UROP is a clearinghouse, a catalyst and an information center for undergraduate research resources. Professor Margaret MacVicar, UROP director, says, "Our program responds to individuals—almost anything is possible."

Bob thinks the UROP ideology is "great, but you only get out of it what you put into it. I'm doing a lot of technician's work but I'm learning how to carry out a research project effectively, and that's what is important."

According to Professor MacVicar, UROP is now sponsoring projects for one third to one half of the undergraduate students at MIT. She says, "One of the major advantages of the program is giving students the opportunity to engage in actual problem as early as the freshman year. Undergraduates can see the heart of what's going on, see a faculty member wrestle with something he can't explain."

The faculty-student relationship is a key factor to UROP's success. Some of the projects are initiated by the student, others by a faculty member. Once a student-faculty team reaches agreement on the scope and terms of a project, they approach UROP for help.

In the Department of Biology alone, UROP is sponsoring student projects dealing with the regula-



Junior Bob Nance working on a project in the biology labs.

—Photo by Margo Foote

tion of enzyme synthesis in bacteria, the production of antibodies in tadpoles and bullfrogs, the genetics of a new bacteria, and the synthesis of DNA in mammalian cells.

Professor Harvey Lodish who supervises UROP projects in biology says, "We have undergraduates working on projects equivalent to first year graduate school research. Unfortunately the biology department is small and we have a large enrollment. We

just can't support enough undergraduate research projects."

Undertaking a UROP project takes a great deal of commitment on the part of the student-faculty team. Professor Peter Griffith, UROP supervisor in the Department of Mechanical Engineering, feels that many undergraduates have an aversion to making such a commitment.

He says, "Students get frustrated when they realize that not all research leads to publishable

results."

In addition to providing an educational experience very different from the classroom, UROP offers students academic credit for their research. During the past year limited wages have also been offered. In addition to these options, Professor MacVicar reports, half of the students working through UROP choose to receive neither pay nor credit.

UROP is not limited to on-campus research. Last summer senior David Ashley from Whittier, California, spent ten weeks studying building systems in Europe with an architect from the Boston Architectural Center and Professor Albert Dietz of architecture. Many other off-campus research opportunities are now open to undergraduates.

The ground rules and procedures for participating in UROP are outlined in the brochure "MIT Undergraduate Research Opportunities Directory" which is available in the Information Center, Room 7-111, or in the UROP Office, Room 20C-231. Additional UROP opportunities are listed periodically in *Tech Talk* and other campus publications.

Technique Seeks Shutterbug Help

Technique needs volunteer photographers to help work on the 1973 edition of MIT's yearbook.

Anyone in the MIT community who has photographic experience is welcome. *Technique* will supply film, chemicals and darkroom facilities, but photographers should have their own equipment.

Photographers interested in working with *Technique* should call Al Ritter on dormline 8-427 or attend a yearbook staff meeting any Saturday at 11am in Student Center Room 451.

Backer Receives Award

Professor Stanley Backer of the Department of Mechanical Engineering and head of the department's Fibers and Polymers Division has received the first award of the Textile Information Users Council of Greenville, South Carolina.

The award, named after Dr. Backer, was established to honor individuals "most responsible for progressive reliability and sophistication in the field of textile and related services."

Dr. Backer has been widely published in a broad range of scientific articles and papers on a variety of subjects dealing with textile technology. He received the S.B. in 1941, the S.M. in 1948 and the Sc.D. in 1953 from the Institute and he has been a member of the faculty here since 1950.

Catalogue Listings Requested

Associate Registrar Robert Cook has asked all members of the faculty to review the listing of their subjects in the 1972-73 General Catalogue for unit changes and description revisions appropriate for the 1973-74 General Catalogue.

Mr. Cook urged faculty members to submit all revisions and proposals for new subjects to the appropriate department head as soon as possible. To meet the catalogue printing schedule, all proposals for new subjects or new curricula should be submitted to the appropriate faculty committees before January 10.

No changes will be made for the 1973-74 catalogue after March 9, Mr. Cook said.

New UROP Listings

For more detailed information on UROP opportunities listed, MIT undergraduates should call or visit the Undergraduate Research Opportunities Program Office, Room 20C-231, Ext. 3-5049 or 3-4849. Undergraduates are also urged to check with the UROP bulletin board in the main corridor of the Institute.

DEPARTMENT OF TRANSPORTATION Cambridge

The Center has a multimillion dollar study of Air Traffic Control (ATC) and management systems for the post-1990 era. One of the subsystems (involving the navigation system, surveillance system, communications systems, and the user's avionics unit) is under initial now as two researchers write a computer simulation that models the enroute airspace between the twenty largest US airports. When the simulation is up, various "experiments" through changes of parameters will be run to give a feeling for delays, conflicts, safety, capacity, etc., of the real system. Computer work is done on both an IBM 360/75 and an IBM 370/155. Students interested in working on this project should know (or learn in process) modelling, FORTRAN IV, assembly debugging and some graphics.

THEFT PREVENTION PROJECT

A West Roxbury businessman wants to work with a student "team" on an alarm to discourage the theft of TV's and stereos. He has some ideas and a preliminary development of one concept. The student "team" and faculty co-supervisors would work with him in developing this and other concepts to the production stage. The "team" would be made up of students with backgrounds in Electrical Engineering, Mechanical Engineering and Management. Interested students should contact UROP.

Graduate Study Opportunities

JOSEPHINE DE KARMAN FELLOWSHIPS

For graduate and senior undergraduate students in any discipline, with special consideration to applicants in the Humanities: US citizens and foreign students already enrolled in a university located in the US. Stipend: \$2,500

for the academic year. For information see the Graduate School Office, 3-134 or for application forms, write to Mr. T. E. Beehan, Secretary, Fellowship Committee, Josephine de Karman Fellowship Trust, c/o Aerojet-General Corporation, 9100 East Flair Drive, El Monte, California 91734. Deadline: January 31, 1973.

ATMOSPHERIC SCIENCES

The fellowships cover a year's study in any US accredited graduate school, in the broad field of atmospheric sciences. Each Fellow will be expected to be in residence in the Advanced Study Program at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado during the summer preceding the academic year for which the fellowship has been awarded. The fellowship stipend is in the amount of \$3,000 plus tuition for the academic year. The summer appointment at NCAR carries a stipend of \$500 per month prorated over the actual period of stay plus reasonable travel expenses to and from Boulder. Any student who will have received his bachelor's degree by the spring of 1973 is eligible to apply. Applications for UCAR Fellowships for the 1973-74 academic year, with supporting documents, must be received by January 15, 1973. Further information may be found at the Graduate School Office, 3-134.

NASA INTERNATIONAL UNIVERSITY FELLOWSHIPS IN SPACE SCIENCE

The NASA International University Fellowships provide an opportunity for promising young scientists and engineers to study and participate in research in the space sciences at leading universities in the United States. Graduate and Postdoctoral Fellowships in Space Sciences are open only to foreign nationals sponsored by their National or Regional Space Research Organizations. Applicants are expected to have training equivalent to that represented by an earned Master of Science or Master of Engineering degree awarded by an accredited educational institution in the United States and must meet graduate student entrance requirements at United States universities. The United States National Research Council, which administers the program for NASA, will pay the Fellow's tuition, academic fees, and appropriate research costs by grant to the University. NASA Fellows

come to the United States as Exchange Visitors. It is not intended that a Fellowship lead to employment in the United States; on the contrary, Fellows will be expected to return to their own countries to support space research activities there. For further information, please drop by the Graduate Office, 3-134.

Student Employment

On Campus: Animal caretaker in Nutrition; experimental subjects for visual acuity experiment; scaffolding builders for Professor Kepes; machine shop helper needed; clerk-typist and precise clerk for Information Center.

Off Campus: Ski binding mechanic at the Ski Market; graduate student worker on solid state electronic arrangements; Chem Library researchers for a research company; electronic technician for electron factory in Woburn; market survey work at Commonwealth Gas; executive interviewing positions at Becker Research.

Off Campus Work-Study Positions (open only to students receiving financial aid from MIT): Clerk-typist in Cardiac EKG Lab at Massachusetts General Hospital; students in all majors at Hanscom Field; child care assistants at Technology Nursery School.

For details on these and other available jobs and how to apply, come in and see Kathi Mahoney, Student Employment Office, Room 5-119.

Other Opportunities

Two representatives from VISTA/Peace Corps will be on campus next week to speak with interested students and hold interviews.

On December 6 and 7 interviews will be held in the Career Planning and Placement Office, E19-455, between 9am and 12noon and between 1:30 and 4pm. Students wishing an interview should make an appointment through the Placement Office, Ext. 3-4733. A booth will also be set up in the lobby of Building 10 between 9am and 4pm for those days.

The representatives are particularly interested in engineers, city planners, math/science majors, those studying economics and anyone who has lived or worked on a farm.

MARIC Center Begins Bimonthly Newsletter

The Marine Resources Information Center (MARIC), a part of the advisory services of the MIT Sea Grant Program, has begun publication of a bi-monthly news bulletin.

The bulletin contains listings of recent MARIC acquisitions and is put out by Barbara Passaro, the Center's information manager. Future issues will also list acquisitions in marine-related fields at other libraries in the MIT library system as well as announcements of new MARIC services, such as the listing of contents of new journals.

Mrs. Passaro emphasizes that MARIC's collection is primarily concerned with the useful application of marine resources. The Center maintains constant liaison with other MIT libraries and can aid the potential user in finding further material elsewhere. In a cooperative program established with Barker Engineering Library, Mrs. Marjorie Chrysostomidis, information services librarian on the Barker staff, will also serve as

information officer for MARIC. At present MARIC's collection comprises relatively few books, approximately a thousand, but over 10,000 technical reports and over 100 journals and bulletins, maintained on a subscription basis.

In addition, MARIC has what is probably the largest collection of foreign reports on naval architecture in New England, a microfiche reader/printer with microfiche collection, National Ocean Survey charts of New England waters and other area charts and maps. Working collections include material on living marine resources, aquaculture, marine economics, shipping, naval architecture, ocean engineering and marine recreation. Mrs. Passaro and her assistant, Asako Burr, continue to expand the collection.

Last summer the MARIC staff renovated the former library of the Department of Ocean Engineering to accommodate the new center in pleasant surroundings. In addition to the former study area there is now an informal reading lounge. MARIC is located in Building 5, Room 331.

Mrs. Passaro reports that use of the library's facilities by people outside the MIT community is increasing. One aim of the new MARIC bulletin is to familiarize New England industries and others interested in coastal zone and marine resources with the Center's information services. MARIC is open to the public from 9am to 6pm, Monday through Friday.

Marksmanship Course Offered

The MIT Pistol and Rifle Club has announced the beginning of a course in basic pistol marksmanship.

The course will be offered for five consecutive Thursday evenings from 6:30 to 8:30pm, beginning December 7. All courses will be held in the Pistol Range in the DuPont Gymnasium.

There will be a \$10 fee for the course, which will open to the first 20 adult members of the MIT community who apply. Those interested in applying should call Range Master Thomas McLennan at Ext. 3-3296.

Patrol Offers After-Dark Escort Service

Now that the sun sets before 5 o'clock, the Campus Patrol reminds members of the community to use the Patrol's escort service when walking to parking lots or remote campus locations after regular working hours.

Anyone desiring patrol protection should call Extensions 3-2997 or 3-2998. A campus patrolman will be dispatched to meet you en route to a parking lot, campus dormitory, or building.

Patrol Captain James Olivieri explains, "Members of the community should feel free to call us. Just give the operator your location, destination and normal route of travel. Unfortunately we do not have enough patrolmen to provide door to door service, but we will meet you en route."

In addition to escorting members of the community to parking areas and other campus locations, the Campus Patrol will also provide patrol protection to members of the community walking to the Kendall Square subway station after normal hours.



Shown above are Mr. and Mrs. Verner Johnson with William R. Dickson, Director of Physical Plant (left) and Philip A. Stoddard, Vice President for Operations behind them. The occasion was a retirement dinner-dance for Mr. Johnson who is leaving the Institute at the end of December after 45 years. Some 150 of his friends and colleagues attended the festivities at which Mr. Johnson received a Viking hat and portable TV among several other gifts.

—Photo by Marc PoKempner



In new roles (left to right) are: Claudia Liebesny, Priscilla Mead and Patricia Williams.

—Photo by Margo Foote

Changes Announced in Personnel

Three changes in staff have been announced in the Office of Personnel Relations.

Miss Priscilla Mead, a personnel representative in the Office Bi-weekly Section for a number of

Professions Conference Announced

Junior and senior women from 363 local high schools have been invited to a conference at MIT on Professions for Women on December 8.

The conference, being sponsored by the Association of Women Students and the Office of Admissions, is focused on the increasing breadth of careers opening up to women. "We hope the conference will touch on and stimulate interest in reaching out to the less traditional careers for women," Cynthia C. Bloomquist, Assistant Director of Admissions, said in the invitation.

The half-day program will feature a panel of MIT women, including students, faculty and staff, discussing the fields in which they are active. Campus tours will be conducted by MIT undergraduate women. The program will conclude with informal conversation and refreshments in McCormick Hall.

Den Hartog to Receive ASME Medal

Professor Emeritus Jacob P. Den Hartog, former head of the Department of Mechanical Engineering, Tuesday received the Timoshenko Medal at the annual Meeting of the American Society of Mechanical Engineers in New York.

The Timoshenko Medal was awarded to Professor Den Hartog in "recognition of his contribution to the theory and practice of applied mechanics as author, teacher and consultant." The award is named for its first recipient, Russian mechanical engineer Stephen Timoshenko.

Professor Den Hartog, one of the world's foremost authorities on mechanical vibration, came to the Institute in 1945. He served as head of the department from 1954 to 1958. Since his retirement in 1967 he has continued to serve as senior lecturer in mechanical engineering.

years, has accepted a position with the Special Services Section. In her new post, Miss Mead will advise and counsel members of the Institute community in regard to tuition assistance, and continue development of orientation programs, and assist in other special programs.

Miss India Thompson has left the Institute after three years in the Personnel Office to accept a counselling post with the Mattapan Housing Authority.

The resulting vacancies have been filled by Mrs. Claudia Liebesny and Mrs. Patricia Williams.

Mrs. Claudia Liebesny, secretary to Personnel Director Robert J. Davis for the past year and a half, will become a personnel representative. She was graduated from Rhode Island College in 1971 and has worked in Washington and Providence.

Mrs. Patricia Williams, administrative assistant to James J. Bishop, assistant dean for student affairs, has also been appointed personnel representative. Mrs. Williams received the B.A. degree from Philander Smith College in 1968 and worked as an administrative assistant for Project Equality for one and a half years.

Opera Workshop Being Organized

An MIT opera workshop is being organized by John Cook, Institute Organist and director of the Noon-hour Concert Series.

His proposal for the establishment of an organization which will study all aspects of the opera has been accepted and he is now recruiting members from the MIT community. He hopes that regular meetings can begin during IAP. Academic credit for IAP may be individually arranged.

Looking ahead, Mr. Cook envisions members of the workshop learning about opera by taking productions apart and putting them together again. "This spring, we might even present a performance of *The Magic Flute*," he said. "Why not aim for the top. There is a lot of room for experimentation in *The Magic Flute*. For example instead of traditional

scenery, which is expensive, we could use films as backdrops," he continued.

"But before a performance can be planned, we need people: to design and make costumes, props and scenery, people for stage direction, management, people to coach, advise and take notes. Also we need singers, lots of singers and orchestra people too," he said.

Persons interested in joining the Opera Workshop should call the music office 3-3210 and leave their names and main interests. Mr. Cook will inform those who inquire about meetings.

Alumnae Seek Nominations

The Association of MIT Alumnae (AMITA) has announced the opening of nominations for candidates for the AMITA Senior Academic Award.

The Award is given on the basis of academic excellence to a woman student in the class of 1973. Factors considered in the selection include cumulative average, depth and breadth of academic accomplishment as shown in course work, special projects and/or thesis research.

"We are especially interested in receiving nominations from research advisors and members of the class of 1973," Dr. Audrey Buyn, the AMITA representative said.

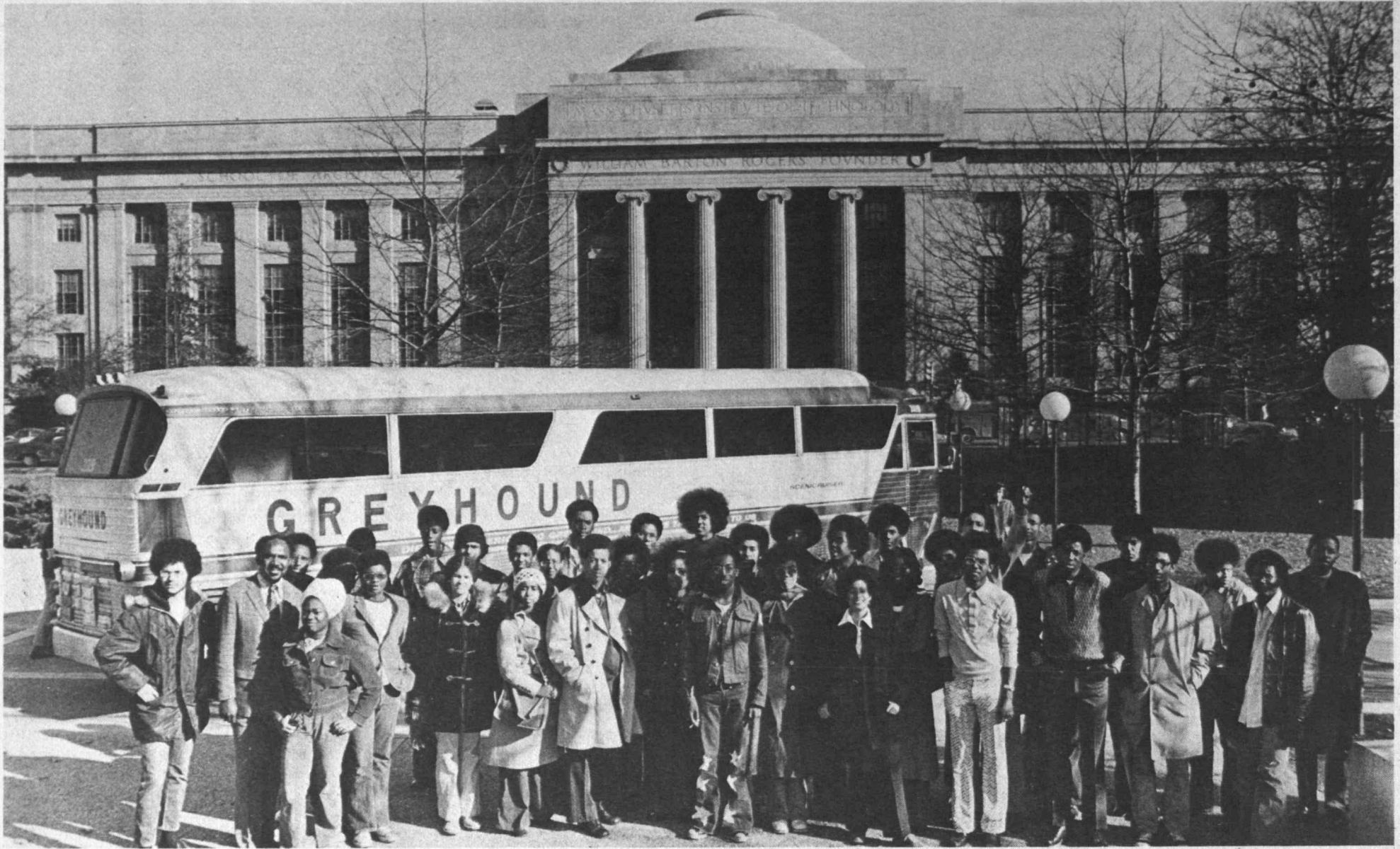
Nominations should be addressed to Dr. Buyn, Room 26-411, and submitted by February 1, 1973. The Award will be presented on April 10 at the AMITA Annual Student Dinner at the Faculty Club.

Book Sale Opens Today

The rush will begin at 10am this morning, November 29, for the over 40,000 books offered at 50 to 95 percent reduced cost at the MIT Press Annual Book Sale.

The sale, held in the Sala De Puerto Rico, will be open until 10pm tonight and will continue from 10am to 10pm Thursday, November 30, and from 10am to 4pm on Friday, December 1. The sale features shelfworn, slightly damaged and overstocked books from the Press' present 1,100 titles in-print.

"Last year we sold over 30,000 books," said Anne Sayre, publicity manager for the Press. "We had very few books left and we expect to do well this year."



Shown above are three-dozen students from high schools in Washington, Baltimore and Philadelphia who took part in one of two bus trips designed to introduce MIT to minority students. At the left are Randolph H. Burton, a freshman from Glencoe, Illinois, John A. Mims, Assistant Director of Admissions and Paula A. Waters, a senior from Chesapeake, Virginia.

The students, representing 23 high schools, arrived November 19, for a two-day program. The second group of minority students, from the New York, Long Island and New Jersey area, is scheduled to arrive Sunday, December 3.

The program featured welcoming remarks by Mrs. Mary Hope, Assistant Dean for Student Affairs, and John A. Mims. Each visiting high school student had an MIT student host.

The following day the visiting students attended classes, had a tour of the campus and an informal rap session with Institute faculty members and students. Also included were two discussions—"An Overview of the MIT Curriculum" by James J. Bishop, Assistant Dean for Student Affairs and "A Minority Perspective" by Wesley L. Harris, Visiting Associate Professor in aeronautical engineering.

The closing session on Tuesday morning was a discussion on admissions and financial aid conducted by Peter H. Richardson, Director of Admissions and J. Samuel Jones of the Financial Aid Office. The program for the upcoming December trip will be similar.

—Photo by Marc PoKempner

New Library Services Available for the Blind

The MIT Libraries have set up and equipped an area in the Student Center Library to provide special library services for the Institute's visually handicapped students.

In addition to recorded news and recreational journals, the new library service features a braille catalog collection of multi-media materials. Equipment for recording, playback and braille transcription is also available.

Several projects are underway to supplement the materials now available in the special library. A

number of textbooks are being recorded by the National Braille Press at the request of visually handicapped students. In addition, orientation materials—including *HoToGamit* and the *Guide to the MIT Libraries*—are being recorded.

One of the most useful services offered by the new library area is a file of readers—people at the Institute who are willing to spend a few hours a week reading textbooks and other materials to blind students. Additional readers are needed, especially in technical areas. Volunteers should call Frances Haslett, Ext. 3-7050. Private rooms are available in the Student Center Library for readers to meet with students.

The impetus behind the new library service came from two graduate students in architecture. Peter Greer and Ann Kidwell, who prepared a joint thesis on a tactual map to help blind students get around the Institute. Library staff members Kathy Grimes, Frances Haslett and Laura Malin worked under the chairmanship of Helen Mitchell of the Catalog Department to set up and equip the special area.

H. G. Parks to Speak

The Community Fellows Program will bring Henry G. Parks, Tuesday, December 4, for its weekly seminar to speak on "The H. G. Parks Corporation and Parks Sausages" from 5 to 6:30pm in E40-169. The Community Fellows Program sponsors seminars each Tuesday which are open to the public.

Revolutionary Tactual Map Opens MIT to Blind People

(Continued from page 1)

find helpful are also indicated on the map. Open grassy spaces are depicted in very low relief while parking areas and outdoor athletic facilities have different textures on the top of the map. MIT has many buildings which are linked together with overhead passes which also produce good auditory clues. These overpasses are indicated on the bottom side of the map.

The map also includes symbols for external stairways, mail boxes, traffic lights and obstructions which a blind person might otherwise be unaware of.

Part of a system of maps and guides for the handicapped initiated by the MIT Planning Office, the map for the blind was prepared by Ann M. Kidwell of Short Hills, New Jersey and Peter Greer of Wheeling, West Virginia. Working with John A. Steffian, associate professor of architecture, the students chose to investigate mapping for the blind rather than a conventional design project as a thesis requirement.

Support for the project was provided by the MIT Planning Office, the American Foundation for the Blind, Howe Press of Perkins School for the Blind, the MIT Dean for Student Affairs Office and the MIT Medical Department.

"We were intrigued by the problems of describing two- and three-dimensional space non-visually," Mr. Greer said. "We think this map is one of the most detailed and complete tactual displays ever attempted."

Working in close collaboration with the Planning Office and their thesis advisor, the students examined the campus in detail, noting steps and entries, curb configurations, mailboxes and traffic lights on a base map of MIT.

Throughout the development of the map the students conferred regularly with blind students at

both MIT and Harvard and with persons who had experience in the field of blind mobility. By using this feedback mechanism the students were able to devise a map which provides maximum information while limiting detail which could be tactually confusing. The map as published incorporates improvements suggested by the blind students using two earlier prototypes.

In the manufacturing process, resinous powders were melted into a sheet of plastic less than a sixteenth of an inch thick during which a mold prepared from a photo engraved plate permanently applied a layer of pigmented vinyl to the base sheet. The same process was used for both sides of the map, after which they were permanently bonded together.

The use of the pigmented vinyl makes the map equally useful for sighted persons. Printed information is recessed in the various levels of embossing so as not to interfere with tactual information. The map includes legends in both braille and print.

The polyvinyl chloride map combines a high degree of durability with enough flexibility to be rolled up and even folded without leaving permanent creases. Though the map is easily portable, the blind students who use it chiefly refer to it in their residences as an aid in planning the routes they will take at MIT.

The map presented the first opportunity for some blind students to perceive that a variety of routes exist in going from one building to another.

A number of the blind students, however, requested a taped or braille supplement to the map which would include instructions for using the map and an index of buildings and major offices, among other things. Under the auspices of the Planning Office, Mr. Greer is preparing the

supplement.

The Planning Office has produced a sufficient supply of maps to give one to each blind student for the next several years. In addition, copies of the map will be distributed throughout the United States and abroad for further testing and evaluation.

"Even though this map represents a breakthrough in mapping for the blind, it is only one possible solution," Mr. Greer said. "Much more needs to be determined about what information is helpful and how best to present it. However, many of the techniques used in the tactual map of MIT could easily be adapted to other locales."

Fulmer Named Suffolk Trustee

Vincent A. Fulmer, vice president and secretary of the Institute, has been appointed a trustee of Suffolk University.

Fulmer's election to the 21-man board fills the vacancy created by the death of Joseph E. Sullivan of Lowell. He will serve the remainder of Sullivan's term, which expires in June, 1977. The appointment was announced by Judge John E. Fenton, chairman of the board of trustees.

A cum laude graduate of Miami University, Ohio, Fulmer received the S.M. in economics in 1953 from MIT. He was awarded an honorary doctor of laws degree from Suffolk University in 1971.

When he was appointed vice president and secretary of MIT in 1963 at the age of 35, he became the youngest person named to the vice presidency since the founding of the Institute. Mr. Fulmer supports the Corporation and its committees in administering their work and he has overall responsibility for direction and coordination of the Institute's relationships with industry.