

## Aero Department Beers Up Under '75 Class Gift

The senior class gift to the MIT Department of Aeronautics and Astronautics consists of 75 beer cans and five beer bottles—all empty.

But it's not as bad as it sounds. The cans and bottles, with some epoxy and fishing line, were the building materials for an impressive model of the "Starship Enterprise," the spacecraft in the popular "Star Trek" television series.

The model was presented to Professor Rene H. Miller, the head of the department, at the senior class dinner at the Faculty Club and now is on display in his office. As a special tribute to the professor, six Miller High Life cans were used on the bridge of the spacecraft.

The chief designer for the

model was Val M. Heinz of Portage, Mich., who received an SB in aeronautics and astronautics this month and who is remaining at MIT to study for his master's.

Other seniors in the department contributed to the project by emptying the beer cans and bottles at a beer bust in May.

For assistance in designing and building the model, Heinz turned to a fellow Burton House resident, Richard L. Hernandez of Houston, Tex., who will be a senior in mechanical engineering next year.

"We put in about 70 people hours," Heinz said.

The model is about a foot tall, three feet long and two feet wide. It weighs approximately six pounds, which Heinz said included

"five pounds of cans and bot-

ties and a pound of epoxy."

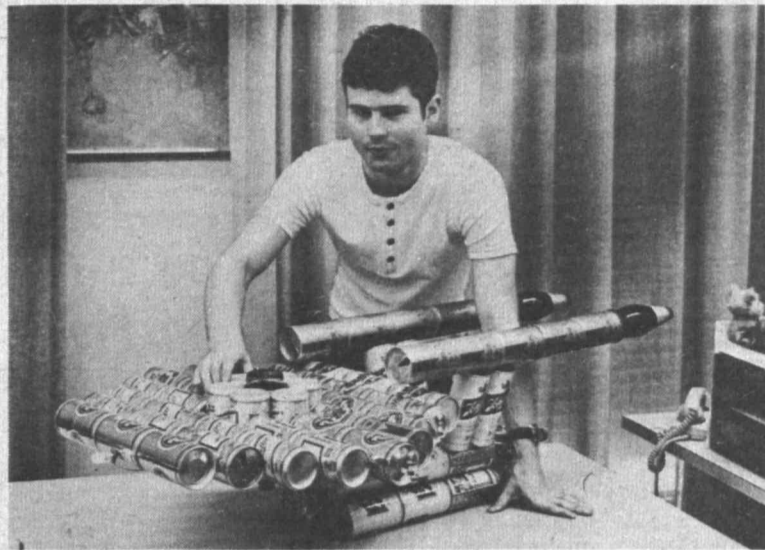
The model was constructed largely by gluing the cans together with the adhesive. Some fishing line was used to support the main hull.

The size of the model was more or less determined by a decision to use exactly 75 cans (for the class of '75) and five bottles (one for each of the department's divisions).

An extra touch is provided by a set of battery-powered red and yellow navigation lights.

Heinz, who said he is a "Star Trek" fan, suggested that the Class of 1976 might want to add warp drive, phasers and a transporter mechanism to the "Space-ship Enterprise."

"Star Trek" fanciers will know what he means.



Val Heinz and the "Starship Enterprise:" A beer blast-off.

## Extraterrestrial Life Search Misguided, Scientist Says

By BARBARA BURKE  
Staff Writer

Believers in extraterrestrial life within the solar system are looking for it in the wrong places, according to Ronald Prinn, assistant professor of meteorology at MIT.

"From a scientific viewpoint, there is almost no basis for life on Mars," he says. "The enormous amount of money being spent on

the Viking landing, which will scoop up samples in an attempt to find biology, is surely a waste of money."

He also rules out life on Jupiter: for the past five years he and Professor John Lewis have been disputing theories that the rusty colors of Jupiter indicate the presence of organic materials—materials which some say could develop into life.

But the most promising place to look has been ignored, he said. No landing or probe is scheduled for Titan, one of Saturn's moons, which has an atmosphere that appears to resemble that of the ancient earth.

If Titan does have oceans for breeding life, the chances are, Prinn says, that they are oceans of ammonia—lethal to life as we know it. But he maintains that it is

the only place in the solar system where a search for extraterrestrial life is justified.

The case against Mars is overwhelming, he says. The longtime favorite with writers of science fiction has little oxygen, large amounts of carbon dioxide and a very thin atmosphere. Most important, its surface receives a steady downpour of deadly radiation: Mars has no atmospheric

layer, like our ozone layer, to protect it from ultraviolet radiation.

Jupiter has intrigued proponents of extraterrestrial life because of its colors. The planet gleams like a prize marble, with rust-colored bands alternating with white, and a large splotch of bright orange to one side—the Great Red Spot. Some scientists, including Carl

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## Carpenter Is 'A Friend, Indeed'

By PATRICIA M. MARONI  
Staff Writer

James Smith, a maintenance carpenter at MIT, is from an Irish family of cattle and sheep farmers who still practice the old Gaelic saying, "When God made time, He made plenty of it."

For the past eight months the native of Donegal County, Northern Ireland, has been donating evenings, weekends and every available scrap of lumber to a Marlboro friend permanently blinded in an automobile accident two years ago.

In taking time from his own family in Arlington to build a workshop for Charles Smith (no relation), James has been particularly helpful to his blind friend's career shift from truck driver to self-employed businessman.

He even persuaded Humphrey Mahoney of the MIT Metal Shop to contribute a set of windows to the project—which began at the suggestion of George Halverson of Stoneham, a co-worker of Charlie Smith's in the appliance distribu-

(Continued on page 6)

## MIT Wins Communications Award

MIT has been named the most effective university in the country in developing and communicating pre-admission information to its prospective students.

The first-place award in the annual College Board/CASE Communications Award Program—sponsored by the College Entrance Examination Board and newly reorganized Council for the Advancement and Support of Education—cited MIT for a package of eight Institute publications that

are sent to prospective applicants. The award, underwritten by Aetna Casualty and Life Insurance, carries with it a grant of \$1,500 for MIT's general scholarship fund.

Unlike any other CASE-sponsored competition, entries were judged by a panel of high school and college students, who made their selections on the basis of

quality, responsiveness and relevance of the information provided to prospective students.

The award will be accepted by James A. Champy, executive vice president of the MIT Alumni Association at the annual CASE conference in Chicago July 8-10.

Included in the winning MIT (Continued on page 8)

## Student Attempts Rescue

An MIT student leaped into the Charles River from the Harvard Bridge Tuesday in an attempt to save an unidentified man who had jumped into the water in an apparent attempt to commit suicide.

Charles F. Jung, 20, was riding his bike across the bridge from Boston to Cambridge when he saw the man. It was about 10am.

"He was on the other side of the railing, his back to the bridge,

looking into the water," said Jung, a member of MIT's heavyweight varsity crew.

"An MDC cruiser pulled up just as the man jumped in. The police threw a life preserver to him but he ignored it and stopped swimming and went under.

Jung, who is six feet three and weighs 190 pounds, jumped feet first into the river, about 25 feet below the bridge at the point

(Continued on page 11)



Carpenter James Smith in his MIT role.

### July 4th Holiday

The Independence Day holiday will be observed on Friday, July 4. Normal activities will be suspended and the usual pay practices applying to official Institute holidays will be in effect.

# Lipchitz, Ernst Works on Loan

Arrangements have been made by the Committee on the Visual Arts for the loan of major sculptures by Jacques Lipchitz and Max Ernst to MIT.

Seven Lipchitz works—six from the artist's widow, Mrs. Yulla Lipchitz, and their daughter, Lolya Lipchitz, and one from the collection of Mr. and Mrs. Ralph Pomerance—are on long-term loan to MIT. Mrs. Pomerance is a member of the Council for the Arts, which was instrumental in obtaining the works.

Max Ernst's *Capricorn*, recently exhibited in the Ernst retrospective at the Guggenheim Museum in New York, was lent by Mrs. Dominique de Menil, also a member of the Council for the Arts at MIT.

The Ernst work and all but one of the Lipchitz pieces are included in the current Hayden Gallery exhibition, *Bronzes from the MIT Collection: New Acquisitions and Loans*. In addition, two renowned sculptures acquired by MIT in 1973, August Rodin's *Large Head of Iris* and Emile-Antoine Bourdelle's *Tragic Mask of Beethoven* are on view. The exhibition continues through mid-summer.

Most of the Lipchitz works will be installed in the Hayden Sculpture Courtyard sometime next fall.

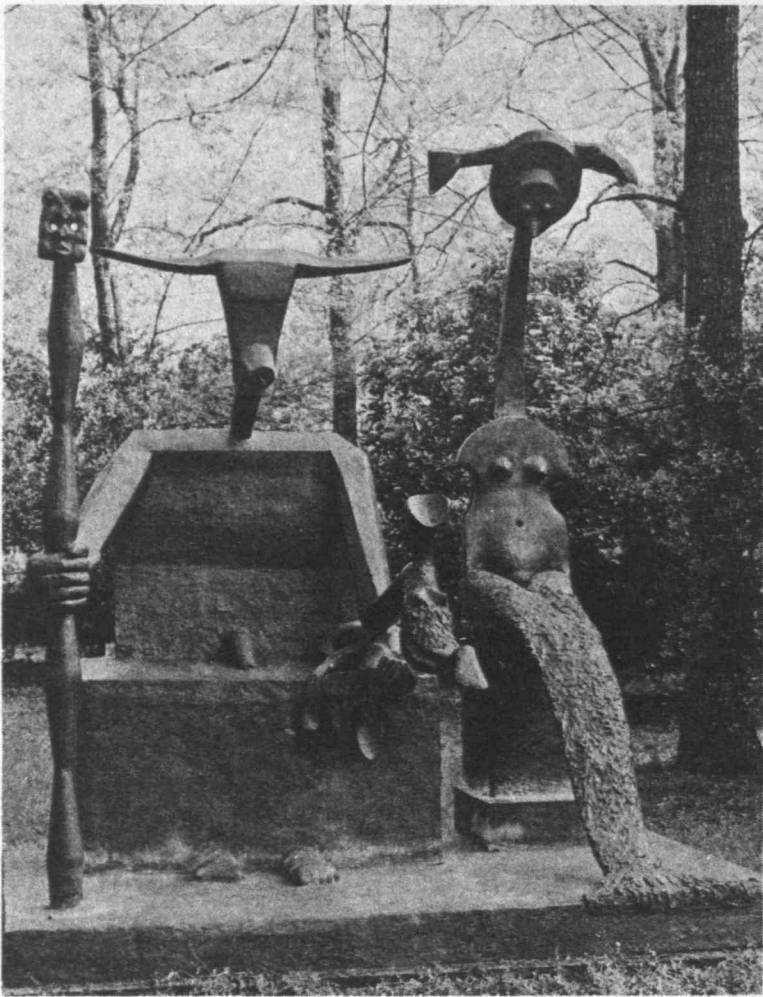
The Lipchitz sculptures represent examples of his stylistic changes over a period of more than three decades. Born in Lithuania in 1891, Lipchitz formed his style and established his reputation in Paris where he went to study sculpture in 1909, gradually absorbing Cubist principles of painting. *Bather* (1923-25) still contains elements of the Cubist idiom of his earlier work. The well-known *Figure* (1926-30) shows the influence of African sculpture which the artist admired and collected; a cast of this work is in the Museum of Modern Art. Around 1927, continuing his inter-

*Hagar in the Desert* (1957) which explores the mother and child theme prevalent in his work.

His preoccupation with the motif of ritualistic sacrifice is interpreted in *Sacrifice III*, executed between 1949 and 1957. A large architectural relief, *Birth of the Muses*, (1944-50) based on one of the Pegasus legends of antiquity is not included in the Gallery

American southwest and the astrological piscine motif.

Ernst is the only original member of the French surrealist group who continues to turn to sculpture as a major form of expression. In 1934 he joined Giacometti and Arp in producing surrealist sculptures by utilizing commonly found objects which he then metamorphosed into



Capricorn by Max Ernst.

exhibition but will be placed in the Courtyard next fall.

*Capricorn* was first executed in reinforced concrete in 1948 in Sedona, Arizona, where Ernst lived for a period of time after his emigration from France during the German occupation. It was cast in a slightly modified version in bronze in 1964.

The hieratic and ritualistic figure group measuring 94 and a half inches high by 80 inches wide and weighing more than a ton, consists of a seated horned male monarch accompanied by a mermaid-queen and two small creature images. Conceived as a family portrait of Ernst, his wife Dorothea Tanning and their two Tibetan dogs, the sculpture originally functioned as a guardian totem at the entrance to Ernst's farmhouse in Sedona.

Imbued with a supernatural presence and acknowledging Egyptian, medieval and primitive sources, *Capricorn* is the culmination of many of the images and ideas Ernst had examined in his earlier work.

Ernst's sculpture adheres to surrealist technique in his use of automatic impulse in the initial creation of a piece, and the hybrid personages are the result of the spontaneous suggestiveness that each additive component reinforces. "I place forms in a mold and then the game of anthropomorphism begins," Ernst has said of his sculpture undertakings.

In *Capricorn*, the prototype for the male horned figure is Ernst's chess king in his well-known *The King Playing with the Queen* of 1944. The queen is a combination of two figures from his earlier architectural decorations of a farmhouse near Avignon, France, and the sceptre the king holds is Ernst's *Standing Woman*, now destroyed. Also employed by Ernst in *Capricorn* are imagery from the Kachina dolls of the

images infused with enigma. Like most of the Surrealists, Ernst was steeped in Freudian psychology and captivated by mythic explorations. Born in Germany in 1891, Ernst participated in Dada events and exhibitions in Cologne, Germany. In 1924 he joined the Surrealist movement in France. Among Ernst's major contributions to Surrealist art were his innovative use of collage and invention of "frottage" or texture rubbings.

When the Hayden exhibition closes, *Capricorn* will be installed in the Lobby of the Center for Materials Science and Engineering (Bldg. 13) where it will remain until its return to the de Menil family in January, 1976.

The sculpture loans augment the Committee on the Visual Arts' art-in-the-MIT-environment program. With the recent acquisition of a work by Pablo Picasso and several sculpture projects in process, the Committee on the Visual Arts plans to have pieces by many major American and European artists located throughout the MIT campus by the end of next year.

## Bicycle Compound

The Campus Patrol has noted the increasing number of bicycles parked within Institute buildings, hallways, stairwells and other unauthorized areas. This constitutes a safety hazard and is prohibited.

It is strongly recommended that bicyclists utilize the attended bicycle shelter located between Buildings 11 and 13.

An attendant is on duty at the shelter Monday through Friday 7:45am-6:15pm.

A check-in-check out system is used and according to the Campus Patrol the facility is one of the safest places to park bicycles on campus.

# Technology and Policy SM Degree Approved

A new program leading to a master's degree in Technology and Policy has been approved on a three-year experimental basis by the Executive Committee of the MIT Corporation and is now open to selected, qualified students.

Graduates of the program are expected to assume positions in government and industry in planning, coordinating, assessing and implementing appropriate, socially responsible policies for large-scale technical systems of many kinds. Alternatively, the program can be used as a base for advanced interdisciplinary graduate or professional study.

Students in the program can continue to concentrate in some area of technology while at the same time taking graduate subjects in economics, political science and systems analysis, as well as a law-related subject. The student's thesis research is expected to concern the problem of coupling users of technology with the social

and policy implications of their applications of technology.

The program will be guided by an interdepartmental faculty steering committee which will oversee the implementation of the program, coordinate its relations with other graduate programs and provide overall supervision of each student's program.

Admission to the program will be through the departments of the School of Engineering. Students should expect to plan, with faculty associates in their area of interest, a curriculum including relevant subjects in the application of technology, the context of policy formulation, and the planning and design of systems.

To integrate technology, policy and social considerations, the program will develop an innovative and intensive "proseminar in technology and policy." This proseminar, which will be at the heart of the program, will be required of all students. The proseminar will be designed specifically to explore central issues concerning the problems of and possibilities for the use of technology. Faculty from engineering, humanities, the social sciences and planning are expected to participate in the proseminar.

The chairman of the steering committee will be Professor Richard L. deNeufville of the Department of Civil Engineering. The chairman of the proseminar will be Professor Thomas B. Sheridan of the Department of Mechanical Engineering. Professor deNeufville is a former White House Fellow, Director of the MIT Civil Engineering Systems Laboratory, and author of texts on systems planning and design. Professor Sheridan is an expert in the field of man-machine systems, author of a text on the subject, and currently serves as President of the IEEE Systems, Man and Cybernetics Society.

Further information about the program can be obtained from either Professor Sheridan or Professor deNeufville, c/o Special Assistant to the Dean of Engineering, Room 3-282, MIT, Cambridge, MA 02139.

## Proposals Sought

The MIT Division for Study and Research in Education reminds faculty members that July 15 is the deadline for grant proposals for the Lilly Faculty Teaching Award Program.

The faculty development program is open to all full-time instructional staff members with doctorates, but at least five of the approximately 12 participants must be instructors or faculty members who next year will be in their first, second or third year of full-time teaching.

Information can be obtained from Elaine Medverd, DSRE administrative officer, at x3-7362.

## Honors

### Sinsky

Anthony J. Sinsky, associate professor of nutrition and food science at MIT, has been awarded the 1975 Samuel Cate Prescott Award by the Institute of Food Technologists for his research on the impact of food processing on microbial metabolisms.

Professor Sinsky, of Boston, was cited for his contributions to public health, quality control and modifications to food processes at the 35th annual meeting of IFT on June 8 in Chicago. The award carries with it a \$1,000 honorarium.

The Award is named for the late Dr. Prescott who was professor of biology and dean of the School of Science at MIT and author of *When MIT Was Boston Tech*.

### Atwater, McCord

Two members of the MIT faculty, Tanya M. Atwater, assistant professor of marine geology and Thomas B. McCord, associate professor of planetary physics, have been named Fellows of the American Geophysical Union, a professional scientific association.

This is one of the few honors that the A.G.U. confers and it is awarded to members in recognition of their acknowledged eminence in some branch of geophysics. At no time does the number of fellows exceed three percent of the association's membership, now at 11,000.

### Driscoll

Professor Michael J. Driscoll of the Department of Nuclear Engineering at MIT has been named the 1975 outstanding teacher of nuclear engineering by the American Society for Engineering Education.

Professor Driscoll was cited for "original scholarship and intellectual contributions, and his ability to inspire these attributes in his students."

### Evans

Dr. John V. Evans, group leader at Millstone Hill Field Station, has been awarded the 1975 Appleton Prize by the Council of the Royal Society in London, in consultation with the Board of Officers of the International Union of Radio Science.

Dr. Evans was recognized for distinguished contributions in the field of ionospheric physics and, in particular, his leadership in applications of the incoherent scatter technique in studies of the physical characteristics and the dynamics of the ionosphere.



Figure (1926-30) by Jacques Lipchitz

est in the human figure, Lipchitz turned to large, monumental works utilizing curved lyrical forms. *Joie de Vivre* (1927) depicting an embracing couple, demonstrates the lyricism that was to flow through Lipchitz' art at various periods.

Lipchitz' interest in biblical subject matter is represented in *Song of Songs* (1945-48) from the Pomerance collection and in

### Tech Talk

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# Two MIT Teams Preparing for SCORE Energy Contest

Student Competitions on Relevant Engineering — SCORE — has turned its attention to energy and challenged the nation's top engineering college students to develop innovative energy conservation and power generating systems for home and light industry, using nonconventional energy sources.

Three MIT students have responded with projects they will enter in the national test event to be held August 12-16 at Sandia Laboratories, Albuquerque, N.M.

Herman Drees, a graduate student in aeronautics and astronautics, has designed a windmill capable of generating about two kilowatts of electricity in a 15-mile-an-hour wind.

"The prototype that I'll enter in the competition will be about 15 feet high and 15 feet wide," Drees said. "The device would serve as a supplementary source of power, capable of running one or two household appliances." Thomas A. Davidson and William H. Battye both sophomores are helping Drees build the prototype.

Drees, a native of the Netherlands, has applied for a patent on

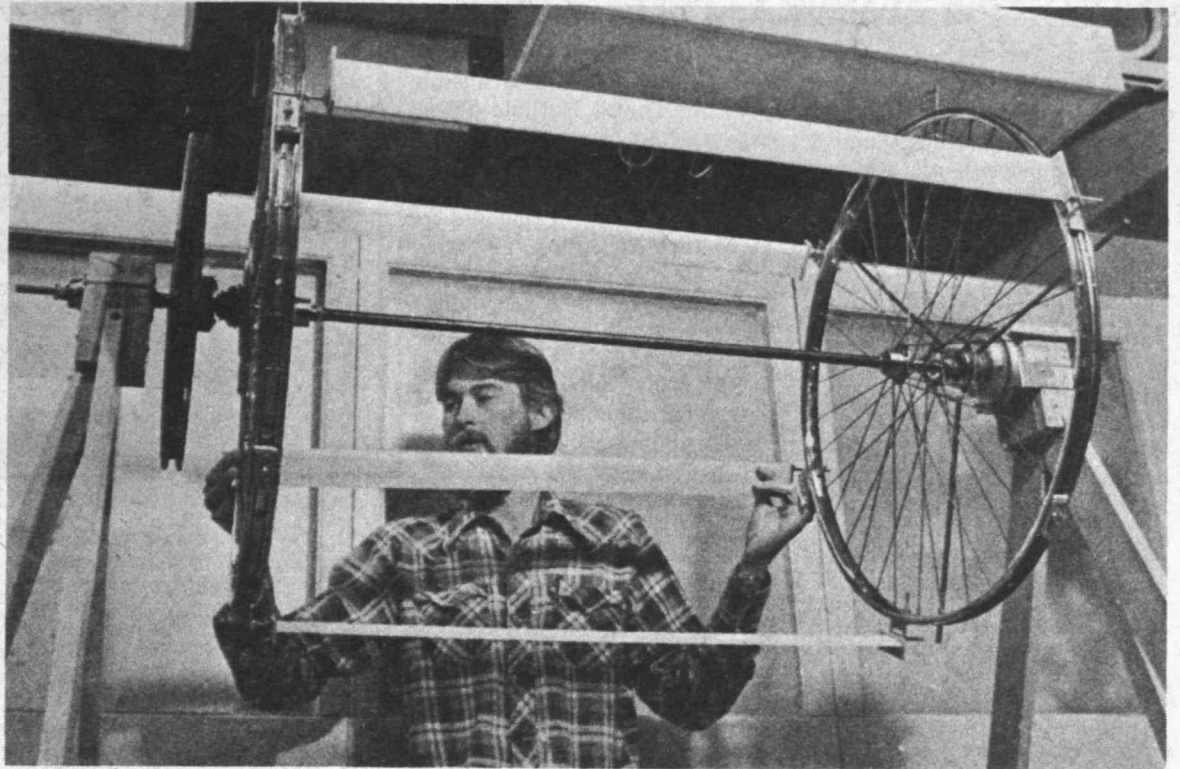
the blade-pitching device he has incorporated into his windmill.

"What I've done is modify a darrius rotor," he explained. "A darrius rotor has curved blades. They are very effective, but costly to make. Straight blades are cheaper, but unless they can be pitched they'll drive the mill too fast."

The other MIT device has been entered in the competition by two graduate students in architecture, A. David Bryan and Conrad R. Heeschen. It is a solar-powered water heater, capable of heating 20 gallons of water to 170 degrees in about six hours. It is designed to be mounted on the roof of a building, or under the eaves of a residential structure.

The unique feature of the Bryan-Heeschen entry is that the plastic bag holding the water is heated from the bottom, through the use of a reflecting mirror.

"Heating from the bottom is more efficient because the heat that rises away from the hot bag rises toward the inside of the insulated box containing the bag, rather than rising off into space as



HERMAN DREES, MIT graduate student in aeronautics and astronautics, fits a blade to a model of the wind-powered generator he has entered in

SCORE's national contest. The prototype of Drees' windmill will be mounted vertically and stand 15 feet high.

## 2 Named Associate Professors

One associate professor and one part-time visiting associate professor have been appointed to the MIT faculty. They are:

Joan W. Bresnan, in the Department of Linguistics, effective July 1, 1975. Dr. Bresnan, who will be on leave for the academic year 1975-76 with a Guggenheim Fellowship, received the BA degree from Reed College in 1966 and the PhD degree in linguistics from MIT in 1972. From 1972 to 1973 Dr. Bresnan was assistant professor of linguistics and philosophy at Stanford University and from 1973 to 1974 she was assistant professor of linguistics at the University of Massachusetts, Amherst.

A member of the associate editorial board of *Linguistic Inquiry*, Dr. Bresnan has also participated in the National Science Foundation research project on the History and Structure of English and in the 1974 Research Workshop on Constraints on Grammer conducted by the Mathematical Social Science Board.

Norman S. Stearns, MD, as visiting part-time professor in the Sloan School of Management, effective February, 1975. Dr. Stearns received the BA degree cum laude, from Harvard in 1943, the MD degree from the Boston University School of Medicine in 1947 and the MA degree in pharmacology from the Boston Uni-

versity Graduate School in 1950.

With his medical practice in internal medicine and cardiology limited to consultations since 1966, Dr. Stearns is associate professor and associate dean for continuing medical education at Tufts University School of Medicine and is education consultant for Newton-Wellesley Hospital.

Among his numerous past experiences, Dr. Stearns has served as director of first and third (Tufts) medical services at Boston City Hospital, director of medical education at the Waltham Hospital (1960-72) and Malden Hospital (1961-67) and executive director of the Postgraduate Medical Institute—the education arm of the Massachusetts Medical Society (1968-71).

Dr. Stearns is also co-author of two books, *Continuing Medical Education in Community Hospitals: A Manual for Program Development* and *Library Practice in Hospitals: A Basic Guide* and is the author of numerous articles in medical journals.

As visiting associate professor at the Sloan School, Dr. Stearns will continue his work with Professor Edward B. Roberts in developing "dynamic consultation"—a new approach used to overcome organizational and behavior barriers in solving problems and achieving change in hospitals.

## Unlikely Apprentice

# Architecture Grad to Study Japanese Gardens

By SALLY M. HAMILTON  
Staff Writer

Katsuo Saito, one of Japan's leading designers of traditional gardens, has accepted an unlikely apprentice to work with his garden construction crew in September.

Andrés E. Schcolnik, an MIT architecture student from Argentina, who graduated Monday, won the apprenticeship—a position rarely granted westerners—while working for an architect in Japan last summer.

Japanese gardens—an ancient art form of mystical and religious origins—have long been appreciated in western countries. However, there is little direct understanding by outsiders of what is referred to as "secret transmissions" and age-old traditions underlying the design and building method.

Mr. Saito, who works at the garden site with his crew, is one of three remaining master gardeners

still working in the traditional style in the interior of Japan.

As an apprentice, Schcolnik will be introduced to the skills of the art in the traditional manner—learning by observation and direct participation while living at the various garden sites with the team of workers from Hakone Ueki company.

"Mr. Saito explained that the traditional concepts and design techniques are not handed on verbally," Schcolnik said. "Each student is expected to reinterpret the tradition for himself through his own sensitivity to the work."

Schcolnik, who will investigate Mr. Saito's design approaches for application within the architectural context, has been preparing for "the exploratory study" with accelerated courses in Japanese at Harvard.

He began looking for a project like this as a result of his studies at MIT. Impressed with the environ-

ment if the bag were heated from the top," the MIT students said.

The mirror also can be adjusted as the sun's angle to the earth changes during the year.

SCORE's national headquarters is at MIT. Mark L. Radtke, an MIT graduate is president.

## Note of Thanks

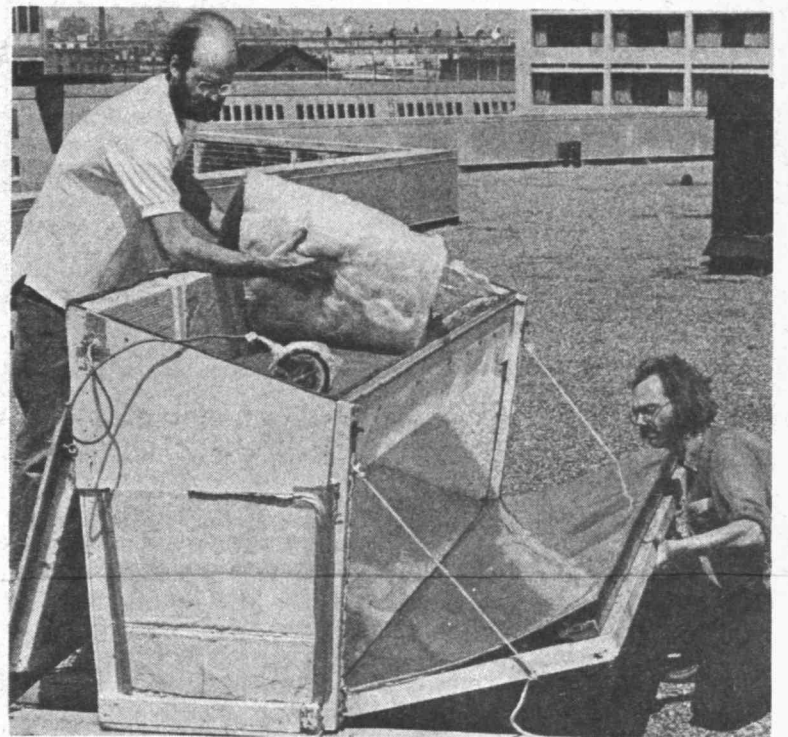
The Louis E. Asinari Family wish to express their heartfelt gratitude to MIT in its entirety and especially to all of John's many friends and sympathizers who extended condolences and shared with them their deep sorrow during the time of the tragic death of their son. Also to convey their gratefulness for the generous contributions toward the establishment of the Asinari Award for undergraduate research in the life sciences at MIT and the scholarship fund at Arlington High School in John's memory.

## O'Neal Receives JD

Charles D. O'Neal Jr., director of the Institute Real Estate Office, was awarded a law degree at Suffolk University commencement exercises last week.

O'Neal took night courses at Suffolk under a four-year program. He was graduated from Yale University in 1949 with a BA in economics.

He and his wife, the former Barbara J. Sengman, live in Acton. They have five children.



MIT ARCHITECTURE STUDENTS A. David Bryan, left, and Conrad Heeschen prepare solar-powered water heater they have entered in this year's SCORE. Bryan adjusts layer of insulation which covers plastic bag containing water. Mirrored surfaces reflect sunlight to heat the bag from the bottom, causing the rising heat to remain inside the insulated box.

—Photos by Calvin Campbell

## Widnall Wins SWE Award

The 1975 Society of Women Engineers Achievement Award—the highest award given by the society—will be presented to Dr. Sheila Widnall, professor of aeronautics and astronautics at MIT, during the Society of Women

Engineers Convention in Pittsburgh, Pa., June 25-29, 1975.

Dr. Widnall is being honored for her significant contributions to the fluid mechanics of low speed aircraft and hydrofoils. Her fundamental research on aircraft-wake turbulence, which currently limits runway capacity, has received international attention.

As a result of her studies of aerodynamic noise of helicopters, Professor Widnall conceived and managed the development of MIT's anechoic wind tunnel facility. She continues the study of noise of V/STOL aircraft in forward flight using the wind tunnel facility and has been active as a consultant to industry in both aerodynamics and aerodynamic noise.

Active in the Women's Forum at MIT, Dr. Widnall was also engaged with Professor Mildred S. Dresselhaus in a Carnegie Foundation study of activities encouraging women to enter non-traditional careers, particularly engineering.

Dr. Widnall, currently on a leave of absence as director of the Office of University Research at the U.S. Department of Transportation in Washington, D.C., will return to MIT in September.

mental values in the indigenous architecture of primitive and traditional cultures, he feels it is necessary for his development to study an example directly.

"In these cultures there is a long-established understanding of the simplest building materials and a traditional attitude and method to work—both of which are combined in an interpretation of nature in their buildings," he said.

"Thus, a building complements the natural landscape of an area and vice versa. Similarly, a Japanese garden complements the natural landscape as well as the house it surrounds.

"There are strong basic principles inherent in these traditional design methods. Valuable information and analogies can be extracted from them and can be translated to contemporary architecture," Schcolnik said.

An Eloranta Fellowship grant

and a grant from the Albert Farwell Bemis Fund will support his work in Japan as well as several documenting his observations there.

These projects will form a basis for graduate work at MIT when he returns in 1976. They will detail actual steps involved in a garden's construction—from initial planning to completion—covering as well the secondary aspects of work methods. To be completed in film, slide and tape form, they will be suitable for seminar presentation as primary sources on design approaches that enhance landscapes.

When he returns to MIT, Schcolnik hopes to put his apprenticeship to further use by designing and building a garden here that would translate some of the approaches he has learned. If he can find a site, and a crew to assist him, MIT may have a new garden to add to its illustrious collection.

# 57 from MIT and Draper Among Lowell Graduates

The Lowell Institute School awarded graduating certificates to 25 MIT employees and 32 Draper employees—all students this year in the Institute's evening program.

Mr. John Lowell, Trustee of the Lowell Institute, assisted the school's director, Dr. Bruce D. Wedlock, with the presentation of certificates at the graduation recently held at the MIT Faculty Club. Dr. Myron Tribus, director of the Center for Advanced Engineering Study, was the guest speaker.

## Pollitt to Study Iron Deficiency

The behavioral effects of iron deficiency—the most prevalent nutritional disorder in the United States—will be studied by Dr. Ernesto Pollitt of the MIT Department of Nutrition and Food Science, with a three-year grant from the National Institutes of Health.

In the study, 400 children from the Cambridge area, age two to six, will be tested to determine physical, biochemical and psychological effects of iron deficiency.

Working with Dr. Pollitt, who is associate professor of growth and development, will be Dr. Rudolph Leibel, Department of Pediatrics, Cambridge Hospital and Harvard Medical School; and Dr. Vernon Young, associate professor of nutritional biochemistry in the MIT Department of Nutrition and Food Science.

According to the Ten-State Nutritional Survey conducted by the Department of Health, Education and Welfare in 1972, iron deficiency is the most prevalent nutritional disorder—regardless of socioeconomic class, age, and sex.

## Safety Office Accident Guide

The Safety Office has begun distribution of a new "MIT Accident Prevention Guide," the first volume in a series of publications aimed at making MIT as safe and accident free as possible.

Volume one contains general information on accidents and injuries, first aid, fire, egresses, storage and office hazards, and traffic and transportation. It also lists safety and security services available from Campus Patrol, the Safety Office and the Environmental Medical Service.

Volume two, now in preparation, will cover MIT policies on safety across the spectrum of Institute activities. Volumes three through six will be detailed descriptions of safety precautions in specific areas, such as machine shops and chemistry laboratories.

The booklets will supersede and update the "MIT Accident Prevention Guide" published in 1966.

## Major Named Editor

David C. Major, associate professor of civil engineering, has been named co-editor for the social sciences of *Water Resources Research*, published by the American Geophysical Union.

The appointment was announced recently by Professor Frank Press, President of the AGU and head of the Department of Earth and Planetary Sciences at MIT. Professor Major, an economist and planner, is internationally known for his work in water resources management and development.

During the 1974-75 academic year, the Lowell Institute School expanded its offerings with new courses in Creative Photography, Scientific Glassblowing, Engineering Drawing, Principles of Video Tape Recording, TV Signal Processing & Measurement and Op-Amp Applications. Enrollment for the year totaled 392, double the enrollment of 1973-74, with 75% of the students having completed their certificate requirements.

MIT employees who received certificates were:

John Albano, Physics; Rocco Albano, Electrical Engineering & Computer Science; Tamas Bakucz, National Magnet Laboratory; Anthony Caloggero, Electrical Engineering & Computer Science.

John Connolly, Research Laboratory of Electronics; E. Ward Deharo, Center for Cancer Research; Herbert Ewin, Laboratory for Nuclear Science; Henry Faulkner, Aeronautics and Astronautics; Norbert Feind, Laboratory for Nuclear Science.

William Frey, Center for Space Research; Donald Goloskie, Laboratory for Nuclear Science; Max Jacobs, Laboratory for Nuclear Science; Diane Major, Psychology; Michael Molnar, Materials Science and Engineering.

Miriam Rich, Materials Science and Engineering; George Sechen, Laboratory for Nuclear Science; William Swan, Aeronautics and Astronautics; Donald Wassmuth, Mechanical Engineering.

Maria Wehrle, Laboratory for Nuclear Science; Edward D. Weiner, Laboratory for Nuclear Science; Thomas White, Physics; Fee Yee, Mechanical Engineering.

Lincoln Laboratory graduates were:

Roland Blais, Louis Hershberg, Paul B. Sebring.

Draper Laboratory graduates were:

Antonio Berardi, Stephen Bonarrigo, Sidney Burton, Edward Cianci, Edmund Collier, John Crepeau, Mark S. Edwards, John Ford, Dario Franchetti.

Rocco Garofano, L. David Hanley, William Horgan, John Howatt, Karen Koehler, William Mallory, Andrew Mangini, Gerhard Mansbach, Edward McCormack, William Murphy.

Robert Pettersen, Raymond Quill, Roy Raeford, Victor Rivera, William Sandberg, Roy Schluntz, Anne Shea, Milton Silverman, David Stevens, Ivan Stokes, Edward Sukach, James Vaccaro, Joseph Wilkie.



A THREE-GENERATION MIT FAMILY visited President Jerome B. Wiesner last week. Maj. Gen. Chang-Tsu Chien, Chinese Air Force (retired), standing next to Dr. Wiesner, received his SM degree in aeronautical engineering from MIT in 1923. The general's son-in-law, Omar Wing, head of the Department of Electrical Engineering at Columbia University, is a member of the Class of 1952. Jeannette M. Wing, Professor Wing's daughter, has just completed her first year at MIT where she is studying electrical engineering. A

resident of Taipei, the general served in the early days of the Chinese Air Force in several training, organization and supply positions. Three of his students have served successively as commander-in-chief of the Chinese Air Force. He retired from military service in 1949 and later served as administrative vice-minister of economic affairs and secretary general of the economic stabilization board. In the early 1950s he served a term as president of the MIT Alumni Club in Taiwan. The general's last visit to the Institute was in 1960.

## Four Appointed Assistant Professors

Four assistant professors have been appointed to the MIT faculty, effective July 1, 1975. They are:

Gregory B. Baecher, in the Department of Civil Engineering. Dr. Baecher received the BS degree in civil engineering in 1968 from the University of California, Berkeley and the SM and PhD degrees from MIT in 1970 and 1972, respectively. From 1974 to the present, Dr. Baecher has studied the siting of large civil facilities at the International Institute for Applied Systems, Austria, while on a Rockefeller postdoctoral fellowship.

David E. Housman, appointed in the Department of Biology. Dr. Housman received the BA degree

in biology from Brandeis University in 1966 and the PhD degree from Brandeis in 1971. From 1971 to 1973, he was a postdoctoral fellow at MIT and in 1973 he became an assistant professor in the Department of Medical Biophysics at the University of Toronto and a staff member of the Division of Biological Research at the Ontario Cancer Institute.

Raymond E. Levitt, in the Department of Civil Engineering. Dr. Levitt received the BSc degree from the University of Witwatersrand (South Africa) in 1971, the MS from Stanford University in 1973 and plans to receive the PhD

degree from Stanford in June, 1975. Before entering college, Professor Levitt worked as an ironworker and carpenter and while in school he served as construction design engineer and project field engineer in South Africa, Canada and California.

Edward Y. Miller, appointed in the Department of Mathematics. Dr. Miller received the BA degree from the University of Pennsylvania in 1964 and the MA and PhD degrees from Harvard in 1969 and 1973, respectively. From 1973 to 1975, Dr. Miller held the position of C.L.E. Moore Instructor of Mathematics at MIT.

## Booklet Outlines Energy Conservation Programs

A booklet giving a detailed description of MIT's energy conservation program, which saved \$1,100,000 in its first full year, has been published by the Department of Physical Plant.

The booklet was prepared by Carl W. Hagge, the department's environmental engineer, and Thomas E. Shepherd Jr., superintendent of utilities. Hagge was hired in April, 1974, to devote essentially full time to energy conservation, after the Union Pacific Foundation had awarded MIT a grant to study ways of reducing energy costs.

The first year's savings, through early 1975, were made up of reductions of 25 percent in the consumption of fuel for heating, 17 percent in the consumption of electricity and 48 percent in the consumption of chilled water for air-conditioning, the booklet reports.

"A continuing program has now been outlined to make possible further savings in the future," it adds.

The booklet observes that most of the energy is consumed by MIT's modern air-conditioned buildings, constructed during a campus "building boom" in the 1960s "when abundant, cheap energy encouraged a rapid expansion of campus-wide air-conditioning and general environmental control."

"Buildings designed in this period," the booklet states, "are characterized by high use of energy for heating, cooling and lighting. No studies during this period found economic justification for capital investments for energy conservation. Environmental control systems were designed specifically to assure adequate safety and comfort."

The data collected by the department disclosed that older buildings, "which by casual observation seem conspicuously to waste energy through leaky windows and poorly controlled heating systems," account for a relatively small amount of energy consumption.

"Indeed," the booklet adds, "the original buildings in MIT's main group, completed in 1916, have modest lighting levels, minimal ventilation systems and fairly low and uniform use of electricity and

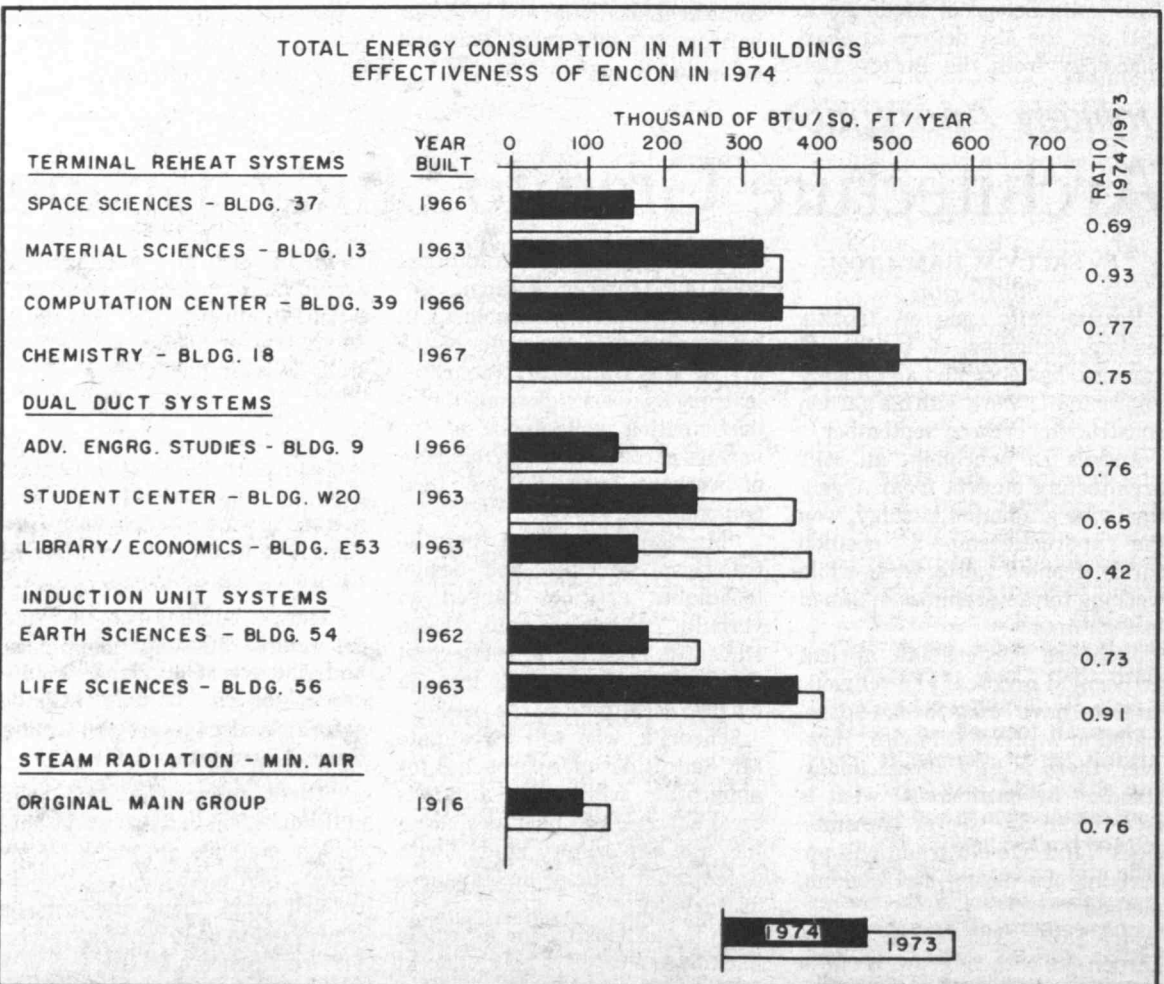
heat." The book sets out how energy has been saved and credits the MIT community with a major assist.

While 75 percent of the consumption of energy on campus is influenced by the actions of the Department of Physical Plant, it reports, "the remaining 25 percent is determined by the various controls operated by members of other departments at MIT."

"Without the wide support of the MIT community for energy con-

servation, the results gained would not have been possible," it states. "Without its continual support, the gains will not be maintained in future years."

William R. Dickson, director of the Physical Plant, said the 14-page booklet has been distributed to the Academic, Faculty and Administrative Councils and to Departmental Administrative Officers. A limited number of copies are available at Mr. Hagge's office (E18-260), and some distribution also is planned outside MIT.



## Blue Cross Rates to Rise

John M. Wynne, Vice President for Administration and Personnel, has announced that the monthly rates paid by Exempt, Biweekly and Hourly employees for Blue Cross-Blue Shield Master Medical coverage will be increased as follows on or about July 1, 1975:

Family coverage from \$8.53 to \$10.72.

Individual coverage from \$3.51 to \$4.41.

The change in rates reflects increases in the projected total unit costs for FY 1976 to \$78.28 per month for the family coverage and \$32.16 per month for the individual coverage. The new rates were computed at 13.7% of these costs, thus continuing the cost-sharing basis which has existed for the past several years. MIT will continue to pay the balance of the costs, which may be more or less than the expected 86.3%, depending on actual experience. In 1975, the actual costs exceeded the projections, so that MIT paid more and employees less than the indicated percentages.

Mr. Wynne said that because of the continued good experience of the MIT Health Plan, the rates paid by plan members for the added services provided under the plan will remain unchanged at \$4.00 per week for the family coverage and \$1.50 for the individual, bringing the total rates to \$14.72 and \$5.91 per month, respectively.

## White House Fellow Named

An MIT alumnus, Martin C. Jischke (SM, PhD, Aeronautics and Astronautics, 1964 and 1968), has been selected to be a White House Fellow in the 1975-76 program.

Jischke, 33, is one of 14 selected to begin fellowships Sept. 1. He is associate professor of aerospace, mechanical and nuclear engineering at the University of Oklahoma.

The White House Fellows Program was started in 1964 to give outstanding young persons between the ages of 23 and 35 first-hand experience in the Federal government. The Fellows are assigned to the staff of the President or Vice-President or to members of the Cabinet or heads of agencies.



Joseph Y. Yeboah of Samerobi, Ghana, one of 1,259 people to receive degrees recently at commencement, came away with his hands full. Mr. Yeboah earned four degrees in four years—bachelor degrees in chemistry, chemical engineering and management and a master's degree in chemical engineering practice. Four degrees in four years is unusual, but since no records of multiple degree recipients are kept it is impossible to say if Mr. Yeboah's accomplishment is without precedent. What's ahead for Mr. Yeboah? "I started work on my doctorate the day after commencement," he said.

## Seven Receive Honorary Degrees

Seven members of the faculty and staff are among recipients of honorary degrees this year.

Degree recipients are:

John M. Buchanan, John and Dorothy Wilson Professor of Biochemistry, from DePauw University, Greencastle, Indiana.

James T. King, Project Officer in the Resource Development Office, from Massachusetts College of Pharmacy, Boston, Mass.

Benjamin Lax, Professor of Physics and Director, Francis Bitter National Magnet Lab, from Yeshiva University, New York City.

Walle J.H. Nauta, Institute Professor and Professor of Neuroanatomy, from the University of Rochester, Rochester, N.Y.

Mary Rowe, Special Assistant to the President and Chancellor for Women and Work, from Regis College, Weston, Mass.

John B. Stanbury, Professor of Experimental Medicine, from University of Leiden, Holland.

Hans-Lukas Teuber, Professor of Psychology and head of the Department of Psychology, from University of Geneva, Switzerland.

# Architects Develop Plan for Multilayered 'Perfect Wall'

By ROBERT C. DIORIO  
Staff Writer

The perfect wall—one that lets in sunlight and keeps heat from escaping when it's cold and that reflects sunlight and dumps heat out into the night sky when it's too warm inside—is closer to being a reality.

Under a grant from the National Science Foundation's RANN (Research Applied to National Needs) Program, Timothy E. Johnson and Sean Wellesley-Miller, assistant professors of architecture at MIT, and Day Chahroudi, a lecturer in architecture, have developed an eight-inch (20.3 cm) thick wall which combines the insulation value of two inches of standard insulating material and the transparency of thermo-pane glass.

The MIT wall is made up of several layers—each more transparent than glass—separated by air gaps. Its development grew out of research focused on variable transmission membranes to modulate short- and long-wave radiation transmission in and out of an enclosed micro-climate.

The MIT researchers developed a conceptual model of the mechanisms needed to achieve this type of solar climate control and an analytical framework that permits comparison between conven-

tional flat-plate solar collector systems and direct use of sunlight.

In recent years a number of modified films and film composites have been suggested or manufactured in trial batches to air condition inflatable structures enclosing a large space.

The MIT research project has concerned itself with the application of this variable membrane concept to conventional frame-supported buildings, using non-inflatable technologies to increase reliability, performance and acceptance.

"Under this approach," said Professor Johnson, the principal investigator on the project, "solar radiation is passed directly into the interior through the building's large external surface area. The building skin is designed to continuously control the amount of short wave radiation entering and the amount of long wave radiation leaving the interior.

"The solar energy heats the building interior masses which regulate the interior temperature and store surplus heat at comfortable controlled temperatures for night release. In effect, the entire building is a single solar collector. The same variable membrane can be used for cooling by reversing the radiation flow by passing more radiation to the out-

side than gets in."

The MIT research has led investigators to several conclusions. Among them:

—Solar climate control using variable transmission membranes is technically feasible.

—Further research is required on heat storage, packaging and structural integration of membrane configurations and architectural aspects leading to a full scale of proof-of-concept experiments.

—Second generation self-regulating climatic envelopes with no moving parts are theoretically feasible.

—Solar climate control using variable transmission membranes will find major applications in the agricultural, industrial and building sectors.

A main concern of the project is to discover ways in which the variable membrane—which becomes the building's skin—can be made to respond well to architectural needs, such as privacy, view, environmental loading and security.

The membrane components are, starting on the inside, a multiple layer of transparent insulation to reduce heat leakage, a solar modulator to block summer sun, a room air duct to bring room air in contact with the radiator when cooling and a transparent infrared radiator with accompanying wind

## Employment Q & A

By CLAUDIA LIEBESNY  
Office of Personnel Services

**What is MIT's policy on the employment of members of the same family?**

The Institute's policy is to base appointments and promotions on qualifications and performance. In keeping with this policy, members of the same family, including husband and wife, are eligible for employment in all job categories. However, a supervisor-employee relationship should not exist at the time of employment or thereafter, nor should one member of the family relationship assume for the other the role of advocate or judge with respect to conditions of employment, salary or promotion. Where members of the same family are recommended to work for the same supervisor, the arrangement should be approved in advance by the Chancellor.

**Although I have worked at MIT for 10 years, I do not know as much about the facilities and benefits available to me as many newer employees. How can I catch up on all the changes?**

The easiest way to get an overview of benefits and facilities is to attend one of the orientation sessions given by the Personnel Office. Although the three-hour program is designed to help new employees to get acquainted with MIT, it can be useful to others who feel that they have not kept up with the benefit improvements. Anyone who is interested in attending one of these sessions should contact Donna Taylor, x3-4271 or Joan Rice, x3-4077.

**I have been told that it is against safety regulations to keep my bicycle in my office or the hallway outside, but I can't afford to have it stolen. Where can I keep it that will be both safe and legal?**

There is presently a bike compound on campus behind Building 13 where an attendant is on duty from 7:45am to 6:15pm, Monday through Friday. There is no charge for the use of the facility at this time. The compound is protected by a ten foot fence topped with barbed wire and a check identification system is used.

Completion of a new compound, to be located on the west side of the Student Center, near the side entrance to DuPont Gymnasium, is scheduled for this summer or early fall. Sites are being considered for another compound to serve the east side of the campus, but the location has not yet been decided. Experience with the existing bike facility as well as the new one at the Student Center will help determine if additional facilities are warranted.

**I have just transferred to a new job at the Institute. Will I be eligible for a "four-month" review?"**

The "four-month review" that you speak of is what we call a "New Employee Review." The first six months of employment at MIT are considered to be a probationary period for all employees. Starting salaries are determined by assessing, through interviewing and reference information, the person's education, skills and experience in relation to the job to be performed. Between the end of the third and sixth month of employment, the performance of each new employee is evaluated. At the same time, the starting salary is reviewed. Employees who transfer to another position within the Institute are not really "new" employees. The salary set at the time of the transfer can be based on an evaluation of work performed at MIT. Questions about individual circumstances should be referred to the department's Personnel Officer.

screen to dissipate interior heat into the night sky.

Professors Johnson and Wellesley-Miller and Mr. Chahroudi predict applications of solar climate control membranes in enclosed climate controlled campuses, covered shopping malls, biogas conversion, warehousing and agriculture.

"By simultaneously exploring the design and the performance of membrane materials and by applying the materials that seem best at present to actual structures," Professor Johnson said, "we hope to set up a productive feedback where building performance influences building design. There is a great deal to be learned in the field about what design specifications for the membrane are actually valid."

As part of a cooperating effort with the Solar Energy Lab, Professors Johnson and Wellesley-Miller and Mr. Chahroudi have designed and built test panels for a 2,000 square-foot structure which the DuPont Corporation may fund.

The MIT researchers are also currently involved with the Argonne National Laboratory of Chicago in a design study for covering the roofs of some two- and three-story apartment houses in Chicago with greenhouses.

"The greenhouses will serve two

functions," Professor Johnson said. "First, because they will use the transparent insulation, they will produce a surplus of heat in the spring and fall that will greatly reduce the heating bill of the apartments below.

"Secondly, they will provide fresh fruit and vegetables to the residents. Since the neighborhoods under study are composed of recent immigrants from the rural south who have retained their agricultural skills, but who have not yet acquired the skills necessary for urban employment, it is hoped that these year-round roof top farms will both provide a sense of identity for the residents with considerable economic incentive and will also reduce the need for support by welfare agencies."

Another project on which the MIT architects/researchers are working involves Weyerhaeuser Company of Tacoma, Wash., which is planning an experimental plug seedling greenhouse for Douglas Fir trees. A prototype structure, incorporating solar climate control using multiple layers of solar membrane and a layer of "cloud gel," is scheduled for construction soon in Centralia, Wash.

# THE INSTITUTE CALENDAR

June 18  
through  
June 29

## Seminars and Lectures

### Wednesday, June 18

**Single Phase Helium Cooling of Superconductors\*** - Dr. Georg Versey, Swiss Institute for Nuclear Research. Magnet Lab Seminar. 2:30pm, 2nd floor conference rm, Magnet Lab (NW14). Tea & coffee at 2:15pm.

**The Effect of Vitamin A Acid on Normal & Tumorous Epithelium\*** - Dr. Lawrence Prutkin, cell biology, NYU Medical Center Nutrition and Food Science seminar. 3pm, Rm 16-310.

**General Aviation Omega Navigation in the National Airspace System\*** - Edward Wischmeyer, G. Doctoral seminar. 3pm, Rm 33-206.

### Thursday, June 19

**Computer-Based Consultations for Antimicrobial Therapy Selection\*** - Edward H. Shorthliffe, medicine, Stanford University School of Medicine. Project MAC Seminar. 3:30pm, 545 Tech Sq, conference rm 512A.

**Genotypic Mixing Among RNA Tumor Viruses\*** - Robin Weiss, Imperial Cancer Research Fund Laboratories, London. Center for Cancer Research Seminar. 4:30pm, Rm 6-120.

### Monday, June 23

**An Experimental and Theoretical Study of Helicopter Rotor Noise\*** - Ying-chieh A. Lee, G. Aero/Astro Doctoral Seminar. 10am, Rm 33-206.

## Community Meetings

**Women's Forum\*\*** - Special meeting for planning the agenda for the Talbot Hse Retreat. Please come, even if you're not going to Talbot Hse, to give ideas and suggestions for Forum activities next year. Wed, June 18, 12n, Rm 10-280.

**Parent's Discussion Group\*\*** - Sponsored by medical department. Marcia West, pediatric nurse, will discuss "Dealing with Childhood Illness," Thurs, June 18, 12:30-1:45pm, Rm 1-236.

**The Wives Discussion Group\*\*** - Wed, 2:15-4pm, Stu Ctr West Lge. Babysitting in Stu Ctr Rm 473.

## Social Events

**24 Hour Coffeehouse\*** Enjoy relaxing conversation, piano playing, games, inexpensive food, candy & drinks. Summer hours: Sun-Thurs, 11am-12m; Fri & Sat, 11am-2am; Stu Ctr 2nd fl lge.

**Ad-Hoc Over 30's Singles Chowder and Marching Society** - Luncheon meeting in Stu Ctr East Lge (small dining room off Lobdell), Fri, 12:30-1:30pm. New members always invited. Look for the table with the red balloon. Erica, x3-2117 or Marty x8-1206 Draper.

**Gay Dance\*** - Sponsored by Student Homophile League in honor of Gay Pride Week, beer, soft drinks and munchies. 9pm-1am, Sat, 6/21, in the Sala. Admission \$1.50. Info: SHL, x3-5440, or x0745 Dorm.

## Movies

**Adrift (Kadar)** - Film Society. Fri, June 20, 7:30 & 9:30pm, Rm 6-120. Admission \$1.

**Murder Most Foul\*\*** - LSC. Fri, June 20, 7:30pm, air conditioned Rm 26-100. Admission \$.50, MIT or Wellesley ID required.

**Lord of the Flies\*\*** - LSC. Sat, June 21, 7:30pm, air conditioned Rm 26-100. Admission \$.50, MIT or Wellesley ID required.

**Bahdhi Ka Naam Dadhi** - Sangam. Indian movie with English subtitles. Sun, June 22, 2:30pm, Rm 26-100. Admission \$.50 with ID.

**The Mouse That Roared** - LSC. Fri, June 27, 7:30pm, air conditioned Rm 26-100. Admission \$.50, ID required.

**Capricious Summer (Menzel)** - Film Society. Fri, June 27, 7:30 & 9:30pm, Rm 6-120. Admission \$1.

**Where Eagles Dare\*\*** - LSC. Sat, June 28, 7:30pm, air conditioned Rm 26-100. Admission \$.50, ID required.

**Baju Bawra** - Sangam. Indian movie with English subtitles. Sun, June 29, 2:30pm, rm 26-100. Admission \$.50 with ID.

## Music

**Hindustani Vocal Music Concert\*** - Featuring Jitendra Abisheki. Sponsored by Sangam. Fri, June 20, 8pm, Stu Ctr Mezzanine Lge. Admission \$3, \$2 with college ID. Info: 491-0080 or 876-7115.

## Dance

**Folkdancing - International:** Sun, 7:30-11pm, Sala. **Balkan:** Tue, 7:30-11pm, Stu Ctr Rm 491. **Israeli:** Thurs, 7:30-11pm, Sala. **Noon dancing:** Fri, 12n-1:30pm, Kresge Oval in good weather, otherwise Bldg 7 Lobby.

## Exhibitions

**Faculty Club Art Exhibit\*** - Works by John Fitch will be shown during the month of June.

**Drawings from Life by Sheila Murphy\*** - During June, Faculty Club Lge.

**Works from the MIT Art Collections\*** - Sat, May 17-Wed, July 16, 10am-6pm daily & Tues, 6-9pm, Hayden Gallery. Free.

**Hayden Corridor Gallery Exhibit\*** - Selections from the William Barton Rogers book collection and a selection of balloon prints from the Theodore N. Vail collection. Sat, May 17-Wed, July 16, Free.

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

**MIT Historical Collection\*** - Permanent exhibition, open Mon-Fri, 9am-5pm, Bldg N52, 2nd floor.

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

\* Open to the public

\*\* Open to the MIT community only

\*\*\* Open to members only

Send notices for June 25 through July 13 to the Calendar Editor, Room 5-111, Ext, 3-3279, before noon Friday, June 20.

# Carpenter Is 'A Friend, Indeed'

(Continued from page 1)

tion business. Halverson is warehouse manager for the Boyd Kitchen Equipment Corp. in Cambridge, where Mr. Smith used to deliver appliances for a local stove company.

"For a friend I met through another friend, Jim Smith is one of the best Smiths I know," said Charles Smith, who plans to forfeit his blindness pension if his new business of repairing lawnmower and snowblower engines succeeds. The shed he will use to house his automatic sharpeners and small engine parts was constructed largely from 2 x 6-foot planks left over from "dunnage" that protected shipped cargo at Mr. Halverson's warehouse.

MIT's Jim Smith provided engineering skill and fund-raising ideas far below the average \$1500 labor cost for such a project. He estimated the cost of erecting a 12 x 20-foot workshed at about \$2500.

"I don't make a practice of working for nothing," he explained, "but when a friend is in need, he won't find anyone cheaper than me."

He talks about "going half" with Mr. Halverson on the purchase of a \$500 heating system for Charlie Smith's shed. It will be the third item that has been bought for the project. Except for the door and plywood sheathing, all other materials have been donated.

One reason for wanting to make time for a friend, Mr. Smith said, was the fact that he knew the feeling of being "up against the wall without any work or options." He emigrated from his native Donegal in 1948 because he could no longer make a living from the

rocky coastal soil of Western Ireland.

Under the sponsorship of an uncle, Thomas Smith of Arlington, he came to America and worked for the family business, Smith and Miller Moving Inc. "I know what it means to suddenly no longer be self-sufficient. Maybe it's a matter of pride, but Charlie Smith happens to be a man with a lot of it, and that's why I wanted to help him."

It was just two weeks ago over a

## Engineer Finds Solution For Computer Amnesia

A way to solve computer amnesia has been invented at MIT.

The semiconductor memory banks used in many computers, although they are smaller than magnetic memories and permit less-expensive and more reliable operation, have one persistent problem: They can literally go blank—be erased—if there is a sudden loss of electric power to the computer.

The propensity to amnesia exhibited by semiconductor memories—called volatility by computer scientists—has been avoided in the semiconductor memory invented by Laurence G. Walker of Hamden, Conn., who has just been awarded his PhD at MIT in electrical engineering and computer science.

The MIT Patent Office has applied for a patent on the invention.

Dr. Walker has invented a non-volatile semiconductor memory storage element that is essentially a semiconductor sandwich—layers of metal, insulating material and semiconductor material fastened to a semiconductor base. It can be integrated into a charge-coupled device (CCD) structure.

The resulting memory element has several advantages, according to its inventor.

braille card game that the two Smith men discovered that they probably met for the first time 15 years ago "when Charlie could see."

"I had sold a car to a neighbor of Jim's," the latter Smith explained, "and I got along well with him then, but after working with him on this whole shed-raising project. I feel as though I've worked with one of the best. I just know the outcome is going to be rewarding for me."

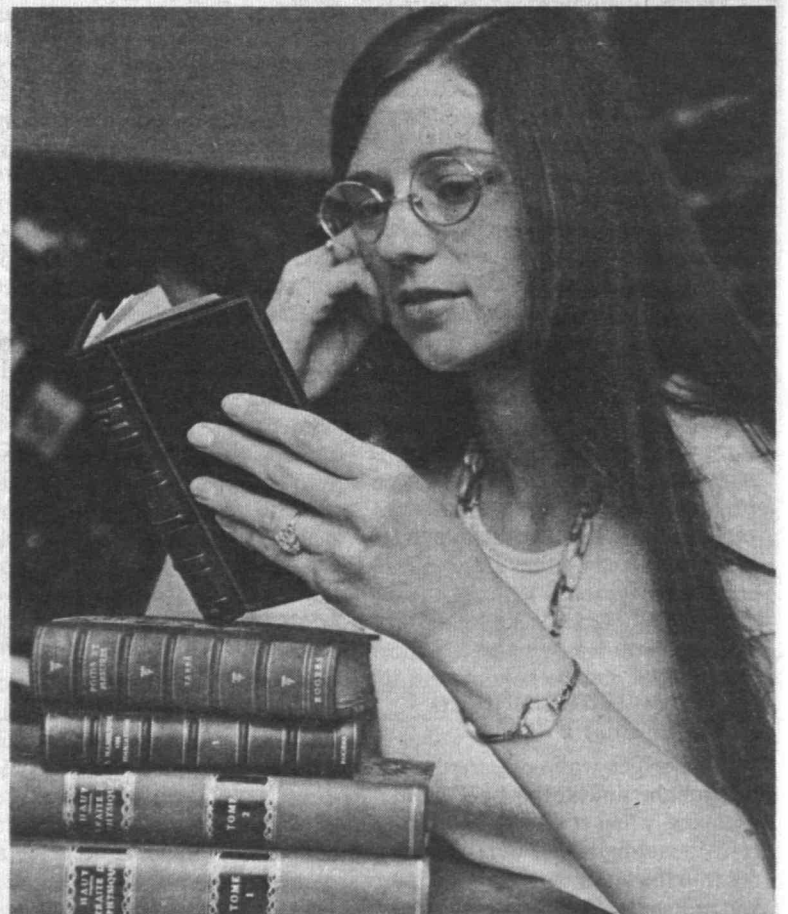
"First, it is non-volatile," Dr. Walker said. "Changes in the power level won't affect it. Second, the information to be retained on the element can be 'written' at low voltage. Third, it can be quickly erased by irradiation—by shining visible light on the memory surface. And fourth, the memory can be read without destroying the information."

The research that led to Dr. Walker's invention was supervised by Dr. George W. Pratt Jr., professor in the Department of Electrical Engineering and Computer Science.

Work is now underway at MIT to develop a memory array consisting of the elements invented by Dr. Walker.

## Day Camp Spaces Available

The MIT Day Camp is still accepting camper applications for the 1975 season. The Camp dates run in four consecutive two-week quarters starting June 30-July 11; July 14-25; July 28-August 8 and August 11-22. For further information call the MIT Athletic Department, x3-2913.



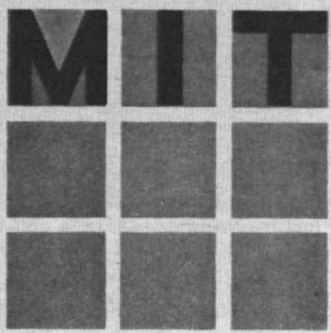
Marilyn G. Walker, assistant librarian in the Humanities Library, peruses a newly rebound volume of Elizabeth Hamilton's *On Education* published in 1813. The book is among a selection of books from the newly established William Barton Rogers Collection on display in the Hayden Corridor Gallery through July 16. The exhibition mounted in honor of the MIT Alumni Association's centennial, is illustrative of the more than 1,000 books that once belonged to William Barton Rogers, founder and first president of MIT, his wife, Emma, and his brother, Henry. The exhibit is accompanied by a brochure that describes the collection, written by Julius A. Stratton, President Emeritus.

## Staff Classification Survey

(Continued from page 1)

ground information on the study, including listings of the staff and faculty members who participated, the classifications determined, and the salary bases for each of the levels. Specific information concerning the levels of any or all classifications will be available to individual staff members to review in consultation with their department heads or personnel officers.

Maintenance and overview of the new Salary Administration Program resulting from the study will be the responsibility of a subgroup of the Academic Council and of a standing Classification Review Committee. One of the first tasks of the Classification Review Committee, in addition to considering new positions, will be to review those position descriptions which were not ready to be reviewed during the classification study itself.



Reprints from  
**REPORTS ON RESEARCH**

**Sensing Smoke**

An inexpensive early-warning fire alarm that uses chemical films to detect the deadly gases produced by smoldering fires is being developed at the Massachusetts Institute of Technology.

The device is a down-to-earth application of aerospace research: it uses substances once investigated as detectors for contaminants in the air inside spacecraft. Its conception and development have been funded by the National Aeronautics and Space Administration.

Dr. Stephen D. Senturia, associate professor of electrical engineering at MIT, who recently finished building and testing the new detectors, says that it will be several years before the early-warning alarm could be available on the market. The biggest problem to overcome is the detector's sensitivity to humidity.

But he says that the device has two big advantages over existing fire detectors. First, it is cheap. He estimates that individual sensing elements could be sold for about one dollar, and that a total alarm unit, including a few sensing elements, the necessary circuitry, and an audible alarm, could be sold for about \$20.

Second, the device can detect the gases produced by slow-developing, smoldering fires. These fires, which often produce little visible smoke, are a leading cause of death and injury from fires.

Existing fire alarm devices respond only to smoke particles. They can be made to respond to very small amounts of smoke, but the more sensitive they are, the higher their rate of false alarms. So in practice detectors of smoke particles are not very useful for slow-developing, relatively smokeless fires.

The MIT detector uses polymers to detect the gases. Polymers are compounds composed of repeating subunits; among the most familiar are nylon and various plastics. Some polymers react with certain gases in a way that affects the polymers' ability to conduct electricity. Since each polymer has its own profile of responses, one can use several polymers to achieve a specific response.

Development of the MIT detector grew out of NASA-sponsored research at the McDonnell Douglas Corporation on the use of polymers to detect contaminants in the air inside spacecraft.

The possibility of using polymer films as fire-detectors was first explored under the NASA Urban Development Applications Program. In mid-1973 the NASA Lewis Research Center in Cleveland, Ohio, awarded two contracts for further work on the problem: one to McDonnell Douglas Corporation, for the development of new polymers; the other to MIT, for building and testing polymeric fire detectors.

The MIT project was recently completed by Professor Senturia and his co-workers, Clifford G. Fonstad, Jr., associate professor of electrical engineering, and Clark K. Colton, associate professor of chemical engineering.

They concluded that polymeric fire detectors will detect gases produced by smoldering fires; that the detectors can be used repeatedly; and that the devices are suitable for use in normal offices and homes.

The sensing equipment of a polymeric fire alarm is made by applying a thin coat of polymer to a microscope slide on which two interleaved finger electrodes have been placed. Changes in the electric current between the electrodes indicate the presence of gases.

The devices tested so far respond strongly to water vapor, ammonia and acrolein (a common combustion product). Certain polymers responded more weakly to carbon dioxide, sulfur dioxide and carbon monoxide.

"We hope," Professor Senturia said, "to combine the responses of several polymers together to have excellent sensitivity to specific hazards, while eliminating unwanted responses, such as to variations in humidity."

The work is complicated by the fact that the products of fires are so varied and complex. "Different materials and different conditions produce different combustion products," Senturia said. So one problem the researchers face is that of deciding just which combustion products a fire detector should detect.

—Barbara A. Burke

**3-D Display**

A visiting professor at MIT has developed—with the use of a rotating mirror—a unique three-dimensional computer display system.

The system was devised by Dr. William Simon for the display of molecular structures, but is expected to have many applications.

Dr. Simon, head of the Division of Biomathematics at the University of Rochester School of Medicine and Dentistry, is visiting this year at MIT's Cognitive Information Processing Group of the Research Laboratory of Electronics.

In the past, a number of methods have been tried to produce a three-dimensional computer display, such as stereoscopic views and psychophysical tricks in which two-dimensional images simulate rotation to create the illusion of three dimensions. None of these has been completely satisfactory, however.

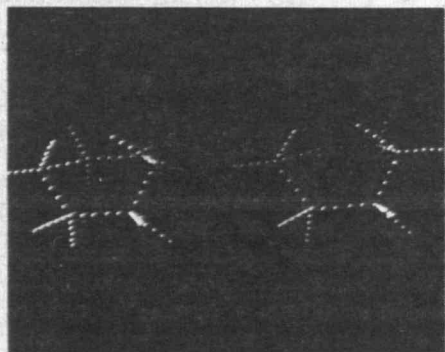
The method developed by Dr. Simon produces a true three-dimensional image which can be viewed without optical aids of any kind and from a wide variety of angles, giving the observer correct perspective and brightness from all angles. Paradoxically, as with any three-dimensional object, it cannot be satisfactorily photographed—except with a stereoscopic camera—without losing its three-dimensional character. However, by viewing two side-by-side photographs such as those accompanying the article with crossed eyes until they merge into one, a three-dimensional effect can be achieved.

The three-dimensional display system is the outgrowth of an earlier version, which consisted simply of a mirror rotating around a vertical in front of a cathode ray tube display and which had a fairly limited field of view.

In its present form, the mirror is mounted on the end of a diagonally sliced cylinder so that the rotation is around the axis of the cylinder and the principle direction of observation is along the axis. As a result, this newer version may be viewed over angles approaching a quarter of the area of a sphere.

What do the three-dimensional objects look like?

To one observer, a cyclohexane molecule had the appearance of a flimsy spacecraft slowly moving through the dark void of space.



By viewing these separate photos of a three-dimensional molecular structure display with crossed eyes, until the photos merge into one, it is possible to achieve a three-dimensional effect.

"Actually, it's difficult to describe the subjective effect of viewing a true three-dimensional computer display," Dr. Simon said. "Most people feel initially that it must be a psychophysical trick. Except for the persistence of vision, it is not. The display really is three-dimensional."

Dr. Simon said the display has one serious drawback, which is that only transparent structures can be displayed. "In some cases, such as the display of molecules, this is desirable. In others, it limits the usefulness of this device. Fortunately there are many such transparent structures of interest as computer outputs."

—Charles H. Ball

**Sand Bed**

MIT researchers are developing a shallow "sandbox" which they say could capture pollutant particles that slip through the mammoth anti-pollution devices now used in utility power plants.

The new device removes pollutants from gases and smoke by giving them an electric charge and trapping them in an electrified bed of sand a few inches deep. It is called an electrofluidized bed—"fluidized" because smoke blowing through the sand makes it slosh about like water in a washing machine.

Unlike existing devices, the electrofluidized bed, or EFB, works effectively on pollutant particles as small as one tenth of a micron in diameter (a micron is a millionth of a meter). These tiny particles, which are known to carry more than their share of toxic substances, are the ones most likely to lodge in the lungs.

The EFB also promises to be much smaller—and therefore potentially cheaper—than its major competitor, the electrostatic precipitator, or ESP, which is used in large utility power plants. ESP's are several stories high; the new EFB could be as small as one foot high.

The EFB is being developed by Dr. James R. Melcher, professor of electrical engineering in the MIT Department of Electrical Engineering and Computer Science, with the help of staff engineer Paul Warren and graduate students Karim Zahedi, Jeffrey C. Alexander and Peter W. Dietz. The work is sponsored by the Empire State Electric Energy Research Corporation.

The device has worked successfully, under laboratory conditions, on oil ash, cigarette smoke, and an oily substance called DOP. Its developers are now building a larger model, which they will test on the MIT central utility plant. Later they hope to make the device work on coal ash, and on gaseous pollutants as well.

"We're very excited," Professor Melcher said. If the EFB is successful, he said, it would be the first major improvement in fine particulate control since the electrostatic precipitator was developed at the turn of the century.

Both the ESP and the new EFB work by giving the pollutant particles an electric charge, and collecting them on a surface that has the opposite charge.

The key difference is that the ESP collects the pollutant particles on tall sheets of metal, while the EFB collects them on grains of sand, combustible particles or the pollutant particles themselves. Each of these grains or particles is polarized, so that one end, or pole, has a positive charge, and the other has a negative charge; the poles collect pollutant particles of the opposite charge.

Because the collection sites are in a fluidized state, the pollutants can be easily removed from the device, by letting the collection grains—which behave like a liquid—flow from the bed.

The disadvantage of the EFB is that it

takes more energy to blow the smoke up through the sand than it does to blow it through the ducts of the ESP. But the researchers believe that the EFB's advantages far outweigh this disadvantage.

The advantages stem from the fact that the grains of sand provide, within a compact space, a large surface area on which pollutant particles can collect—so that the particles have a short distance to travel before they bump into a surface.

This means that the gas or smoke can be cleaned much more quickly than in an electrostatic precipitator: a bed of sand a few inches deep has been shown to clean smoke as efficiently as sheets of metal several stories tall.

It also means that sub-micron particles, which can carry only a weak electric charge, will be collected. In the electrostatic precipitator, weakly charged sub-micron particles frequently do not make it all the way to the metal collection sheets.

A third, and less obvious consequence of the short distance to a collection surface is that the EFB can use alternating voltage to collect the pollutants. This should make it much more effective than the ESP in collecting the highly insulating combustion products of low-sulfur coal.

ESP's cannot use alternating voltage to charge the collection sheets because a pollutant particle heading for one sheet, or electrode, would be repelled by it before it got there. It would rush back and forth



MIT graduate student Karim Zahedi shows how the electrofluidized bed removes pollutant particles from smoke. As electrically charged smoke blows up through sand—making it slosh about like a liquid—charged pollutant particles collect on oppositely charged poles of the grains of sand.

between electrodes, never reaching either.

The ESP, therefore, must use a voltage of constant polarity, and only pollutant particles of one charge stick to a given electrode. This is a problem with highly insulating pollutants, such as those from low sulfur coal: as the particles accumulate, their charge begins to neutralize the charge of the electrode. This causes some of the pollutant particles to flake off.

This problem wouldn't occur with the EFB: it can use alternating voltage, since pollutant particles can reach a grain of sand before the charge of the poles is reversed. Thus the EFB is potentially more effective than the ESP in collecting low-sulfur coal ash.

But before the EFB can be used for any kind of coal ash, the problem of disposing of the pollutant ash must be solved. The obvious solution is to replace the pollutant-coated sand with clean sand. But because coal ash contains large particles, this probably would be expensive, since the sand would have to be changed frequently. Therefore, the MIT researchers are studying the possibility of using the pollutant particles themselves to collect other pollutant particles.

The EFB has already been shown to be more effective than its giant competitors in collecting such sub-micron particles as cigarette smoke.

If the MIT researchers are successful in their attempt to make the device work for coal, as well, the shallow sandbox could help resolve the conflict between clean air and cheap energy: the dirty, native fuel could be burnt without polluting the air, and without prohibitively expensive anti-pollution devices.

—BAB

# MIT Called Wellspring of New Industry

(Mr. Flender is treasurer of the MIT Development Foundation, Inc. The article appeared in *Industry*, official monthly magazine of Associated Industries of Massachusetts.)

By JOHN O. FLENDER

The commercialization of research and development activities conducted in universities has always presented industry and the academic community with serious problems. Both the nature of the work and the state of development are such that considerable additional cost must be incurred before commercial products are available to the public. Often the potential returns from such projects cannot justify their cost. Additionally, within the industrial community, tradition, existing competitive programs, cost structures, absence of patent protection, or the investment requirements tend to discourage the commitment of industrial resources to the commercialization of new ideas.

The presence of such barriers within established larger companies has, in many cases, been responsible for the development of new technology-based enterprises throughout the greater Boston area during the last 30 years. In these companies, entrepreneurs have been able to pursue a concept or innovation to the point of commercial success without the inhibiting factors found in most larger, more traditional corporations.

For many years, Massachusetts Institute of Technology has been vitally concerned with the relevance of its research and the contribution of its staff to industrial progress. As early as the prewar years, Karl T. Compton, then president of the institute, encouraged consulting by members of the faculty as a way of maintaining contact with the practical world. In the postwar period, he was an early proponent of the philosophy of technology commercialization through new enterprise. He supported the establishment of American Research and Development Corporation in 1946 and served as one of its three technical advisors, all of whom were members of MIT.

Aside from its initial involvement with AR&D, MIT's participation in the new enterprise process until the early 1970's had been, at best, passive. Companies started, grew and flourished around Route 128 during the 1950's and 1960's without any direct financial or other types of assistance from the Institute. Although MIT as an organization did not officially participate in the new enterprise process during these years, its faculty and members of the staff of its laboratories as individuals were very active in the starting of new companies. Studies have identified 250 successful so called MIT spinoffs, including such well known names as Ionics, High Voltage Engineering, EG&G, Ditigal Equipment Corporation, Bolt Beranek & Newman and many others.

With the changing climate for starting new companies, which came with the 1970's, Richard S. Morse, former president and founder of the National Research Corporation, and senior lecturer at MIT, at the request of the MIT Executive Committee, began to look at ways in which MIT could aid, encourage and hasten the commercialization of new technology via the new enterprise process. The result of Morse's investigations came in April 1972 with the incorporation of the MIT Development Foundation, Inc., a chari-

table Massachusetts Corporation organized and controlled by, and established for the benefit of the institute. Despite its name, the Development Foundation is not technically a foundation, but rather has been ruled a tax exempt corporation by the Internal Revenue Service.

Once the foundation was established, Morse's first task was to develop relationships with commercial organizations who were interested in the technology transfer process and who could contribute to the commercial evaluation of new ideas. Morse believed strongly that the academic community needed linking mechanisms with industry, if university-developed technology was to find its way into practical application.

Not surprisingly, the early financial sponsors of the foundation included the First National Bank of Boston, Texas Instruments, Exxon, Dow, Monsanto, Cabot Corporation and Johnson & Johnson, all of which were interested in the new enterprise process as a way of developing new technology. Today the foundation has 18 sponsors representing the following industries: electronics and semiconductors, photographic supplies and equipment, chemicals, papers, petroleum and energy, healthcare, capital goods, mining and exploration, building materials, publishing, etc. Additionally, there are among the sponsors representatives of the financial community including investment advisory, banking, and insurance groups.

Although the primary objective of the Development Foundation is to reduce the time required for the commercialization of new ideas, it has studied at some length the techniques of technology transfer and has supported academic work to increase the understanding of the process. Additionally, the foundation has undertaken a study for the National Science Foundation which resulted in the establishment of an experimental program in Maine to stimulate entrepreneurship through education and communication, and to encourage the development of new companies in an economically lagging area. At MIT the foundation has contributed to the educational process and members of the staff have supervised student research projects and theses, and have lectured to groups interested in new enterprise.

In the area of technology transfer, the foundation has evaluated approximately 150 ideas which have been submitted over a period of two years. About 80 percent of these ideas have come from within MIT and the balance from unrelated individuals in the Boston area and elsewhere throughout the country. Naturally, the great majority of these ideas lack the characteristics required to form the basis of a new enterprise; however, four projects appeared to have sufficient potential to warrant continued work.

Although the foundation's active work in technology transfer represents only part of its program, it is, perhaps, most difficult to understand and, consequently, warrants more detailed discussion.

Preliminary selection of projects for commercialization has been done informally as a result of discussions among members of the staff of the foundation, sponsors, and others. Once a project has been selected, an entrepreneur-manager must be identified to undertake the program. In the technology transfer process the key factor is people, and the success or failure of any project is dependent upon the entrepreneur who will be its champion. Once on

board, the entrepreneur works with a foundation staff member in forming a company, in completing market studies, in developing corporate strategy, and in preparing a business plan which will be used by the entrepreneur in efforts to finance the company.

The early gestation period is a trial period, and one of intense activity in which the entrepreneur, inventor, and foundation staff begin to know one another and begin to develop working relationships. During this period the foundation may provide small amounts of seed money to continue development of a technology outside of MIT or to support the entrepreneur while the business plan is being finished. With the completion of the plan, the entrepreneur is on his own. It is he who must make the financing solicitations and raise the capital for the new business. The entrepreneur must undertake this phase of the activity alone for two reasons:

first, the raising of capital is not an appropriate activity for the foundation and second, potential investors who may include sponsors of the foundation are interested in talking with the entrepreneur who will be using their money rather than with an intermediary.

Although the Development Foundation will not participate in the solicitation, it may assist the entrepreneur in selecting the most appropriate sources of venture capital and will give him guidance in preparing an appropriate approach to these sources.

After the company has raised the necessary capital, the foundation does not walk away from the project, but rather maintains an active interest through board membership or some type of advisory role. In short, the foundation believes that once the company is successfully launched, it has a moral obligation to bring

whatever help it can to permit that company to achieve the goals established in the business plan.

Of the four projects which have been undertaken so far, the first has been financed and is now operating; the second is well on the way to completing a financing; and the third has just started to look for money. A fourth company has been organized but, as yet, no plans for financing have been made.

It is not clear yet if MIT's new experiment in technology transfer will be a success. Considerable interest and favorable speculation have been raised by its activities so far, and if nothing else, sufficient commercial support for the four active programs have been generated to justify efforts to date. As far as the success of the new ventures is concerned, the outlook is very optimistic but several years will still be required to determine their ultimate future.



THE SHUFFLEBOARD COURT at the Lyndon B. Johnson Apartments for the Elderly—part of MIT's Housing Program in Cambridge—became active recently when the Institute donated a shuffleboard set. Players are (left to right): Salvatore Rana,

building manager, Joseph S. Collins, special assistant in the office of the MIT chairman, Charlotte Kennedy, president of the LBJ tenants council and Alfreda Simpson, advisor and consultant to the tenants council.

## Communications Award

(Continued from page 1)

packet were the *General Catalogue, Courses and Degree Programs, Undergraduate Residence, the Freshman Handbook*, a booklet entitled *Thoughts on Financial Aid*, the student-initiated brochure, *MIT—A Place for Women*, and the "Undergraduate Applications for Admissions and Financial Aid" package, which contained the mini-catalogue, *MIT Today*.

An accompanying essay outlining the communications philosophy at MIT written by Janet Snover, production manager of the

MIT Bulletin, was also submitted.

In responding to prospective students' information needs, MIT uses extensive personal contact by its Admissions Office staff, the Educational Council, and an organization of over 1,000 alumni representatives throughout the country. Cited as examples of MIT's institute-wide effort to reach prospective students were faculty lectures at high schools, counselling and follow-up of specific students, participation in local college nights, and on-campus programs like the *Boston Globe Science Fair*.

## July Music Festival

July is approaching and with it comes the annual Festival of Summertime Music—to be held as a six part concert series.

This year's concert schedule includes:

- Tuesday, July 1 A concert by Alexander's Feast
- Tuesday, July 8 A recital by pianist John Buttrick of works by Schubert, Mozart, Beethoven and Chopin.
- Tuesday, July 15 Violinist Abraham Comfort and John Buttrick in a concert of works by Schumann, Debussy, and Beethoven
- Friday, July 18 Violinist Abraham Comfort and John Buttrick in a concert of works by Brahms, Mozart and Reger.
- Tuesday, July 22 The New Black Eagle Jazz Band will present a concert of dixieland jazz.
- Tuesday, July 29 Pianists Nicholas and Trudi Van Slyck. Program will be announced.

All of the concerts will be held in Kresge Auditorium at 8pm and, except for the jazz concert, will be open to the public free of charge. Tickets for the jazz concert are available at the Technology Community Association in the Student Center at \$2.50 per ticket.

## Fire Detectors

Just three days remain—through Friday, June 20—for members of the MIT community to buy home fire detection units at reduced cost under a special purchase program set up by the Safety Office.

Nearly 200 of the units have been sold since the month-long program began, according to John M. Fresina, Safety Office director.

For information, call or go to the Safety Office (x3,4736, E19-207).

## Obituaries

### Malcolm C. McGary

Malcolm C. McGary, 53, a division leader in the Air Force Programs Department at Draper Laboratory, died on June 4 in Gloucester, Mass. Mr. McGary came to Draper in 1963. He leaves his wife, Joanne, and five daughters: Robin, Kristen and Ginger, all of Gloucester; Jo, of Key West, Fla.; and Susan E. Roberts, of Beacon, N.Y.

### George F. Lee

George F. Lee, 82, of Belmont, who retired as a guard at Lincoln Lab in 1958, died on June 1. Mr. Lee came to the Institute in May, 1947. He is survived by a brother, Lawrence, of Manchester, N.H.





# Positions Available

(Continued from page 9)

human body are measured, perform specific lab measurements, design lab equipment. Experience with low-frequency electronics, magnetics, heart and lung physiology required. Must be available for occasional evening and weekend work. 40 hr/wk. D75-8 (1/22).

**Acad. Staff, Tech. Asst.,** in Biology will do research related to isolation and physical characterization of key components of blood coagulation systems and molecular mechanisms by which components interact in fulfilling physiological roles. BA or BS in Chemistry or Biochemistry, laboratory skill required. C75-13 (6/11).

**Spons. Res. Staff** in Lab for Nuclear Science, will do postdoctoral research on medium energy nuclear structure with electrons, photons and pions at Bates Linear Accelerator, Middleton. Experience in experimental work in particle or nuclear physics, preferably including use of electro magnetic probe, Ph.D., required. Position is for 1 year, but may be extended. D75-106, D75-107 (6/11).

**Spons. Res. Staff** in Lab for Nuclear Science will do heavy ion physics research including instrumentation development, operation and data handling with MIT groups, using Brookhaven Nat'l Lab facilities (NY). Ph.D. in Physics plus 3 years experience in nuclear instrumentation and interpretation of nuclear reaction data required. Position is for 1 year, but may be extended. D75-105 (6/11).

**Acad. Staff, Asst. to the Director,** Center for Advanced Engineering Study, will have responsibility for all business and personnel affairs of Center: manage financial resources (oversee budget preparation, proposals; carry out financial studies); hire Center personnel; act as Center EEO rep. (monitor affirmative action activity), and as liaison with Personnel Office; participate in special Center, School and Institute activities and committees. Bachelor's degree in social science or science, and management experience required. C75-14 (6/11).

**Spons. Res. Staff** in Center for Cancer Research will perform independent research on tumor-associated antigens including selection of test materials and evaluation of assay procedures. MD degree, experience with human tumors and pathology, biochemistry and microbiology required. Recent clinical experience desirable. D75-108 (6/11).

**Spons. Res. Staff, Engineer,** in Energy Lab project on advanced gas turbines using advanced cooling methods. Candidates should be experienced in advanced testing techniques of turbomachines (i.e., hot blow-down, shock tunnel facilities), in mechanical and aerodynamic design of advanced cooled turbines and analysis of their performance. SM in Mech. Eng., or Aero/Astro, plus minimum of 3 years related experience required. D75-100 (6/4).

**Spons. Res. Staff** in CAES will be responsible for development of innovative curricula for technical education at post-high school level as part of 5-yr research and development program sponsored by Imperial Organization for Social Services, Iran. Initial emphasis will be on curriculum development for grades 13, 14 in electrical, mechanical, civil engineering technology, manufacturing materials technology. Advanced degree in engineering or technical education and curriculum development required. Industrial training experience desirable. Some overseas travel required. D75-101 (6/4).

**Admin. Staff, Asst. to Director,** Office of Sponsored Programs will have responsibility for administration of sponsored projects; proposal review, grant and contract negotiations, post-award administration. Will represent OSP in academic depts. and labs in sponsored project matters. Bachelor's degree in business administration, or equivalent combination of education and experience, and experience in sponsored program administration in university environment required. A75-37 (6/4).

**Spons. Res. Staff, Tech. Asst.,** in Cell Culture Center will perform technical work relating to production and quality control of tissue culture medium including mycoplasma testing and tissue culture procedures. Bachelor's degree in Biology or Chemistry required. D75-102 (6/4).

**Spons. Res. Staff** in Research Lab of Electronics will perform system programming for symbolic computation in plasma dynamics. SB in Elec. Eng. and Computer Science, experience in symbolic computation programming and in use of assembler language and computer graphics systems required. Familiarity with plasma physics and knowledge of ITS computer system desirable. D75-103 (6/4).

**Spons. Res. Staff, Programmer,** in Humanities will have responsibility for hardware/software systems maintenance for computer music project: maintain PDP-11/50 and diverse peripherals; oversee student design and construction of special purpose digital hardware: develop applications software for music research. BS in computer science, or equivalent, experience with PDP 11 DOS systems required. D75-95 (5/28).

**Spons. Res. Staff, temporary,** Computational Linguist in the Research Laboratory of Electronics will be involved in development and implementation of parsing programs, testing and interfacing to morphological and phonological programs. Must have extensive background in English language parsing or understanding systems, and experience with implementation of natural language processing programs, and be able to interact effectively with other programmers and linguists. Temporary for 4 mos. D75-93 (5/28).

**Spons. Res. Staff Systems Programmer,** in Humanities computer music project will assume major responsibility for maintenance of existing system software on PDP-11/50 under DOS or RSX. May develop a music score editor using high resolution vector graphics or develop new operating system support for the special needs of an interactive music system. BS in computer science or equivalent experience with PDP 11 DOS systems required. D75-94 (5/28).

**Acad. Staff, Tech Asst. in Biology** will do research involving nucleic acid isolation, enzymology, bacterial assays, growth and maintenance of bacteriological stocks, as well as some lab management. Sophisticated knowledge of nucleic acid chemistry and biochemistry techniques, particularly in areas indicated, required. Bachelor's degree in Biology or Biochemistry and previous experience as technical assistant preferred. Recent graduates, please submit list of relevant courses taken. C75-12 (5/21).

**Admin. Staff, Alumni Regional Representative** for Boston District will be responsible for all Alumni Assn. programs in metropolitan Boston area including Alumni Fund, Club activities and Alumni Relations programs generally. Position requires interaction with alumni, MIT faculty and administration. MIT degree or extensive knowledge of the Institute also necessary. Will report directly to Executive Vice President of the Alumni Assn. A75-35 (5/21).

**Spons. Res. Staff, Biomedical Technical Asst. in Physics department** Biophysics Lab will assist in sample separation of proteins from animal and human lenses; determine properties of isolated proteins, and evaluate biochemical effect of metabolites and catarogenic agents on intact lenses and in vitro lens preparation. BS in Biochemistry or Medical Science, experience in biochemical techniques (chromatography, spectroscopy, substrate and product analysis), and physical chemistry of proteins required. Will be trained in electronics, laser light scattering, and computer. D75-91 (5/21).

**Admin. Staff, Graphic Designer,** in Design Services will have responsibility for all publications of Alumni Assn. Formal education in typography and design as well as considerable experience in graphics design required. A75-32 (5/14).

**Acad. Staff, Tech. Asst. in Nutrition and Food Science** will perform specialized and routine chemical analyses on body fluids using spectrophotometric and fluorometric methodology. Primary responsibility will be in operation and maintenance of Mass Spectrometer; will also use Technicon Auto Analyzer and automated Beckman amino acid analyzer. MT (ASCP) or BS in chemistry, with minimum of 2 years experience in clinical chemistry procedures required. C75-9 (5/14).

**Admin. Staff, Programming Analyst,** Information Processing Center User Services Group will provide programming information and debugging help to users; produce user documentation, conduct seminars, workshops, short courses; implement and maintain software such as debugging compilers, utility tools, plotting packages. Bachelor's degree, preferably in computer science, or equivalent, strong experience with large time-sharing systems, PL/1, Fortran and system control languages required. Communications and documentation skills also necessary. A75-30 (5/7).

**Acad. Staff, Tech. Asst.,** in Biology will be involved in research on Molecular genetics of bacteria: DNA mediated bacterial transformation of mutants, isotope labeling density gradient centrifugation. Bachelor's degree in Biology or related field plus experience in Microbiology preferred. C75-7 (5/7).

**Spons. Res. Staff Economic Advisor** at the Joint Center for Urban Studies will advise the Presidents of MIT and Harvard on the state of the economy and labor force of Cambridge, and prospects for future economic develop-

ment; evaluate proposals in fields of health, education, housing, transportation, and community development in view of their impact on the advisory committee of faculty and administration members from both institutions. Doctoral degree or equivalent experience in urban economics, manpower, community development required. Ability to work effectively with local government and university officials. Ability to plan and conduct research. 74-753-A (7/17).

**Spons. Res. Staff, Project Manager,** for Center for Transportation Studies research group involved in federally sponsored demonstration project in Integrated Metropolitan Transportation Systems which includes implementation and operation of computerized dial-a-ride system, integration of DAR and conventional fixed route services, development and evaluation of special services for transportation disadvantaged areas. Mgr. will also supervise several graduate students. Masters degree in transportation systems or urban planning with solid transportation background required. Familiarity or experience with conventional transit services effectively with citizens groups, political leaders, and to make frequent site visits. D75-81 (4/30).

**Admin. Staff, District Officer,** in Resource Development will coordinate volunteer solicitors in major geographic areas. Out of town travel necessary 50% of the time. Familiarity with MIT required for effective representation as well as poise and ease in dealing with people, demonstrated initiative and ability to work independently, good oral and written communication skill. A75-16, (3/26), A75-25, A75-26 (4/16).

**Admin. Staff, director,** Development Office will have overall responsibility for MIT's central development services; supervise a support staff of 15 people and report to Director of Resource Planning. Minimum 5 years professional fund-raising experience is required preferably in university environment, with emphasis on top-level support functions including prospect identification, evaluation, research, funding strategy development, proposal writing. Demonstrated ability to direct a staff also necessary. (MIT has recently launched a \$225 million, 5 year capital campaign). A75-27 (4/23).

**Admin. Staff, Alumni Regional Representative** for NY Area will be responsible for Alumni Assn. programs in metropolitan NYC area, including the Alumni Fund, Club activities, administrative support for the Educational Council, Alumni Relations programs generally, and various other MIT activities; manage NY regional office. Position requires interaction with alumni, MIT faculty and administration, residence in NYC as well as some other travel. MIT degree or extensive knowledge of the Institute is also necessary. Will report directly to the Executive Vice-President of the Alumni Assn. A75-23 (4/16).

**Spons. Res. Staff, Electrical Engineer,** in Lab for Nuclear Science will work on operation and modification of Bates Linear Accelerator rf system. Minimum of 5 years experience in design and operation of high power microwave transmitter systems is required. Experience with digital systems and computer control systems helpful. Flexible work schedule required to accommodate round-the-clock operation. D75-70 (4/16).

**Spons. Res. Staff,** in Lab for Nuclear Science (Linear Accelerator Lab, Middleton, MA.) will provide instrumentation development, operation and data handling support for research group in electron scattering and other programs. Strong EE or Physics background at BS level, or equivalent, minimum 5 years experience in nuclear instrumentation including Scintillation, Solid State and Multi-wire Proportional Counters, Nanosecond digital and Analogue Electronics, CAMAC required. PDP/11/45 experience helpful. D75-55 (3/26).

**Spons. Res. Staff, Economist/Econometrician** in Energy Lab will participate in projects on development and application of models of domestic and international energy production and utilization; develop and apply econometric procedures to estimate energy models; assist in model formulation and development of energy data and accounts in US and other industrialized countries, supervise junior staff and students, perform related duties as required. Ph.D. Economics, specifically mathematical economics and econometrics, experience in application of functional specifications, such as translog and generalize leontief; familiarity with economic accounts of at least one foreign industrialized country required. D75-48 (3/5).

**Spons. Res. Staff, temporary** in Project MAC Planner Group will write and implement programs in PLASMA and LISP. Experience in these languages required. Position runs Sept.-Dec. 1975. S75-1 (2/26).

**Spons. Res. Staff** at the National Magnet Laboratory will work on the Alcator thermonuclear experiment. Conceive, design, and carry out plasma diagnostic experiments using neutron,

X-ray, optical, electrical, magnetic and microanalysis and assessment of data. Ph.D. in plasma physics or related area required. Familiarity with tokamak devices desirable. 74-1512-A (5/1).

**Spons. Res. Staff** in the Energy Lab must have a minimum of 5 yrs experience in defining, securing, organizing and supervising student theses, research and staff; Ph.D. in Mechanical Engineering required. 74-359-A (5/1).

**Technical Assistant, Acad. Staff,** in Nutrition and Food Science, will perform specialized and routine chemical analyses on body fluids. Operate and maintain mass spectrometer, Beckman automated amino acid analyzer; assist in new methodology development; occasionally supervise other lab personnel. BS, chemistry, biology or medical technology and minimum 2 years experience in clinical chemistry required. C75-4 (2/5).

**Inpatient Staff Nurse, Exempt,** in Medical Department will primarily do bedside nursing and will assist with first aid treatment in emergency clinic. Mass. Licensed RN required. Emergency Room or ICU experience desirable. Rotating shifts: 3pm-11pm and 11pm-7am. E75-12 (6/18).

**Accountant, Exempt or Staff,** will perform internal cost audits of research contracts and grants, coordinate accounting, cash flow and audit functions with Office of Sponsored Programs, MIT departments and schools. Prepare billings and varied fiscal reports as required. General business education and 3-5 years accounting experience, or BA in Accounting, or equivalent combination of education and experience required. E75-21 (6/18).

**Exempt, Accountant,** in the MIT Press Accounting Office will maintain detailed cost accounting records for in-process inventory; calculate costs of completed titles; monitor perpetual inventory and cost of sales for finished books; reconcile subsidiary records to control accounts; perform other projects as required. Accounting certificate, or equivalent experience, required. E75-18 (5/28).

**Exempt, Admin. Asst., Office Mgr. in Libraries Microreproduction Lab** will be responsible for office management, financial and statistical, security, personnel and purchasing functions of Lab. Duties include supervision of 4 employees and of the processing of all requests, maintenance of accounting records, assistance in analyses and budget preparation; handling of classified materials. Will perform other related duties as required. Administrative skill and an interest in microfilm applications are required. E75-19 (5/28).

**Tech. Asst. V in Psychology** will handle technical and data analysis aspects of neurohistological work including small animal surgery; perfusion and preparation of brains for histological procedures (silver stains, normal cell and fiber stains); microscopic analysis of results; graphical reconstructions. Experience in histological procedures including a knowledge of cytoarchitecture of small animal brains and reconstruction techniques required. B75-237 (6/11).

**Tech. Asst. IV programmer,** part-time, temporary, in Architecture will program graphic data from land use maps and building space-behavior maps; assist in development of innovative graphics programs relating to site and design prediction; catalogue computer routines for replication. Familiarity with SPSS, Multics, Architecture Machine, desirable. 20 hrs/wk. Position runs through 5/31/76. B75-190 (5/14).

**Admin. Asst. V in Architecture** will perform secretarial duties relating to elderly housing project; prepare student payroll, assist in preparation of grant proposals. Secretarial skills, flexibility, experience with Federal grants and MIT accounting procedures required. Position begins 9/2/75. B75-257 (6/18).

**Sr. Secretary V** in Office of the Director, Arteriosclerosis Center will arrange complicated schedules; maintain extensive telephone contact within MIT, with medical institutions and patients; review and type final draft manuscripts; file. Excellent typing and machine transcription skills, ability to work in high-pressure, hospital-like setting with little supervision required. 37½ hr/wk. B75-223 (5/28).

**Secretary IV-V** in Harvard-MIT Program in Health Science & Tech. will perform varied administrative and secretarial duties in Program's administrative office. Must have organization and secretarial skills, and be able to work independently. Shorthand and knowledge of MIT accounting procedures desirable. Command of English language necessary. Non-smoking office. 37½ hr/wk. B75-234 (6/4).

**Secretary IV** to International Management area faculty and staff, Sloan School, will prepare class material; order books, films; arrange for guest speakers; type and edit manuscripts; arrange travel, meetings and conferences; maintain course and student records. Excellent typing, shorthand/

speedwriting, experience with dictating equipment, command of English language required. Minimum of 2 years secretarial experience necessary. B75-262 (6/18).

**Secretary IV** to Director and Administrative Officer, Division for Study and Research in Education will perform general secretarial duties; arrange appointments; maintain calendar; place large volume of telephone calls; take and transcribe dictation. Ability to interact with and assist a wide variety of people, to relay messages accurately, to organize and follow through on work required. Shorthand, secretarial experience or training also necessary. B75-263 (6/18).

**Secretary IV** to several Mechanical Engineering faculty members will type varied material; arrange travel, appointments, coffee seminars; maintain accounts. Excellent secretarial skills including shorthand/machine dictation, technical typing and the ability to interact well with people required. Possible job-sharing opportunity. B75-253, B75-255 (6/18).

**Secretary IV** in Research Lab of Electronics will perform secretarial duties for several faculty and staff; transcribe and type technical material from shorthand notes; type charts, tables; verify report references; arrange report formats; arrange appointments and travel; independently reply to correspondence. High school training, or equivalent, plus 3 years secretarial experience required. B75-267 (6/18).

**Secretary IV** to Assistant Directors, Development Office will maintain calendars, files, telephone; type error-free reports and correspondence including material for senior Institute officers. Initiative, mature judgment, discretion and a sense of teamwork desirable. Excellent secretarial skills, ability to interact with Institute personnel at all levels necessary. Shorthand helpful. B75-268 (6/18).

**Secretary IV** in Political Science will handle duties related to student job placement involving contact with students and other university representatives; perform secretarial and administrative duties for publication (*Journal of Interdisciplinary History*), possibly including some editorial work. Will also type manuscripts, do library research. Excellent typing, college training and 3 years office experience required. Ability and willingness to assist people required for job placement activities. Shorthand helpful. Position begins 9/1/75. B75-238 (6/11).

**Secretary IV** to Mechanical Engineering faculty member will type correspondence, proposals, class material from tapes; answer phones; file; may do occasional secretarial work for other staff and students. Typing skill, command of English language and ability to use dictation equipment required. Knowledge of medical, biological, engineering terminology helpful. B75-242 (6/11).

**Secretary IV** for Sloan School Senior Executive Program and Urban Executives Program will make living arrangements for participants, schedule classes, order and prepare program materials; handle routine correspondence; maintain records; handle program announcements. Typing, shorthand/speedwriting skills, initiative ability to follow through on details required. B75-244 (6/11).

**Secretary IV** to two faculty members in Center for Space Research will handle volume typing of correspondence, reports; arrange travel and meetings; act as student and staff contact. Organization and technical typing skill required. Ability to work independently also necessary. B75-248 (6/11).

**Secretary IV** to Lab for Nuclear Science research group including faculty, students, staff will type and edit reports, manuscripts which include technical material; arrange appointments, travel; maintain files and budget records; answer phones. Excellent typing skill, flexibility required. 32½ hr/wk 9am-4:30pm. B75-245 (6/11).

**Secretary IV** to Harvard-MIT program in Health Science and Technology will perform secretarial duties for inter-institutional research group working on health care technology project: transcribe from oral and machine dictation; arrange travel; administer grant, edit and type manuscripts. Excellent secretarial skills including shorthand/speedwriting and interest in health care required. College training, familiarity with medical/technical subjects desirable. B75-252 (6/11).

**Secretary IV** to two Civil Engineering faculty members: type and edit course material, correspondence and technical reports; answer phones; maintain files; monitor accounts; arrange travel. Typing skill required. Must be able to type technical material or be willing to learn. B75-229 (6/4).

**Secretary IV** in Harvard-MIT Program in Health Sciences and Technology will perform general secretarial duties: type, file, arrange travel and meetings; edit and proofread reports; write and/or suggest replies to office correspondence. Excellent typing skills plus

5 years secretarial experience required. Shorthand/speedwriting, familiarity with MIT procedures desirable. B75-214 (5/28).

**Secretary IV** to Nutrition and Food Science faculty member involved in research on malnutrition, learning and behavior: will perform standard secretarial duties including shorthand, typing, filing, machine dictation. Secretarial school training or equivalent experience required. Knowledge of medical/biological terminology helpful. B75-217 (5/28).

**Secretary IV-Admin. Asst. V** in Sloan School health education and management research project will handle budget, administrative matters; provide information on projects by written correspondence and phone, type and edit reports and manuscripts; act as liaison between project members and outside institutions. Organization skill, excellent typing, command of English language and ability to use dictating equipment required. Knowledge of MIT accounting procedures, shorthand skill helpful. B75-212 (5/28).

**Secretary IV**, part-time, in Architecture Solar Energy Lab will perform general secretarial duties; compile bibliographies. Will be trained to provide information on Lab's activities to callers and visitors. Typing skill and ability to deal with people required. 15-20 hrs/wk. Position begins 8/1/75. B75-193 (5/21).

**Secretary IV** to two Mechanical Engineering faculty members will handle general secretarial duties including large volume of technical typing; make travel arrangements; monitor sponsored accounts; arrange seminar coffee hours. Excellent technical typing skill, ability to set priorities required. B75-170 (4/30).

**Secretary IV** in the Energy Lab will work with students and staff of Energy Information Group; perform general secretarial duties which include correspondence and technical typing, maintaining files, travel arrangements and monitoring of sponsored research accounts. Ability to work independently required. Secretarial school training and MIT experience desirable. B75-157 (4/23).

**Secretary IV** to faculty member and research staff in Urban Studies and Planning will perform varied secretarial duties including technical typing, editing; maintain computer lists by key-punching. May do occasional library research and contract administration. Technical typing skill, keypunch ability (or willingness to learn) required. Shorthand skill preferred. Economics background helpful. Non-smoking office. B75-130 (4/2).

**Secretary III-IV** in Chemical Engineering will type correspondence, class materials, reports, including technical data; maintain student records; act as receptionist; arrange appointments and travel. Fast, accurate typing, organization skill required. Technical typing experience preferred. B75-265 (6/18).

**Secretary III-IV** in Purchasing Dept. will handle varied secretarial duties including typing of correspondence and forms, filing, recordkeeping; answer phones; greet visitors; answer inquiries regarding purchasing procedures; research billing problems. Accurate typing, initiative required. B75-259 (6/18).

**Secretary III-IV** will provide secretarial support to Center for Space Research faculty and staff. Duties include large volume of proposal, correspondence and publication typing, answer phones; arrange travel and meetings. Typing skill, including ability to type technical and scientific material and to organize work required. B75-249, (6/11).

**Secretary III-IV** in Medical Department Radioactivity Center will have responsibility to contact radium patients for participation in MIT studies. Work requires some evening work (compensatory time off during regular work week). Will maintain equipment and supply records; compose and type memoranda; interview patients; process requisitions, travel vouchers. Excellent telephone manner, ability to relate to elderly people, typing skill required. Some college helpful. 37½ hr/wk. B75-247 (6/11).

**Secretary III-IV** in Meteorology will handle general secretarial duties for faculty member and staff; type correspondence, manuscripts, including technical material; arrange travel, monitor accounts; maintain small library. Position offers opportunity for independent work and expanded responsibility. Excellent typing and organization skills required. College training preferred. Position begins 8/15/75. B75-209 (5/21).

**Secretary III** in Treasurer's Office will perform general secretarial duties under supervision of Admin. Asst.; open and distribute mail; greet visitors; answer phones; type correspondence. Shorthand and machine dictation skills, facility with figures required. Knowledge of investments helpful. B75-258 (6/18).

**Secretary III** in Operations Research

Center will assist three persons in headquarters office: maintain calendar; type reports and correspondence; monitor accounts; answer phones; coordinate seminars, workshops; assist with other general office functions. Technical typing skill, or willingness to learn, flair for figures, ability to work with detail required. B75-270 (6/18).

**Secretary III** to Office of Sponsored Programs grant administrator will have responsibility for maintenance of grant and contract records, coordination of approval process, typing of letters, forms and other general secretarial duties. High school graduate with 3 years experience, or equivalent combination of education and experience required. Shorthand and MIT experience helpful. B75-186 (5/14).

**Computer Operator IV** in the Office of Administrative Information Systems will operate IBM Model 145 and associated peripheral equipment under DOS/VS. Must have good knowledge of DOS job control, multiprogramming experience and ability to follow standardized operating instructions. Minimum 1 year experience required. 12 midnight-8am shift. B75-195 (5/21) 4pm-12midnight shift B75-251 (6/11).

**Keypunch Operator III** in Comptrollers Acctg. Office will keypunch data input for Account Reporting System (accounts payable, receivables, travel advances, journal entries); verify and balance batch input. 2-3 yrs. keypunching experience required. Knowledge of Inforex key-to-disk entry system helpful. B75-215 (5/28).

**Sr. Clerk IV-V** in Comptroller's Acctg. Office will tabulate research expenditures and cash flow for sponsored research projects; assist in data collection for cash forecasts; maintain daily cash balances; prepare monthly billings and fiscal reports; handle all aspects of interim and final audits. Interest in and aptitude for figures, 2-3 years accounting experience required. Good typing desirable. B75-254 (6/18).

**Sr. Clerk IV-V**, Accounting Assistant, in Sponsored Accounting Section, Comptrollers Accounting Office, will tabulate sponsored project research expenditures and cash flow; collect forecast data; maintain daily balances prepare monthly billings and fiscal reports. General business background plus 2-4 yrs. accounting experience required. Typing skill desirable. B75-99 (3/12).

**Sr. Clerk IV** in Office of Personnel Relations will provide comprehensive clerical and statistical support to Wage and Salary section. Duties include data collection, computations and extensions; develop charts, graphics, summaries. Perform varied clerical duties related to unemployment compensation program: process claims, act as liaison with Institute departments. Will also provide general clerical assistance as required. A flair for working with figures, initiative and typing skill required, as well as an interest in learning basic APL programming desired. B75-246 (6/11).

**Clerk Typist III** at MIT Press will assist in taking phone orders, greet visitors, distribute mail; assist secretary and staff with typing. Excellent typing skill, ability to use dictation equipment, familiarity with office procedures required. Secretarial school training desirable. B75-261 (6/18).

**Sr. Clerk III** in the Center for Cancer Research will perform clerical duties including posting of information, preparing invoices for approval; filing; checking of monthly statements; analyze expenditures and commitments and prepare reports on research grants. Must like to work with figures, be able to abstract information from complex records. Typing skill required. B75-205 (5/21).

**Clerk II**, Medical Dept., will perform various messenger and clerical duties throughout department: sort and deliver incoming mail, record boxes; maintain stock room; file and pull medical records; collect and process outgoing mail. High school graduate, or equivalent, reliability, and some previous work experience required. Deliveries may include lifting of heavy objects. 40 hr/wk. B75-269 (6/18).

**Glassware Washer**, part-time in Arteriosclerosis Center will be responsible for washing non-radioactive glassware. Must be able to work with minimum supervision. 2 hrs/day; flexible schedule. H75-63 (6/4).

**Cook** at Endicott House, Dedham, Mass, will cook breakfasts 6 days a week and assist in luncheon, dinner preparation; prepare dinner 1 night per week; assist in preparation and serving of large functions; wash utensils used in cooking and clean kitchen. Expertise in preparing and presenting attractively a variety of breakfast foods and in baking, preparing desserts and hors d'oeuvres required. Must be punctual, reliable; will begin work at 6am when preparing breakfast. Own transportation required. 40 hr/wk. Irregular schedule. H75-62 (6/4).

**Machinist A**, temporary in Lab for Nuclear Science will set up and operate commonly used machine tools with minimum supervision, working to close

tolerances from blue prints, specs., verbal instruction or sketches; make tools, dies, jigs and fixtures as required; may direct and train lower-grade machinists; machine parts for nuclear physics experimental apparatus. May carry jobs from preliminary stages to complete assembly (planning sequence, selecting tools and equipment); make precision angular layouts, measurements; use shop mathematics. Minimum of 5 years applicable machinist experience required. Temp. for 3 mos. 40 hr/wk. H75-59 (6/4).

**Instrument Maker** temporary, in Lab for Nuclear Science must have all qualifications for Machinist A and demonstrated mechanical ingenuity and experience in construction, adjustment and repair of a wide variety of instruments in construction, adjustment and repair of a wide variety of instruments related to scientific and research work; may direct and train other machinists; duties include machine and assembly of precision parts, mechanical movements; make cameras, collimators, scattering chambers; work with all standard machine tools and instruments. Must have secured formal apprenticeship (3 yrs), and have 10 addl. years experience working to close tolerances on precision instruments and/or intricate mechanical devices. 40 hrs/wk. H75-60, H75-61 (6/4).

**Technician B (EM)** in Lab for Nuclear Science at Brookhaven Nat'l Lab., L.I., N.Y. will assist in laboratory or research work; operate experimental and technical equipment. Experience in use of lathes, milling machines, drill presses, grinding machines, power tools, familiarity with wiring equipment, and ability to modify piping and associated hardware required. Familiarity with gas flow and vacuum equipment desirable. Graduate from 2 year day technical school, or equivalent, ability to work without supervision and to travel, as necessary, to other locations (MIT, Fermi, Nat. Lab., Batavia III) and work there for varied time intervals required. Must work extended shifts including nights, weekends, and be prepared to relocate at end of project. MIT transfers only. H75-55 (5/21).

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

D75-46	Spons. Res. Staff
D75-69	Spons. Res. Staff
B75-222	Sr. Clerk III
B75-125	Secretary IV
A75-34	Adm. Staff. (cancel'd)
B75-227	Secretary IV
74-1512R	Spons. Res. Staff
D75-62	Spons. Res. Staff
D75-20	Spons. Res. Staff
B75-226	Clerk III
B75-232	Clerk II
B75-239	Secretary IV
B75-228	Secretary III
D75-67	Spons. Res. Staff
B75-208	Secretary IV
A75-20	Admin. Staff
D75-90	Spons. Res. Staff
B75-197	Secretary IV

The following positions are on HOLD pending final decision:

A75-36	Admin. Staff
B75-194	Secretary III
B75-206	Secretary V
B75-218	Secretary IV
D75-89	Spons. Res. Staff

## INSTITUTE NOTICES

### Announcements

**Official Notice**—Applications for advanced degrees in Sept. 1975, must be returned to the Registrar's office, Rm E19-335, by Fri, June 27.

**Latin American Teaching Fellowships**—Teach in Latin American University. Computer science assignments available in Mexico, Costa Rica, Brazil and especially Venezuela. Non-Spanish and non-Portuguese speaking candidates invited to apply. Salary range \$1,000-\$1,500/month. x3-5226.

**HoToGAMIT**—Anyone interested in helping with HoTo GAMIT 7, call Gail, TCA, x3-4885, evgs. Use your summer free time constructively (well, it keeps you off the streets!)

**TCA Summer Hours**—Open approx 12n-2pm, occasional evg hrs. Call ahead to see if open. x3-4885.

**MIT Family Day Care Program**—Openings for homes in Eastgate & Westgate. If you live on campus & can provide day care in your home for children from infancy thru 5 yrs, call or stop by Child Care office, Rm 4-144, x3-1592.

**Student Furniture Exchange**—Open Tues & Thurs, 10am-2pm. Buy and sell to students, tax-free donations gratefully accepted. 25 Windsor St. x3-4293.



A TOY HIGH CHAIR, symbolic of an easy chair for his home, was the Medical Department's major gift to Dr. Samuel D. Clark at a retirement party at the Faculty Club last week. The symbolism was double-edged because Dr. Clark played a major role in establishing birth control and family planning services in the Medical Department. Dr. Albert O. Seeler, head of the Medical Department, right, made the presentations, which also included a new squash racket. Dr. Clark will continue to practice part-time at MIT.

## Student Attempts Rescue

(Continued from page 1)

where the man had gone in.

"When I got to him he had already stopped breathing and was turning blue. I held him in a life-saving hold and put my other arm through the life preserver and had the police tow me to the nearest concrete bridge support where I gave him mouth-to-mouth resuscitation."

Meanwhile, MIT Campus Patrolman Leslie Pardy and Roy Foote and Tony Adams of the MIT Boathouse were on their way to the scene in a boat. They pulled Jung

and the unconscious man out of the water and returned to the boat-house. Jung continued giving the man—estimated to be about 65 years old—mouth-to-mouth resuscitation and heart massage.

The man was taken to Massachusetts General Hospital where he was pronounced dead at 11:10am, MDC police said.

Jung, whose home is in Randolph, Wisc., received an anti-tetanus shot at the MIT Medical Center, but did not require treatment.

### Placement

The following companies will be interviewing during the time period covered by the current Institute Calendar. Those interested may sign up in the Career Planning and Placement Office, Mon-Fri, 9am-3pm, Rm 10-140, x3-4733.

**Latin American Teaching Fellowship Program**, Fletcher School of Law and Diplomacy, Tufts University, will send a representative today, June 18, to speak with students and faculty who are interested in the program. The LATF Program is seeking individuals in computer science and computer applied fields for placement under the auspices of this special program.

**Careers Advisory Service**, University of London—Anne Avant, staff member of the Service, is visiting Fri, June 27, 2pm. This is an opportunity for British students who have not been in touch with the employment situation in Britain for some time to meet with Mrs. Avant.

### New UROP Listings

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

**New England Aquarium** Boston  
The New England Aquarium is interested in involving undergraduates in the following research projects being conducted at the Aquarium. 1. Measurement of metal complexing capacity in real water systems and its effect on phytoplankton productivity. 2. Determination of heavy metal associations in fresh water and marine sediments. 3. Gas chromatography of inorganic oxygen containing anions. 4. Time stability of nutrients in phytoplankton culture medium. 5. Trace metal uptake and transport by fresh water algae. 6. Transitional metal trace analysis by gas chromatography. 7. Separation and characterization of polar organic material from sea water and phytoplankton culture media.

### UROP-Innovation Center

A biomedical opportunity exists for an undergraduate student interested in working with electrodes and chemical columns. For further information please contact the Innovation Center, x3-6947.

### MIT Club Notes

**Bridge Club\***—ACBL Duplicate Bridge. Open pairs Thurs, 7pm. Stu Ctr Rm 473. Jeff, 864-5571.

**MIT/DL Bridge Club\*\***—ACBL Duplicate Bridge, Tues, 6pm, Stu Ctr Mezzanine Lge.

**MIT Diet Workshop\*\***—Will be continued another 10 wks. Meetings Thurs, 12n, Stu Ctr Rm 491. New members welcome.

**Space Habitat Study Group\***—Meetings Wed, 7:30pm, Rm 24-407. Info: M. Gaffey or B. Havelton, x3-1917.

**Strategic Games Society**—Sat, 1pm-1am, Walker Rm 309 & 318. Offers opponents and discounts on merchandise to members plus gaming & periodical library. Help needed for SUMMERCON & WINTERCON. Info: Paul Bean, 266-6108 or Robert Sacks, 494-8889. Origins I Avalon Hill Games Convention info: Paul Bean.

**Student Homophile League\***—MIT Gay Lounge (Rm 50-306) open for lunch and most evgs; call ahead x0745 Dorm. Meetings 1st and 3rd Sundays each month, 4pm, Rm 50-306. For info, talk, help in coming out, call Tom at the Hotline, x3-5440 (Hotline is being moved and is temp out of commission!)

**MIT Tae Kwon Do Club\*\***—Meetings & workouts Tues & Thurs, 5-7pm, Stu Ctr Rm 491.

**Tech Squares\*\***—Square dancing Tues, 7:30pm, Sala. Admission \$1, at door.

### Religious Activities

The Chapel is open for private meditation 7am-11pm daily.

**Roman Catholic Mass\***—Sun, 10am, Chapel.

**Summer Bible Study Group\*\***—Tues, 12:30-2pm, Rm 13-5002.



SUMMERTIME—a fire hose snaking through the grass feeds the Killian Court lawn, stippled in afternoon sun and shadow.

## Extraterrestrial Life Search Misguided, Scientist Says

(Continued from page 1)

Sagan of Cornell University, have interpreted these colors as a sign of organic material.

Prinn, who summed up the evidence at a recent meeting in Tucson, Arizona, says that they based their arguments on experiments with laboratory flasks that are irrelevant to conditions on Jupiter.

In these experiments, scientists mixed together methane, water vapor, ammonia, hydrogen sulfide and ethane, which exist in extremely small amounts in the Jovian atmosphere, and bombarded them for up to 14 days with a powerful ultraviolet lamp or an electric discharge. The reddish material which collected on the sides of the flasks was declared to be organic.

Prinn, in the Department of Meteorology, and John Lewis, who is associate professor of geochemistry and chemistry in the MIT Department of Earth and Planetary Sciences, criticize these experiments on several grounds:

The helium and hydrogen that form the bulk of the Jovian atmosphere are not included; the temperature used has not reflected real Jovian temperatures; and the ultraviolet lamp and electric discharges are up to one million times more powerful than one would expect natural lighting on Jupiter to be.

But even if these discrepancies were corrected, the experiments would still be irrelevant, Prinn says.

"You can't simulate the atmosphere in a flask—all the reactions occur on the wall. And it doesn't allow for turnover of gases with at-

mospheric movements."

Lewis and Prinn explain Jupiter's colors by the presence of inorganic materials—sulfur and red phosphorus.

"Recently our cause got a big boost," Prinn said: it was discovered that the red polymer Sagan had produced in his flask experiment was not organic, as had been thought, but was instead 96 percent sulfur.

According to Lewis and Prinn, there are three levels of clouds on Jupiter. The top cloud is colorless ammonia; the bottom cloud is water vapor and ammonia. The colors come from the middle cloud, of ammonium hydrosulfide, which turns yellow in sunlight.

The colorless bands between the colored strips are cloudless belts. The bright orange or red spots (the largest one, the Great Red Spot, has been observed for several hundred years) are red phosphorus. This occurs only where storms quickly carry phosphine up above the clouds of ammonia, where ultraviolet radiation turns it into red phosphorus.

Lewis and Prinn maintain that there is no evidence that organic material does form on Jupiter. But even if it did, they say, there would still be nowhere for it to evolve into life. On earth, scientists theorize, organic materials became concentrated in pools and oceans, where after millions or billions of years, simple forms of life could develop.

But Jupiter has no oceans; in fact, it has no surface. "It's a huge gas ball, like the sun," Prinn said. If organic materials did collect in clouds of water vapor, they wouldn't remain there for more than a few weeks or months—not nearly long enough for life to evolve. Instead, they would soon be destroyed in the hot atmosphere below the clouds.

# Space Probe Information Changes Concept of Planets

(Dr. M. Nafi Toksoz, professor of geophysics in the Department of Earth and Planetary Sciences, wrote the following popular version of a paper presented to the American Geophysical Union June 17, in Washington, D.C. The original paper was written by Dr. Toksoz, graduate student David H. Johnston, and J.W. Minear of the NASA-Johnson Space Center.)

By M. NAFI TOKSOZ

While the plate tectonic concepts were making revolutionary changes in our understanding of the Earth, the Moon, Mars, Venus and Mercury were being explored by Apollo and Mariner missions as well as those flown by the USSR.

This new wealth of information has changed our concepts about the composition, structure and the evolution of these planets. What we find are great contrasts rather than similarities between even the closest neighbors such as the Earth and the Moon. The Earth is tectonically and geologically an active dynamic planet. More than two-thirds of the rocks on the earth's surface were formed in the past 200 million years. The Atlantic and Pacific oceans opened during this period. There is volcanism and differentiation. Yet on the Moon the youngest volcanic rocks are more than 3 billion years old. In fact the bulk of the lunar crust may be older than 4 billion years. There is no volcanism on the Moon at the present.

Since both the Earth and the Moon were formed 4.6 billion years ago, why have they evolved differently? Why is it that the Earth continued to evolve for more than four billion years while the Moon completed the bulk of its evolution in about 1.5 billion years?

Such contrasts are not unique to the Earth-Moon pair. Mercury's surface, as revealed by the TV observations of Mariner 10 spacecraft, is similar to that of the Moon. There is no evidence of volcanism or active tectonism at the present time. Mars, on the other hand, displays terrains characterized by large volcanoes—13 miles high—and great canyons. Venus which is shrouded by a dense atmosphere, has mountain ranges, craters, and granitic rocks at the surface.

These contrasts can be explained by the different thermal histories of the planets. Thermal regime of a planet controls the evolution of its interior and the

geologic processes at the surface. Because of their different sizes and compositions, the planets evolved at different rates. The calculations show that the Earth and Venus are at their evolutionary peaks, while the Moon and Mercury evolved rapidly in the first 1.5 or 2.0 billion years. Today they are tectonically inactive, and are dying slowly. Mars is in between these two categories. It is over its peak in evolution but still has some activity.

How does a planet evolve? According to most widely accepted theories, first the planetary material condenses from solar nebula to form solid grains. These grains agglomerate into larger planetesimals. Finally, they are swept by the gravitational attraction of a nucleus or protoplanet. As they fall on to form the planet, the interior heats up because of gravitational energy and the compres-

sion. This produces melting and differentiation. Iron sinks to form the core, and light silicates float up to form a crust. Radioactive elements such as uranium, thorium and potassium provide heat and keep the interior hot. Eventually these radioactive elements move toward the surface and heat sources are reduced in the interior. Slow cooling starts from the surface towards the interior. It takes billions of years to conduct the heat from the deep interior of a planet such as the Earth. A relatively cool shell at the surface called the lithosphere is 100 km thick in the earth and is about 600 km thick in the Moon and in Mercury. The cores of the Earth, Venus and Mars are molten. Mercury, which has a large iron core may be partially molten. The Moon could have only a small core, and if so, it is in a partially molten state.

## Erdely to Study Music Of Boston Ethnic Cultures

Steven Erdely, associate professor of music, whose field of interest is European and American musical folklore, has recently received a grant for \$7,500 from the National Endowment for the Arts to study the folk music of various ethnic cultures of Boston.

The grant, which is matched by city funds, calls for him "to collect the traditional music from Boston's ethnic groups and to study their representative types and styles and observe the life of these traditions among the popular American trends."

The results of his work—to be compiled from field-work in Boston's ethnic communities—will be returned to the communities through Festival Bostonian, a newly inaugurated multi-arts program series. Each month the Festival "celebrates" a different cultural group, sponsoring a variety of events illustrative of that group's heritage.

The Festivals, to run throughout this year and 1976, are organized as a special Bicentennial project by the Mayor's Office for Cultural Affairs with whom Professor Erdely will work directly.

His investigations will be concentrated this summer within Boston's Italian, Jewish, Hispanic and Baltic communities—all

groups with Festival programs scheduled for the fall and winter months.

Professor Erdely, who has done similar studies on ethnic folk music in Cleveland, Ohio, communities, will be assisted this summer by Gregory Grefenstette, a sophomore from Pittsburg, Pa.

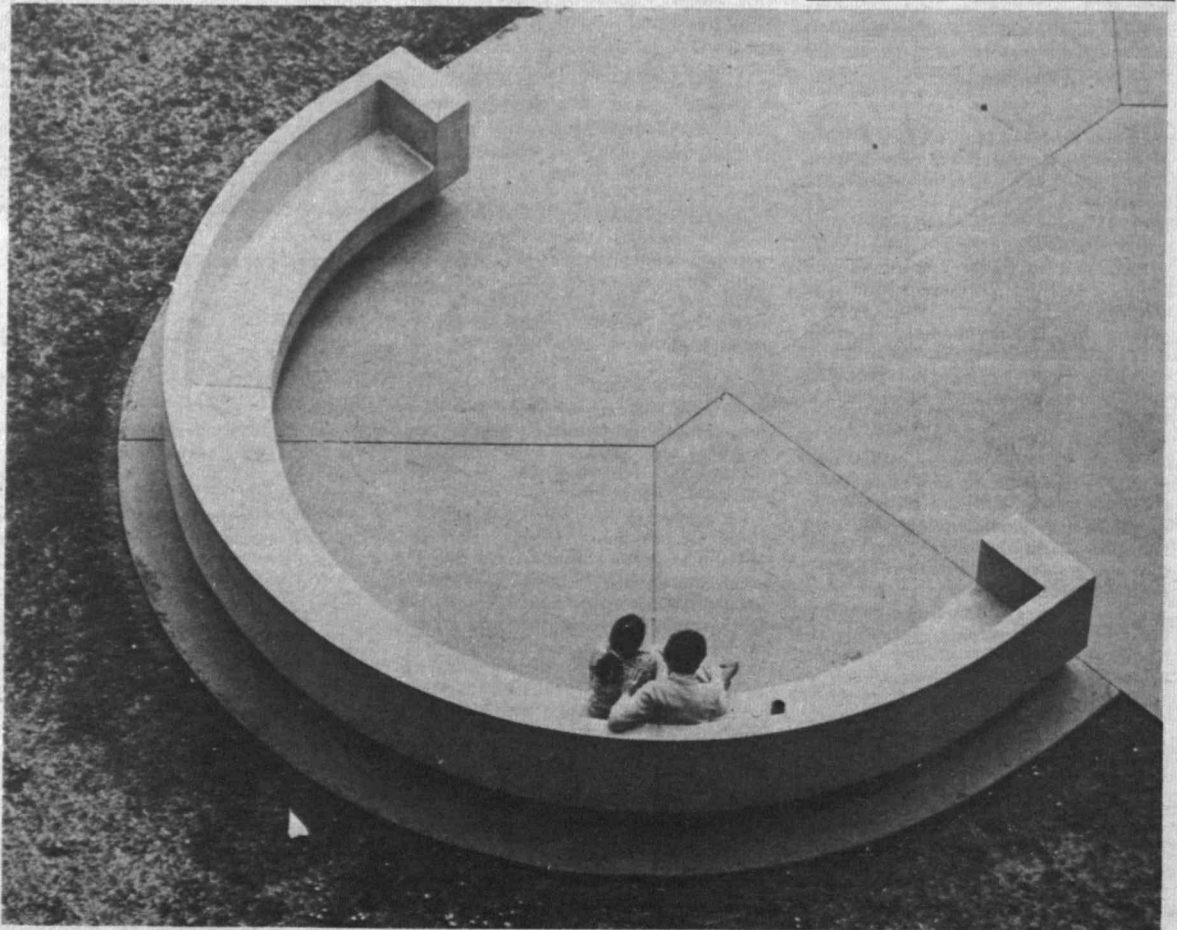
## NSF Facilities Grants

Grants totaling \$30,700 have been awarded by the National Science Foundation to MIT as part of \$4 million in NSF grants to aid in purchase of scientific equipment related to undergraduate instruction at more than 388 colleges and universities.

Professor M. Nafi Toksoz of the Department of Earth and Planetary Sciences was granted \$19,500 and Professor Igor Paul of the Department of Mechanical Engineering received \$11,500.

## No Paper July 2

Tech Talk will not be published July 2. Persons with news, calendar listings or ads which need to appear before July 9 should submit them by Friday, June 20. Publication will resume July 9.



Warm weather lured this couple to the crescent-shaped bench for some quiet moments in the sun.