

Institute Phones Will Cut to Centrex Saturday

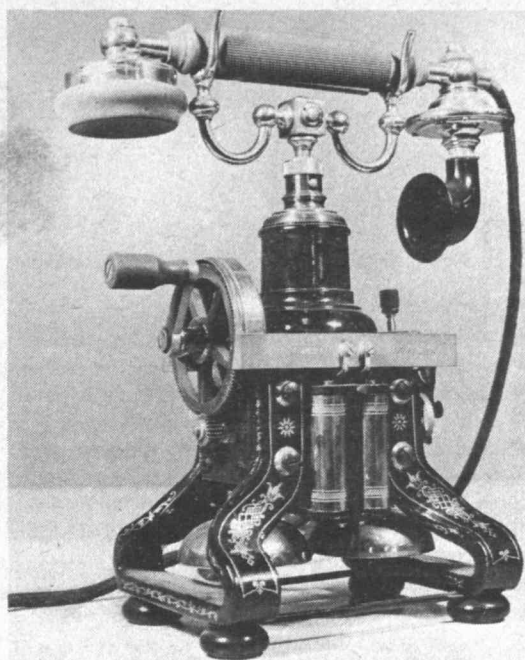
More than five years of planning and preparation will culminate this Saturday morning at 2am when MIT and Draper Laboratory telephone service is changed to the Centrex system.

MIT boasts the largest in-house phone system in the New England area with 10,000 telephones on campus plus 2,600 telephones in the residence system. The conversion to Centrex will be one of the largest single cutovers ever made in the nationwide Bell Telephone network. The change has been talked about since as early as 1957 and the order for Centrex was placed with the New England Telephone Company in 1968.

New telephone books are being distributed this week which have detailed information on the use of the new system.

One major feature of Centrex will be the necessity to use five digits when dialing within the system. All MIT extensions will be the same as they are now prefixed by a "3" and all Draper Lab extensions will be prefixed by an "8". Some Draper Lab numbers will be changed.

Direct inward and outward dialing is another feature of the new Centrex system. To reach an MIT extension directly, an outside caller will add the 253 prefix to the four digit extension and to reach a



This ornate Ericsson handset, circa 1895 is one of many in MIT's collection of historic telephones. For a history of the telephone at MIT, see page 5.

Draper Lab extension an outside caller will add the 258 prefix. The main Institute telephone number will be 253-1000 and the main Draper Lab telephone number will be 258-1000.

The outward dialing capacity of a particular telephone will depend on the type of service that instrument has been wired for. Most Institute phones will have the capacity to dial local calls directly and some phones will have the capacity to dial long distance as well as local calls directly.

The new system will retain the present capacity to transfer any incoming call to another extension within the system. It will not be possible, however, to transfer calls from an MIT extension to a Draper Lab extension or vice versa.

Calls to the present Institute telephone number (864-6900) will be intercepted after August 12 by an Institute operator who will direct callers to the proper number. This operator will not have the capacity to connect a caller with an extension and there will be no charge to the caller for reaching the old number.

There may be an outage of from one to five minutes after the 2am cutover to the new system. This interruption will not affect the Institute's emergency lines.

Forecast Projects Continued Increase of Sponsored Research

The volume of sponsored research at MIT will for the first time exceed \$200 million during the current 1972-73 year, according to a forecast by MIT's Division of Sponsored Research.

The 1972-73 year, which began July 1, will be the second in a row during which the increase in research funding has exceeded the increase in inflation, thus marking the second consecutive year in which real research growth has occurred, the forecast said.

The annual forecast—made just before the start of each fiscal year to assist the university in financial planning and management—is based on detailed reports and estimates from each of MIT's departments, interdepartmental laboratories and centers and special laboratories. The forecast for this year was made by Frank R. Stevens, director of the MIT Fiscal Planning and Budget Office, and Robert M. Dankese, assistant director. In past years such projections have proved to be accurate to within a few percentage points.

According to Paul V. Cusick, Vice President for Business and Fiscal Relations, several factors are responsible for increased federal support for research at MIT this year. Not the least of these is continued inflation which forces up the cost—and, hence, the required funding—for on-going research projects. Equally important, however, is the fact that research areas undergoing rapid expansion at MIT—biology, nutrition and food science, bio-engineering, medical and health studies and studies having to do with the environment including the oceans and space—coincide with areas in which the federal government recently has been increasing its funding levels.

According to the forecast on-

campus research is projected at a level of \$75,832,000 for 1972-73, while the two large laboratories, Draper Laboratory and Lincoln Laboratory, are forecast at \$60,000,000 and \$71,599,000 respectively—a total of \$207,431,000.

When the effect of major subcontracts are excluded, the resulting figures represent significant increases over the research funding level of the previous year, 1971-72. The on-campus volume contained in the forecast is approximately 13 percent higher than in the 1971-72 volume; the Draper Lab forecast is about nine percent higher than the 1971-72 volume, and the Lincoln Lab forecast represents an increase of nearly six percent. The salaries and wages component of the total MIT research volume forecast is estimated at a seven percent increase over 1971-72.

The forecast for the School of Science showed the largest increase in on-campus research, the estimate for 1972-73 totaling \$18,204,000 compared with \$15.8 million last year. Within that school two departments—Biology and Nutrition and Food Science—had larger increases forecast than the others. Biology is estimated at \$4.6 million for 1972-73 as opposed to \$3.9 million last year, while Nutrition and Food Science is forecast for \$4.3 million this year compared to \$3.1 million last.

Four interdepartmental laboratories also showed significant increases in forecast. The Artificial Intelligence Laboratory is forecast at \$1.6 million compared to \$1.1 million a year ago, the National Magnet Laboratory is estimated at \$4.2 million compared to \$3.2 million last year, the Laboratory for Nuclear Science is at \$6 million compared to \$4.9 million, and the new Program in Health Sciences and Technology is

forecast to jump from \$60,000 last year to \$2 million this year. However, the \$2 million includes major subcontracting to Boston area hospitals.

The research forecast for 1972-73 reveals several shifts in the sources of funding. While the percentage of total research funds coming to MIT from the federal government has increased slightly, from 84 percent of the total on campus research budget in 1971-72 to 86 percent this year, there have been changes in support within the government.

Department of Defense funding of on campus research, for example, will be down somewhat over 16 percent in 1972-73, accounting for only 17 percent of the campus total this year compared to 22 percent in 1971-72. This is partly due to the National Science Foundation assuming support of the National Magnet Laboratory and the Materials Science and Engineering Center previously

(Continued on page 2)

Physical Plant Staff Changes Announced

William R. Dickson, director of Physical Plant, has announced several changes in the Physical Plant staff assignments.

Miles P. Cowen, formerly superintendent of building maintenance, has been appointed assistant director of the Physical Plant for special services. In his new position, Mr. Cowen will coordinate a number of existing plant services and assist Mr. Dickson in developing new service-oriented programs.

Paul F. Barrett has been appointed superintendent for engineering and construction and will head the newly formed Engineering and Construction Division of the department. The new division will consolidate the design and construction sections of the department and be responsible for all Plant-related engineering and design. In addition, it will be responsible for the management of all construction carried out at the Institute. Mr. Barrett was former-

ly construction manager in Physical Plant.

Henry J. Leonard has become superintendent for support services. Formerly personnel officer for the department, Mr. Leonard will coordinate the activities of the building services and grounds sections of the department. He will continue to hold responsibilities for Physical Plant operations on the West Campus.

Theodore M. Doan, Jr., formerly assistant superintendent of building services, has been appointed manager of building services. He will be responsible for the operations of the Building Services Section, including custodial operations, watch service and mail service.

Conor Moran, formerly manager of Kresge Auditorium, has been appointed manager of the Student Center, Kresge and the Chapel. In this capacity he will be responsible for the day to day supervision of these West Campus facilities.



Is Lincoln Laboratory under siege? Not really. See story on page 7.

—Photo by Marc PoKempner

Civil Chamberman

Any time he wants it, John Frederick Collins has our vote. He is, as we learned in the course of a chat with him last week, a man of many hats—former Mayor of Boston, professor of urban affairs (consulting) at the Sloan School of Management, and most recently new president of the Greater Boston Chamber of Commerce. We congratulated him upon his latest office. "Oh, I wasn't at all overjoyed," he replied waving us into a chair. "But the nominating committee brought my name in and I thought it might be a chance to bring together some new perspectives on problems of the greater Boston area. I'd already taken a hand in introducing a Task Force approach to certain sorts of problems as a way to get new people and new views into the Chamber's program."

The phone rang. Professor Collins has the silver hair and silver tongue of one's very picture image of the ideal politician and also the uncommon grace of making a visitor feel downright privileged by the calibre of the phone calls that interrupt his visit ("Mr. Attorney General. Hello, Bob, how are you?") Notes are made. A frank and penetrating glance begs ones pardon while an important message is sent briefly to another. "Now then, where were we? Oh yes, the Chamber Task Forces. Well, there are three of them and I thought they might help the Chamber in several ways. First of all there's that old dreary image of a Chamber of Commerce being filled up with a lot of business types, tycoons and that sort of thing. The Task Forces, in addition to bringing a number of disciplines to bear on urban problems, are also a good way to get interaction among people with various backgrounds. Each one has about 30 members—minority groups, labor, League of Women Voters, a sprinkling of academics. The theory being, and I think it's a sound one, that interaction and the exchange of views on matters of genuine importance breed tolerance and understanding. People come to see that businessmen are concerned about more than the bottom line and businessmen in their turn come to realize that there are some pretty smart people in other walks of life. The second point I'd like to make about the Task Forces is that they are not institutional. The members can present their own personal views. For example, one man on the Urban Affairs Task Force happens to work for the NAACP in Boston, but he doesn't represent his organization to the Chamber. He's just a good man."

Professor Collins' secretary entered at this point to remind him he was to give a talk that evening and tell him what he was to speak on. She fished a folder out from under a stack of papers. "Oh, yes," said Professor Collins, glancing at it. "I haven't had the chance to look at it all day." We marveled out loud at the politician's capacity to speak at the drop of a hat. "Thank the Lord," Professor Collins agreed. "If I had to write down everything I said I'd never get anything done."

We had admired the speech Professor Collins gave upon his inauguration as 48th president of the Chamber at its 1972 annual meeting, particularly, we told him, his emphasis on "civility", not a word generally conspicuous in political discourse these days.

"Well it was a different sort of speech," Professor Collins admitted. "I remember that after I gave it, a fellow came up and said 'only you would have lectured them like that.' Civility is one of the most important public virtues. Without it it is nearly impossible for people to make enough sense to resolve conflicting claims. We have done genuine discourse in this country a grave disservice—and I'm afraid I must put a large share of the blame for it on our more liberal elements—by a sort of wholesale insistence on rights, without regard for the rights of others. This has exacerbated the situation of our cities, which isn't the best in any case, by raising expectations that can't actually be delivered on. It is a problem of our society as a whole, of course, but particularly of cities, if only because some 70 per cent of the population now lives in urban areas. When people are frustrated they tend to turn on the nearest symbol of authority.

"One of the reasons so many well-intentioned programs don't work in fact is that they are aimed at improving only one aspect of the system, and thus ignore the interrelationships that are inevitably present. Cities are trade-offs, and the public needs to become more aware of this. There are no utopias. But suppose utopia was possible. Suppose in fact you could deliver on all of the political promises and create a city with fair streets and no crime, the best cultural attractions, schools, housing, low taxes, progressive social amenities, and so on. Why, everyone would want to live there. And the sudden influx of all those new people would swiftly drive the city's living standard down to the point where people would start to flee.

"What we need," Professor Collins continued, warming to this aspect of his subject, "what we need—and what I must confess I was unaware of myself when I was coping with daily crises in the Mayor's office—is a new kind of decision-making process that can take account of the long-run effects of our short-run policies. This is why I'm working with Jay Forrester. I have hopes that the digital computer can help supplement the way we think about what have become, after all, terribly complex problems. It is not that our political system is wrong, or that politicians are venal, but rather that the social fabric is so complexly interwoven that the decisions we could make some years ago no longer work the way they used to. We all use mental models to make decisions, but our models are incomplete. If you get ten people together, you get ten different, incomplete, mental, models. Even if you can get a consensus it may not help much because the short-range good may entail a long-run evil. We could do a lot to promote this sort of approach to problem solving, and I think incidentally that the Chamber is going to make quite a contribution this way, if we could all be a bit more civil with each other as we work out new approaches. I'm all for civility."

So were we, we told Professor Collins as we left. It put us in mind of two lines from Yeats's *Prayer for My Daughter*, and we thought them appropriate to a prayer for our cities as well: How but in custom and in ceremony/Are innocence and beauty born?"



SAY IT WITH FLOWERS goes the old slogan. Bob Marcusson of IPC Magazines in London did just that to thank Heddy Richter at the Reference Desk in the Libraries for her help in locating some information he needed very quickly. Knowing only that the book he wanted concerned both ecology and economy, Mr. Marcusson called from England to seek help from the Reference Desk in finding either the name or the author. After a concerted search Miss Richter came up with Dennis Meadows' *The Limits to Growth*, and Mr. Marcusson sent the flowers in thanks.

—Photo by Margo Foote

Minority Fellowships Announced by Ford

The Ford Foundation has announced the award of 12 new or continuing fellowships to members of minority groups who are doing graduate work at the Institute.

The fellowships are divided into three categories: Advanced study awards, doctoral fellowships and ethnic study dissertation fellowships.

MIT Research Outlook Good

(Continued from page 1)

funded by DOD. NSF funding will be increased 56 percent, now accounting for 22 percent of the total budget this year as opposed to 15 percent last year.

Funding from the Department of Health, Education and Welfare has also increased. HEW funding is forecast up 29 percent in 1972-73, accounting for 19 percent of the total research budget this year compared to 15 percent last.

According to Mr. Stevens, underrecovery of indirect costs is estimated to be \$648,000 in 1972-73 compared with \$968,000 estimated in 1971-72.

"We like to think this means that MIT is beginning to get its message across to sponsors that the direct costs of a contract or research program by no means completely cover the total costs incurred by the Institute," Mr. Stevens said.

"I would also like to point out that our forecasts, which are gathered from information provided by the departments and laboratories, can be out of line here and there and still be counted on to generate an overall accurate picture of the level of research at MIT in the coming year. On the whole the estimates are usually accurate within a very few percentage points."

Students receiving new fellowships include: Harold W. Gray, foreign languages and literatures; Keith Hinch and Glenn C. Loury, economics; and Karen Maze Carter, political science.

Continuing fellowships were awarded to: Michael Hartwell, Shirley Jackson and Ronald McNair, physics; Nilda Martinez and John R. Williams, chemistry; Richard E. Winstead, economics; and Linda Sharpe, political science.

Morris Lounds, a doctoral candidate in political science, received an ethnic study dissertation fellowship.

Ex-NASA Workers Must Report

Former employees of the National Aeronautics and Space Administration (NASA) now employed by the Institute are required by law to report their present employment.

Reports must be filed on NASA form 1480 by the November 15th following the close of each fiscal year.

The following categories of former NASA employees are exempt from filing requirements:

1. No former or present employee is required to file a report for any year prior to fiscal 1971.
2. No former employee is required to report for a fiscal year during which he was employed by or served as a consultant or otherwise to an aerospace contractor at a salary rate of less than \$15,000 per year.

Forms for filing reports are available at the personnel office of the NASA installation where the employee was last employed. Questions about NASA employee status should be referred to Richard Hughes at Ext. 4274.

Sea Grant Publishes Report

A report on the geology, geochemistry and geophysics of marine resources has just been published by the MIT Sea Grant Program.

Written by Howard S. Lahman, research assistant in the Department of Ocean Engineering, and Joseph B. Lassiter, III, instructor of ocean engineering, the report is titled *The Evolution and Utilization of Marine Mineral Resources*. It provides an overview of the marine environment from the geological perspective and discusses a variety resource exploration techniques including geochemical, gravitational, magnetic, electrical, and oceanographic methods currently in use.

The authors stress, in their introduction, the need for economic analysis of the potential recovery of mineral resources from the sea. "The presence of enormous resources within and beneath the sea does not guarantee that these resources can be exploited economically in the immediate future," they warn. "Too often pundits of marine resources totally ignore maxims of economics such as the laws of supply and demand... Because there has been little development of marine resources... each resource problem must be regarded as unique and examined on its own merits. We further feel that the analysis must be multidisciplinary since any project will require, at the bare minimum, consideration of engineering, transportation and economics. At the present time, most marine resources are, at best, only approximately competitive with land-based resources."

TECH TALK
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Mail subscriptions are \$5 per year. Checks should be made payable to Bursar, MIT, and mailed to the Business Manager, Room 5-122, MIT, Cambridge, Mass. 02139.

Please address all news and comment to the editorial office, Room 5-111, Ext. 3277. (Ext. 3-3277 after August 12).

UVDC Begins Testing

Heavy showers interfered with initial testing of vehicles entered in the Urban Vehicle Design Competition which began Monday in Milford, Michigan, but did not dampen the spirits of some 500 students associated with the competition.

More than 60 cars from as many colleges and universities were on hand at the General Motors proving grounds as rain washed out acceleration, braking and handling tests scheduled for the first day of the week-long competition. Both entrants and organizers, however, remained optimistic about the results of the competition.

"The number of vehicles that actually made it here has been a pleasant surprise," said Martha Morris, a law student at the University of Pennsylvania and a member of the UVDC coordinating committee.

"Almost 80 teams were registered before the race, but we really didn't expect more than about 40 to show up."

"We're also happy about the quality of the cars that made it. Almost all of them are the result of more than a year of effort on the part of the teams, and they represent every conceivable type of automobile."

Internal combustion engines are the most popular power source, Miss Morris said, but steamers, electrics, hybrids and turbines are also represented in the competition. Many of the cars were built from the ground up, and all have special safety features to go with low pollution emissions.

A brochure describing the MIT vehicle is available in the Information Center, Room 7-111.

MIT's Wankel-powered entry was among those scheduled to be tested Monday, but completed only three tests—handling, noise and consumer cost—before the rain delayed further testing. "We did reasonably well in those tests," reported Mike Martin, a senior from Bedford, Indiana, "finishing in the top quarter in all three. But it's too soon to tell what the overall standings will be. The pollution emission test, scheduled for Tuesday night, will be the major determining factor."

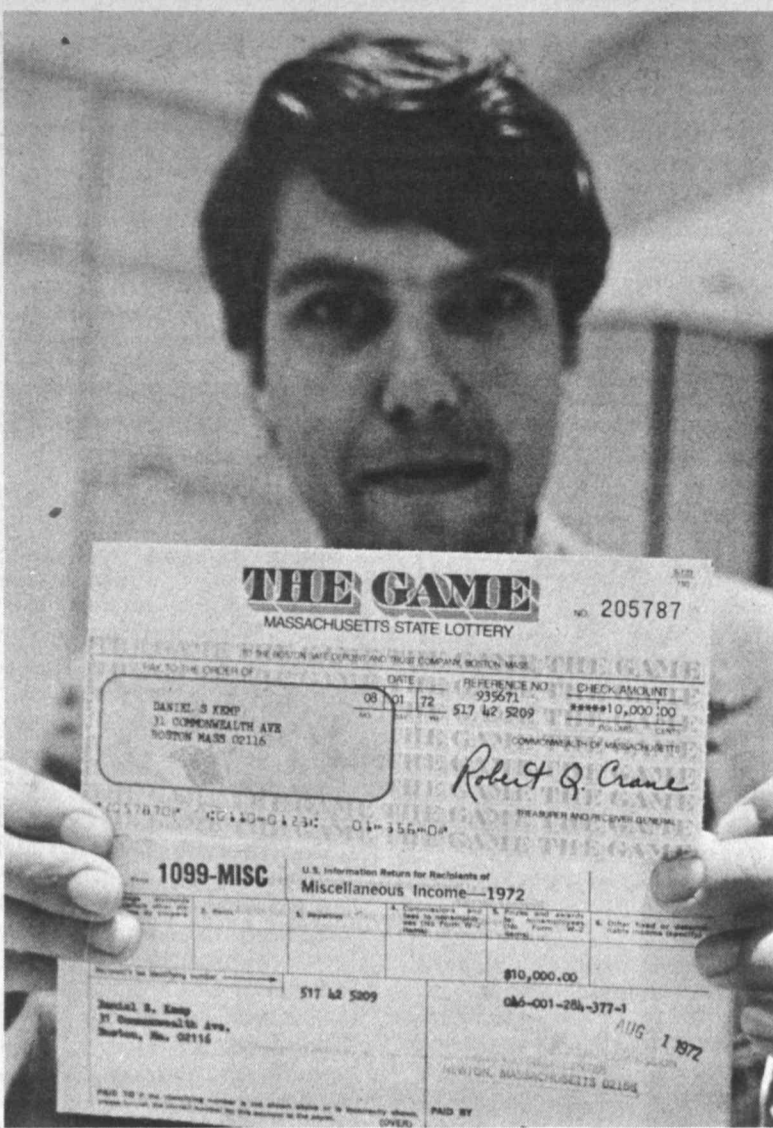
Testing will continue through Friday, when the coordinating committee will use a complex formula combining scores in performance, safety, cost, and exhaust emissions to determine the overall winner. Awards in minor categories such as emissions and safety will also be given.

MIT Hosts Workshop for Plant Managers

The Association of Physical Plant Administrators is holding its 14th annual workshop on the MIT campus this week.

The workshop is being attended by over 70 college and university Physical Plant administrators from the east coast. A similar meeting will be held at the University of California at Santa Barbara for administrators from western states.

The workshops are being conducted by physical plant personnel and representatives from industry, academic staff and consulting firms. Some of the speakers featured at the workshop include



Professor Kemp displays his check—together with its tax form.

—Photos by Margo Foote

Million Dollar Drawing Yields Kemp \$10,000

Dr. Daniel Kemp, associate professor of chemistry, is \$10,000 richer this week thanks to his luck in the Massachusetts Lottery.

Professor Kemp was one of 80 semi-finalists in the million dollar drawing held in the Grand Ballroom of the Sheraton Boston, August 1. Pessimistic about his chances, Professor Kemp sat calmly throughout the drawing to emerge as one of only 15 persons to win more than the \$500 every semi-finalist receives.

Student Killed in Mishap

Steven Maxwell of Portland, Oregon, who completed his freshman year at MIT in June, was killed in a mountain climbing accident near his home on July 31.

Maxwell and a companion were descending the rocky north face of Kellogg Butte by rope when Maxwell apparently lost his hold and fell, only to be caught by his safety rope which tightened around his neck, investigators said.

At MIT, Maxwell was a member of Sigma Chi fraternity.

MIT's Director of Physical Plant William Dickson, Thomas Shepard, superintendent of utilities at MIT, John Fresina of the Institute Safety Office and Richard Chamberlin, Institute industrial hygiene officer.

The APPA workshop is exploring a broad range of topics, from campus landscaping to personnel management and environmental health and safety. This year's workshop is the first in a three year program designed to give a general background in the field of physical plant administration and help promote professionalism in the field.

State Treasurer Robert Q. Crane presented Professor Kemp a check for \$10,000 before a cheering crowd of more than 400. When asked what he planned to do with his windfall, Professor Kemp replied "for one thing, I promised my students a blast."

Since the beginning of the state lottery in April, Professor Kemp has bought more than 40 tickets. He had not won any other prize up until now, but considers his win last week to be a good return on his investment.

Representatives from IBM will be at the Career Planning and Placement Office on Tuesday, August 15.

Placement Interviews

The interviewers are seeking candidates for S.B. and S.M. degrees in chemistry, physics, mathematics and computer science to work as programming trainees. Electrical engineering candidates for S.B. and S.M. degrees are also sought for positions working with systems rather than hardware.

Positions offered require US citizenship or permanent visas.

Interested persons may call Miss Karen Rosa, Ext. 4733 to make an appointment.

Voters Urged to Register

Saturday, August 19, is the final day to register to vote in the September 19 state and county primary elections.

Cambridge residents may register in person at the Cambridge Election Commission, 362 Green Street, daily from 8:30am to 4:30pm. The Election Commission will be open from noon until 10pm on Saturday, August 19.

Solar Flares Are A Puzzle to Scientists

If you think the weather around Cambridge has been unseasonable, then you should see what is happening on the sun.

Solar experts are puzzled by the huge solar flares that have been produced over the past week or so. Normally, the flares are associated with sunspots that reappear in regular eleven year cycles, and were not expected at this stage of the cycle.

Practically, flares are important now, and will be more so in the future, as man spends more and more time in space, unprotected by the atmosphere. Particles from flares disrupt the ionosphere in our atmosphere, the layer that allows radio signals to be bounced over the horizon, and consequently can disrupt radio transmissions.

Also, large flares result in electro-magnetic fluctuations that can induce currents in long-distance power transmission lines, causing power surges that could trip circuit breakers. The magnetic storms that result from flares also increase the intensity of auroral displays, the colorful northern lights.

Dr. Bruno Coppi, MIT professor of physics, has been studying solar flares from a theoretical point of view, and is a member of a worldwide group of scientists interested in solar flares. His interest, he says, is "primarily that of an amateur," and is a natural outgrowth of his plasma research.

"We think," Professor Coppi says, "that the huge flares that are flung away from the sun are produced by the release of magnetic energy stored in the sun's chromosphere, the layer just under the

corona or outermost layer of the sun.

"But, there is as yet no good way to explain how magnetic energy can be transformed to produce radiation emission of the intensity and relatively short time that are typical of solar flares. Theoretically, flares should take much more time to evolve than is observed.

"A fascinating aspect of solar flares is that they emit energy over an extremely wide spectrum, from particles with billions of electron volts to emissions in the radio frequency band.

"The flare is produced in two phases. First is an explosive phase, in which bursts of high energy particles and radiation are emitted, and then a thermal phase where the chromospheric gas is heated, and during which visible light emission is prevalent."

Solar flares present a very difficult problem for study, Professor Coppi feels, about as complex as is the study of weather here on earth. "But, we are learning a great deal about this phenomenon from the theoretical and experimental research on plasmas being conducted throughout the world," says Professor Coppi.

Examination Notice

Applications for postponed final examinations and for advanced standing examinations are due Monday, August 14, in the Schedules Office, Room E19-338.



Dean Eisenberg and Miss Seelinger discuss the operations of the Dean's office.

Alice Seelinger Accepts Post in Dean's Office

Dean Carola B. Eisenberg has announced the appointment of Alice M. Seelinger as administrative officer for the Dean for Student Affairs office, effective August 14.

In making the announcement, Dean Eisenberg said, "The concerns of the Dean's office have grown in many directions in recent years. We feel that an administrative officer will be of great value in coordinating the various responsibilities of the staff for maximum effectiveness.

A graduate of Simmons College, Miss Seelinger has been at MIT for more than 12 years. Most recently

she has been administrative assistant to Vice President Kenneth R. Wadleigh. Miss Seelinger was Mr. Wadleigh's secretary during the eight years when he was Dean of Student Affairs.

"In many respects my new role will be similar to the one I held in the Dean's office before," Miss Seelinger said. "Chiefly I will be concerned with such things as the budget, personnel and inner office scheduling. However, I look forward to the opportunity of working more closely with students again."

Miss Kathryn Brownell, who was secretary to the former Dean for Student Affairs, will become Mr. Wadleigh's secretary.

THE INSTITUTE CALENDAR

August 9
through
August 18, 1972

Please notify the Calendar Editor, X3279, Rm 5-111, of any activities which have been suspended for the summer. Thank you.

Events of Special Interest

Ocean Engineering Summer Laboratory Slide Show*
Students from the Summer Laboratory will preview some of the slides and pictures taken during July, including some underwater photographs taken of the Revolutionary Warship *Defense*. Wednesday, August 9, Rm 5-314. Persons attending are cautioned that the waters in the vicinity of the wreck are very murky, hence, some people may be disappointed in the quality of the photographs.

Benefit Performance for the Vendome Fire Fund*
Tagore Society, Sangam and Stage I present the musical dance drama, *Chandalika*, and *Varsha Mangal*, by Rita Subramanian. Sunday, August 13, 6pm, Kresge Auditorium. Donation, \$1.50.

Steer Roast***
A summer get-together for members of the Silver and Quarter Century Clubs and their guests. Thursday, August 17, 5:30pm, Kresge Plaza. In case of bad weather, the gathering will be held in the Mezzanine Lounge at the Student Center.

Seminars and Lectures

Monday, August 14

Music in Persia Today*
Hormoc Farhat, chairman of the music department, University of Teheran. MIT Music Faculty. 7:30pm, Music Library (Rm 14E-109).

Women's Forum

Women's Forum**
Every Monday, 12n, Rm 10-105.

Student Meetings

Student Information Processing Board Meeting*
Every Monday, 7:30pm, Rm E39-200.

MIT Club Notes

Classical Guitar Society**
Concert guitarist Hugh Geoghegan is available for private instruction for intermediate and advanced students. Call Vo Ta Han, 661-0297.

Hobby Shop**
Open weekdays, 10am-4:30pm, duPont Gym basement. Fees: students \$6/term, community \$10/term. Call X4343.

Tiddlywinks Association*
Every Monday, 8-11:15pm, Student Center Rm 491.

Classical Guitar Society**
Special summer lessons for beginners, group and private. Mondays and Tuesdays. Call Vo Ta Han, 661-0297.

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

Outing Club*
Every Monday, Thursday, 5pm, Student Center Rm 473.

MIT/DL Duplicate Bridge Club**
Every Tuesday, 6pm, Student Center Rm 491.

Fencing Club**
Every Tuesday, 6-9pm, duPont Fencing Rm.

Beginning Mandarin Classes**
Chinese Students Club. Lectures on Tuesdays, 7:30-9pm; recitations on Thursdays, 7:30-8:30pm; through August 17. Rm 3-442. Admission \$5.

Glee Club**
Every Tuesday, Wednesday, Thursday, 5-6:30pm, Kresge. New members, especially tenors, welcome. Call Cyril Draffin, 247-8691.

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

Urban Vehicle Design Competition
Volunteer meetings. Every Wednesday, 3pm, Rm E40-250.

Nautical Association**
Basic Sailing Shore School, repeated every Wednesday throughout the summer, 5:15pm, Sailing Pavilion. Non-members welcome.

Science Fiction Society*
Every Friday, 5pm, Student Center Rm 421.

Student Homophile League*
Meeting and mixer meets Fridays, 8pm, Odd Fellows Hall, 536 Mass Ave, Cambridge. For gay help (anonymous) at MIT, call the student gay tutor, 492-7871 anytime.

Chess Club**
Every Saturday and Sunday, 1:30-5:30pm, Student Center Rm 491.

Social Events

Muddy Charles Pub**
Join your friends at the Muddy Charles Pub, 110 Walker, daily 11:30am-7:30pm. Call X2158.

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

Movies

It Conquered the World and King Kong vs. Godzilla**
LSC. Saturday, August 12, 7 and 10pm, Rm 10-250. Tickets 50 cents. Must show ID.

Farz*
Sangam. Saturday, August 12, 7pm, Rm 26-100. Admission free.

Judo Man**
LSC Kurosawa Retrospective. Sunday, August 13, 8pm, Rm 10-250. Tickets 50 cents. Must show ID.

To be announced*
Film Society. Monday, August 14, 8:30pm, Rm 10-250. Tickets \$1.

Last Year at Marienbad*
Modern Fiction Film Series. Tuesday, August 15, 7:30pm, Rm 10-250. Admission free.

Music

The Music Library will be open from 9am to 10pm every Monday during the summer.

Theater and Shows

Variety Cultural Program*
Sangam. Sunday, August 13, 7:45pm, Kresge Auditorium.

Dance

Folk Dance Club*
International folk dancing. Every Sunday, 7:30-11pm, Sala de Puerto Rico (exceptions to be posted).

Summer Dance Classes*
Dance Workshop. Beginning modern, Tuesday and Thursday, 12n-1:30pm; beginning ballet, Tuesday and Thursday, 3:30-5pm; intermediate/advanced modern, Monday and Wednesday, 7-8:30pm. McCormick Gym. Admission \$1.75/class. Hannah, 492-4583.

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

Modern Dance**
Tuesdays and Thursdays, 7-8:15pm, McCormick Gym.

Folk Dance Club*
Every Thursday, 7:30-11pm, Sala de Puerto Rico.

Friday Afternoon Dance Break*
International folk dancing on the Kresge Oval, every Friday (weather permitting), 12:30-1:30pm.

Exhibitions

Photography Exhibition*
An exhibit of photographs by local photographers including David Akiba, Roz Gerstein, Lawson Little, Mary Kay Simqu, Sean Wilkinson and others. Hayden Corridor Gallery through August 26. Free.

Autographed Music Scores
Exhibition of autographed musical scores in honor of Klaus Liepmann and the Choral Society. Music Library (Rm 14E-109) through the summer.

Hart Nautical Museum*
"Ocean Engineering Summer Laboratory Projects 1971 and 1972." Bldg 5, first floor.

Religious Services and Activities

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

Roman Catholic Mass*
Every Sunday, 10:30am, Chapel. Special Holy Day masses, Tuesday, August 15, 8am in the Chapel and 12:05pm in Kresge Auditorium.

Divine Light Mission*
Discourses on the direct experience of Truth given by Guru Maharaj Ji. Every Monday, Wednesday, Friday, 7:30pm, Rm 4-145. Call 369-1603 (Concord).

Ananda Marga Yoga Society*
Group meditations. Every Tuesday, 5pm, Rm 14E-303. For information, call X3664.

Christian Bible Discussion Groups*
Every Thursday, 1pm, Rm 20B-031. Call Prof. Schimmel, X6739, or Ralph Burgess, X2415.

Islamic Society Prayers*
Every Friday, 12n, Student Center Rm 402.

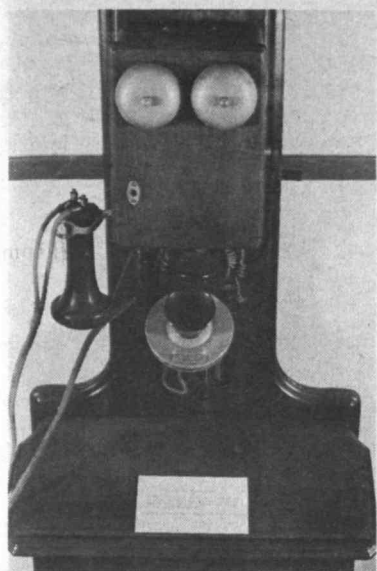
Announcements

Society of the Sigma Xi certificates may be picked up daily from 2-5pm in Rm 5-230.

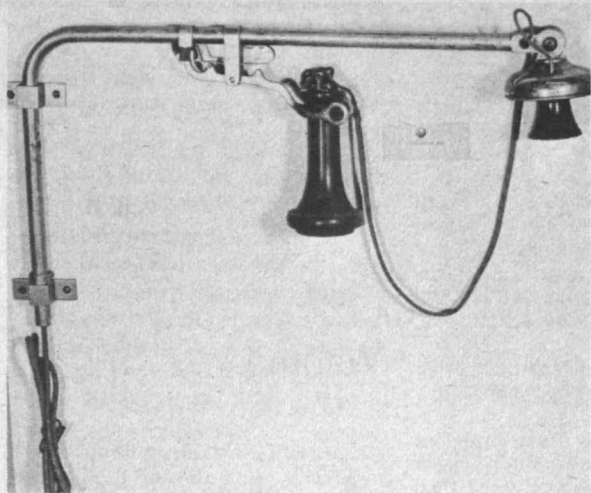
Group for New Parents*
Those interested in forming such a group may get further information from Adelle or Richard, 661-8690.

*Open to the Public
**Open to the MIT Community Only
***Open to Members Only
†Freshmen encouraged to attend

Send notices for August 16 through August 25 to the Calendar Editor, Room 5-111, Ext. 3279, by noon Friday, August 11. Note: after August 12, call Ext. 3-3279.



Wall telephone, circa 1900.



Transmitter arm.



Dial telephone, 1908.



Cast brass desk stand, 1895.

MIT and the Telephone

The conversion to the Centrex telephone system will be one of the most significant single changes in more than 90 years since the Institute has had telephone service, according to Morton Berlan, Communications Officer.

The telephone was invented in Boston and this area continued to be the focus of its development until the American Telephone and Telegraph Company moved its laboratory to New York in 1917. On June 3, 1875 Alexander Graham Bell first transmitted speech over wires in his laboratory at 109 Court Street, now the site of the John F. Kennedy Building.

It wasn't until March 10, 1876, however, that the first intelligible words were spoken over wire. The now famous words of Professor Bell, "Mr. Watson come here, I need you," marked the invention of a workable instrument for transmitting and receiving voice communications. This historic event took place at the home of Professor Bell at 5 Exeter Place—just a few blocks from the MIT campus then near Copley Square.

The first telephone was installed at the Institute when "Technology" was located in the Roger's Building in Back Bay around 1881. The one telephone, located in the office of President Francis Amassa Walker, was handled by Julia Comstock, assistant in the office of the president. President Walker refused to use the instrument.

Telephone service developed slowly at the Institute but in 1890 arrangements were made with the New England Telephone and Telegraph Company to have a line installed between the Rogers Building at Copley Square and the Engineering Building at Trinity Place. The telephone company built and maintained the line for \$50 per year "this sum not to include care of bells and instruments."

By 1910 the Institute's telephone—387 Back Bay—had six trunk lines and 66 telephones. The cost of maintaining telephone service was the subject of a memo sent to department heads by President Richard Maclaurin in October of 1910. In the memo he said, "Amongst the numerous 'minor' expenses which by addition add so largely to the financial load of the Institute, the outlay on telephones is one that seems to be growing steadily."

In 1909, 44,000 calls were charged to the Institute. This compares to the 382,000 message units charged to the Institute this past May alone.

At the dedication of the new Cambridge campus on June 15, 1916 the telephone played a prominent role. At those ceremonies, Alumni President Charles A. Stone said, "Perhaps the most marvelous of all the achievements of

science is the power to transmit the human voice 3,000 miles and more. The courtesy of the American Telephone and Telegraph Company had made it possible for us to speak this evening, not only to alumni and guests in Boston, but also to the alumni gatherings in 34 cities in different parts of the United States."

Mr. Stone then introduced Mr. J.J. Carty, chief engineer of the American Telephone and Telegraph Company who explained briefly the nature of the demonstration. He also said that it was especially fitting that it should be Tech men who participated in it since the telephone owed more to MIT than to any other institution.

A recent history of the telephone at the Institute cannot be complete without discussing the contributions of Professor Carlton Tucker of the Electrical Engineering Department. Professor Tucker was recognized as an authority on telephone communications and made a substantial contribution to the Institute's phone service.

It was Professor Tucker who devised the block number system which was necessary with extended service and the dial system which was to come in 1942. It wasn't until 1938 that the Institute telephone book carried extension numbers. Up until that time there were few enough telephones and people that the operators simply had names by each plug on the switchboard.

The system which Professor Tucker developed assigned telephones in a department a number in the hundred series corresponding with the course number. For example, Civil Engineering, Course I, numbers were 100's. Dialing 100 would reach the department headquarters. The head of the department customarily had the next number, 101, in the example cited. Vestiges of this numbering can still be found, though no three digit numbers remain.

Professor Tucker was also instrumental in the development of the dormitory telephone system. The dorm system began operation in 1938 and some of the original equipment is still in use today.

The 1942 transition to dial service was the first major development for Institute telephone service which then had a capacity for over 2,000 phones. The switchover was made on April 11, 1942 and was the last major installation before World War II. Dial service was inaugurated when President Karl T. Compton put through the first call at ceremonies attended by representatives of both the Institute and the New England Telephone and Telegraph Company.

The 1942 transition also meant an expanded capacity—and confusion over access or tie lines to other switchboards. On March 10 a

brief memo was issued by Bursar D. L. Rhind outlining the use of tie lines and listing the seven numbers which gave telephones connected to the MIT switchboard direct access to places such as the Radiation Laboratory (431) and the Cambridge police (111).

Confusion followed the initial memo on tie lines and a subsequent communication was issued on March 17. Members of the MIT community were urged to use the tie lines whenever possible "to save time and also to save message charges."

The next major transition for telephone service at the Institute came in 1952 when phone service served over 10,000 people with 1800 telephones on MIT's Kirkland 7-6900. The 6900 number (now 864-6900) was requested by Professor Tucker because at the time the main address for the Institute was 69 Massachusetts Avenue.

The 1952 telephone improvement expanded the capacity of Institute telephone service, provided 24 hour operator service and required 4 digit dialing.

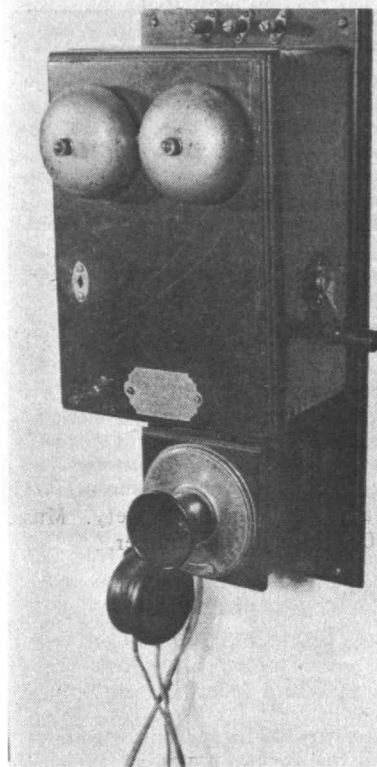
On January 26, 250 representatives of Bell Telephone Company and MIT were on hand at Huntington Hall (Room 10-250) to inaugurate the new service. A call was placed by the president of New England Telephone and Telegraph Company Joseph Harrell to Institute President James Killian attending a meeting of the MIT Club of Southern California in Los Angeles.

Mr. Harrell recalled that "telephone progress can be traced back to the technological skill demonstrated in the research that has been carried on by so many young Americans from schools like MIT."

One of the final contributions Professor Tucker made to Institute telephone service before his death in 1966 was the design of the Institute information switchboard. Using his design the information operator, apart from the regular operators, could connect a caller directly with his desired extension. This system bypassed the time consuming step of having a caller transferred back to the main operators to have his call completed.

The conversion to the Centrex system this weekend represents the most significant change in telephone service at MIT since 1942 according to Mr. Berlan. The new system will provide MIT with modern switching apparatus, number identification which will allow direct outward dialing and direct inward dialing.

Even though the new system will require fewer operators, none will lose her job because of the transition. The switchover has been anticipated for some time and operators who have retired or left in the past few years have been replaced by part time help—mainly students.



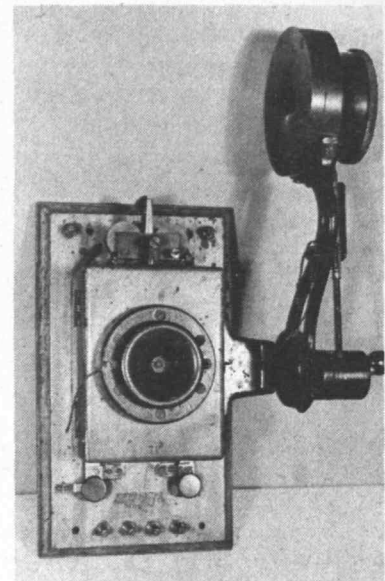
Wall telephone introduced in 1891.



Wall mounted series.



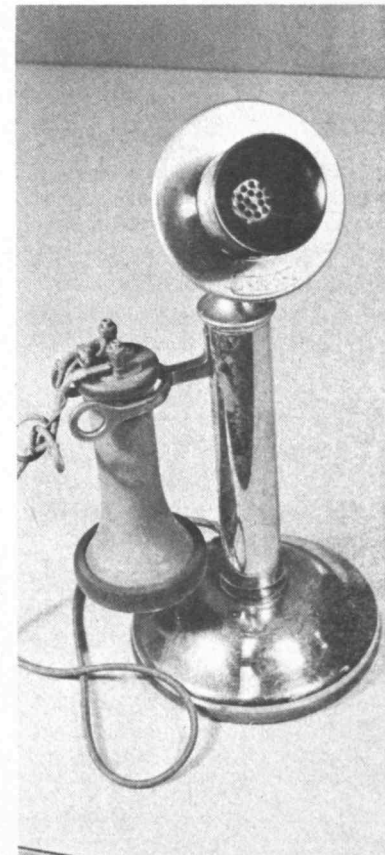
Dial equipped desk stand, 1920.



Edison transmitter with chalk receiver.



Combined set with pull-down dial.



Desk stand, 1908.



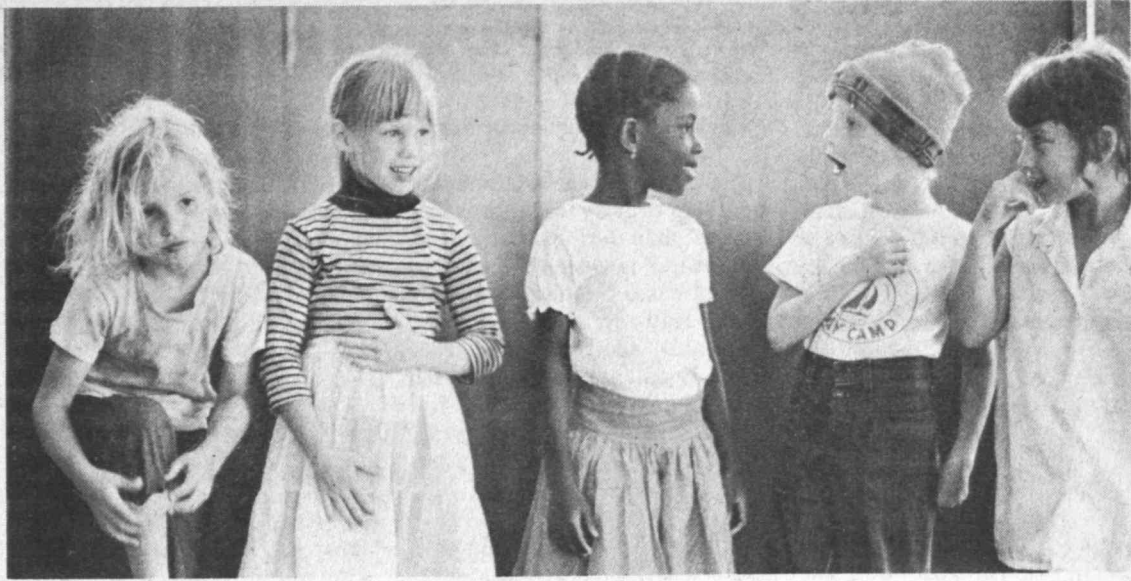
Campers Parody TV

Popular television shows were parodied during last week's skit show at the Day Camp.

At left, Amy Blackburn happily struggles with her costume as she and her group prepare to do their version of "Let's Make A Deal."

On the right are a group of the Ants—the youngest campers. Dressed in a motley assortment of costumes, they parodied "Petticoat Junction." Left to right, they are: Antonia Benney, Shannon Brooks, Betty Lihau, Sarah Cliff and Mara Zelain.

—Photos by Margo Foote



Lincoln Man Donates Prize Winning B25 Model to Smithsonian Institution

Eleven years of dedication to a painstaking hobby will pay off in a kind of immortality for William F. Harney next week when he delivers his scale model of an American B-25 bomber to the Smithsonian Institution in Washington, D.C.

Harney, who works in Lincoln Laboratory's illustration service, is donating the model at the museum's request. It will be the only representative of the B-25 in the Smithsonian's huge collection of technological memorabilia.

The prize-winning model is an exact scale replica of the famous flying fortress of World War II. Its metal skin—hammered out of multilith plates—is fastened to the frame with 80,000 hand-punched rivets. The instrument panel in the cockpit contains a complete set of tiny dials and switches and a working internal lighting system. All access hatches and canopy windows, as well as ailerons and rudder trim tabs, are fully operable. Using a three-guide-wire system and small motors hidden inside the mock cowl, it can fly at speeds in excess of 100 miles per hour.

"Most people think of model airplanes as toys that little boys and their fathers put together from kits," said Harney.

"But competitive scale modeling is a little bit more than just gluing numbered pieces together. Half of the job is research—I looked at more than 700 photographs of B-25s just to get detailed specifications."

Harney started researching the model in 1951. During the next few years he spent hundreds of hours in libraries, historical museums and government offices tracking down data. To compete nationally or internationally, each detail of the model had to be authenticated for position and scaling. More than once, he tore down the model and started over because of new findings or accidental crack-ups.

The most striking feature of the model Harney added after the B-25 was built.

"The shiny polished metal didn't look like the real planes I had seen, so I dirtied it up, chipped some paint, and added a few details," Harney explained. The details included burn marks on the wings and tail, tiny dents in the body, and

even footprints where the crew walked to the machine gun sights. The effect of these remarkable changes—all documented in photographs and exactly scaled—is almost unbelievable realism.

"When I showed the model to bomber pilots who flew B-25s during World War II, they all said it was perfect. That's when I decided to stop changing things."

The model won many regional competitions between 1962 and 1969, when it placed second in the nationals, earning Harney a position on the US team that year. For the world championships, he decided to retire the old bomber, which had poor flying characteristics, and build a new Focke-Wulf. This time it took him only 5½ months to finish the job. The model placed third in its class and top in the world in scale points.

The request from the Smithsonian came earlier this summer when Harney decided to build a Japanese Zero for next year's nationals.

"I wrote to them asking if they had a Zero that I could study, and I enclosed a picture of the B-25 so they would know that I was a serious modeler. When they wrote back, they said that they did have both a Zero and models of Zeros, but that they had nothing to represent B-25s, and they asked me to donate my model."

Harney will go to Washington August 15 to give the plane to the museum.

"After 11 years of building and another ten of fiddling, I'll still be sorry to see it go. But the Smithsonian is a good place for it, and I have to start working on the Zero."

Caution Can Prevent Spills

Erratic water pressure is a major cause of laboratory flooding, according to John Fresina of the Safety Office.

Flooding is a constant problem around the Institute and can be dangerous as well as a nuisance. A flow of water is often used in experiments as a coolant and disruption of the flow can cause serious problems and even ruin experiments.

The water pressure in the Cambridge area increases from about 40 pounds per square inch during the day to about 65 psi after 5pm. The connections between the water faucet and experiment should be clamped at all times and especially if the experiment is to run into the night to prevent them

Smith Plays Key Role in Olympic Crew Choice

If the eight-oared and four-with-coxswain squads on the US Olympic rowing team bring home gold medals from Munich in September, much of the credit will belong to the supporters of a national rowing camp for selection of the squads.

"The selection of the rowing team for this year's games was a very controversial matter," according to Ross H. Smith, MIT director of athletics and chairman of the organizing committee for the national camp.

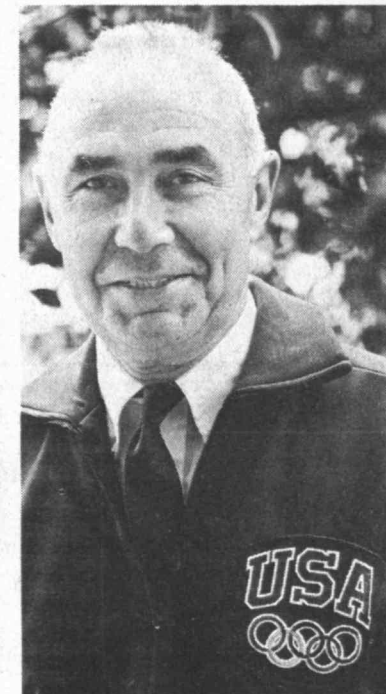
In the past, US oarsmen were chosen on the basis of open trials, with the best crews from clubs and colleges competing. The winning squads were kept intact for the Olympics. This is the first time that a camp has been set up to judge individuals rather than teams and pick a truly "national" squad.

"The weight of tradition is behind choosing experienced crews as a whole rather than the most talented individuals. So we compromised and selected individuals for eight-oared and four-with at the camp, and left the crews for the other five rowing events to be selected on a team basis in open trials."

US eights had won gold medals in all but one modern Olympiad but in 1968, they limped home last in the finals. Professor Smith and other members of the US Olympic Rowing Committee for 1972, which assembled soon after the Mexico games in 1968, realized that European rowing powers were leaving the US astern and took steps to reverse the trend. In addition to the usual rowing development subcommittee, which Professor Smith also chaired, the committee began debating the change in selection

procedures. When the compromise decision was reached, plans began for a national camp to test individual rowers rather than crews.

The actual selection process started last fall when Olympic head coach Harry Parker of Harvard and his assistants re-



Professor Smith.

—Photo by Margo Foote

viewed more than 400 oarsmen and 80 coxswains from all parts of the United States. Of those, 49 oarsmen and ten coxswains were invited to attend the four-week camp at Dartmouth College in Hanover, New Hampshire, during June and July. There, each man was examined for style, strength and endurance. The final 18 who made the squads were chosen on the basis of the coaches' subjective judgement.

Immediately after the camp, the eight and four-with crews went to Munich for the West German championships. The eights won, setting a new course record in the process.

"Those results were very pleasing to us," said Professor Smith, "but the newspapers immediately made our crew into the favorites. That may be overly optimistic, but we're all hoping for at least one gold medal."

Professor Smith is also the manager of the US rowing team and will travel with the squad to Munich. "I don't have anything to do with coaching. My job is administrative—making travel plans, keeping track of equipment, and getting people to the right place at the right time." The team will assemble in Washington for a presidential reception at the White House, then fly to Germany. The games start August 26.



The B-25 comes into scale in this photo with modeler, Bill Harney.

—Photo by Marc PoKempner

CU Notice

Members of the MIT Federal Credit Union are asked to report any changes of home or office addresses to Mr. Otenti at the Credit Union Office, Room E19-601.

Davidson Conceives Alternative to Building Second Panama Canal

With a pint-size bathtub-like model and an HO gauge railroad, Frank Davidson, a Senior Research Associate at the Urban Systems Laboratory has devised a possible alternative to building a second Panama Canal.

The idea is too new yet even to qualify as a proposal. If built the device would be able to handle ships as large as the 65,863-ton Queen Elizabeth II, floating them in an enormous bathtub which would be pulled on a special railroad across the isthmus of Panama. Mr. Davidson's idea could represent a solution to the environmental, economic and political problems of building another Panama Canal.

Mr. Davidson was founder of the Channel Tunnel Study Group whose proposal for a \$1 billion

tunnel between England and France has now been approved by the British and French governments.

A similar system already exists, Mr. Davidson says. The system to transport the large Saturn booster rockets used for the Apollo moon shots is comparable in size to the one he proposes for ships.

Ship railways were first used by the ancient Greeks across the isthmus of Corinth several hundred years before Christ. The Russians now are reported to have a ship railway system which will transport ships of up to 6,000 tons, but that system handles ships dry-dock fashion and only for short distances.

Mr. Davidson is aware that most people will take one look at his model and condemn it as being impractical because of its size and cost. He believes, however, that there is the possibility that a facility similar to this could be built, and built at less cost than another canal. No fundamentally new technology would be necessary to build a ship railway, just applying what we already know on

a much vaster scale, according to Mr. Davidson.

The impact on the environment for a ship railway would probably be less than for another canal, especially if nuclear devices were used for canal blasting. Politically a ship railway might be more acceptable, too, since numerous international agreements govern the building of canals but few govern ship railways.

A railway system for ships would not necessarily be limited to use in Panama. In 1971, after more than \$50 million had been spent on the Cross Florida Barge Canal, President Nixon halted work on the project on the recommendation of the Council on Environmental Quality. Mr. Davidson believes that there are systems other than a canal which might have better suited the situation.

Mr. Davidson is now working on the details of the idea with Michael Telson, a graduate student in electrical engineering who helped build the model. One of the problems they foresee is the tremendous pressure the roadbed for such a project would have to endure.

Mr. Davidson does not refer to

his model as a project or even a proposal. Although he believes it might be feasible, he created it as a "conversation piece" designed as a catalyst to a more creative approach to macro engineering problems. Mr. Davidson feels that engineering projects require consultation with other disciplines in order to understand all the possible implications.

"There are several different ways to accomplish an objective such as transporting ships across an isthmus," Mr. Davidson says. "The full spectrum of feasible solutions should be explored."

"Grandier things have been built," he says pointing to the grand canal of China and the Dutch Zuyder Zee project. The China canal has been working for over 2000 years and is the world's largest. The Zuyder Zee project is a massive effort to dam the inland water ways of the Netherlands in the continual battle against the intrusion of the sea.

Mr. Davidson says his idea is in the very preliminary stages. It would take at least five years to study fully the advantages, disadvantages, cost and implications of such a project.



Mr. Davidson poses with a model of his bathtub-like alternative to a second Panama Canal. --Photo by Margo Foote

Friends Are Confused by Identical Triplets



LOOK ALIKES (left to right): Carol Grossman, Claudia Liebesny and Cheryl Coomber. --Photo by Margo Foote

When Cheryl Coomber moved out of Eastgate last August, some people in the building didn't even realize she had left because her sister Carol Grossman moved in a short time later.

Cheryl and Carol are sisters and both work at the Institute. So does a third sister, Claudia Liebesny. What makes it confusing is that the three sisters are identical triplets.

Cheryl is working at Draper Laboratory, Carol is working in the chemistry department at the Institute and Claudia is secretary to Robert Davis, director of the office of Personnel Relations.

The triplets have all come to work at the Institute "by coincidence more than anything else," according to Claudia. Claudia and Carol's husbands are attending graduate school here and Cheryl's husband is on the staff at Lincoln Lab.

Cheryl's husband David also received his S.B., S.M. and the Engineer's degree in electrical engineering from MIT. Claudia's

husband, John, is doing graduate work in electrical engineering, too, but Carol's husband, Jerry, is completing requirements for his Ph.D. in mathematics.

Claudia, who received a B.A. in history from Rhode Island College, says that the only problem she has had is running into people in the hall who think she is one of her sisters. When she does not recognize them, she says, they sometimes feel hurt.

Her sisters agree. Cheryl, who is working at the Institute only for the rest of the summer at a job she has held for three years, is studying history at Boston University. Carol received her B.A. in English Literature from George Washington University.

Cheryl was the first to come to the Institute. She arrived four years ago when her husband began his graduate studies. Two years later Carol came when her husband enrolled for graduate work. Last year the triplets were reunited when Claudia and her husband arrived.

Write On Responses Are Sought

The results of the *Write On* effort to expand communication between the Institute and its employees have been less than expected, particularly in the past six months according to the Office of Personnel Relations.

Write On, a paper form, was introduced early in 1971 as a method of receiving suggestions or criticisms from all Institute employees. One reason for the lack of response was thought to be inaccessibility of the forms. However, personnel representatives distributed additional copies to all departments during the bi-weekly salary review in March. *Write On* forms should now be available in an obvious place in each headquarters office.

People in the Personnel Office are hopeful that more employees will take advantage of this opportunity to speak up. Although personnel representatives are available to discuss all personnel matters, inquiries through *Write On* may be made on any subject. Responses to specific questions are coordinated through appropriate departments to assure definitive answers.

How to Use CENTREX Service at MIT

To make calls for:	Dial:
Campus telephones	3 + four digits
Local area telephones	9 + seven digits
Directory assistance	
Campus	3 + 1300
Local area	9 + 411
Toll calls using credit cards, etc.	190*
Telephone trouble	3-3654
Emergency	100
Campus Patrol	3-2996
C.S. Draper Laboratory	182 + five digits
Lincoln Laboratory	181 + four or three digits
Linear Accelerator	183 + three digits
Dormitories	180 + four digits

How to Use CENTREX Service at C.S. Draper Laboratory

To make calls for:	Dial:
Laboratory telephones	8 + four digits
Local area telephones	9 + seven digits
Directory assistance	
Laboratory	0
Local area	9 + 411
Toll calls using credit cards, etc.	190*
Telephone trouble	0
Emergency	100
MIT	182 + five digits
Lincoln Laboratory	182 + 181 + four or three digits
Bedford Flight Facility	183 + three digits

* From a limited number of telephones—dial 9 + desired number.