



RAD LAB REUNION—Thirty-five years seemed like only yesterday for the 270 former members of the Radiation Laboratory and their spouses who attended a reunion Monday at MIT. Some had not seen each other since 1945 when the Rad Lab, site of the development of radar, one of the major scientific achievements of World War II, was disbanded. In left photo, MIT President Jerome B. Wiesner and Edward M. Purcell of Harvard's Lyman Physics Laboratory, examine one of the early radar components on display in the lobby of Kresge Auditorium. Dr. Purcell is one of five former Rad Lab members who won Nobel Prizes. In center photo, from left, Dr. James R. Killian, acting MIT president during the Rad Lab years; Dr. Lee A. DuBridge, director of the Rad Lab,

later president of California Institute of Technology and, still later, science adviser to President Nixon; Dr. Isidor I. Rabi, associate director of the Rad Lab, also a Nobel Prize winner; Dr. Albert G. Hill, former vice president for research at MIT and the last head of the Rad Lab's Division 5, who organized the reunion, and Dr. Wiesner. At right, Ragnar Rollefson of Madison, Wis., a Rad Lab project engineer, and Professor Louis D. Smullin of the MIT Department of Electrical Engineering and Computer Science, find familiar faces in some old photos, part of the exhibit prepared by MIT Historical Collections, which will remain on display until Wednesday afternoon. Professor Smullin was a member of Rad Lab Group 53.

—Photos by Calvin Campbell

The IAP Corner

Study Group Plans Synergistic Projects

By MARY ENTERLINE
Editor, IAP Guide

Next spring when members of the Alternative Technology Study Group feel hungry, they should be able to climb two flights of stairs to the roof of Building E40, pick some vegetables and catch a few fish from the tanks in their greenhouse, and prepare a stew on their solar cooker.

To make this scenario happen all the group needs is sufficient financial backing and enough volunteers for their Independent Activities Period workshop, January 5-28. Craig Decker of Cambridge, a graduate student in political science and chief designer of the workshop, explains that he and his colleagues want to build and test the small-scale alternative technologies they have been planning theoretically.

Decker has divided the plan into four projects, each of which calls for eight to ten volunteers. One group will build the solar-heated, 15 by 20-foot greenhouse with a wooden frame and plastic walls. To minimize heat loss the north wall of the greenhouse will be heavily insulated with a panel that will reflect heat and light back into the greenhouse during the day. Insulation panels will also be raised over the roof at night, and a hinged panel on the front side will be raised at night for insulation and folded down during the day to serve as a reflector.

To retain heat from the sun the greenhouse will contain large plastic tubes of water. Within these tubes the second project team will grow fish and algae. This team will also grow a variety of vegetables in both soil and nutrient water solutions and compare the yields produced by the two methods.

A third group will build a solar cooker to boil food and also a wood stove/oven from 55-gallon oil drums to provide auxiliary heat for the greenhouse and to roast and bake foods.

In the fourth project, a team will try to heat the Alternative Technology Study Group's office on the third floor of E40 with energy from the rooftop greenhouse. The team will prevent heat loss from the office by weather stripping and double glazing the windows and installing insulation on interior walls.

Then participants will install a cool and a hot-air duct between the greenhouse and office along the outside of the building. Small fans in the ducts will keep the air circulating. If time permits, the fourth team will also build and install a small wind generator on the roof to run the fans and lights in the office and greenhouse.

Decker estimates that materials for all these projects will cost \$1,700, but he thinks the total system will be cost effective. "We're trying to integrate a number of different systems and take advantage of the synergy between them. Alone none of them would be cost effective, but we predict that together they will be."

The Alternative Technology Study Group was begun last summer by a group of undergraduate and graduate students who were taking Professor Langdon Winner's seminar on "Alternative Technologies" and Professor Carroll Wilson's seminar on "Critical Choices for the Future." Last summer the group received a small grant from the National Science Foundation to support twelve students investigating the potential of small-scale alternative technologies, such as solar collectors, wind generators, methane digestors, and organic farming and aquaculture, for making new and existing communities more self-reliant. As a second IAP activity the group will report on this research during a seminar on Wednesday, Jan. 12, from 3-5pm in 20D-205.

"There has been some feeling among the group that after doing the theoretical planning, we need to get our hands dirty and build the actual technology," said Decker. "We think this is a valuable thing to do at MIT where there are a lot of resources to build small technologies, but where past emphasis has been on large-scale technologies."

Leading the workshop with Decker will be Professor Langdon Winner of the Department of Humanities and Professor Tim Johnson of the Department of Architecture. However, the group is still seeking members for the four teams as well as people with related experience to head the projects. Anyone interested in volunteering should contact Decker at x3-5107 or 864-6841.

Novel Pharmacy Program Announced

When MIT's former Urban Systems Laboratory, in association with the Boston University School of Medicine and the Massachusetts College of Pharmacy, issued a voluminous report in July, 1974, on a study of "Effective and Affordable Medication Delivery," its major recommendation was that pharmaceutical services be provided at inner city neighborhood health centers.

On Monday, November 15, at a Faculty Club luncheon, Dr. Raymond A. Gosselin, president of the Massachusetts College of Pharmacy, announced that his school has signed a contract to set up a prototype pharmacy at one of the centers.

The luncheon was arranged by James T. King, who served as project director for the Urban Systems Laboratory study. Guests included Charles L. Miller, MIT professor of civil engineering and former direc-

tor of the MIT Urban Systems Laboratory; General James B. Lamport, MIT vice president for resource development; and Dr. Merle W. Mudd, director of The Medical Foundation, Inc., one of the funding agencies for the study. The project also received funds from MIT, the state Board of Higher Education and the Committee of the Permanent Charity Fund.

King, who is presently a project of-

ficer in the MIT Office of the Vice President for Resource Development, said, "It seemed appropriate to bring together people who had a hand in the study. This is one of those satisfying occasions when a research project seems to have played a role in converting to reality something that those of us involved in the study saw as a highly desirable goal."

King wrote the study report with
(Continued on page 4)

Jim Dine Prints: 1970-76 To Be Exhibited in Hayden

Jim Dine Prints: 1970-1976 will be on view in Hayden Gallery at MIT from November 20 through December 18 with a public opening on Friday, November 19, from 5-7pm.


Jim Dine, London, a film on the

artist by Michael Blackwood, will be shown at MIT in Room 54-100 on Wednesday, December 1, at 7:30pm and 8:30pm, admission free.

Organized at Williams College where Dine was an artist-in-residence and sponsored at MIT by the Committee on the Visual Arts, the exhibition will include 54 impressions from the artist's own collection. They form a major retrospective of his work of the 1970s. Throughout his career, Dine has been involved in drawing. Printmaking was a natural development in this genre, and he now works regularly in both media.

In an interview with Frank Robinson and Michael Shapiro published in the September-October, 1976, issue of *The Print Collector's Newsletter*, Dine explained the relationship: "Prints and drawings stimulate each other for me since the way I print is in a draftsmanlike way rather than a painterly way. I've rarely used a brush in making a print although in

(Continued on page 4)



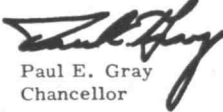
OFFICE OF THE CHANCELLOR

November 15, 1976

TO: Members of the M. I. T. Community

The record of contributions to the United Way pictured below shows us making progress toward our goal of \$130,000. We appreciate the generous response by those who have contributed to this annual appeal. However, as indicated on the chart, the percent of our participation at this stage in the campaign is less encouraging. The successful achievement of our goal depends upon the individual contributions made by each member of the M. I. T. community.

The United Way is the principal source of funding for 165 human care agencies serving more than one million people in the Massachusetts Bay area. They merit our support and each pledge, regardless of the amount, helps these agencies. Our campaign will continue to December 6. I hope all who have not yet contributed this year will do so in the time remaining, either by pledge or by direct donation through the departmental solicitors.

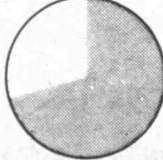


Paul E. Gray
Chancellor


M. I. T. UNITED WAY


\$130,000 GOAL

\$91,826
contributed



23%
contributing





Faculty To Meet

A regular meeting of the faculty will be held today (Wednesday, Nov. 17) at 3:15pm in Rm 10-250. Agenda items include:

—Procedure for appointing ex officio members of the faculty.

—Resolution concerning the substitution of Master of Architecture degrees for graduate Bachelor of Architecture degrees.

—Discussion of MIT finances. (A comprehensive report on the Institute's finances with background history on trends and a summary of major issues bearing on the MIT budget was circulated to the faculty earlier this week and is included as a supplement to this issue of Tech Talk.)

THE INSTITUTE CALENDAR

November 17
through
November 28

Seminars and Lectures

Wednesday, November 17

Bermuda — an Oceanic Stirring Rod* — Nelson Hogg, physical oceanography, WHOI. Oceanography Sack Lunch Seminar. 12n, Rm 54-311. Coffee, bring lunch.

Food First: Getting Beyond the Hunger Myths* — Joe Collins, Institute for Food & Development Policy. International Nutrition Planning Group Seminar. 12n, Rm 66-144. Brown bag.

Optimal Analysis of Muscle Use During Human Gait* — David E. Hardt, G. Mechanical Engineering Systems & Design Division Seminar. 1pm, Rm 3-465. Coffee & tea. Smoke-free.

Concepts and Design of the PDP 11/34 — Robert Armstrong, '70, DEC, designer of PDP11/34 and PDP11/04. PDP-11 Users Group Seminar. 1:30pm, Rm 26-414.

Career Opportunities for the Chemical Engineer in Process Design and Economics* — Bob Fischer, Amoco Oil Co. AIChE Career Seminar. 3pm, Rm 66-110.

Coolant Mixing in the LMFBR Outlet Plenum* — Y. B. Chen, G. Nuclear Engineering Doctoral Seminar. 4pm, Rm NW12-222.

The Legionnaire's Disease and the Scanning Proton Microprobe* — Lee Grodzins, physics. Undergraduate Physics Colloquium. 4:15pm, Rm 4-339. Refreshments.

Women & Money* — A speaker from the Feminist Credit Union. Association for Women Students Seminar. 7pm, Rm 66-110. Men & women welcome.

Thursday, November 18

Experimental Performance of an Atmospheric Path Direct Detection Optical Communication Link* — F. Davidson, Johns Hopkins University. EECS Optics Seminar. 2pm, Rm 36-428.

Medical Device Safety and Legislation* — Saul Aronow, radiology, MGH. Biomedical Engineering Center for Clinical Instrumentation Seminar. 4pm, Rm 26-217. Refreshments 3:45pm.

The People Side of the Technical World* — John D. Funkhouser, Arthur D. Little, Inc. Analytical Chemistry Seminar. 4pm, Rm 8-205.

Membrane Biogenesis* — George E. Palade, Yale Medical School. Biology Mayer Lecture in Life Sciences. 4pm, Rm 54-100.

Management and Regulation of Nuclear Wastes* — Richard Lester, G. Energy Assessment Group Seminar. 4pm, Rm 24-121.

Quasars* — Philip Morrison, Institute Professor, physics. Physics Colloquium. 4:15pm, Rm 26-100. Refreshments 3:45pm, Rm 26-110.

Friday, November 19

Demonstration of a De Anza Color Display* — Charles Masters, vice president of De Anza Systems. Aeronautics Seminar. 1pm, Rm 33-220.

Feasibility of Farming Kelp for Food, Feed and Fuel* — Norman D. Heidelbaugh, US Army Natick Research & Development Command, Natick. Nutrition & Food Science Seminar. 2pm, Rm 4-145.

Some Studies of the Chemical Systematics of Single Crystal Catalytic Surfaces* — Robert P. Merrill, chemical engineering, University of California, Berkeley. Chemical Engineering Seminar. 2pm, Rm 66-110.

The Entropy Crisis — Updated* — George N. Hatsopoulos, senior lecturer, mechanical engineering; president of Thermo Electron Corp. Mechanical Engineering Seminar. 3pm, Rm 3-133. Coffee 4pm, Rm 1-114.

What Do We Know About the Safety of Nuclear Reactors* — Joel Yellin, CIS, lecturer in political science. Norman Rasmussen, head of Department of Nuclear Engineering, will comment. CIS Technology Studies Program & Nuclear Engineering Seminar. 3:30pm, Rm 35-225.

Applications of Synchrotron Radiation in the Vacuum UV and Soft X-Ray Ranges: Especially Photo-Electron Spectroscopy* — D. E. Eastman, IBM T. J. Watson Research Center. Center for Materials Science & Engineering Seminar. 4pm, Rm 9-150. Refreshments 3:30pm.

US-USSR Technological and Strategic Balance* — William Kaufmann, political science, CIS. MIT Technology & International Security Seminar. 4pm, Rm E53-482.

Monday, November 22

Return Migration and Development: The Spanish Case* — Robert Rhoades, Northeast Missouri State University. CIS Migration & Development Seminar. 12n, Rm E53-482.

Career Opportunities for the Chemical Engineer in Technical Sales and Service* — John Meakim, assistant vice president, director of market management, Betz Laboratories, Inc. AIChE Career Seminar. 2pm, Rm 66-110.

Japanese Heavy Water Project-FUGEN* — Sadamu Sawai, manager of FUGEN Project; Power Reactor & Nuclear Fuel Development Corporation of Japan. Nuclear Engineering Special Seminar. 2pm, Rm NW12-222. Refreshments 1:30pm.

The Technology of Free-Space Power Transmission by Microwave Beam and its Application to Power From Space* — William C. Brown, Raytheon Co. Aero/Astro General Seminar. 3pm, Rm 37-252. Coffee preceding, Rm 37-222.

Recursive Filtering for Two-Dimensional Random Fields* — Eugene Wong, University of California, Berkeley. ESL Control & Communications Seminar. 4pm, Rm 26-214.

Some Results in Learning Theory in Mathematical Logic* — Jan Mycielski, mathematics, University of Colorado. Applied Mathematics Colloquium. 4pm, Rm 2-338. Tea 3:30pm, Rm 2-349.

Hydrological and Chemical Factors in Bog Ecology* — Harold Hemond, G. Ralph M. Parsons Laboratory Water Resources & Environmental Engineering Seminar. 4pm, Rm 48-316. Coffee 3:45pm, Rm 48-410.

Tuesday, November 23

Schlieren (Color) Photography, With Many Examples* — John Kim Vandiver, ocean engineering, Henry L. Doherty Professor in Ocean Utilization. Strobe Lab Seminar. 11am, Rm 4-402.

Plasma Diagnostics* — Louis Scattura; **Design of a Z-Pinch, Part II*** — Mark McKinstry; G. Nuclear Engineering Doctoral Seminar. 12n, Rm 38-166.

Solutions for Fluid-Saturated Porous Media* — Michael P. Cleary, mechanical engineering. Applied Mechanics Seminar. 3pm, Rm 3-270. Coffee follows, Rm 1-114.

The Climatic Effect of an Increase in Atmospheric Carbon Dioxide* — Syukuro Manabe, Geophysical Fluid Dynamics Laboratory, Princeton University. Meteorology Seminar. 4pm, Rm 54-100. Refreshments 3:30pm, Rm 54-923.

Using Sample Survey Weights to Test for Model Misspecification in a Linear Regression Model* — William H. Du Mouchel, University of Michigan. Mathematics Seminar. 4pm, Rm 2-338. Refreshments 3:30pm, Rm 2-349.

Structure-Property Relationships of Polyurethane Block Copolymers* — C. Sung, polymerics. Materials Science and Engineering Seminar. 4pm, Rm 10-105. Coffee 3:30pm.

Energy Consumption and Disposal in Group IIIb Oxidation Reactions* — John M. Parson, chemistry, Ohio State University. Seminar in Physical Chemistry. 4pm, Rm 4-370. Coffee 3:45pm, Rm 6-321.

Prospects for the Detection of Gravitational Radiation* — Rainer Weiss, physics. Astrophysics Colloquium. 4:15pm, Rm 37-252. Coffee 3:45pm.

What is the Best Way to Study Transcripts of Genes in Mammalian Cells?* — James Darnell, The Rockefeller University, New York. Biology Colloquium. 4:30pm, Rm 6-120. Coffee 4pm, Bldg 56, 5th fl vestibule.

Women's Admissions** — Peter Richardson, director of admissions. Association for Women Students Seminar. 7pm, Rm 3-310. Men & women welcome.

In the Form of Bread* — Phyllis Morrison, teacher and author. Technology Studies Seminar with series of ethnographic films. 4pm, Rm 20D-205. Coffee 3:30pm.

Wednesday, November 24

On the New England Continental Shelf Frontal Zone* — Charles Flagg, G. Oceanography Sack Lunch Seminar. 12n, Rm 54-311. Drinks, bring lunch.

The Case for Infinite Product Life* — David Gossard, mechanical engineering. Mechanical Engineering Systems & Design Division Seminar. 1pm, Rm 3-465. Coffee & tea. Smoke-free.

Coding Theorems for Individual Sequences* — Jacob Ziv, Bell Laboratories. ESL Control and Communications Seminar. 4pm, Rm 39-500.

Markovian Reliability Analysis Under Uncertainty* — I. A. Papazoglou, G. Nuclear Engineering Doctoral Seminar. 4pm, Rm NW12-222.

Community

Prenatal and Parent Education Group — Sponsored by Medical Department. Wed, Nov 17: *Falling in Love With Your Baby: Bonding Mechanisms and How They Work.* Muriel Sugarman, MD, Harvard Medical School, will speak after showing of film, "The Amazing Newborn," by Marshall Klaus, MD. 12n, 3rd fl conference rm, Infirmary. Drinks, bring lunch. Babysitting: Maria DeMarco, x3-1316.

TWO International Cookery** — Wed, Nov 17, 8pm, Rm 10-340. Raquel Villanueva will prepare Mexican dishes. Cost: 50¢ members, \$1 non-members. Info: Judy Cooper, 625-1062 or Jenny Gordon, 547-6471.

Wives Group** — Group leaders: Charlotte Schwartz, sociologist & Myra Rodrigues, social worker, both from Medical Dept; Carol Hulsizer, faculty spouse in residence, Ashdown Hse. Wed, 2-4pm, Stu Ctr West Lge. Babysitting Stu Ctr Rm 473. Cheryl, x3-4911.

TWO Bake Sale* — Sponsored by Technology Wives Organization. Thurs, Nov 18, Bldg 10 Lobby.

TOPS* — Tech Organization of Professional Secretaries. Meetings Thurs, 12n, Walker Blue Rm. Nov 18: John Wynne, vice president for administration and personnel, will speak.

Association for Women Students** — Planning committee meeting for IAP & spring activities. Thurs, Nov 18, 5pm, Rm 10-310. Refreshments.

Project MUG — Microprocessors users group meeting Tues, Nov 23, 3:30pm, Rm 16-134. Progress reports on ECD Micromind. Specifications of Micromind display processor expected to be available.

Low Back Problem Exercise Class — Thurs, 1-2:30pm, Stu Ctr West Lge. Bring 3 pillows and an OK from your doctor. \$15/each class. Info: x3-4138, Mon, 9am-5pm.

MIT Women's Forum** — Meetings Mon, 12n, Rm 10-105. Nov 22: Richard A. Cohn, management, Sloan School, will discuss insurance in general and ways in which it can best serve women.

TWO Craft of the Month*** — Tues, Nov 23, 7:30pm, Rm 10-105. Mary Schaller will demonstrate how to make bread baskets.

TWO Exercise Class** — An hour of serious exercise taught by Marilyn de Kler. Mon, until Dec 13, 8pm, duPont Gym exercise rm. Price: 25¢ TWO members, 50¢ non-members.

Student Art Association Darkroom** — Non-class related use of darkroom still available. Contact SAA thru Fri, Nov 5, 1-5pm, Stu Ctr Rm 429. Students: \$20, others \$30. Info: x3-7019.

Social

Faculty Club Special Dinners*** — Thurs, Nov 18: Chinese Buffet. \$5.95 + tax, children 5¢ per pound. RSVP, x3-4896.

Strat's Rat — Fri, Nov 19, 8:30pm, Sala. Light & dark beer sold, (35¢/16 oz glass), plus wine by glass or bottle. Live announcer plays requests. Admission free with college ID.

Coffee House #2* — Sponsored by B'nai Brith Hillel Fdn. Live entertainment with Miriam & Les, folksingers. Sat, Nov 20, 8:30pm, Stu Ctr Rm 407.

Admission \$1.50, Hillel members \$1. Free food (Mideastern) & free atmosphere.

Movies

Stratified Flow; Rotating Flows* — Fluid Mechanics Films. Thurs, Nov 18, 4pm, Rm 39-500. Free.

2001: A Space Odyssey** — LSC. Fri, Nov 19, 7 & 10pm, Kresge. Admission 75¢, MIT or Wellesley ID required.

Torment (Sjoberg)* — MIT Film Society. Fri, Nov 19, 7:30 & 9:30pm, Rm 6-120. Admission \$1.

Hester Street** — LSC. Fri, Nov 20, 7 & 9:30pm, Rm 26-100. Admission 75¢, MIT or Wellesley ID required.

The Good, the Bad and the Ugly** — MidNight Movie. Sat, Nov 20, 12m, Sala. Admission 25¢, bring blanket.

A Delicate Balance* — LSC. Sun, Nov 21, 6:30 & 9:30pm, Rm 26-100. Admission 75¢.

Films of Jon Rubin* — Presentation by the film maker Sun, Nov 21, 8pm, CAVS, Bldg W11. Sponsored by CAVS. Free.

Magnetohydrodynamics; Rarefied Gas Dynamics* — Fluid Mechanics Films. Mon, Nov 22, 4pm, Rm 39-500. Free.

Dr. Carl Gustav Jung; Freud** — Humanities Films. Mon, Nov 22, 7pm, Rm 14N-0615. Free.

Son of Frankenstein; Wolf Man** — Humanities Films. Tues, Nov 23, 7pm, Rm 4-270. Free.

The King of Hearts** — LSC. Fri, Nov 26, 7 & 9:30pm, Rm 26-100. Admission 75¢, MIT or Wellesley ID required.

Port of Call (Bergman)* — Film Society. Fri, Nov 26, 7:30 & 9:30pm, Rm 6-120. Admission \$1.

The Count of Monte Cristo (1974)** — LSC. Sat, Nov 27, 7 & 9:30pm, Rm 26-100. Admission 75¢, MIT or Wellesley ID required.

What's Up Tiger Lily** — SCC. Sat, Nov 27, 12m, Sala. Free, MIT or Wellesley ID required. Bring blanket.

Lost in the Stars* — LSC. Sun, Nov 28, 6:30 & 9pm, Rm 26-100. Admission 75¢.

Lobby 7 Events

Folk Dance Club* — Will be dancing Fri afternoons in Lobby 7 throughout the winter months. Come and join in! Fri, 12n-2pm, Bldg 7 Lobby. Free.

Music

Clavichord Recital* — Bernard Brauchi. Thursday Noon Hour Concert Series, Nov 18, Chapel. Free.

MIT Women's Chorale Concert* — In memory of the Chorale's founder, Mrs. William Scatchard. Sun, Nov 21, 3pm, Chapel. Free. (Rehearsal 2pm).

The Fires of London* — Music Section's Visiting Artist Series concert Sun, Nov 28, 8:30pm, Kresge. Peter Maxwell Davies, conductor. Program: Schoenberg's *Pierrot Lunaire*, Maxwell Davies', *Missa supra L'homme Arme*. Free.

Chamber Music Society Concerts* — Wed, 5:15pm, Music Library. Call x3-3210 for information.

Theater

An Evening of One-Act Plays* — MIT Dramashop productions of *Orpheus* by Jean Cocteau, directed by William Morris, and *Fumed Oak* by Noel Coward, directed by J. D. Everingham. Fri, Nov 19 & Sat, Nov 20, 8pm, Kresge Little Theater. Free.

Dance

MIT Folk Dance Club — International: Sun, 7:30-11pm, Sala. Balkan Tues, 7:30-11pm, Stu Ctr Rm 491. **Informal:** Fri, 12n-2pm, Kresge Oval (good weather). **Israeli:** Thurs, 7:30-11pm, Sala.

Renaissance Dance Group* — We dance for our own amusement Wed 8pm, Burton dining rm. Info: Beth Parkhurst, 964-1840.

Exhibits

Exhibition and Sale of Original Prints* — By old masters & leading contemporary graphic artists, from Roten Galleries. Sponsored by Student Art Association. Mon, Nov 22 & Tues, Nov 23, 11am-6pm, Stu Ctr West Lge. Info: x3-7019.

Mud and Ice Photos* — Photographs by Carl Nesjar, CAVS Fellow. Thru Fri, Dec 10; CAVS corridor exhibition area. Hours: Mon-Fri, 9am-5pm.

Photographs by Joe DeMaio and David Hanson* — On exhibit in Creative Photography Gallery (Bldg W31) thru Sun, Nov 28. Hours: Mon-Sat, 10am-6pm & Sun, 12n-8pm. Free.

Faculty Club Exhibit* — Sculptures by Beatrice Paipert. Thru Tues, Nov 30, Faculty Club. Hours: Mon-Fri, 9am-11pm. Free.

Jim Dine Prints: 1970-1976* — Hayden Gallery exhibit Fri, Nov 19-Sat Dec 18. Hours: Mon-Sat, 10am-4pm. Public opening Fri, Nov 19, 5-7pm.

Big Prints* — Exhibition of oversized graphics, including works by Patrick Caulfield, Joe Goode, Tom Holland and John Walker. Hayden Corridor exhibit Fri, Nov 19-Sun, Jan 2. Open daily.

Strobe Alley* — High speed photographs by Harold E. Edgerton, Institute Professor and Professor of Electrical Measurement, Emeritus. Bldg 4, 4th fl.

Hart Nautical Museum* — Permanent exhibit of rigged merchant and naval ship models of yachts and engine models. Bicentennial exhibit: "1776-1976" — a frigate, 2 schooners, a gondola, and the Durham boat of the American Revolution. Open daily in Bldg 5, 1st 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 a department and field.

*Open to the public
**Open to the MIT community only
***Open to members only
Send notices for Nov 24 through Dec 5 to the Calendar Editor, Room 4-111, Ext. 3-3279, before noon Friday, Nov 19.

M.I.T. FINANCES: RECENT TRENDS AND FUTURE OUTLOOK

(A report prepared for discussion at the November 1976 meeting of the faculty)

I. SUMMARY

At the October faculty meeting, we gave a brief report on our recent financial experience, and the goals and prospects for the next three years. This report is intended to provide more extensive background information for a discussion at the November 17 faculty meeting on some of the key financial issues and choices facing M.I.T.

The focus of the report is a comprehensive description of the flow of revenues and funds into the Institute and of the various ways in which we use our financial resources. It includes a review of historical trends in the Institute's finances over the past 15 years, highlighting those events and decisions which had significant impact, and it outlines some of the major issues that must be considered as we make program decisions and financial plans for the next several years.

I.A. Problems and Goals

The overall financial dilemma we face can be described in the following way:

First, the Institute has operated with a significant deficit during each of the past three years, and will similarly end the present year (fiscal year 1977) with a deficit. (See Glossary for definition of terms.) These deficits mean that instead of building the endowment of the Institute, we have had to expend some of our funds (including reserves) accumulated in prior years which could now be functioning as endowment, producing additional investment income for support of our programs.

Second, while the problem of operating deficits is by no means trivial, our primary long-term concern relates to the forces that tend to produce chronic year-to-year growth in the operating deficit. That is, balanced budgets tend to grow out of balance, and deficits tend to grow at an alarming rate even when there is no year-to-year change in the programs of the Institute. We estimate this growth in the deficit to be in the range of \$0.5 to \$1.5 million each year.* It is primarily this problem that has required us to reduce operating expenses and to curtail some programs and services in each year since 1970.

In its simplest terms this problem arises primarily because in recent years two important sources of revenue—investment income and annual gifts—have not grown as rapidly as inflation-driven expenses. Because these rates of growth are different, total income does not grow as rapidly as total operating expenses, and the difference, which is the deficit, tends to grow dramatically from year to year. This problem became apparent in the late sixties when two decades of rapid expansion in MIT's programs (and the growth in resources available to support this expansion) came to an end. In recent years, it has been particularly exacerbated by "stagflation"—the combination of high levels of inflation and low levels of economic growth—which has afflicted the national economy.

We believe that this dynamic imbalance in our finances is the most difficult and intractable problem we face. As long as it persists, we must continue to reduce budgets—biennially, if not annually. While we can reduce expenses to cope with the immediate problem, these efforts provide no long-term remedy, and their continuation can lead to a decline in innovative activity, and ultimately, to decreases in quality on a broad scale. While the Institute has sufficient resources for the immediate future, it is our longer-term vitality that is at stake.

In view of these problems, our future planning efforts are focused on four basic objectives that affect finances:

First we are committed to bring the operating budget into balance next year (1977-78) and to keep it in balance in each subsequent year so that we are no longer drawing upon the capital resources of the Institute.

Second, we are determined to manage the financial affairs of the Institute in ways that will continue to enhance the intellectual and academic strengths of M.I.T. It is not sufficient to confine stewardship to a concern for the preservation of the financial resources, the "green" capital, of the Institute. We must be equally concerned with the continuous building of what the Provost has referred to as the "grey" capital of the Institute—the collective intellectual resources of the men and women on whom the future of the Institute depends. Thus we seek a balance between fiscal requirements and the demands of changing and expanding academic frontiers.

Third, it is our goal to set aside each year some portion of the unrestricted funds received so that they can be used for capital purposes, such as endowment, facilities development and renewal, and support of new educational ventures.

Fourth, we seek to shape the Institute's finances so that the operating budget will be dynamically balanced. More precisely, we intend to move toward a condition in which the growth rates of revenues and expenses are, and remain, in balance over an extended period. Since we cannot continue to reduce expenses forever, we must ultimately generate new sources of recurring income and try to increase the rates of growth of both investment income and gifts used in operations. This is the central purpose of the Leadership Campaign—to secure additional endowment, as well as additional resources that can be used for current and future programs.

I.B. Future Outlook

Our immediate goal is to eliminate the operating deficit by the end of the fiscal year 1977-78. Achieving this goal is not without cost. We have had to reduce some programs and services, raise tuition, permit crowding in undergraduate houses, and restrain the growth of salaries and wages (which account for over two-thirds of our educational and general expenses). On the other hand, we have been able to increase the Institute's resources through the Leadership Campaign and through expansion of the Industrial Liaison Program.

Our current estimates show that we could achieve our goal to eliminate the deficit by the end of next year (FY78), and to set aside, once again, some of our annual unrestricted revenues for capital purposes and new programs, provided that the following assumptions hold true:

1. we continue to exercise restraint in salary and wage increases;
2. the inflation rate remains near the current level;
3. research volume continues to grow (relative to the costs of instruction);
4. the Industrial Liaison Program and Leadership Campaign meet their established goals;
5. the investment income we can distribute grows at an annual rate of at least 3%;
6. the enrollment increases planned several years ago are achieved;
7. further expense reductions of about \$2 million (\$1 million net) are achieved; and
8. the annual increase in the supplement from unrestricted funds required for undergraduate student financial aid can be kept at a minimum.

Added to this list of conditions is an unusual element of uncertainty in the financial picture relating to the reimbursement of research costs by research sponsors. There is pressure both in Congress and in Federal funding agencies to depart from long-established principles relating to reimbursement for the full costs—both direct and indirect—of research. This would mean that all universities having sponsored programs would have to pay out of their own funds a greater share of the cost of research. We are making maximum efforts to preserve current policies relating to full-cost reimbursement, but if Federal policy moves in the directions being proposed, the M.I.T. deficit could increase by several million dollars.

The list of conditions and uncertainties bearing on our immediate financial goals is long. And even if we are able to balance the budget by next year, there remains the basic problem of the imbalance in rates of growth of revenues and expenses. In addition to the Leadership Campaign and other major efforts aimed at generating new income, we have undertaken a number of activities this year, including a two-year intensive budget planning cycle, in order to address more effectively the longer-term problems.

For example, in the area of support services, we intend to continue to reduce expenses as much as possible—consistent with maintaining the quality and effectiveness of the essential services which support both instruction and research activities (such as personnel, medical and financial services, libraries, physical plant, and general administrative and student-related services.) Because we have made sizable reductions in the support services during the past seven years (totaling about \$11 million), it is not clear what additional savings are achievable. In addition to cost cutting, therefore, we must assess the possible advantages of consolidating or reorganizing some services. The emphasis in the review of each area in the next two years will be as much on maintaining and improving quality as on looking for opportunities for additional savings.

In the area of academic programs, reductions in the past seven years have amounted to about \$4 million. Budget planning for the next two years will be guided by departmental reviews undertaken by the President, the Chancellor, and the Provost. The reviews have focused on each department's needs, problems and opportunities as they fit within the broader context of the Institute and the activities of professional peers throughout the country. The task of translating the valuable insights gained from these reviews into specific decisions and budget allocations to the schools and departments is not an easy one. But we are planning to give each of the Deans of the five schools sufficient guidance by early December so that the planning of the academic budgets for the next two fiscal years can begin before January.

Glossary

Operating Expenses: the costs of instruction, research, services supporting both instruction and research, auxiliary activities, scholarships and fellowships, and other operating expenses (shown in figure 9).

Operating Revenues: income generated by operations, including tuition and fees, reimbursement for the direct and indirect costs of research, investment income and restricted gifts used in operations, and revenues from auxiliary activities (shown in figure 9).

Operating Gap: the amount by which total operating expenses exceed total operating revenues in a particular year.

Current Unrestricted Revenues: annual unrestricted receipts from patent revenues, the use of facilities allowance from research sponsors, and unrestricted gifts, grants, and bequests.

Deficit: the amount by which the operating gap exceeds current unrestricted revenues. In other words, the excess in a particular year of operating expenses over total operating revenues plus current unrestricted revenues.

*This dynamic imbalance in the operating budget was discussed in some detail in our report to the faculty last fall. See Tech Talk, December 3, 1975. Our current estimate of the intrinsic growth rate of the operating deficit is somewhat lower than the rate presented in that article because of our actions to control expenses and the addition of some new recurring revenues.

Addressing the goals and problems identified earlier requires a careful balance between the short-term and long-term needs of the Institute. Our discussions must include consideration of M.I.T.'s basic role in teaching, research, and public service, and the relation between these fundamental missions of the university. The following are some of the important issues we face:

- A university's health and vitality depend on its ability to move into new areas of inquiry, to generate new ideas, and to take fresh looks at old problems. The younger faculty are a key to this institutional vitality. The most important problem facing the departments today is the squeeze on the number of younger faculty as a result of budget stringencies. Several proposals have been made about ways to deal with this problem (in addition to efforts to increase our endowment). They relate to the degree and manner in which research support might grow; the development of new educational programs (e.g., in continuing education); the opportunities for early retirement of faculty who may wish to take this option; and more broadly, the extent to which soft money can and should be allowed to support faculty growth.
- As we continue to assess the degree and manner in which our research programs might develop, and as we look for ways to maintain our strength and leadership as a major research university, we must recognize and respond to the changing climate for research support in the country. Many of the forces and trends that we must consider are discussed in the Report of the Committee on M.I.T. Research Structure. The alternatives for increasing research revenues must be viewed in terms of their influence on the relation between teaching and research at M.I.T., our capability for entering (or developing) new fields, and on the relations among the departments, the interdepartmental laboratories and centers, and the special laboratories.

- The notion of permitting a differential tuition schedule for specific programs (e.g., graduate programs in management) and/or a different tuition fee for graduate students is an important policy question before us. The critical issue here is the effect which such changes might have on the integrated character of the M.I.T. academic program, on the level and types of interdepartmental cooperation, and on the ease with which students—regardless of their departmental major—can take subjects in any department or school.
- The growth of knowledge is in conflict with M.I.T.'s current needs to cut back programs. We seek a new level of stability which would allow us to build on the fundamental strengths of the Institute and to respond to the needs of the times. This challenge—to meet the problems of financial constraints on the one hand, and the pressures of expanding knowledge on the other, while striving to maintain and improve the quality of M.I.T.'s instructional programs—requires a single-minded and dedicated effort on the part of everyone at M.I.T. For the faculty, this means involvement not only in the planning of academic programs, but in efforts to build a stronger financial base. The faculty participation in the expansion of the Industrial Liaison Program has been a major source of strength in our recent achievements. We need more of this help and involvement if we are to succeed in increasing the flow of gifts and other revenues for endowment and for current and future Institute programs. At the same time, we must be sensitive to the growing burden of these activities on faculty time and the potential cost of distraction from the primary responsibilities in teaching and research.
- The inadequacy of our resources to meet growing needs for financial support to undergraduates requires a review of our financial aid policies. We need to explore new sources of support and to examine the mix between loans, student employment, and scholarships in our financial support packages—both in terms of the resources we have available and in terms of how the mix affects our ability to attract the most able students.

- Graduate student support continues to be a vexing issue because of a decline in certain external sources, such as Federal fellowships and traineeships. Opportunities for greater support from research are there, as research volume grows, but we must continue to explore ways to control the overall costs of research assistants charged to contracts and grants, because of competition for research support.
- We must continue to provide high quality services to the departments and faculty, in support of their instructional and research activities.
- An adequate and competitive level of compensation for faculty, and for the Institute staff at all levels of employment, is essential if we are to continue to attract and retain the most talented and best qualified men and women. At the same time it is clear that further budget savings will require continuing restraint on salaries and benefits, since these costs account for over two-thirds of our educational and general expenses. Wherever trade-offs or choices are possible within the general constraints of the budget, we will strive to reward productivity and merit, for these are the necessary safeguards of maintaining high quality throughout the institution.
- In the reviews of the academic departments, one of the needs frequently mentioned was the need for renewal of laboratory equipment. Provisions for replacement and renewal of equipment, together with provisions for maintenance and space changes and renovations, are becoming more and more important as the Institute facilities and programs mature, following the rapid postwar growth and the extensive building program of the 1960s.

The material which follows has been assembled to provide additional information with regard to the various constraints, uncertainties, and historical factors which relate to some of the problems and issues facing the Institute.

II. FLOW OF REVENUES AND FUNDS: RECENT HISTORY AND CURRENT ISSUES

There are many factors influencing the financial health of the Institute. One way of understanding these factors is to look at the current state and recent history of M.I.T.'s finances in terms of the total flow of financial resources into and out of the institution. A picture of the total flow of revenues and funds for the year just ended (FY76) is shown in figure 1. The chart has four basic parts:

1. At the top are identified all the sources of support and the revenues which were received during the year.
2. At the bottom are shown the various ways in which we use our financial resources: for student support, for current operations (teaching, research, support services, etc.—further amplified in figures 9 and 14), for additions to the educational plant (new buildings and facilities), and for some other uses.
3. On the upper right are shown the endowment and other funds of the Institute (exclusive of student loan funds and funds expended for educational plant, represented elsewhere on the chart). Almost all of these funds are invested, thus producing investment income each year. During the year there is a continuous flow into the funds and an outward flow from the funds for such uses as operating expenses and building construction. These flows result in a net increase or decrease in fund balances at year end.
4. The central part of the chart, labeled "Distributions of Revenues and Funds," represent a large number of transactions involved in the disposition of all incoming revenues and funds used each year. Some of these transactions are simply distributions of funds which came into the Institute with a specific restriction from the donor or source as to their use. Other transactions represent designation of funds (as to their use) by decision of the Corporation Executive Committee. For example, funds which may come in to M.I.T. without restriction may be designated by the Executive Committee for endowment or student aid or buildings or other purposes, and thus become restricted. Finally, there are those transactions which represent management allocation decisions for operating expenses and for other uses.

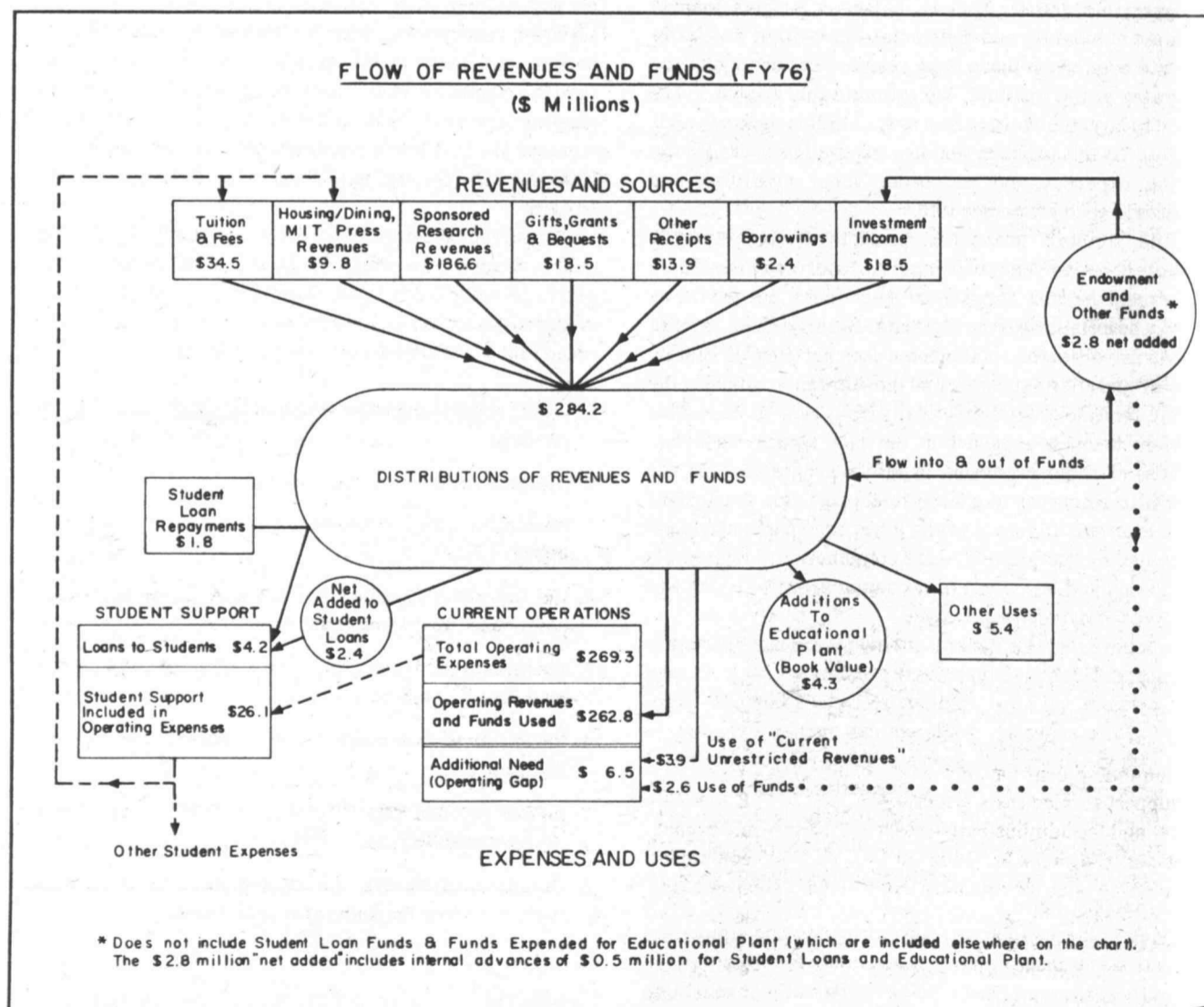


Figure 1

In the following pages, the various revenues, expenses, and funds (shown in figure 1) are defined in more detail, and are discussed both in terms of historical trends and considerations for the future.

In this report, several graphs are used to illustrate various trends. All numbers used represent actual, rather than budget, figures—unless otherwise indicated. Some of the graphs are drawn on semilogarithmic coordinates so that exponential growth is shown as a straight line. The percentages shown are the average compounded annual growth rate. Some of the data also are shown in constant dollar terms; that is, the GNP price deflator has been used to remove the effects of inflation for better comparison in terms of real growth over the years.

II.A. Revenues and Sources

The revenues we receive each year come from a variety of sources: research sponsors, students and their families, alumni and other friends of the Institute, foundations, business and industry, our own invested resources, and various lending institutions.

TUITION AND FEES include, for example, tuition for the academic year and summer session, student medical fees, and application fees. These revenues totaled \$34.5 million in FY76 (see figure 1).

Since 1962, income from tuition and fees has grown at an average annual rate of 9%, reflecting both increases in student enrollments (about 2,000 since 1962), and in the tuition rate. (See figures 2, 3, and 4.)

Although the tuition rate has more than doubled during the past decade, the average total cost to undergraduate students and their families each year (before deducting any financial aid) has remained in line with the national median family income over the years (see figure 5). (Median family income, of course, does not reflect the number of dependents in college, changing income tax rates, and other factors important in assessing the burden of college costs on family income.)

Tuition and fees theoretically are subject to change as a matter of administrative policy. In fact, tuition charges are driven up, on the one hand, by growth in the cost of programs and services, and are restrained, on the other hand, by a number of factors, including a desire to keep tuition growth in line with general economic growth (e.g., in per capita income) and in line with other institutions with which we compete for students. Recent growth in the tuition rate is already in this range of about 8% per year.

Adding students can provide additional revenues, but decisions to increase enrollments (without adding additional programs, and therefore expenses), must be weighed against the influence such increases would have on our ability to provide the best education for our students—in the classroom and laboratory, as well as in the campus living environment. For example, in terms of the quality of the living environment, undergraduate housing capacity is a serious constraint to increasing enrollments, particularly in view of the current crowding in the campus houses. (It is our policy to guarantee all entering freshmen eight terms of residence on-campus.) Next year is the last year of a five-year program to increase undergraduate enrollments by 8% to 10%; further growth is not planned. Graduate enrollment growth is constrained primarily by our ability to provide adequate student support and by the limitation on the faculty's time to supervise the research of additional students.

An expanded continuing education program or differential tuition schedule (by schools, departments, or programs) could help increase revenues. Opportunities and problems in these areas are now under study.

REVENUES FROM AUXILIARY ACTIVITIES include revenues from the housing and dining services and the M.I.T. Press, and totaled \$9.8 million in FY76 (see figure 1). Though expected to be break-even operations, expenses have exceeded revenues in recent years in the M.I.T. Press and in earlier years in the housing and dining services. As the costs of operating the student housing facilities go up (driven particularly by inflation in energy and construction costs), the rent increases students are asked to pay directly increase the needs for student financial support.

REVENUES FROM SPONSORED RESEARCH (totaling \$186.6 million in FY76—see figure 1) pay, in principle, the full costs of research, including both the direct costs of research conducted on campus and at the Lincoln Laboratory, and a proportionate share of the indirect costs of services which support both instruction and research. Revenues for the direct costs of research include payment for the salaries and wages, materials and services, computation expenses, and subcontracts of specific research programs. The reimbursement for indirect costs includes a portion of the support service costs discussed in section II.B (see figure 14) and the administrative costs in the academic departments, an allowance for using our buildings and equipment for research, and the vacation expense for research staff. In FY76, \$154 million was received for the direct costs of research and \$33 million for the associated indirect costs (see figure 6). The Lincoln Laboratory accounts for about half of the total research revenues.

Included in the research volume are a broad range of contracts, and a variety of grants such as those which help support a faculty member pursue his or her field of interest, grants which help support student research training, career development grants, and equipment grants. Although government grants and contracts are subject to differing statutory requirements, there is little significant difference between them in terms of M.I.T. research policy and administrative procedure.

Going back to the 1960s, total sponsored research (on campus, at the Lincoln Laboratory, and at the Draper Laboratory) grew at a rate of 10-11% per year until 1968. For the following three years, there was no growth (which repre-

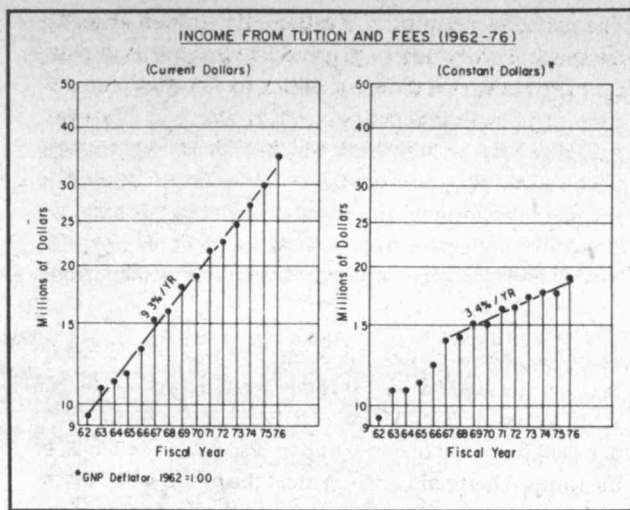


Figure 2

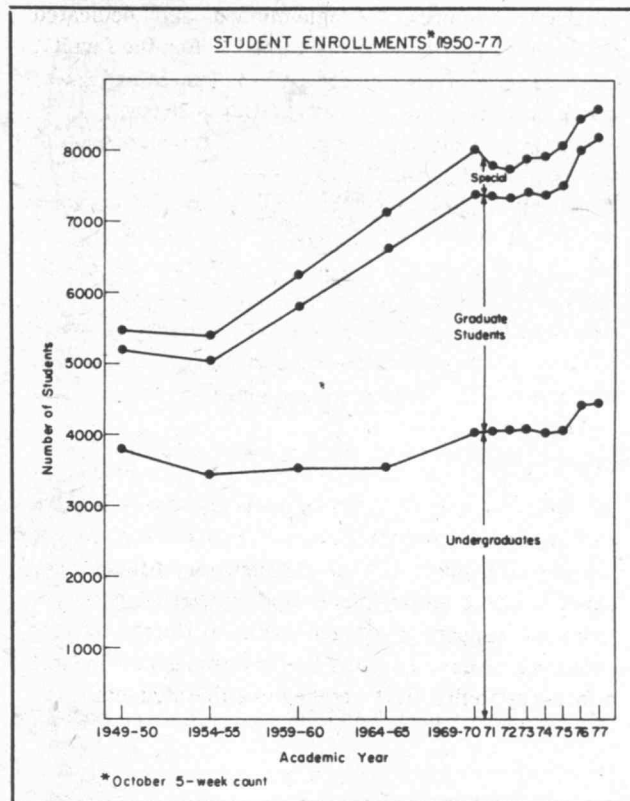


Figure 3

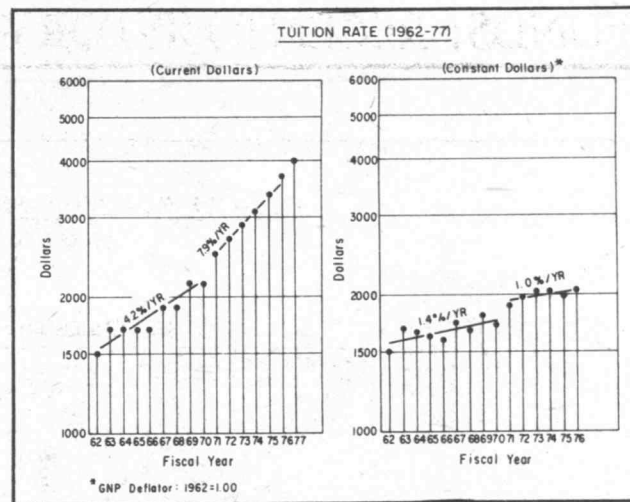


Figure 4

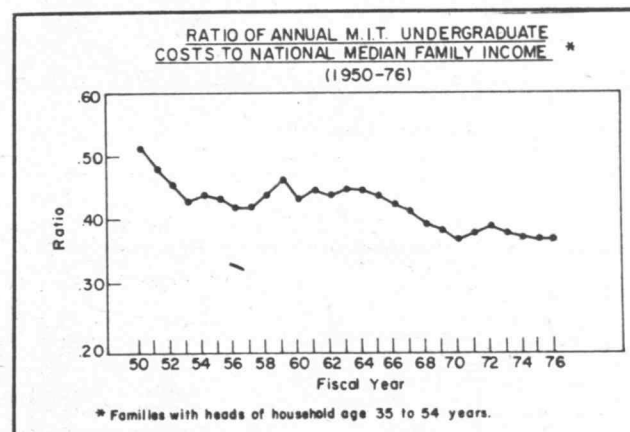


Figure 5

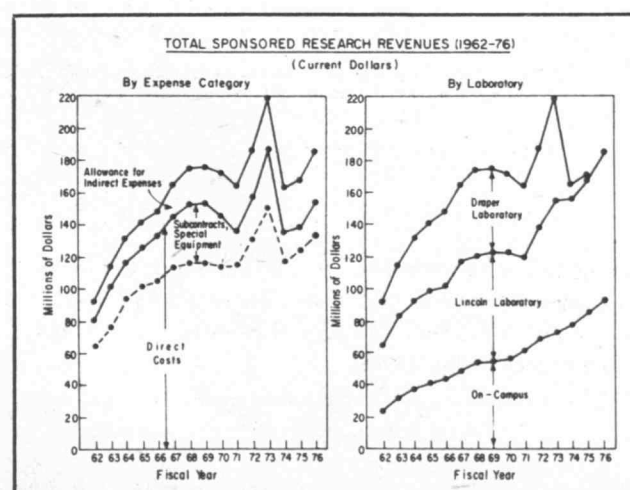


Figure 6

sents a substantial decline in constant dollars); this is partly responsible for the recent budget deficits. Research support began to grow again after 1971 (in part because of the development of such new research programs as the Cancer Center and the Energy Laboratory), but a pattern of sustained real growth of research support on campus had not developed through 1975 (see figures 6 and 10).

This pattern of fluctuations in the growth of research volume has had an influence on the proportion which research sponsors pay of the costs of those Institute services which support both instruction and research. This proportion is determined (under Federal guidelines) on the basis of the relative share of the support services attributed to instruction and to research activities. This proportion declines as a fraction of the total costs of these services if research activity grows more slowly than instructional activity (which has been the case in recent years, as indicated in figures 10 and 11). This means that a higher proportion of the total support costs must be paid out of the Institute's general funds. Although intended to provide full reimbursement for the services which help support research activities, the Federal guidelines deny, for example, reimbursement for interest expense and for strictly fund raising activities (even though the latter may result in a new facility which is used solely for research).

The only indirect cost reimbursement we receive which is not a current out-of-pocket expense is an allowance for using our buildings and equipment for research; this allowance amounts to about \$1.5 million per year and is treated in a special way (see below, Section III.A).

The divestment of the Draper Laboratory in 1973 reduced significantly the total volume of research at M.I.T. As a result, the share of total indirect costs paid by research decreased, and the ratio of indirect costs to direct costs in research contracts increased. (A detailed explanation of this change appears in the Report of the Committee on M.I.T. Research Structure, pp. 144-146.)

GIFTS, GRANTS AND BEQUESTS (\$18.5 million in FY76—see figure 1) include those which can be used in support of current programs and those which are designated for such purposes as endowment and new facilities. Some gifts and grants received from private sources for current programs support the research efforts of faculty members, or faculty career development—and thus could be regarded as part of the total research support of the Institute.

The addition of gifts, grants and bequests has significant impact on the Institute's finances, and the vitality and continued excellence of the Institute depend heavily upon support of this kind keeping pace with our needs.

As shown on figure 7, this has not been the case the last several years; in fact, gifts have declined in terms of constant dollars, a reflection of general economic conditions. Of course, this graph refers to gifts that have been received and does not include pledges received recently as a part of the Leadership Campaign. (The extraordinary level of gifts in 1966 and 1971 resulted from the Alfred P. Sloan and Katharine Dexter McCormick bequests.)

Given the size and nature of M.I.T., it is estimated that we are under-endowed by about \$200 million (which would provide about \$10 million in additional investment income per year if invested in the current mix of holdings). A major goal of the Leadership Campaign is to increase the endowment by about \$100 million and to secure about \$125 million for current and planned programs and facilities. A successful campaign will be a tremendous help in ensuring the future strength of the Institute. To the extent that gifts (or the investment income they earn) can be used for our current academic programs, they also help the short-term budget problems we face. This is one area where it is difficult to predict accurately the level of support that we will receive each year. Most of the gifts we receive are designated for a specific purpose. With the exception of several major bequests, only a small portion of the annual gifts have been totally unrestricted as to use. These unrestricted funds provide great flexibility in meeting the needs of the Institute; the total has generally been in the range of \$1 to \$3 million per year over the past decade.

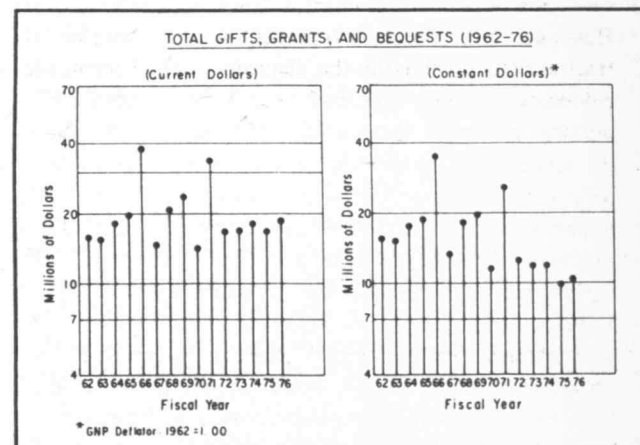


Figure 7

OTHER RECEIPTS include such items as the fees from the Sloan Senior Executive and Sloan Fellows Programs, the net realized gain (or loss) on the sale of investments, income from the Industrial Liaison Program, student aid receipts from the government, foundations, and agencies (NSF, NIH, NDSL, etc.), and patent revenues, and totaled \$13.9 million in FY76 (see figure 1).

The total amount of National Direct Student Loan (NDSL) funds rose significantly after 1971. Of the \$22 million in outstanding loans we have made to students, about half are NDSL funds ultimately owed to the Federal government. During the last decade, patent revenues have come primarily from two major patents. With the expiration of one of these patents in FY73, income from this source decreased from over \$1 million per year to about \$0.5 million per year. When the second major patent expires in FY82, our income from patent revenues will drop to less than \$50,000 annually, unless new patents are licensed.

BORROWINGS. In FY76, a total of \$2.4 million was borrowed (see figure 1). Over the years, the majority of our borrowings have been for new buildings—primarily those which have a well-defined source of revenue (e.g., student housing rents) to repay the loans. Our current indebtedness for buildings is \$26 million. More recently, we have borrowed funds (now totaling \$4 million) to be loaned to students for financial aid. These borrowings were required because our students' needs for loans are now much greater than the funds we have available to lend. In order to continue to meet students' needs for financial aid, we estimate that over the next several years we will need to borrow an additional \$1.5 million per year to lend to students. There are some hazards (e.g., increasing interest rates) in the Institute's having to borrow funds on the basis of short-term notes in order to make long-term loans to students at fixed rates.

INVESTMENT INCOME is used primarily to support current program expenses, including scholarships and fellowships, and totaled \$18.5 million in FY76 (see figure 1). Nearly all of our investment income is earned on funds whose purpose has been restricted by the donor or designated by the Corporation Executive Committee to support current ongoing expenses, and therefore the income must be used accordingly.

Investment income grew at the rate of 12% per year in constant dollars through the middle sixties (see figure 8), reflecting in part the substantial addition of endowment and other funds during that period. More recently, investment income has not kept pace with the rate at which program expenses have grown; in fact, there has been some decline in investment income in constant dollars since 1967.

The growth of investment income that most faculty see is not based on what our investments earn, but on what is distributed to the particular invested funds the faculty member or department uses. The distribution rate increased at an average rate of 8% per year from 1970 to 1974, which exceeded the average growth in our investment earnings—in part because of the effects of the 1974 recession on investment income. (In FY75 and FY76 this required us to use prior years' earnings from the reserve of "Investment Income for Distribution to Funds" to make up the difference between what was earned and what was distributed.) The distribution rate has been held constant for several years (to allow investment earnings to catch up), and now we expect the distribution rate to grow at about 3% per year.

Part of the difficulty in increasing investment income results from the composition of the invested funds in our portfolio. For example, of the \$43 million in real estate holdings, only about \$5 million provides an adequate return on investment from outside sources. The remainder is invested in property that either will be converted in the next decade to academic uses (and therefore cannot be committed to long-term leases or major renovations) or that is held for future capital growth and currently provides a low level of income.

It has been our policy to distribute as investment income only the earnings on our invested funds and not to distribute in any way the capital growth of the investments. Our objective is to maximize the total return (earnings plus capital growth) on our investments, consistent with an acceptable level of risk. Although our experience varies widely depending upon economic conditions, the average maximum total return we might expect is in the 8-10% range. Since the degree of risk and the maximum total return are constrained by external factors, it is difficult to increase our investment income any faster. For example, in terms of our portfolio, an 8% return is approximately divided between dividend and interest earnings of 5% (which we distribute) and capital growth of 3% (which roughly represents the growth rate of future income). If we distributed 7%, for example, the future income would only grow at the rate of 1% per year, which is inadequate in terms of future needs (e.g., keeping up with inflation). Our current policy

attempts to achieve balance between the short-term and long-term needs of the Institute. Unless major new endowment funds are added, the investment portfolio cannot be expected to yield growth in investment income beyond the current rate.

Up to this point we have discussed all of the sources of support and the revenues which M.I.T. receives. The remainder of section II focuses on the various ways in which we use our financial resources.

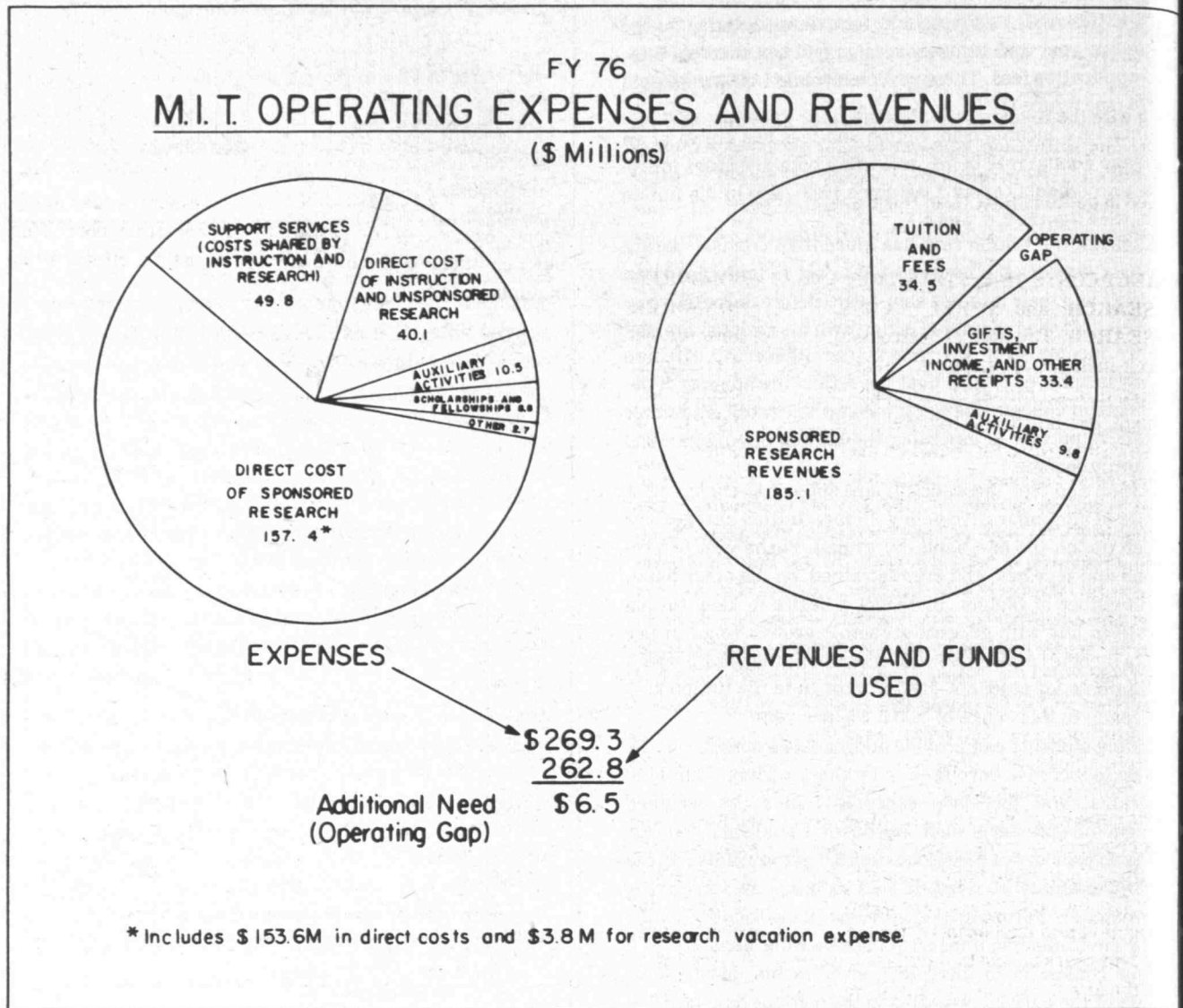


Figure 9

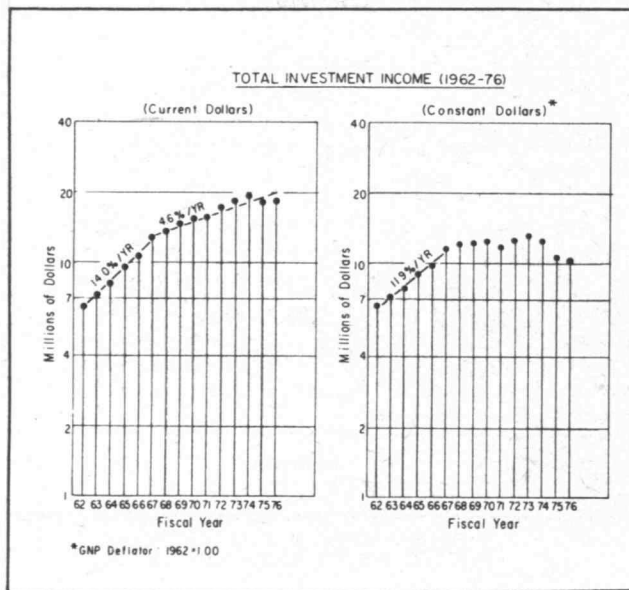


Figure 8

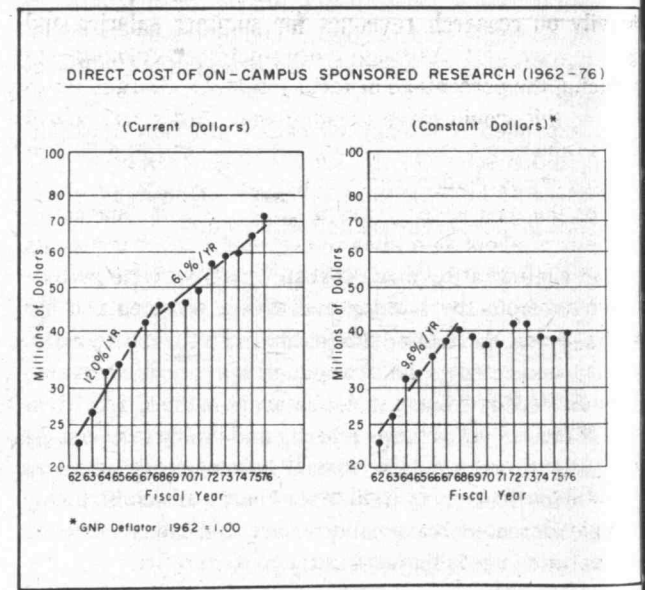


Figure 10

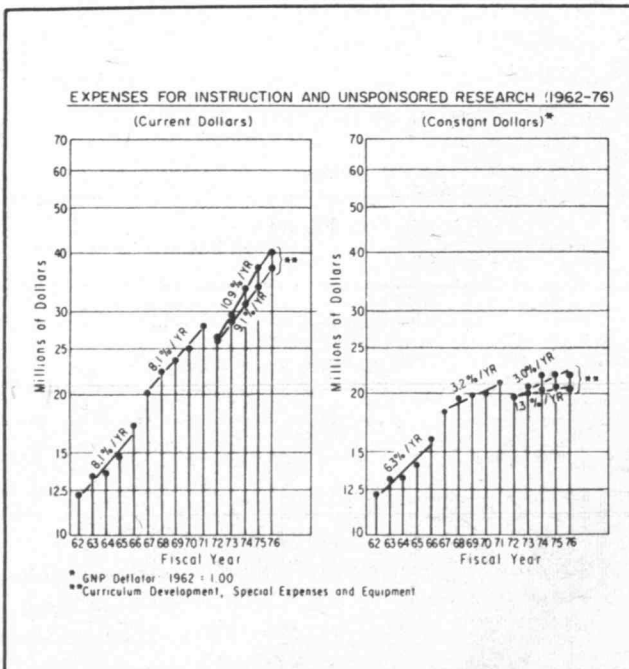


Figure 11

ACADEMIC BUDGET[†] FY 76 BY EXPENSE AND RESOURCE CATEGORIES

	Sources of Funds		FY76 Academic Budget*	
	General + Funds	Sponsored Research	Dollars (Millions)	Percent
Faculty Salaries--Tenured	79%	21%	\$ 17.7	15%
Faculty Salaries--Untenured	73%	27%	\$ 6.4	5%
Other Academic Staff	42%	58%	\$10.0	9%
Summer Supplement	24%	76%	\$ 4.2	4%
Research Staff	5%	95%	\$10.5	9%
Student Salaries And Financial Aid Support Personnel	37%	63%	\$17.8	15%
Operating Expenses	34%	66%	\$14.0	12%
TOTALS:	23%	77%	\$36.4	31%
	38%	62%	\$17.0	100%
	\$44.2	\$72.8		

† Instruction and un-sponsored research, direct costs of on-campus sponsored research, and financial aid included in the academic budget. These are budgeted, not actual, expenses.

Figure 12

I.B. Expenses for Current Operations

Each year, the expenses for current operations utilize by far the largest portion of the total revenues received. These expenses totaled \$269.3 million in FY76 (see figure 1). The Institute's operating expenses primarily include the direct costs for instruction and unsponsored research, the direct costs of sponsored research, costs for services which support both instruction and research, the auxiliary activities, and scholarships and fellowships.

Figure 9 shows these categories of expense for FY76, along with the revenues and funds which were used to meet them. The difference between revenues and expenses of \$6.5 million (the operating gap), and how it was met, is discussed in detail in Part III of this Report.

DIRECT COSTS OF INSTRUCTION AND UNSPONSORED RESEARCH and DIRECT COSTS OF SPONSORED RESEARCH. The cost of instruction and unsponsored research includes all expenses (except sponsored research) budgeted and managed through the five schools and through the interdepartmental laboratories and centers. These costs totaled \$40.1 million in FY76—see figure 9. The direct costs of sponsored research include the costs of sponsored research activity at the Lincoln Laboratory (\$82 million in FY76) and on campus (\$72 million in FY76, including research in both the departments and the interdepartmental laboratories and centers). While the costs of instruction and unsponsored research are separated from the costs of sponsored research for budget purposes (and shown separately in figure 9), the reality of M.I.T. is that instruction and research on the campus are complementary, interdependent activities, which together make up the Institute's academic program. Neither could exist separately, and each supports and enriches the other.

Two decades of 10% real growth (constant dollars) in the direct costs of on-campus sponsored research ended in 1968, and these costs have been, in constant dollar terms, essentially flat for eight years (see figure 10). The expenses for instruction and unsponsored research have grown slightly in recent years in constant dollars (see figure 11), but faster than the direct costs of on-campus research.

The left side of figure 12 shows how the various expenses in our on-campus instructional and research programs were funded in FY76. On the average, about one-quarter of academic year faculty salaries are paid by sponsored research (over one-third in the School of Engineering) and we rely heavily on research revenues for summer salaries and graduate support. Although there would be advantages to reducing the percentage of faculty salaries charged to research, this would place an additional burden on general funds (and also reduce indirect cost recovery) at a time of already serious budget constraints.

Over the past seven years, there have been budget reductions of about \$4 million in the academic departments (offset somewhat by new program funds in some areas). These reductions include some across-the-board cuts (in the early seventies), selective cuts by department (more recently), and changes in the way funds are provided for curriculum development and sabbaticals. At the same time that these reductions have been made, changing enrollments have increased the need for teaching, advising, and thesis supervision in several departments. In addition, certain government agency policies, as well as more intensive competition for research funds, have increased faculty workloads in terms of the needs for multiple proposal writing and report preparations.

Budget reductions in the departments have been necessary to help our immediate financial situation, but not all such cuts can be sustained if we are to maintain the vitality of our intellectual activities. For example, in the early seventies, the number of assistant professors at M.I.T. dropped dramatically as the slowdown in funding (both in research and in other sources of support) caused a decline in faculty growth at the same time that tenure commitments were increasing (see figure 13). Budget stringencies over the past several years have not allowed us to increase the number of younger faculty. Also, reductions in academic budgets and program development funds have limited departmental flexibility to undertake new programs. By forcing a narrower range of choices, limited resources also constrain the vital dialectic between discipline-oriented and problem-oriented approaches in some fields. These and a number of other needs facing the departments must be considered as we plan for the Institute's future.

The academic departments vary widely in terms of mission, size, style, stage of development, and spectrum of activities. These variations, coupled with the wide diversity in the structure of fields of knowledge, make it difficult to determine how best to allocate our limited resources among schools and departments. One of the problems we face involves the reallocation of resources when enrollments and

program emphases shift. We can add resources to departments, but it is more difficult to reduce expenditures correspondingly where enrollments are declining. In order to better understand the various needs of the departments, the President, the Chancellor, the Provost, and Vice President Simonides have held half-day sessions with each department head and Dean in the past four months. This "internal visiting committee" experience has been productive and rewarding, and we plan to repeat it at regular intervals in future years.

In recent years, we have seen a major shift in operating style, from a mode in which we were largely "idea limited" in terms of what we did, to a mode in which we are largely "resource limited." There have been times when almost any good idea could be supported, at least initially, by general funds. Now we are so limited by resources that many good ideas are in competition for financial support. This new condition, to which we are still adjusting, affects all of our operations.

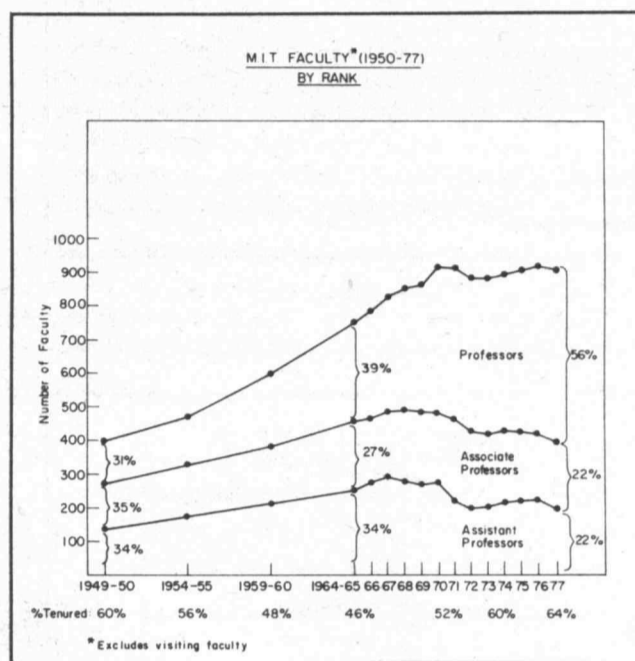


Figure 13

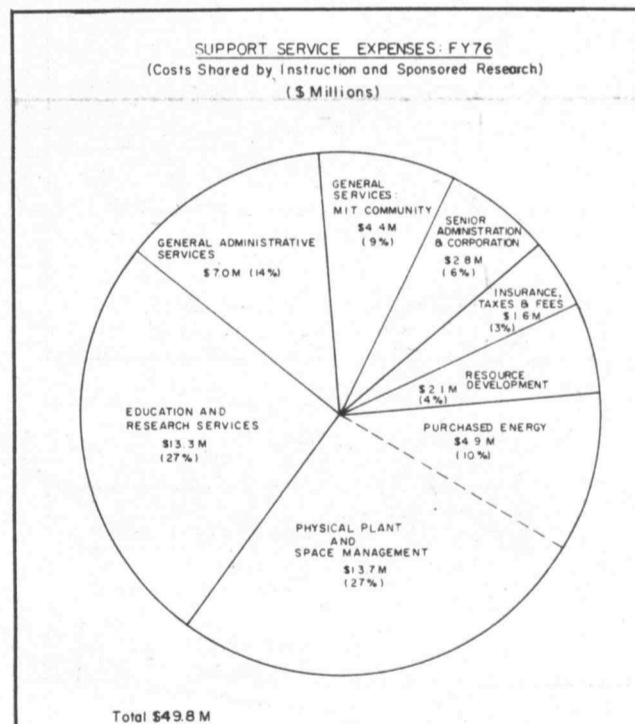


Figure 14

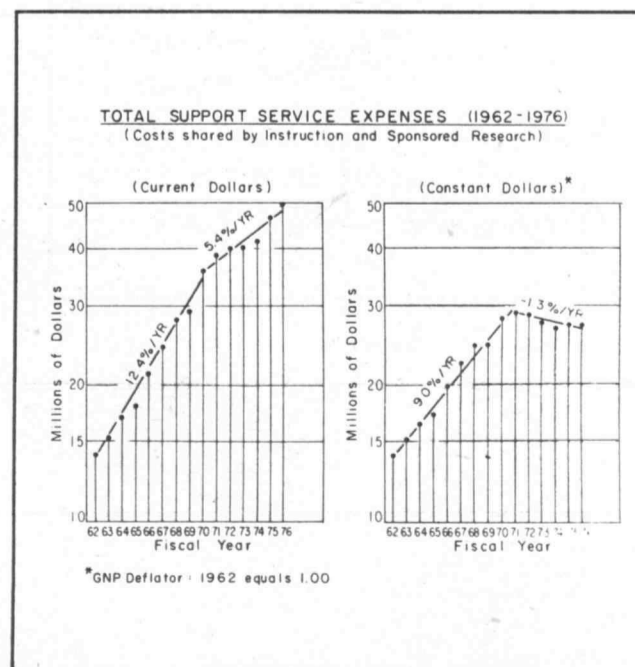


Figure 15

SUPPORT SERVICES. These services, representing \$49.8 million in expenses in FY76, support both the instructional and research programs of the Institute (see figure 9). These expenses are shown in detail in figure 14:

Physical Plant and Space Management includes buildings and grounds services, space changes, the trade shops, utilities operations, and space planning and monitoring;

Purchased Energy includes the costs of oil, electricity, steam, gas (and water);

Education and Research Services includes the student-related services (admissions, student affairs, financial aid, etc.); athletics; libraries; various other academic programs such as Summer Session, academic computation, UROP, IAP, and the Wellesley Exchange program; and research fiscal services (Office of Sponsored Programs and Lincoln Fiscal Office);

General Administrative Services includes financial services, personnel services, information processing (OASIS), and the Institute's information services;

General Services to the M.I.T. Community includes medical, environmental medical, safety, and campus police services;

Senior Administration and Corporation includes the senior academic and administrative officers and their staff and office expenses. (Departmental administration is included in the cost of instruction and unsponsored research.);

Insurance, Taxes and Fees includes payments in lieu of taxes to the City of Cambridge, insurance costs, and professional fees for legal and financial services;

Resource Development includes the Industrial Liaison Program and Associates Program, and support for the Leadership Campaign.

As shown in figure 15, the costs of support services continued to grow rapidly until 1970, primarily because of expanding research and instructional activities, and the addition of new facilities. Since that time there has been nominal growth—and a decline in terms of constant dollars. This reflects our recent budget reduction efforts which have been concentrated in the support areas. Over a seven year period, total budget adjustments of \$11 million (before salary and wage changes) have been achieved in the support area. Although sizable reductions have been made, there are a number of pressures tending to increase costs: tripled per-unit energy costs, high inflation rates, the addition of several major buildings, a rise in employee benefits costs, several Federally mandated programs, and expansion of support staff for the Leadership Campaign. Even with the budget savings described above—which reflect both decreases in programs, services, and people on the payroll, as well as more efficient ways of doing things (such as the energy conservation program)—the reductions have been offset largely by salary and wage increases (though the net effect has been a shrinkage in constant dollars).

AUXILIARY ACTIVITIES (see figure 9) were discussed earlier under "Revenues and Sources."

SCHOLARSHIPS AND FELLOWSHIPS (see figure 9) are part of operating expenses (\$8.8 million in FY76), but are discussed in the next section on student support.

OTHER OPERATING EXPENSES (see figure 9) are primarily expenses related to the Alumni Association and to several projects for upgrading and renewing facilities, and totaled \$2.7 million in FY76.

I.C. Other Uses of Revenues and Funds

These uses of resources (shown in figure 1) are for student support, additions to the educational plant, and some other purposes.

STUDENT SUPPORT. As shown in figures 1 and 16, the majority of student support is part of the operating budget (\$26 million in FY76) and takes the form of student employment (salaries for research and teaching assistants, College Work Study, UROP, etc.), scholarships for teaching assistants and training grants, and other scholarships and fellowships.

The portion of financial support not included in operating expenses is student loans. As shown in figure 1, the funds for these loans come from student loan repayments (\$1.8 million in FY76) and from gifts, added NDSL monies, and Institute borrowings (\$2.4 million net added to student loans in FY76).

"Scholarships and Fellowships" (see figures 9 and 16) include the scholarship supplement required from unrestricted Institute funds to meet the full financial need of undergraduates; Federal fellowships and traineeships (including a supplement from unrestricted funds for these); and gifts, grants and bequests and endowment income used for scholarships. These have grown from a total of \$2 million in 1962 to the current level of \$9 million, though the amount has remained fairly constant since 1968 (a decline in constant dollars). There has been a dramatic decline in Federal fellowships and traineeships (which come primarily from NSF and NIH) from \$3.3 million in FY70 to \$1.6 million in FY76.

The financial support requirements of our students have increased significantly over the past 15 years owing to the expansion of graduate student enrollments (made possible in part by the growth in research revenues) and the decision in 1966 that the Institute should meet the full financial need of undergraduate students. These changes have increased the burden of scholarship funding on the Institute's operating budget. At the undergraduate level, about one-quarter of the income generated by tuition increases is offset by the increased requirements for scholarships.

Figure 17 shows the growth since 1966 in "Total Undergraduate Financial Aid Need" and "Average Per Student Need." Average per student need, which reflects average student costs minus parental contributions and summer earnings, has grown at the rate of about 11% per year since 1970. Total undergraduate need (the average need times the number of needy students) grew at the rate of 12% per year until 1971, and then leveled off for several years (largely because we began requiring verification of parental income and the number of needy students dropped). Since 1975, however, total undergraduate financial aid need has been rising at the rate of about 20% per year. (This reflects increases in enrollment and the number of needy students, changes in the way financial aid need is determined by the College Scholarship Service, and increases in tuition and other student expenses.) The projected need for unrestricted funds to supplement the undergraduate financial aid program (included in Scholarships and Fellowships in figures 9 and 16) could increase from \$1 million this year to as much as \$3 million in FY79. Given this prospect (coupled with the possible need for the Institute to borrow \$1.5 million in additional funds each year to lend to students), we need to re-examine our current financial aid policies and explore ways to meet the increasing financial support needs of our students.

ADDITIONS TO EDUCATIONAL PLANT (including academic facilities, dormitories, and support facilities, such as the parking garages) are funded primarily from gifts designated for buildings, unrestricted gifts, Federal building grants, and borrowings. As shown in figure 1, \$4.3 million was added to the book value of the educational plant in FY76. Since 1962, 3.7 million square feet—represented by over 30 new or renovated buildings—have been added to our physical plant facilities. This growth has more than doubled the area within the physical plant, which in turn has added substantially to plant maintenance and operating expenses. Beginning with the Second Century Fund, it has been our policy not to undertake a new academic building without having adequate maintenance funds or pledges in hand. However, some of these were "wasting funds" (the principal and earned income of these funds would be used over a specified period, typically 10 years), and some of these funds are now almost depleted. Obtaining adequate funds to renovate and maintain our aging plant facilities is a serious problem.

OTHER USES (shown in figure 1) include repayment of money we have borrowed (\$2.0 million repaid in FY76) and a variety of other deductions, for example, payment of investment income to the donors or beneficiaries of Life Income Funds, interest and principal paid on funds borrowed to build the Student Center, distribution from the revenues of the Industrial Liaison Program and M.I.T. Associates Program for department or faculty use (revenue sharing), and major maintenance and equipment expenses for the housing and dining services.

Loans to Students	\$ 4.2
From Operating Expenses:	
Student Employment	\$14.3*
Scholarships for Teaching Assistants and Training Grants	3.0*
Scholarships and Fellowships	8.8
	<u>26.1</u>
TOTAL	\$30.3

* Budget figures

Figure 16

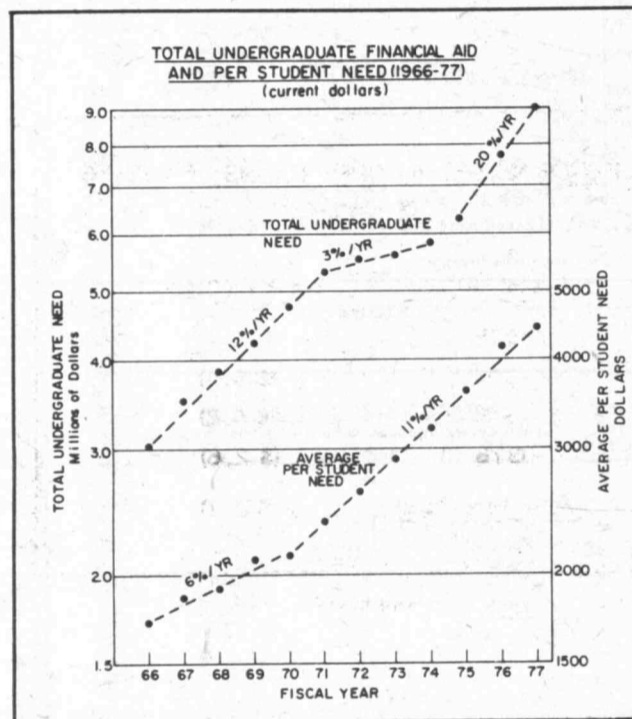


Figure 17

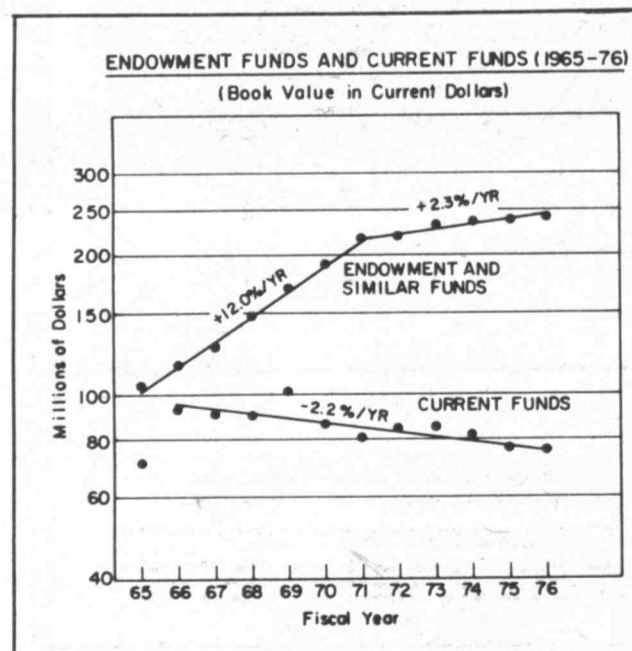


Figure 18

I.D. Endowment and Other Funds

The endowment and other funds of the Institute are represented on the right hand side of figure 1. The Institute carries on its books—in accordance with the principles of fund accounting—thousands of separate funds or reservoirs of money received for a variety of purposes. Some are restricted to specific uses and some may be used for any institutional purpose at the discretion of the Corporation and/or the officers of the Institute. Some are "endowment funds" of which only the investment income may be expended; some are similar in nature to endowment ("funds functioning as endowment"), i.e., unrestricted gifts, bequests and other receipts which were added to the principal of the endowment by action of the Executive Committee. A portion are "current funds" in the sense that they are expendable resources; most of these funds are not viewed as expendable, however, because nearly all are invested and earn income for current programs. A small portion are: "plant funds," which are committed to existing or future facilities; "life income" funds on which the donor or beneficiary receives the investment income until his or her death, at which time both the principal and investment income are available for Institute purposes; and "agency funds," which the Institute holds as custodian for affiliates such as alumni groups and student organizations. (Although student loan funds and funds expended for educational plant also are part of the Institute's funds, they are of a different character and are represented elsewhere on figure 1.)

During any given year there typically is a continuous flow into and out of the funds, leaving a net increase (or decrease) in fund balances at year-end—a \$2.8 million net increase in FY76 (see figure 1). At the end of FY76, endowment (and similar) funds totaled \$241 million, current funds totaled \$76 million (of which \$65 million were "current invested funds"), and plant funds and life income and agency funds totaled \$15 million.

Figure 18 shows the growth in our endowment (and similar funds) and current funds over the past decade. Together these funds account for nearly all of the investment income available for the Institute's programs. Although the endowment funds grew rapidly during the sixties, that growth slowed considerably in the seventies. Our current funds have been declining in recent years, that is, we have been expending these funds faster than we have received them.

Unless major new sources of endowment are added to provide additional growth in investment income for support of current programs and activities, it will be difficult to achieve a dynamically balanced financial condition in which revenues grow at least as fast as expenses. Achieving this growth in our endowment is a major goal of the Leadership Campaign.

III. BUDGET TRENDS AND OUTLOOK FOR THE CURRENT YEAR

The discussion in Part II focused on the specific components within the flow of revenues and funds into and out of the Institute. In this section, we will review the interaction of these components: the impact on the bottom line of the operating budget and the outlook for the current year.

III.A. Operating Gap and Deficit

The relation between the expenses of current operations and the total revenues available to meet these expenses leads to a surplus or deficit each year. Since 1974, this interaction has resulted in an annual operating gap and deficit (see Glossary for the difference in the meaning of these terms as used in this report). During the year which ended June 30, 1976, the operating expenses of the Institute totaled \$269.3 million. Operating revenues and funds used totaled \$262.8 million. The difference between these two numbers (\$6.5 million) is the operating gap, representing the need for additional unrestricted revenues and funds. (See figures 1 and 9.) This gap was met from two sources (which are described below).

One of these sources is "current unrestricted revenues." It has been the Institute's policy to segregate certain unrestricted revenues received during the year (from patent revenues, the use of facilities allowance from research sponsors, and annual unrestricted gifts, grants and bequests) for designation by the Executive Committee. This resource is not included automatically as a part of our operating revenues on the grounds that the operating budget should be in balance without it and that these revenues should be available for capital purposes.

Until 1973-74, the annual flow of "current unrestricted revenues" was (with the exception of one year) sufficient to cover the operating gap and to leave a residual sum which was added to the Institute's endowment, or used for educational plant construction, or used to provide seed money for new academic programs. Since 1974, we have had to use not only these "current unrestricted revenues" to meet our additional need for unrestricted funds in operations, but we also have had to draw upon various income-producing funds which had been accumulated in prior years. This extraordinary increase in the demand on funds for current operations was caused primarily by the divestment of the Draper Laboratory (for which we had made provisions), by a tripling in the fall of 1973 of energy costs, and by a subsequent surge of inflation which affected essentially all of our costs. These latter two causes had not been anticipated, and they compounded our problem.

The annual deficits—i.e., the amount by which the operating gap exceeds the "current unrestricted revenues" available—have continued to the present. For example, in FY76, we used \$3.9 million in "current unrestricted revenues" to help meet the operating gap of \$6.5 million (see figure 1). The remaining need of \$2.6 million—the deficit—was met by using \$1.2 million of various fund balances, including reserves, and by expending \$1.4 million of funds functioning as endowment (see figure 1—the dotted line labeled "use of funds").

The historical progression of operating surpluses and deficits is shown in figure 19 for the four-year period starting with 1972-73, which was the most recent year in which current unrestricted revenues were more than sufficient to meet the operating gap. The cumulative deficit for the four-year interval was \$12 million. This represents funds which, had they not been used to meet current operating expenses, would be generating about \$600,000 per year in investment income (which in turn could be used in operations—now and in subsequent years).

In FY75 and FY76, two large unrestricted bequests (totaling \$1.5 million) were designated by the Executive Committee as endowment in order to memorialize the donors. Had this \$1.5 million been available to help meet the operating gap in these years, the cumulative deficit would have been \$10.6 million. (Instead, other funds were used to meet the deficit, and the two bequests were treated as if they had been restricted gifts.)

Taking a broader look at trends in the use of unrestricted funds, during the 15-year interval from 1962 to 1976, a total of \$103 million in unrestricted funds (current unrestricted revenues, investment earnings on these funds, and the additional funds required to cover deficits) were used as follows: about 36% was added to endowment, about 21% was used for buildings, and the remaining 43% (or \$44 million) was used in operations. Figure 20 shows the year-by-year shift in the way these unrestricted resources were used. This shows a trend toward using these resources for balancing the operating budget. It is our goal in the long run to operate in a manner which permits us to add to, rather than expend, these crucial income-generating resources in order to help provide maximum opportunities for future M.I.T. programs.

Accordingly, we have set about to reverse this trend, and have been partially successful in reducing the deficit for the past two years (see figure 19). The reduction of the deficit in FY76 resulted from concerted efforts and actions which were felt throughout the Institute:

1. The enrollment of full-time students increased by over 400.
2. Research volume grew both on campus and at the Lincoln Laboratory. The increase of 11.4% represents the first significant real growth of research activity (5% above inflation levels) since 1972.
3. Budgeted expenses for the year were reduced by \$2.3 million (before salary and wage increases).
4. All operating units of the Institute kept a close watch on expenses and almost all closed the year at or under their budgets.
5. Unrestricted gift income generated by the Leadership Campaign met the budget target of \$800,000 we established for the year. (These unrestricted gifts are in addition to pledges and restricted gifts received as a result of the Campaign. The total pledges and receipts from the Campaign to date stand at about \$90 million.)
6. The Industrial Liaison Program and the M.I.T. Associates Program each increased the number of participating companies significantly, thereby increasing revenues from these sources by approximately 42%.

Fiscal Year	Surplus (Deficit)
1973	\$ 1.1
1974	(\$ 5.4)
1975	(\$ 5.2)
1976	(\$ 2.6)
Four Year Total	(\$12.1)

Figure 19

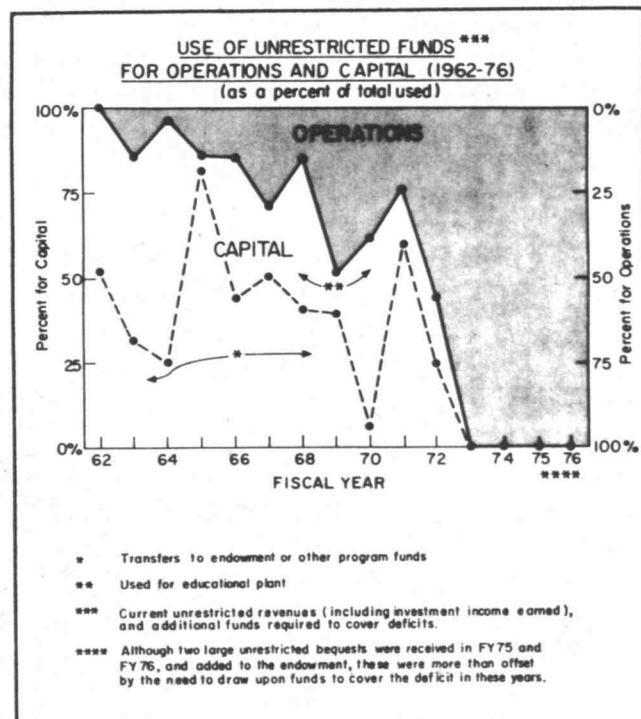


Figure 20

III.B. Current Outlook

The Summary outlined a number of conditions and assumptions bearing on our financial outlook. Several specific comments can be made about the operating budget for the current year (1976-77):

1. The expenses for instruction and unsponsored research are likely to increase in the range of 6% to 8%. Although that part of departmental budgets coming from general funds shows an increase of 8% over budgets for last year, the departments have not yet budgeted all the specific funds which they control and will spend during the year—so that it is not possible at this time to predict more precisely what the overall budget growth will be.
2. We anticipate further growth in sponsored research, particularly in the departments and on-campus interdepartmental laboratories, in the neighborhood of 8% (real growth of about 2% above inflation).
3. The 1% growth projected for services which support both instruction and research is much less than the underlying inflationary growth. This is the case because of budget adjustments accomplished last spring. Before salary and wage changes, budget adjustments in the support areas of about \$2.8 million were achieved. The corresponding figure for adjustments in the academic departments was \$0.5 million.
4. Expenses for the Alumni Association, the M.I.T. Press, and the housing and dining services are expected to increase about 4%.
5. While we expect the current year to yield a deficit, the amount of this deficit, about \$1.3 million, is considerably reduced from last year's figure of \$2.6 million. (Because of recent budget changes, this estimate of the deficit is slightly higher than the \$1.1 million figure reported at the October faculty meeting.)

As discussed in the beginning of this report, the estimates of research revenue that are contained in the operating budget embody higher levels of uncertainty than usual. A Federal task force is presently studying cost reimbursement policies and considering revisions proposed both by funding agencies and the universities. We intend to make a maximum effort, by ourselves and in concert with other research universities, to preserve the policy of reimbursement for the full costs, direct and indirect, of sponsored research.

In the face of uncertainties such as this, achieving our financial and program goals is all the more difficult. It must be said, however, that the level of understanding, the effort and cooperation on the part of everyone at the Institute, and the sustained sense of achievement and excellence in our academic and service activities, are a continuing source of optimism as we enter the planning phase for the next two years. We hope that the perspective on the Institute's finances provided by this report will be of help as we continue to discuss and address some of the central issues facing M.I.T.

CLASSIFIED ADS

Ads are limited to one per person per issue and may not be repeated in successive issues. All ads must be accompanied by full name and Institute extension. Only Institute extensions may be listed. Members of the community who have no extensions may submit ads by coming in person to the Tech Talk office, Room 5-111, and presenting Institute Identification. Ads may be telephoned to Ext. 3-3270 or mailed to Room 5-111. Please submit all ads before noon, Friday, Nov 19. They will be printed on a first come first serve basis as space permits.

For Sale, Etc.

Pr H75x15 snow bird tires, used only 2 mos, prac nw, \$35. x3-4419.
For sale or trade: k sz waterbed, frame, htr, platform, exc cond, \$70; yel parakeet, cage, food, toys, \$15. Russ, x3-3976.
Lt wd 8 drwr desk, \$25. George, x3-5854.
Sonic EV-40 spkr, exc cond, must hear, \$50. x5-6253 Dorm.
Port GE cassette recorder w/AC adapter, \$25; port Sanyo amfm radio w/AC adapter & batta, \$20; sgl spd oscillating 10" fan, \$8; all exc cond. Silvia, x3-3300.
(1) A78x13 Gdrich w tire, 2 ply sidewalls, 4 ply tread, b nw, nego. Hal, x5809 Linc.
Whls, 15" diam w/5 bolts & stud snws, F78x14, \$20. Chris, x3-6750.
Antique china tbl lamp, \$25; BR lamps & shades, \$3; dresser, \$20; blu chr, \$17. Call 643-4283, aft 5:30.
Twn sz bed compl w/matt, solid hrdwd hd & fbrds, \$45; KLH mdl 26 amp w/Garrard trmbl, \$70. Call 547-3630, evgs.
Exclusive Optpy: Nikon 2FS body & prism, only \$400; Bessler 67C enlarger w/35 mm access & El Nikkor 50 mm f2.8, \$200; all equip immac cond, 11 mos grnty, urgently n'd. Call 547-7350.
Tires, all L78x15 belted w/ pr stud snws, gd cond, \$35; 4 reg, 2 gd, 1 fair, 1 poor, \$25/lot; changed to radials, Ed, x7448 Linc.
Sheepskin coat sz 38-40, \$120; used r-to-r tapes, best. Steve, x3-5033.
B nw tire, stl belted radial HR78x15, \$35; 2 stl belt radial snws mtd Ford LTD rims, blnds, HR78x15, cost \$160, ask \$110 or best; 2 mos use in '75. Jones, 427-2840.
Advent 100A Dolby, wint cab, mint w/manuals, \$170 or best; Yamaha NS-670 spkrs, 3-way soft dome, list \$450, \$350 or best. Barry, 787-5206, evgs.
Kneissel Wht Star R5 skis, 205 cm, used once, w-Marker bndgs, \$100; Weston mdl 1290 o-10 V DVM, \$75; Dunlop K-81 mtceyl tires, 3.60x18 & 4.10x18, \$45/pr. Chip Farley, x3-6050.
F Rieker ski boots sz 7, \$20; St Anton fbrglass 5' skis, nd bndgs, make offer; trunk deck ski rack, holds 4 prs, \$15. Bill, x5377 Linc.
(1) take-off tire, 735, nw. x3-3477.
(2) end tbls, \$51.50; 2 tbl lamps, \$46.50; wall mirror, \$35. Euren, x8-3501 Draper.
Adjust ski rack for any sz car. Rega, 266-3385.
Handmade Holly Hobby dolls, order now for holidays, \$17/ea; knotty pine bar, \$35; genuine shell necklaces on liquid silver chains. J. May, x8-2843 Draper.
Child lift-top sch desk, wrought iron legs, \$15; antique oak roll top sm child's desk, \$25. x3-4603.
AC, 6000 BTU, 15" wide, 21" hi, 5 yr wrnty, \$130. Pete, x3-1834.
Pr mtd stud H78x15 snws, b nw last fall. Elisabeth, x446 Linc.
(2) Bancroft Exec tennis rckts, 4 7/8 grips, 14 1/2 & 15 oz., 1 nds stringing, \$20/pr. Jim, x7724 Linc.
Pr Pinto rims, \$10; pr Pinto rims mtd w/stud snws, \$20. MacKinnon, 327-6864.
Formica K tbl w/4 org hi back chrs, 1 leaf, opt mtch hutch, best; couch w/slip covers. Gail, x3-4296.
Chldm's workbench, approx 18x36", w/back, great for yng carpenter or hobbyist, wd alone worth price, \$10. Call 862-1935, evgs.
E78x14 stud snow w/rim, \$15. Janet Mahoney, x8-3528 Draper.
Snorkel parka, grn, w/hood, m sz med-kg, exc cond, \$15. x3-3665.
Pr 14" stud snws used only 1 seas, \$20. Call 492-2739, evgs.
Polaroid mdl 420 camera, mdl 490, focused flash & owns manual, gd cond, \$40 or best. Kevin, x3-5239.
RCA 16" b&w TV, \$40. Paul, x3-2189.
Used cptone color Magic Chef stove, 4 nw top elements, gd cond, can be seen, \$75 firm. Roberta, x3-7078.
M or f 10 spd bike, 23", Campagnolo components, comb 531 & stl tubing, nego; sheepskin coat, m or f, sz 40-42, orig \$300, exc cond, hrdly used, nego. Beth, x5-8231 Dorm.
Wht wicker 5 drwr changing tbl, \$5; formica feeding tbl, was \$35, \$5; misc toys. Call 661-3722.
Stud snws, Gdry A70x13 polyglass belted, w/whls, \$60 nego. x3-4840.
Vita-Sprint 10 spd, almost nw, \$100 or best. Les, 262-5090, aft 5.
Sony TC-55 peck cassette recdr, mint cond, all accs, best. Call 661-9775.
K set, 42" rmd tbl w/leaf, lt tan formica top, 5 mtch chrs, \$50 or best; red shag oval rug approx 8x10, \$20; wndw valances, wd frame w/padded brocade covering & red vlvt edging, 84" & 52" W, \$8 & \$4, or \$10/both. Irving, x5781 Linc.
Penski Dwell tch, nw \$60 + tax, still in box, nvr used, \$40. x8-3337 Draper.
Pr. 7.00x13 snws, 4 ply, lk nw, \$30. Dave, x5-6632 Dorm, evgs.
Used pr stud belted snws, F78x14, mtd Chevy (Pont) rims, gd cpl more seas, real cheap; nw F78x-14 belted Fstrne, mtd & blncd, on nw Chevy rim, cheap; other useable GR78x14 Fstrne radials mtd same rims, give away if buy anything; \$30 takes all. Yum, x3-6097, lve msg.
(2) mtch KLH bkshlf spkrs, sm, wint, work, \$25/pr; junk circuit brds form calculating & misc equip, for parts, v cheap. Call 494-8888.

Red kryptonite bike lock, \$14. Joan, x3-6922.
Stl shelving, 4 units, \$2/shelf; wd playpen, \$9; doll carriage, \$4; doll crib, \$4; bowling ball, \$9; storm wndws, \$2/ea. Call 232-0205.
Red/gold 87" sofa, \$50; alum 32" wht storm dr, \$20; alum 60" canopy, \$5. David, x5451 Linc.
Baby items: mpl crib w/matt, \$60; chr, \$5; screened in crib, \$10; dress tbl, \$10; folding carriage, \$10; wd potty chr, \$7. Call 484-7423.
M fig skates, CCM sz 8, virtually unused, \$30. Mark, x3-5343.
Sofa, yr old, \$60. Call 494-8347, aft 6pm.
Pr stud 195R-14 stl belt ww radial snws, mtd, gd cond, \$60 or best. x3-4588.
Nw Technics SA5060, 12 W rcvr, retails \$169, best. Steve, x5-8422 Dorm.
Herculon sobafed & mtch chr, lk nw, \$150; 2 mbrl top end tbls, \$45/pr. Joe, x3-4136.
Lady Kenmore washer, \$35; stereo console phone, Garrard changer, \$25; frpl screen & andirons, \$35. x3-7239.
Slide proj, auto, 4", f3.5 lens, w/8 circular mags & xtra proj bulb, \$40. Leo, x3-6404.
Pr stud snws w/rims, \$15. Ruth, x3-7966.
Shag rugs: blk & off-wht, 23 sq yds, gd cond, \$60; pastel prpl & pink, 18 sq yds, exc cond, \$60. Dave, x7889 Linc.
Camera equip: Canon FTb w/f1.8.50 mm FD lens & case, fltr, \$200; 200 mm Canon FL f3.5 lens w/case & fltr, \$100; 28 mm Canon FD f3.5 lens w/case & fltr, \$120; exc cond. Kevin, 547-4135, evgs.
Peterson conv stroller, grn plaid, exc cond, \$25; infant carrier, exc cond, \$2; push-pull baby sled, nvr used, \$7. x3-1622.
Bedstead, about 40" W & 76" L, mtl side rails, wdn slats, grn hd & fbrds, no matt or spr, \$25; sm mtl bed frame, best. Call 661-6377, evgs.
Sears 24" snow blower, beaut cond, nwlly ovrrhd, 6 hp motor, \$150. Hal, x5809 Linc.
GE washer, fam sz, 14 lb. capacity, v gd cond, \$65. Peter, x3-5203.

Vehicles

'63 VW bug body (w/out eng), frame exc cond, body w/fbrglass patches, \$150. Hugh, 547-1250.
'63 Ply Valiant, gd run cond, 6 cyl, 4 dr, fall sticker, \$200. x3-2238.
'65 Dodge Polara, V8, p st & br, exc cond, nw tires, \$450. Call 254-7190, aft 6pm.
'67 Pont Tempest, 6 cyl, economical, many parts in gd cond, \$250. Lee, 776-0780, aft 7pm.
'67 Rambler Amer, auto, gd eng, dented body, nw brakes, tires & muff, gd transp, \$150. Eli Gai, x8-1548 Draper.
'67 VW Sgbk, body rusty, eng gd, best. Lon Hocker, x3-2007, kp try.
'68 Pont GTO, 4 bbl Holley carb, 4 spd Hurst, all nw tires, nw brakes, exh & clutch, exc cond, \$950. Jack, x8-3754 Draper.
'69 Pont LeMans conv, gd run cond, \$750; sofa; DR tbl & chrs; lamps; full sz matt, box spr, hdbdr; full sz matt; bunkbed; hichr & car carrier for baby; vac; tbl; radio; alarm clock; etc. Call 643-8796.
'69 Mustang, 302 V8, 65 K, p st & br, \$700. Ray, x3-7235.
'70 VW, 9 psgr wgn, v gd cond. Dave, x3-2336.
'70 Ford Mustang, exc cond & eng, snws, lvg cntry, \$900. Diego, 494-8867, evgs prf.
'70 Saab 99E, amfm stereo, 34 mpg, \$1,000 or best. Kathy, x5572 Linc.
'70 Chevy Bel Air, snws, auto, gd cond, \$600 or best. Ramos, x3-3259.
'70 Karmann Ghia, 49 orig K, w nw snws, am radio, gd cond, \$1,295. Raymond Mynardi, x8-3511 Draper.
'71 Ply Fury III, 4 dr sed, auto, p st, radio, fac AC, nw trans, exc cond, \$1,100. Arnold, x3-1833.
'71 VW Fstbk, gd cond. Jim, x3-6533.
'71 AMC Gremlin, gd mech cond, snws, \$850 or best. Call 648-4467.
'72 VW bus, 7 psgr, red & wht, std, 67 K, 27 K on eng, just tuned, Pirelli radials, nw front brakes, \$1,500. Mike, x3-1420.
'72 Buick Skylark, 4 dr, exc cond, 29 orig K, p st & br, exc tires & snws, \$2,000. Call 924-7511.
'73 Merc Colonial Park wgn, bckt sts, radials, exc cond in & out, best. John, x8-4475 Draper.
'73 VW, exc cond mech & body, nw tires, 40 K, x8-1325 Draper.
'73 Buick Century, 2 dr, yel w/bm landau roof, 42 K, just tuned, exc cond, \$2,500 firm. Mary, x8-1828 Draper.
'74 Fiat 124 sed, 18 K, radio, radial snws, exc cond, \$2,000 or best. x7391 Linc.

Housing

Bedford, 3 rm furn apt, LR, BR, K, full B, pkg, walk to shops & Bos train, no chldrn or pets, prf qt prsn or cpl, \$250 incl util. Call 275-6901.
Belmont, attractive 2 BR cape, Dr, frpl LR, mtd K, garage under, exc cond, \$39,500. Call 489-2368.
Bos. S End twnhse restored w/elegant classic detail, nw plumbing & wiring, lg sunny grdn w/deck, gd loc nr Copley Sq. x8-2837 Draper.
Bkline, 8 rm furn hse nr BR, rent Jan-July, all conv, garage. x3-4992.
Bkline, nr Cldg Cntr, furn apt avail Dec thru Feb, elegant condo, huge LR, 2 lg BR, 2 B, qt str, secure bldg, pkg incl. Call 862-3276.
Camb, Cent Sq, BR, K, LR, ideal for cpl, \$190 incl util. Janet, x3-4831.
Cohasset, furn 11 rm hse, 5 BR, 3 B, Steinway, all appl, 1/2 acre, water nw, walk to Bos transp, Jan-June, \$575. x3-3146.
Randolph, 3 BR raised ranch, lg fenced in lot on qt dead end str, encl sunporch, conv loc, 1 mi from Sq, 40's. Bill, x5565 Linc.
Som, mod 2 BR apt avail 12/1, nr T & Porter Sq, \$295 + elec. Iguchi, x3-3237.
Lovely Wht Mtn chalet for sale or seas rental, 3 BR, frpl, nr Canon, Loon, Vt areas. Eva, x3-5742.

Animals

AKC doberman pinscher pups, lg litter, priced to sell. Jerry, x3-7713.

Lost and Found

Found: Chrysler Corp key in Rm 1-027. Weldon, x3-2206.
Lost: gold hoop earring somewhere btwn 100 Mem Dr & Bldg 14. Lee Linsky, x3-1782.

Wanted

IBM Selec or comparable elec typwtr. Call 494-8886, aft 6pm.
Wd hichr, reas; china cab. Call 933-4686.
Trucking or driving to Chi? Have btchr blk, weighs 70 lbs, wl pay freight charges. Leon, x8-4444 Draper.
Kunii & Levenspiel's Fluidization Engineering. Gary, x3-6474.
Doll hse for Christmas, wl pay reas amt, furn or unfurn. Kathy, x7029 Linc.
Pt-time secy/typist nded for minimum of 3 times/wk, tl 10-15 hrs, \$3/hr, must be accurate & dependable. Call 482-8971.
Prof, wife & cat nd lg qt apt w/yard nr T, Belmont or Wtrtwn, wl consider purchase 2-3 fam hse. x3-3454.
Babysitter for 6 yr old girl 2-6pm, 1 or 2 afta/wk, in Wtrtwn. Call 926-4138.
Grad stu looking for apt to rent 12/22-1/5, Eastgate, Westgate, anywhere in Camb or Bos. x8-9778 Dorm.

Roommates

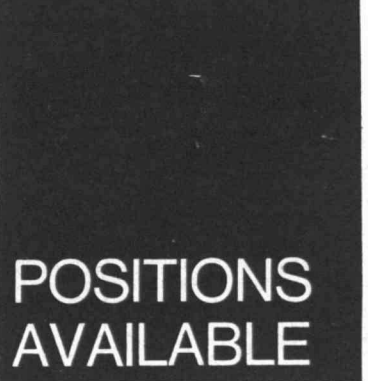
(2) self-sufficient, privacy-loving prof f seek 3rd to share 3 BR sunny Cambport apt in hse, 2 porches, ideal for out-of-town PhD stu, no pets or cigs, \$88 + util. Jessie, x3-3141.
M rmmate, share 5 BR apt in Bri nr Cvlnd Crcl, nr T, \$68 incl ht. Don, x3-4675.
Rm avail in Tang Hall apt 13B, lr cmr rm, beaut view, avail immed to MIT affil. Byron, x3-3507.
F to share beaut H Sq apt, own BR, \$114 incl ht & wtr. x3-7110.
M or f to share 3 BR Lex hse w/m & f, furn or unfurn rm, nr T, avail 11/76-6/77, \$150 incl util. Graham, x321 Linc.

Parking

Note to parking sticker swappers; please remember to inform your supervisor and the Campus Patrol of the exchange you have made so that their records accurately reflect your new parking area.
Wl swap West for Albany or East. Bob, x3-2364.

Miscellaneous

Wl do gen, tech or thesis typing. x3-1713.
Wl type theses, manu, tech, fast & accurate, IBM Correct Selec. Debbie, x3-1848.
Typing, fast & accurate, theses, papers, letters, manu. Sandy, x3-4342.
Typing, scientific & tech, fast, reas rates. Sherry, x3-7758.
Typing, term papers, reports, manu, theses, etc, IBM Correct Selec. Linda, x3-7023.
Ride offered to Summit, NJ, for Thanksgiving, lvg 4pm Wed, rtn Sun pm. Call 354-2781.
Ride nded to NY (Manhattan) Wed bef Thanksgiving, late aft best, rtn sometime Sun aft or evg, wl share exp. Carol, x3-1491.
Typing, fast, accurate & reliable, reas rates. Jean, 628-8271.
Chart & graph srvc for thesis & publication. Joyce Cahill, x3-7019, aft.
Typing, papers, theses, reports, etc, IBM Correct Selec. x3-7453.



This list includes all non-academic jobs currently available on the MIT campus. Duplicate lists are posted on the Women's Kiosk in Building 7, outside the offices of the Special Assistants for Women and Work (10-215) and Minority Affairs (10-211), and in the Personnel Office (E19-239). Personnel Interviewers will refer any qualified applicants on all biweekly jobs as soon as possible after their receipt in Personnel.

- Persons who are NOT MIT employees should call the Personnel Office on extension 3-4251.
- Employees at the Institute should continue to contact their Personnel Officers to apply for positions for which they feel they qualify.
- Dick Higham 3-4278
- Pat Williams 3-1594
- Carolyn Scheer 3-1595
- (Secretary - Ann Perkins)
- Virginia Bishop 3-1591
- Mike Parr 3-4266
- Ken Hewitt 3-4267
- (Secretary - Joy Dukowitz)
- Sally Hansen 3-4275
- Levis Redding 3-2928
- Richard Cerrato 3-4269
- (Secretary - Jenni Leibman)
- Sponsored Research Staff, Biochemical Technologist, to participate in biochemical/biophysical study of lens cataract formation (Physics Dept.). Techniques include column chromatography, gel electrophoresis, spectroscopic assays, optical mixing spectroscopy and computational methods. Bachelor's degree in a basic science required. Laboratory experience, organization skill and technical flexibility preferred. D76-204.

Sponsored Research Staff, Research Analyst, in the Center for Policy Alternatives, a multidisciplinary academic center conducting research in various current issues. Will work on several sponsored projects in the areas of manpower markets for scientific, technical, engineering and professional personnel; collect data and develop time-series and cross-sectional data bases; econometric analyses of supply and demand factors; develop models for forecasting labor market behavior. A Bachelor's degree, a strong background in economics with experience in developing econometric models is required, as well as familiarity with labor economics and strong written and oral communications skills. D76-220 (11/17).

Admin. Staff, Programming Analyst, in the Information Processing Center User Services Group to 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. A bachelors degree, or equivalent, strong experience with large time-sharing systems, PL/I, Fortran and system control languages required. Communications and documentation skills necessary. A76-49 (11/17).
Academic Staff, Technical Assistant, in Biology Department Microbiology/Biochemistry laboratory studying the molecular biology of mutagenesis. Activities include growth of bacteria and phage, isolation of mutants, running gels and columns, isolation of plasmids, pouring plates, use of Ames Saomonella/microsomal screen for detecting carcinogens as mutagens and other lab operations. Will be involved in laboratory organization and will be responsible for ordering basic lab supplies. A Bachelors or Masters degree in microbiology/biochemistry is required. C76-21 (11/17).
Admin. Staff, Investment Real Estate Officer, in the Treasurer's Office to direct the development and management of M.I.T.'s investment real estate holdings; oversee the managing agents of investment real estate; represent the Institute in tenant relations; provide staff and management support to activities for developing, purchasing, selling and leasing investment real estate. A Bachelor's degree and experience in both real estate development and management at a senior level is required (ten or more years of such experience is desirable.) Familiarity with Cambridge and Boston real estate markets desirable. A76-48 (11/10).

Admin. Staff, Facilities Inventory Auditor, in the Office of Facilities Management Systems. To act as central source of information about room function, intensity of use, physical configurations by field-checking all M.I.T. facilities. Duties include interaction with departmental space administrators; assisting in decision making regarding room use; recording of field data for future audit; preparation of data for machine coding. A Bachelor's degree, or equivalent experience, a thorough knowledge of buildings from a buildings services and occupants' perspective is required, as well as the ability to read and scale measurements from floor plans. Position will be full time for approximately the first year and, thereafter, full time for 6 months each year. A76-47 (11/10).

Sponsored Research Staff, temp., in the Joint Center for Urban Studies to conduct independent computer programming and analysis of census and other data in connection with Center research of metropolitan and national housing needs. Extensive experience in designing, coding, debugging and operating Fortran required. Experience in housing data gathering and analysis helpful. Temp. for 3-4 mos. D76-217 (11/10).

Sponsored Research Staff in the Center for Cancer Research to assist in experiments on RNA tumor viruses and chemical carcinogens; maintain cell cultures and assay virus; carry out other general biochemical procedures; assist in maintaining supplies and equipment. Bachelor's degree in Biology required. Experience with cell culture or microbiology required. Laboratory experience helpful. D76-218 (11/10).

Secretary V, in Leadership Campaign District Office. Will handle varied duties to support activities of volunteer solicitors. Compose own correspondence; arrange extensive travel for District Officers; coordinate data collection and prepare solicitation reports; maintain computerized solicitor assignment system; type various material from shorthand and machine dictation. Excellent secretarial skills, including shorthand, are required as well as executive secretarial experience and the ability to work independently. Candidates must also be able to work occasional overtime. Non-smoking office. B76-590 (11/10).

Secretary V, in Humanities Department to handle all general and secretarial duties for the Foreign Language and Literature Section. In conjunction with part-time secretary, will maintain records; answer student inquiries; arrange meetings; collect information for headquarters and prepare all class materials for German and French language and literature subjects (type, duplicate, etc.). Excellent German reading and typing skills, competency in French are required, as well as a command of the English language. Organization and general secretarial skills, secretarial experience also necessary. B76-591 (11/10).

Secretary IV, in the Medical Department Nursing and Surgical Service to provide reception and secretarial support to Nursing Service and Surgical Service. Type correspondence, reports, surgical notes, arrange travel; answer phones; schedule surgery with local hospitals; arrange patient admissions and discharge. Excellent general secretarial and organizational skills required. Secretarial experience in a busy setting also necessary. B76-595 (11/17).

Secretary IV, part-time, to handle general secretarial duties for three Mathematics Department faculty members. Will type a large volume of technical material (manuscripts, class material); answer phones; arrange travel. Technical typing experience, ability to work under pressure required. 20 hr/wk. 1pm-5pm Mon. through Fri. B76-598 (11/17).

Secretary IV, part-time, in the Dean for Student Affairs Office will act as departmental "floater" secretary; perform general secretarial duties; type various material; answer phones; schedule appointments; interact with students, faculty and staff. Good typing skills and telephone manner, sensitivity and tact in dealing with people, flexibility to respond to direction from more than one person is required. 20 hrs/wk. B76-603 (11/17).

Secretary IV in Resource Development's Leadership Campaign Office to provide general support: arrange appointments; travel; compose correspondence; type from machine dictation. Requires excellent typing, organizational skills; ability to set priorities and work independently. At least 2 years experience necessary. College background plus MIT experience preferred. B76-602 (11/17).

Secretary/Library Asst. IV, in the Dewey Library to perform general secretarial duties for the Head Librarian; maintain supplies; prepare student payroll; answer phones; assist at the public service desk and in processing specialized materials. Good typing skills, flexibility for changing assignments, ability to handle details with accuracy required. Formal secretarial training preferred. Library experience desirable. Position includes occasional evening or weekend work on a prearranged schedule. B76-593 (11/17).

Secretary IV-V, part time, to the Director, Office of Facilities Management Systems and a small group involved with internal and external use of MIT's computerized space accounting system (INSITE). Will type; arrange travel; maintain accounts; prepare payroll reports; assist in organizing conferences and in editing a newsletter. Excellent secretarial skills, 3-5 years experience, ability to work independently required. Shorthand/speedwriting and machine transcription skills preferred. This is a job-sharing position. 20 hrs/wk. 1pm-5pm. B76-441.

Secretary III-IV, in Mechanical Engineering. Will independently answer routine inquiries; monitor accounts; arrange conferences and social meetings; prepare course materials, correspondence, reports including some technical material; maintain student records; coordinate activities of student and faculty groups. Excellent typing, organization skills required. Shorthand skills, College and secretarial training preferred. B76-592 (11/17).

Science and Engineering. Will handle varied duties: act as receptionist; arrange meeting and luncheons; maintain supplies and files; pick up and deliver materials at various MIT locations; type forms, memos, correspondence. Typing skills, ability to work under pressure required. 40 hr/wk. B76-594 (11/17).

Sr. Clerk III/IV, Chemistry Department headquarters, will assist in various accounting procedures; type forms, correspondence; maintain records; verify time sheets for payroll reporting as well as budget information for proposals. Typing skill and facility with figures required. B76-599 (11/17).

Clerk III in Accounts Payable section of Comptrollers Acctg. Office. Will apply discounts to invoices; apply payments to purchase orders, audit invoices; prepare listings of outstanding commitments. Compute totals on processed invoices and prepare records for keypunching. Ability to work with figures as well as proficiency in use of adding machine required. B76-335.
Sr. Clerk III, in Aeronautics and Astronautics to handle all aspects of payroll reporting; distribute petty cash; handle purchasing and payment procedures; assist in financial report and budget preparation. Formal training in accounting or equivalent experience required. Facility with detailed work, command of English language required. Non-smoking office. B76-596 (11/17).

Clerk III, in Physical Plant to operate a Computer Console which monitors mechanical and electrical aspects of the Institute environment. Duties involve communications with Work Control Center, Heat and Vent, and others by telephone, radio page and other means. Respond to alarms and emergencies; handle related clerical procedures. Typing skill, command of English language required. Work experience in a physical plant department (or equivalent), familiarity with HVAC Control systems (electrical and pneumatic) helpful. Ability to react effectively in emergency situations necessary. 40 hr./wk. Position occasionally involves an irregular schedule. B76-600 (11/17).

Sr. Clerk III in the Admissions Office to process applications; maintain records; coordinate procedures with secretaries in MIT academic departments; answer correspondence and other student inquiries. Good typing skill, accuracy with detail required. Some college training helpful. B76-569.

Clerk Typist II-III, part-time in the Industrial Liaison Program to handle general typing assignments: mailing labels, bibliographies, and other materials. Excellent typing skill required. 15 hr./wk. B76-601 (11/17).

Computer Operator IV, in the Laboratory for Nuclear Science. Will operate IBM 360/65 Operating System; perform all phases of batch processing installation, maintain log of software and hardware malfunctions; assist in resolving related problems; perform necessary maintenance functions (i.e. clean tape drives) Ability to operate the IBM 360/65 Computer Complex including Console without supervision, knowledge of HASP and OS Operating Commands required. 40 hr./wk. 4pm-midnight B76-597 (11/17).

Stock Clerk, hourly, in Electrical Engineering and Computer Science. To unpack goods, inspect for quality; pack good; disperse electronic instruments; set up and maintain academic teaching laboratory stations. Experience and knowledge of stock required. Knowledge of electronic stock desirable. 40 hr/wk. H76-117 (11/10).

Waiter/Waitress, hourly, part-time in Faculty Club to set tables, take orders, serve food and beverages on banquet trays, clean and reset tables; dust chairs; wipe tables. Experience helpful but not necessary. 11:00am-3:00pm, Mon-Fri. Some evening and weekend work may be required. H76-124 (11/17).

The following positions were still available at Tech Talk deadline. The date following each position is the date of the most recent Tech Talk issue in which the position was described.

- ADMINISTRATIVE STAFF:
- A75-71, Documentation Manager, Admin. Info. Systems (7/14)
- A76-19, Systems Planner, Info. Processing Serv. (7/14)
- A76-37, Dir. MIT Educ. Council, Admissions (9/29)
- A76-40, Systems Prog., Info. Proc. Serv. (10/20)
- A76-42, Programmer, Resource Planning (10/27)
- A76-43, Asst. Dir./Prog., Office of Spons. Prog. (10/27)
- A76-44, Applications Prog., Admin. Info. Syst. (11/3)
- A76-46, District Officer, Resource Devel. (11/10)
- BIWEEKLY:
- B76-204, Tech. Typist III, Res. Lab. of Elec. (8/25)
- B76-262, Admin. Asst. V, National Magnet Lab. (10/20)
- B76-334, Sec. III, Sloan School (8/25)
- B76-336, Sec. IV, Ctr. for Space Res. (8/25)
- B76-348, Sr. Clerk III, Registrar's Office (8/25)
- B76-349, Sr. Clerk III, Registrar's Office (8/25)
- B76-359, Sr. Clerk III, Devel. Office (8/25)
- B76-365, Production Asst./Sec. IV, Campus Info. Serv. (8/25)
- B76-366, Sec. IV, Humanities (8/25)
- B76-377, Sec. IV, Chemical Eng. (11/10)
- B76-391, Sec. IV, Alumni Assoc. (9/8)
- B76-400, Sec. IV, Earth & Planetary Sci. (9/8)
- B76-432, Sec. IV, Political Sci. (10/20)
- B76-438, Sec. IV, Joint Ctr. for Urban Stdy. (9/15)
- B76-470, Sec. IV, Resource devel. (9/22)
- B76-486, Sec. IV, Office of the Chairman of the Corp. (9/29)
- B76-498, Sec. IV, Biology (10/27)
- B76-511, Asst. Computer Oper. III, Office Admin. Info. Systems (10/6)
- B76-525, Sec. IV, Physics Dept. (10/13)
- B76-526, Sec. IV, Ctr. for International Stdy. (10/13)
- B76-539, Clerk III, Physical Plant (10/13)
- B76-554, Sec. IV, Chemistry Dept. (10/27)
- B76-561, Sec. IV, History of Art & Architecture (11/3)
- B76-562, Sec. III-V, Treasurer's Off. (11/3)
- B76-564, Sr. Clerk III, Registrar's Office (11/3)
- B76-568, Bookchecker II, Sci. Library (11/3)
- B76-572, Sec. IV, Biology (11/10)
- B76-576, Sec. IV, Nutrition Food Sci. (11/10)
- B76-580, Sec. IV, Aero/Astro. Innovation Ctr. (11/10)
- B76-581, Sr. Clerk III, Alumni Assoc. (11/10)
- B76-582, Sec. IV, Nutrition Food Sci. (11/10)
- B76-583, Sec. IV, Nutrition Food Sci. (11/10)
- B76-584, Sec. IV, Nutrition Food Sci. (11/10)
- B76-586, Admin. Asst. V, Mathematics (11/10)

- ACADEMIC STAFF:
- C76-6, Microbiologist, Medical Dept. (4/21)
- C76-11, Asst. Radiation Protection Officer, Medical Dept. (8/11)
- C76-13, Admin. Officer, Div. for Stdy. & Res. in Educ. (11/10)
- C76-14, Tech. Asst., Biology Dept. (9/15)
- C76-18, Nursing Super., Medical Dept. (10/20)
- C76-19, Institute Archivist, Librarian, Libraries (10/27)
- C76-20, Chemical Engineer, Energy Lab. (10/27)
- SPONS. RES. STAFF:
- D75-48, Economist, Energy Lab. (6/25)
- D75-161, Economist Policy Analyst, Energy Lab. (9/15)
- D76-17, Biochemist, Res. Lab. of Elec. (2/25)
- D76-61, Energy Economist, Energy Lab. (5/5)



TAKING CHANCES at winning a trip to a warm clime during the winter are (left to right): junior William Lasser, Professor Murray Biggs of humanities, senior Elaine Tell and junior Keith Bennett. Holding the flyer is Dr. Louis Menand, special assistant to the provost and a trustee member of the MIT Community Service Fund, beneficiary of proceeds of *The Trip*—a lottery sponsored by the Quarter Century Club. Trips offered this time include San Juan, Santo Domingo and Lima, Peru. Chances—at \$1 each or three for \$2—will be sold daily 11:30am-1:30pm this week in the lobbies of Buildings 7, 10, E19, Walker and Lobdell. Philip A. Stoddard, vice president for operations will draw the winning tickets Monday, Nov. 22, at noon in the Building 7 lobby.

Holiday Schedule

MIT will be closed Friday, Dec. 24, to observe the Christmas holiday and Friday, Dec. 31, to observe the New Year's Day holiday. John M. Wynne, vice president for administration and personnel has announced. The usual pay practices applying to recognized Institute holidays will be in effect for employees providing essential services who are required to work on these holidays.

(Continued from page 3)

- D76-67, Biologist/Biomedical Engineer, Mech. Eng. (5/5)
- D76-70, postdoc. res., Physics, Lab. for Nuclear Sci. (5/5)
- D76-71, postdoc. res., Physics, Lab. for Nuclear Sci. (5/5)
- D76-84, postdoc. res., Res. Lab. of Elec. (6/2)
- D76-108, Eng. Prog., Res. Lab. of Elec. (7/14)
- D76-113, Res. Engineer, Ctr. for Trans. Study. (7/14)
- D76-115, Immunologist, Clinical Research Ctr. (7/14)
- D76-121, Res. Engineer, Energy Lab. (7/28)
- D76-123, Staff Biophysicist or Biochemist, National Magnet Lab. (7/28)
- D76-126, Immunologist, Clinical Research Ctr. (8/11)
- D76-131, Research Analyst, Ctr. for Policy Alternatives (7/28)
- D76-140, Operations & Instrumentation Manager, National Magnet Lab. (8/25)
- D76-148, Systems Prog., Lab. for Nuclear Sci. (9/15)
- D76-151, Magnet Design/Mathematical Analyst, National Magnet Lab. (9/15)
- D76-172, Chemist, Elec. Eng. (10/6)
- D76-175, Scientific Prog., Earth Planetary Sci. (10/6)
- D76-179, Programmer, Ctr. for Space Res. (10/13)
- D76-180, postdoc. res., Physics, Lab. for Nuclear Sci. (10/13)
- D76-181, coal/gas combustion res., Energy Lab. (10/13)
- D76-182, Staff Engineer, Elec. Eng. & Computer Sci. (10/13)
- D76-183, Staff Engineer, Elec. Eng. & Computer Sci. (10/13)
- D76-185, Mechanical Eng., Lab. for Nuclear Sci. (10/13)
- D76-186, Postdoctoral Scientist, Ctr. for Space Res. (10/13)
- D76-187, Postdoctoral Scientist, Ctr. for Space Res. (10/13)
- D76-188, Postdoctoral Scientist, Ctr. for Space Res. (10/13)
- D76-189, Tech. Asst., Nuclear Eng. (10/13)
- D76-198, Res. Engineer, Energy Lab. (10/20)
- D76-203, Scientific Prog., Elec. Syst. Lab. (10/27)
- D76-204, Staff Biochemist/Biophysicist, Physics. (10/27)
- D76-208, Technical Writer, Aero/Astro Innovation Ctr. (11/3)
- D76-209, Biochemist, Nutrition Food Sci. (11/3)
- D76-210, Radiochemist, Nuclear Reactor Lab. (11/3)
- D76-211, Plasma Physicist, National Magnet Lab. (11/10)
- D76-212, Fusion Reactor/Res., National Magnet Lab. (11/10)
- D76-213, Reading & Writing Specialist, Provost's Off. (11/10)

EXEMPT:

- E76-32, Admin. Asst., Microreproduction Lab. (9/15)
- E76-34, Admin. Asst., MIT Press (9/22)
- E76-35, Food Serv., Prod. Superv., Food Serv. (10/6)
- E76-37, Admin. Asst., National Magnet Lab. (10/13)
- E76-40, Systems Programmer, Info. Processing Serv. (11/3)

HOURLY:

- H76-103, Cook's Helper, Dining Serv. (10/13)
- H76-108, Campus Patrol Officer, Campus Patrol (10/20)

The following positions have been FILLED since the last issue of *TECH TALK*:

- B76-573 Cashier III
- B76-570 Sec. III
- D76-173 Spons. Res. Staff
- B76-567 Sec. IV
- B76-585 Acct. Asst. V
- B76-437 Sec. IV
- B76-571 Clerk II
- B76-565 Sec. IV
- B76-283 Sec. IV
- B76-587 Sec. IV
- B76-554 Sec. IV
- B76-559 Sec. IV
- H76-107 Tech. A (EM)
- B76-579 Clerk III
- B76-588 Sec. IV

The following positions are on HOLD pending final decision:

- B76-336 Sec. IV

Jim Dine Prints: 1970-76

(Continued from page 1)
coloring some lithographs I have. . . Prints trigger drawings for me because they seem so throw-away and so you can be cavalier with them. . . I was able to be freer not necessarily in technique but in making decisions about the content and what the thing looked like."

Dine was born in Ohio in 1935. He attended the Boston Museum School and the University of Cincinnati before moving to New York City in 1958. Developing at a time when artists were trying to break away from abstract expressionism, Dine became involved with "happenings" and multi-media "performances." He had his first one-man show of paintings at the Reuben Gallery in 1960. Identified as a "new realist," his particular concern was with everyday objects—toothbrushes, tools, clothes—given "pop" expression. His work of the '60s had sculptural and theatrical overtones which allowed him to experiment with a multiplicity of effects.

In his graphic output of recent years, there is a shift in emphasis to the human figure and self-portrait.

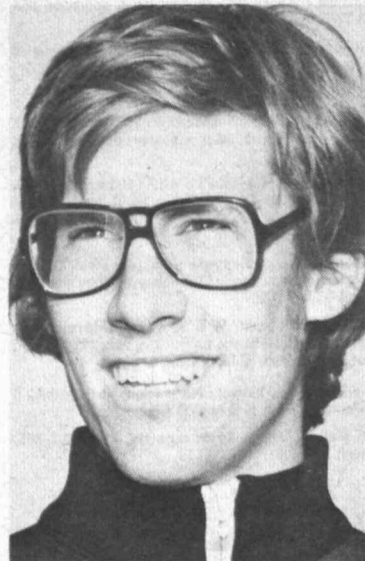
"I could keep on making variations of the tools and refining that and I'm sure that would have been fine. But it wasn't enough," Dine said when interviewed. "As long as I was being realistic, it seemed to me that I had to upgrade the content of the subject matter and instead of

the past decade.

The regulations of the state Department of Public Health were changed subsequently to permit pharmacies in the centers. The prototype medication delivery service established by the Massachusetts College of Pharmacy at the Charles Drew Family Life Center in Dorchester is the first of its kind. It is to be staffed by student interns working under the direction of MCP faculty members.

dealing with the obscure metaphor for the human figure, the tool, to deal with the human and make that metaphor go for itself, which then makes it more powerful in content."

Dine's work has been widely exhibited and is represented in many public and private collections, including those of the Museum of Modern Art and the Whitney Museum of American Art in New York City, the Tate Gallery in London, and Stedelijk Museum in Amsterdam, and MIT.



Senior Frank Richardson (Sac City, Iowa) firmly established himself as MIT's all-time premier cross country runner. His fourth place finish in last Saturday's Division III NCAA Championships at Cleveland and, two days later, a first place in the ICAAAA College Division Championships in New York City, marks the best post-season effort ever by a Tech harrier. Richardson's NCAA performance earned him a third All-American certificate in cross country and track. His gold medal finish in the ICA's marked a first for an MIT individual performer.

Pharmacy

(Continued from page 1)

H. Forbes Little, SM, Albert H. Taubman, PhD and Jonathan B. Wiesbuch, MD. They were assisted by David M. French, MD, former professor and chairman of the Department of Community Medicine at the BU School of Medicine.

The report said that pharmaceutical services were needed at the neighborhood level to enhance the compliance level of patients from inner city areas.

"Even when they were getting adequate medical care," King said, "we found that they often neglected to obtain needed drugs, even when they were provided without cost, because a pharmacy wasn't conveniently available." This was related to the fact that the number of pharmacies had declined drastically in the low-income neighborhoods during

CABLE TV SCHEDULE

November 17-23

Channel 8:

- Wednesday, Nov. 17
- 12 Noon YOU ARE THE WAY to 1pm
- 4:30 to 24-30 FPS Live with Ricky Leacock
- 5:30pm
- 5:30pm TUESDAY NOON (r) to 6:30pm
- 8:30pm 24-30 FPS to 9:30
- Thursday, Nov. 18
- 12 Noon AN EYE TO THE PAST to 1pm
- 1pm to 24-30 FPS (R) 2pm

MIT Libraries Thanksgiving Hours

Library	Wednesday November 24	Thursday November 25	Friday November 26	Saturday November 27	Sunday November 28
Aero & Astro	9 - 5	Closed	9 - 5	12 - 4	Closed
Archives	9 - 5	Closed	9 - 5	Closed	Closed
Barker Engineering	9 - 6	Closed	9 - 6	9 - 6	1 - 11
Chemistry Reading Room	10 - 5	Closed	10 - 5	Closed	Closed
Dewey	8:30 - 6	Closed	8:30 - 6	9 - 6	1 - 11
Humanities	8 - 6	Closed	8 - 6	9 - 6	1 - 11
Lindgren	8:30 - 6	Closed	8:30 - 6	10 - 6	1 - 11
Microreproduction	9 - 5	Closed	9 - 5	Closed	Closed
Music	8:30 - 6	Closed	8:30 - 6	9 - 6	1 - 11
Reserve Book Room	8 - 5	Closed	8 - 6	9 - 6	1 - 11
Rotch	9 - 6	Closed	9 - 6	12 - 6	2 - 10
Rotch Visual Collections	9 - 5	Closed	9 - 5	Closed	Closed
Science	8 - 6	Closed	8 - 6	9 - 6	1 - 11
Space Center Reading Room	9 - 5	Closed	9 - 5	Closed	Closed
Student Center	T W E N T Y F O U R H O U R S A D A Y				
Von Hippel Reading Room	9 - 6	Closed	9 - 5	Closed	Closed

INSTITUTE NOTICES

Announcements

Drop Date—Wed, Nov 24 is the last day that students can cancel subjects from their registration.

Preprofessional Opportunities—Thurs, Nov 18: New York Law School, Marcia Blecker, assistant director, will conduct small group meetings 9:30am-12n, Rm 7-141. Northeastern Law School, Prof. Richard Daynard, 1-4pm. Sign up for both in Preprofessional Advising & Education Office, Rm 10-186.

Industrial Tour—Itek Corp (Optical designers of Viking-Mars lander), Tues, Nov 23 sponsored by EECS Student-Faculty Committee. Leave MIT, 12:30pm; return 5pm. For reservations call EECS Undergrad Office, x3-7329. Rm 38-476. Space Limited.

The Nat'l Society of Black Engineers—Meeting, Sun, Nov 21, 3pm, BSU Lng.

R/O Coordinator—Those interested in applying for position next year should attend one of the following meetings in Rm 7-103: Wed, Nov 17, 4-5pm; Thurs, Nov 18, 2-3pm. Anyone unable to attend contact FAC Office, x3-6771 and leave your schedule. Salary is \$1,000.

Scheduling for Student Center—Scheduling for Spring term will begin Dec 1.

Special Students—Deadline for applications for February term is Dec 1.

Club Notices

MIT Soaring Association—Monthly meeting Thurs, Nov 18, 7:30pm, Stu Ctr Rm 491 for anyone interested in learning to fly gliders. Carl Reistroffer, parachutist, speaker; movie on soaring. Refreshments.

Religious Activities

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

MIT Vedanta Society—Meditation and discourses on the Gita by Swami Sarvagatanda, of the Ramakrishna Vedanta Society of Boston. Fri, 5:15pm, Chapel.

Echoes

50 Years Ago

Dr. Charles G. Abbot '94, recognized world authority on the subject of solar radiation phenomena, will speak about "A Life of Research." Dr. Abbot is Director of the Smithsonian Astrophysical Observatory.

40 Years Ago

The Advisory Board has forbidden card playing in the 5:15 room except during lunch hour. The ruling was provoked by a group reported playing cards in the room during regular Institute hours.

The Radio Society is to tour Bell Telephone and Telegraph Co. in Boston. They will inspect the new automatic remote control telephone transmitter.

25 Years Ago

An unsuspecting freshman opened the door of his dorm room then hastily shut it. It seems the room was stacked with newspapers from floor to ceiling. The end result was an unexpected night in a hotel for the freshman and five hours of work for three porters.

Prepared by Marsha Conroy, MIT Historical Collections, x3-4444.

TECH TALK

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