













# This Is MIT 1966-67

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Technology Bulletin



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# **This Is MIT**

## **1966-67**

Massachusetts Institute of Technology Bulletin



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This booklet about the Massachusetts Institute of Technology has been written especially for students who are considering their choice of a college or university. It describes many features which M.I.T. has in common with most schools—features which assure a complete college experience in an environment which fosters fellowship and growth. More important, however, are the many qualities described here which set M.I.T. apart, by which the Institute provides a unique intellectual experience especially relevant for an era when modern technology will increasingly affect all our lives.

You may want to prepare for a career in engineering, science, architecture, management, or the humanities; you may plan to become a lawyer, doctor, teacher, minister, or public servant; or you may have as yet no particular career in mind. But whether you seek a challenging undergraduate education with outstanding opportunities for preprofessional work or a more general education founded in science, you should know more about M.I.T.

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INSTITUTE OF TECHNOLOGY



# This Is MIT

The Massachusetts Institute of Technology is a private, coeducational institution with about 3500 undergraduate students, 3500 graduate students, and a teaching staff of over 1500. The Institute was founded in 1861, when science and engineering were beginning to alter the character of industry, commerce, and the arts. Its founder envisioned for M.I.T. a new form of higher education, in which the foundations of a professional life could be combined with and contribute to a liberal education, to the enrichment of both. His view was prophetic, and the Institute remains devoted to the concept of a truly liberal education in the environment of modern technology, a special kind of learning uniquely relevant to the central problems of our age.

Thus M.I.T. today is far more than a school teaching scientific and engineering subjects. It is a modern university devoted to science, engineering, architecture, management, and those social sciences and humanities—such as economics, psychology, political science, philosophy, and linguistics—that relate most di-

rectly to modern technology. M.I.T.'s growing breadth is an essential response to the deepening influence of modern technology on every domain of contemporary human affairs; in a very real sense the Institute is a literal expression of the unity of present-day society.

Science and mathematics are central in M.I.T.'s educational plan. They represent a discipline of mind and way of thought; in all teaching at the Institute there is a strong sense of the quantitative and the analytical, a critical analysis of cause and effect, a demand for precision, and a powerful curiosity about things not understood. This singleness of method and diversity of interest assure for M.I.T. students important qualities of intellect and creativity, and they make possible an unusual interdisciplinary dialogue which embraces the entire campus from architect to metallurgist, political scientist to engineer.

Also central in the Institute's educational philosophy is an unremitting emphasis on fundamentals and on self-reliance. M.I.T. has always sought to give its students a superb

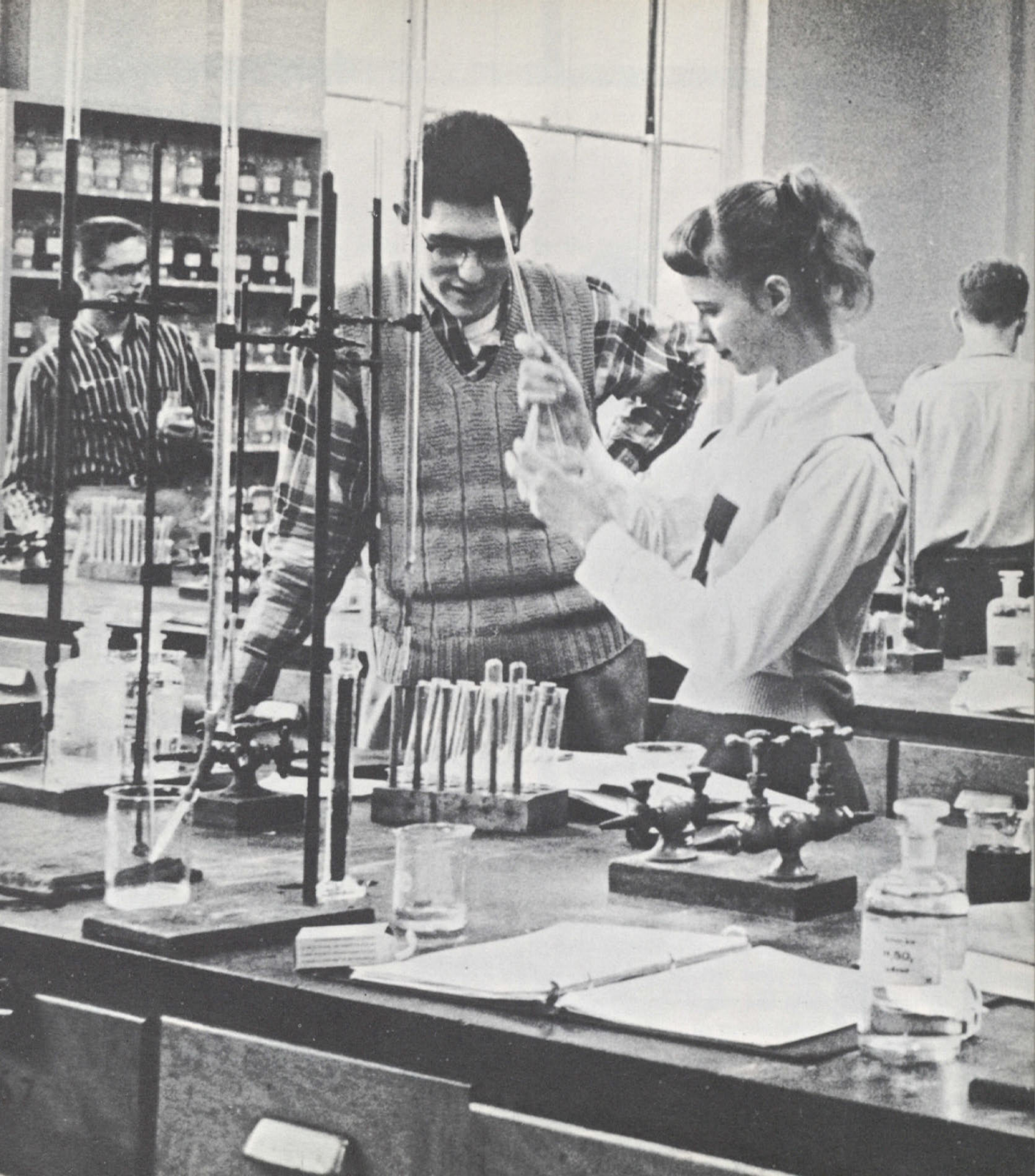
command of basic principles, versatility of mind, keen insight and perspective, and the habit of continued learning. The faculty believes that such an education is the best foundation for continuing professional achievement in a fast-changing world which places superficial knowledge of techniques and facts in constant jeopardy of obsolescence.

At the same time, the Institute has sought to foster in its students those qualities of intellect and character which distinguish truly educated men and women.

In short, its purpose is to send forth graduates of highest professional competence, with the breadth of learning, the understanding, the respect for moral values, and the qualities of leadership needed to deal creatively with the increasingly complex problems of our society.

There is growing evidence that many undergraduates are coming to M.I.T. in the belief that—whatever their ultimate professional goals—this kind of preparation will serve them well in an age so powerfully influenced by the social and practical implications of science.









# Undergraduate Education

Today M.I.T. offers bachelor's degrees in 25 "Courses" (the name given at M.I.T. to organized undergraduate curricula) in architecture, seven fields of engineering, three fields of the humanities and social sciences, management, and five fields of science. These curricula are largely unspecialized, flexible, and open-ended, giving students basic professional competence without focussing on technical detail. There is also undergraduate teaching in six other fields in which only advanced degrees are offered. The fields in which undergraduate and graduate Courses are given at M.I.T. are described in the next section of this booklet.

Students who enter M.I.T. share a basic desire to study further in science and mathematics, but every student who comes here should be prepared to examine all fields of knowledge with an open mind. No student is required to choose an area of major concentration until the end of his sophomore year, although many do so at the end of their freshman year. This arrangement affords the opportunity for

early concentration by the student who has settled on a particular Course, and, simultaneously, it provides time for other students to explore their interests and abilities before making a decision.

## **Elective Opportunities**

M.I.T.'s educational plan gives students freedom in planning their academic programs that is unusual if not unique in professional education.

Each undergraduate completes a group of basic requirements in mathematics (two terms), physics (two terms), and (except for students in architecture) chemistry (one term); and he completes at least the minimum program in the humanities and social sciences which is described on page 13. While meeting these requirements, each student is assured an opportunity to study in three fields of science of his choice (while meeting the Science Distribution Requirement) and to participate in one laboratory subject (while meeting the Laboratory Requirement).

In addition, each student completes the program of studies specified for the Course in which he is

enrolled. Typically this program includes certain required subjects which, taken in a prescribed sequence, provide a firm foundation for professional development. At the same time, these departmental programs provide considerable flexibility so that each student can study professional subjects which suit his own interests, background, abilities, and future goals.

Although many of the subjects in the normal curricula are specified, students are not required to take work in which they are already proficient. Such students may enter with Advanced Placement Credit, may take Advanced Standing Examinations for work studied elsewhere or on their own, or may make other substitutions in curricula where appropriate.

In sum, the Institute's educational plan is one which assures an excellent foundation for professional achievement and yet retains unusual freedom for every student to explore many avenues of possible interest and to meet his own particular needs, whether they be broad or narrow.

### **Faculty Advisers**

Every student at M.I.T. has a faculty adviser who helps him to choose his program and watches over his progress. Each freshman adviser has only twelve to fourteen students—so adviser and student can get to know each other well.

The Freshman Advisory Council tries to assign each freshman to an adviser in the field in which he is interested, but sometimes this is not possible. In the upperclass years, however, after he chooses his major, each student is assigned to an adviser in his department.

Thus at every stage there is a member of the faculty to whom the student can turn as counselor and friend. Many alumni remember M.I.T. especially in terms of the faculty members who were their advisers.

### **Freedom and Responsibility**

M.I.T.'s policy is to have as few rules and regulations as are consistent with its academic purposes. The students have great freedom, and with it a commensurate responsibility for selecting their academic programs and for running their own affairs.

### **The Scope of Teaching**

Teaching and research at M.I.T. closely support one another. "The faculty member who spends most of his time somewhere on the edges of

human knowledge," one professor has said, "spends the rest of it talking to students. Even in the most elementary classes there is a steady filtering through of the newest knowledge." The curricula are continually being changed to take account of new advances and new viewpoints.

M.I.T. supports a single faculty, and there is little separation between the undergraduate and graduate schools. Most undergraduates complete the necessary prerequisites and take some subjects at the graduate level before completing their undergraduate degrees. A number of the undergraduate programs continue directly to the simultaneous award of both Bachelor's and Master's degrees. It is essentially impossible for undergraduates at M.I.T. to exhaust the educational experience available to them in their areas of interest.

Scientific discovery and engineering innovation are each in their way arts, requiring imagination as well as knowledge. Actively creative themselves, the M.I.T. faculty are keen to encourage creativity in the student. Among the opportunities for independent study and research under faculty guidance are seminars on research topics offered as electives in the freshman year and laboratory projects in the upperclass years which are often parts of larger M.I.T. research programs. In addition, many

seniors do these—independent study and research under the guidance of the faculty. Some of the most advanced equipment in the country is available for undergraduate projects, including high-energy Van de Graaff accelerators, electron microscopes, a nuclear reactor, several high-speed computers, and many other powerful tools. M.I.T.'s excellent libraries are also a vital source of support for teaching and research.

### **Humanities and Social Sciences**

Future engineers and scientists must understand the problems of the world and their place in it as human beings. They must be able to communicate effectively, using both the spoken and the written word. And they need a sense of the purpose and importance of the humanistic disciplines. With these objectives in mind, M.I.T. has developed an integrated program of studies in the humanities and social sciences in which every undergraduate participates in each of his four undergraduate years. Each student must devote no less than 20 per cent of his academic program to study under this program, and many are able to take even more work in the humanities while completing the requirements of a professional Course.

(There are also, of course, several curricula in which students focus their major attention on study in the

humanities or a social science. These Courses, in humanities, economics, and political science, are described in the next section of this book).

The general humanities program for all undergraduates is built upon first-year study of the Greek and European traditions. During the second year, each student chooses two subjects in the area of twentieth-century history and social science or in literature and philosophy. During the final two years of undergraduate work, each student studies at least one humanities or social science subject in each semester, choosing from over 175 electives given in the School of Humanities and Social Science. These subjects fall into ten fields:

Economics  
History  
Labor Relations  
Literature  
Modern Languages: French, German, and Russian  
Music  
Philosophy  
Political Science  
Psychology  
Visual Arts

Each student may choose humanities electives from any of the ten different fields, but he must proceed to some depth in one. The following four groups are typical combinations of subjects which M.I.T. students

majoring in architecture, engineering, management, or science might select in humanities during their junior and senior years:

Problems in Contemporary Philosophy  
Architecture: 1750 to the Present  
Phenomenology and Existentialism  
Philosophy of Science  
  
Introduction to Music  
Modern Poets: Yeats, Eliot, Stevens, and Williams  
Literary Analysis  
Myth and Symbol in Western Literature  
  
History of Engineering  
Current U.S. Defense Problems  
Postwar U.S. Defense Policies  
Politics, Society, and Policy Making  
  
Seventeenth-Century French Literature  
Economic Principles I and II  
Comparative Economic Systems

### **Out-of-Classroom Learning**

M.I.T. is not easy. Both the faculty and students work hard. Yet M.I.T. offers more than a challenging curriculum, for the Institute does not expect its students' learning experience to take place only in the classroom and laboratory or as they prepare homework every night. In extracurricular activities each stu-

dent, depending upon his own personal inclinations, may find at M.I.T. a wealth of informal educational experience—in student government, hobby and professional clubs, music, and athletics. The athletic program is designed to encourage the widest possible participation, and a large proportion of the students are active in intercollegiate or intramural sports. The students are responsible for their own government in the fraternities and undergraduate houses, and an Institute-wide structure of committees represents the student body as a whole. Student publications include a weekly newspaper, an engineering journal, a humor magazine, and a literary review. An FM-AM radio station broadcasts daily. There are a vigorous dramashop and a variety of musical activities—the Choral Society, the Symphony Orchestra, the Concert Band, the Glee Club, the Logarithms (barbershop), and the Techntonians (jazz). There are also the annual Tech Show, a musical review, and the productions of the Gilbert and Sullivan Society. Altogether there are over 80 different clubs and organized activity groups.

Every student is encouraged to discover beyond the classroom within himself new skills, aptitudes, interests, and pleasures; and to discover values which may not be so apparent in the context of the curricular program.

### **Women at M.I.T.**

Many people are surprised to learn that M.I.T. is coeducational, that there are now more than 300 women enrolled, half of them undergraduates. The Institute encourages women to apply here, recognizing that many women today want to plan professional careers; and coeds with strong and realistic professional motivation can expect challenging opportunities and a rewarding experience.

Physics and mathematics are the most popular major fields among the present group of undergraduate women, though twenty of the Institute's twenty-two departments have women enrolled. More than half of the women completing Bachelor's degrees here continue into graduate training at M.I.T. or elsewhere.

All undergraduate women who do not live at home have accommodations in McCormick Hall, a new on-campus dormitory with excellent facilities for residence and for social activities. It provides a unique opportunity for girls to share real academic interests and professional goals with colleagues from many different backgrounds. The size of McCormick Hall will be doubled by 1967, and the number of women attending M.I.T. can then be markedly increased.

Coeds join the extracurricular life at M.I.T. on a completely equal foot-

ing with the men; they take an active part in student government, use many of the athletic facilities, and are represented in nearly all undergraduate organizations, including the musical groups, publications, Debate Society, Dramashop, and Tech Show.

### **Religious Activities**

M.I.T. is, by charter, nonsectarian and open equally to students of all faiths. It believes that an institution which is concerned with general as well as professional education must give attention to man's spiritual life. Close to the center of the campus is a chapel of unique design which is used for worship by all faiths. The Institute welcomes the campus representatives of the various faiths to serve as Religious Counselors and provides them with offices on the campus.

### **R.O.T.C.**

The Air Force, Army, and Navy offer R.O.T.C. courses at M.I.T., and freshmen may enroll in them as part of the freshman elective program. Upon graduation, those who have successfully completed four years of R.O.T.C. classroom work and one period of summer training are commissioned as officers in the Reserves of their respective services. Opportunities for commissioning in the Regular forces are also available. The Air Force and Navy R.O.T.C. programs at M.I.T. are unique; the

Navy's is the only one in the nation producing solely "engineering duty only" officers, and the Air Force program is planned especially for science and engineering students. Air Force and Army R.O.T.C. have two- and four-year programs, with scholarships available to certain candidates in four-year programs.

### **Physical Education**

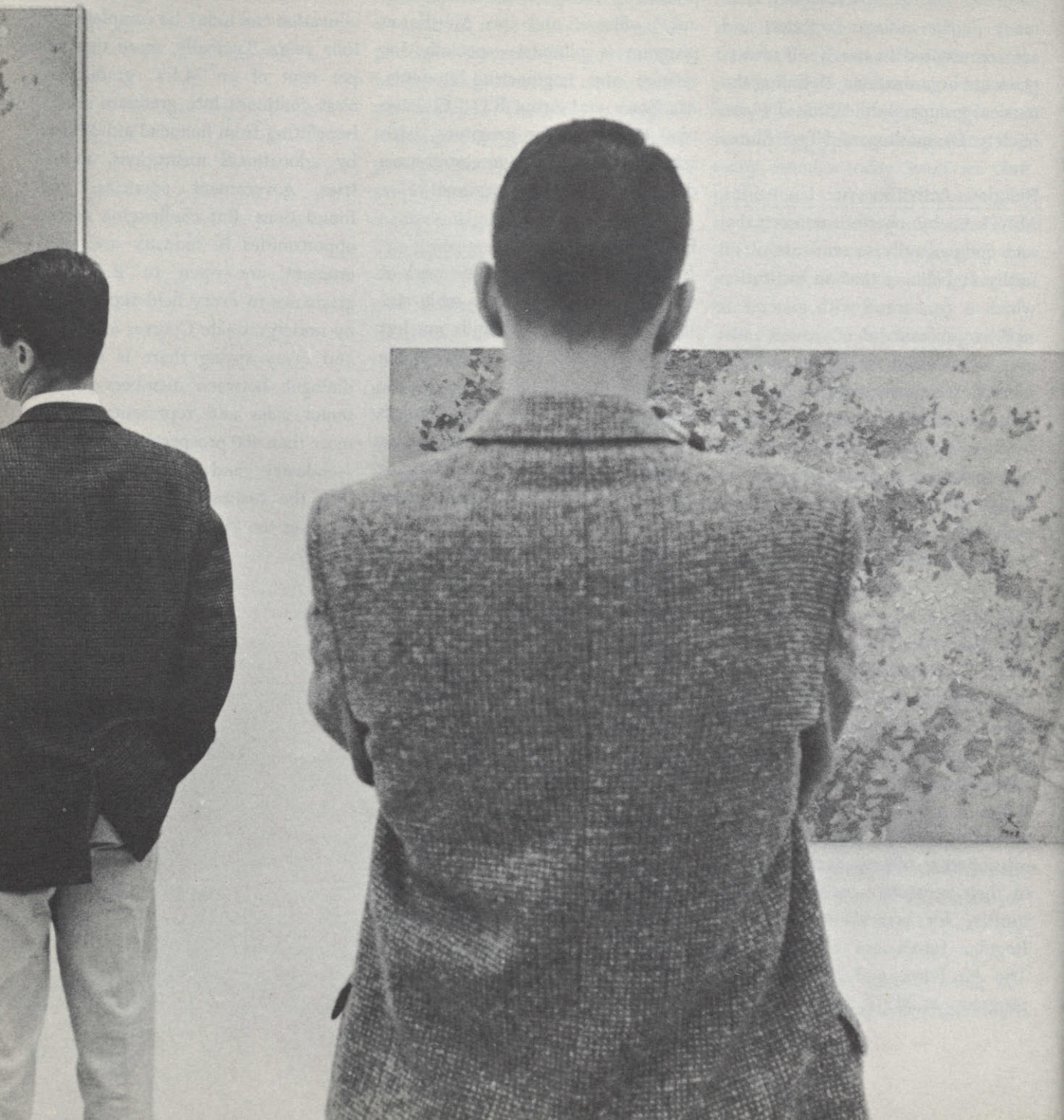
In addition to the academic work of the first two years, every male student is required to compile not less than 8 points of athletic credit. He may join one of the intercollegiate freshman or varsity teams (2 points for fall or spring sports, 4 points for winter sports), or he may take part in organized classes (2 points each half-term) to develop skills in such recreational sports as sailing, tennis, golf, swimming, and skating. Every student when he enters must submit a record of a recent medical examination and must pass a swimming test and a physical fitness test. Those who do not meet certain minimum standards are recommended for swimming or developmental classes.

### **Student Health**

The Institute maintains excellent medical facilities on campus, staffed by a group of specialists. The Homberg Medical Infirmary houses doctors' offices, special clinics, and a twenty-three bed hospital.

### **Student Placement**

No one pretends that a professional education can today be completed in four years. Typically, more than 60 per cent of an M.I.T. graduating class continues into graduate study, benefitting from financial aid offered by educational institutions, industries, government agencies, and foundations. But challenging career opportunities in industry and government are open to Bachelor's graduates in every field represented by undergraduate Courses at M.I.T., and every spring there is a lively dialogue between members of the senior class and representatives of more than 400 prospective employers—industry and government—who visit the Institute to interview students at the Placement Bureau.









# Programs of Study

The undergraduate at M.I.T. has 25 programs to choose from in 17 departments. In addition, six other departments offer classes for undergraduates but grant only graduate degrees. As is explained in the section on the freshman year, the undergraduate may make his choice of major field by the end of his freshman year or, if he wants more time to make up his mind, during his sophomore year. Introductory work in the first year in mathematics, physics, chemistry and the humanities provides a common starting point for all the undergraduate programs at the Institute (architecture requires no chemistry). This section describes briefly the different departments with curricula for undergraduate and graduate degrees and the opportunities they offer.

## **Aeronautics and Astronautics**

The Institute has pioneered in the scientific study of flight since 1914, when Professor Jerome C. Hunsaker introduced at M.I.T. the first graduate program in aeronautics at an American university. Today the Institute's Department of Aeronautics

and Astronautics is famous for its work on instrumentation and guidance systems for aircraft, missiles, and space vehicles as well as for its contributions in structures, aeroelasticity, fluid mechanics, and propulsion. Its graduates occupy prominent positions in nearly all phases of aerospace activity.

The educational objective of the Department is to prepare graduates for effective leadership in developing new aeronautical and astronautical systems through creative applications of science and engineering.

The undergraduate curriculum provides subjects in propulsion, control, aerodynamics, and structures and finally a combination of these elements in the synthesis of flight vehicles as systems problems. Engineering science electives are offered for students interested in research, and professional engineering subjects are ready for students attracted to work in the solution of real-world problems. The Department offers four-year programs leading to the degree of Bachelor of Science in Aeronautics and Astronautics with emphasis on engineering science or

systems engineering and a four-year cooperative program for selected students, which includes five months in industry. There is a five-year honors course for outstanding students who want to combine work for the Master's and the Bachelor's degrees.

## **Architecture**

M.I.T. was the first university to organize and develop formal architectural education in the United States. As part of an institution especially alert to technology's potential for improving human life, the Department of Architecture at M.I.T. is dedicated to the search for a physical environment which expresses our culture, which encompasses the scientific outlook, and which uses modern industrial methods and materials while giving full satisfaction to our hunger for aesthetic fulfillment. The work of its graduates may be seen in many cities of the world.

The Department offers a five-year program leading to the degree of Bachelor of Architecture. The program combines a strong core in architectural design with work in

visual design, art history and criticism, structures, construction technology, and environmental controls such as acoustics. Study in planning is conducted by the Department of City and Regional Planning, which awards only graduate degrees. Supplemented by practical experience, the program in architecture provides preparation for independent practice or for further study.

### **Biology**

With small but distinguished beginnings under William T. Sedgwick, a noted bacteriologist and a pioneer in public health, the Department of Biology has seen an exciting expansion in recent years. It has chosen to lay special emphasis on the physics and chemistry of living things—molecular biology—as is fitting in an institution noted for its work in physics, chemistry, and instrumentation.

The Department offers a four-year program leading to the degree of Bachelor of Science in Life Sciences, including general biology and organic and analytical chemistry in the second year; biochemistry, microbial genetics, and physical chemistry in the third year; and developmental biology and physiology in the fourth year. Electives allow each student to pursue a special interest in developmental biology, physiology, biochemistry, biophys-

ics, microbiology, nutrition, food science, psychology, or medicine.

Most of the students who graduate in life sciences are planning to continue with graduate work leading to the M.D. or Ph.D degree; the Course is a popular choice for pre-medical students.

### **Chemical Engineering**

M.I.T. was the first institution in the world to offer a program in chemical engineering. Since then chemical engineers have contributed notably to the development of modern industry, and today they are active in the fields of synthetic organics, microbiology, pharmaceuticals, plastics, petrochemicals, new metals, energy conversion, process development, combustion, catalysis, and surface chemistry. The chemical engineer is a creator of change, and a primary aim of the Department of Chemical Engineering at M.I.T. is to cultivate its students' capacity for handling new problems with competence.

In addition to mathematics and physics, each student in the Department takes a core program in chemistry and chemical engineering. Elective time is available for studies in such related areas as automation, biochemistry, computers, economics, electronics, fluid mechanics, geophysics, industrial management, metallurgy, undergraduate nuclear

engineering, and properties of materials. This four-year program leads to the degree of Bachelor of Science in Chemical Engineering.

### **Chemistry**

Chemistry has been an important subject at M.I.T. since the beginning, when Charles William Eliot, afterwards President of Harvard, was Professor of Analytical Chemistry and Metallurgy. Since that time noted contributions have been made at M.I.T. in the different branches of chemistry, including in recent years the first synthesis of penicillin.

The Chemistry Department offers a four-year program leading to the degree of Bachelor of Science in Chemistry. It provides a general education suitable for those who seek only the Bachelor's degree and for those who wish to go on to graduate study and a professional career in chemistry. The program includes a carefully planned sequence of required subjects in organic, inorganic, analytical, and physical chemistry with a choice of restricted electives in three advanced fields. There is additional free elective time and a liberal policy of substitution.

### **City and Regional Planning**

The Institute's Department of City and Regional Planning is concerned with the study of our large-scale physical environment and its inter-

action with our society. The Department's program for graduate students aims at training practitioners, teachers, and staff men in city and regional planning; no undergraduate degree is offered. Suitable preparation for graduate study in the Department is offered by the undergraduate programs in architecture, civil engineering, economics, political science, humanities, and industrial management. Prospective students should plan their programs in consultation with the Department, preferably during their second year.

### **Civil Engineering**

M.I.T.'s Department of Civil Engineering focuses its teaching and research in three principal areas—the applied earth sciences, involving applications of the mechanics of fluids and particles to problems in water resources and earth materials; structures and materials, involving the design of structures and the specification of the materials from which they are built; and civil engineering systems, involving the coupling of modern methods of computation to the design of large-scale engineering projects. In their four-year programs undergraduates in civil engineering may follow any one or a combination of these areas to a depth that includes advanced classroom work and research in partnership with faculty and graduate students.

All students in the four-year civil engineering program leading to the S.B. degree begin with classes centered about the modern engineering sciences and applied mathematics. Liberal elective time in the third and fourth years makes it possible for every student to focus on areas which especially interest him, and these individual programs often include work in industrial management and the sciences as well as in other engineering departments.

Outstanding undergraduates may participate in the Department's Inter-American program, involving significant research carried out in conjunction with selected universities in Latin America.

### **Economics**

M.I.T.'s Department of Economics is acknowledged as a leading one in the nation, with a faculty noted for its contributions in research and public service. The scope of its teaching ranges from general education for all undergraduates through a graduate program for the doctorate. For undergraduates who elect to major in economics, the Department offers a four-year program leading to the Bachelor of Science in Economics.

A distinctive feature of this program, in contrast to comparable ones in liberal arts institutions, is the combination of study in economics

with a strong admixture of mathematics and science—and engineering as well, if the individual student so elects. As a result, economic problems can be formulated and analyzed with a maximum of rigor and with the most modern quantitative techniques. The basic objectives of the program are to develop the ability to analyze, both theoretically and empirically, economic problems of the firm, the industry, and the economy as a whole; to provide a knowledge of modern economic and social institutions; and to promote an understanding of a broad range of questions of social and economic policy.

Depending on how the individual student uses his free electives, he may concentrate rather heavily in economics and related social sciences or he may combine with his economics a fairly substantial concentration in a particular field of science or engineering. Graduates who do not go directly into private or governmental employment may continue with graduate study in economics, in other professional disciplines such as business or law, or in some instances in science or engineering.

### **Electrical Engineering**

From a modest start about a century ago, electrical engineering has become a key technology of great

scope and variety. It is characterized by two main concerns: the processing, transmission, and control of energy; and the processing and the transmission of information. Achievements in both fields have had a revolutionary impact on our civilization.

During World War II M.I.T. became a major center of electrical research in this country and indeed in the western world, and it has remained so since. Members of the faculty have pioneered in the development of radar, computers, servomechanisms, and the fundamental science of information theory. Work in progress today includes research in magnetohydrodynamics—the application of the interactions between electromagnetic fields and conducting fluids (e.g. a hot gas) to achieve electromechanical energy conversion—and in communications biophysics, applying the techniques and tools of communications engineering to study the electrical signals of the human nervous system.

The undergraduate programs offered by the Department of Electrical Engineering center on a core of classroom and laboratory work in circuit theory; electronic devices, circuits, and signals; field theory; energy processing; and materials. In the core classroom courses, emphasis is placed on basic principles and methods of application. The labora-

tory work and electives provide an opportunity to apply these principles to a broad range of specific electrical processes and equipment. A large part of the laboratory time is devoted to project activity, the major objective of which is to develop independent, creative ability, and individual study under staff guidance is encouraged. The Department has developed "take-home" laboratory kits which enable each student to experiment at his home or dormitory.

The Department offers three four-year programs leading to the degree of Bachelor of Science in Electrical Engineering and two five-year programs leading to Bachelor's and Master's degrees: a four-year electrical engineering program; an electrical science program for selected students, leading to the Bachelor's degree in four years or to the Bachelor's and Master's degrees together in five years; and a cooperative program which includes thirty to sixty weeks of practical experience in industry, leading to the Bachelor's degree in four years or to both Master's and Bachelor's degrees in five.

### **Geology and Geophysics**

The earth sciences are seeing an exciting expansion as new and powerful techniques enable scientists to probe ever deeper and more effectively into our environment of earth, sea, air, and space.

The Institute's Department of Geology and Geophysics offers a four-year program leading to the degree of Bachelor of Science in Earth Sciences and a five-year program for selected students which leads to the degree of Master of Science in Geology and Geophysics with the Bachelor's degree. Both programs are built around a small core of prescribed professional subjects, a large amount of work in fields of science within which each student has free selection of individual subjects, and a generous allocation of free electives. The programs provide a broad preparation for careers in geology, geochemistry, geophysics, oceanography, or meteorology. Undergraduate work in meteorology is offered by the Department of Meteorology, which, however, gives only graduate degrees.

All these activities are centered in the new 20-story Green Building, M.I.T.'s only skyscraper, which provides a superb home for the interdepartmental Center for Earth Sciences. In addition, the National Magnet Laboratory has magnets capable of continuous fields of up to 250,000 gauss, which are invaluable for studies of the magnetism of the earth and of the sun, and the M.I.T. Reactor provides a high-intensity neutron flux used for studies of the geochemistry of trace elements in the atmosphere, oceans, and earth.

### **Humanities and Engineering or Science**

Besides offering work in the humanities to students majoring in architecture, engineering, science, or management as part of the Institute's regular programs in these fields, the Department of Humanities offers its own degree programs which allow students to devote equal time to a branch of science or engineering and to an area in the humanities. One part of each program is undergraduate work in one of the engineering or science departments; the other is a sequence of advanced studies in the humanities, concentrating in a particular area of the student's choice: literature and the arts, history, philosophy, or the history and philosophy of science. The work of the senior year includes a special Humanities Senior Seminar as well as the Bachelor's thesis. The program leads in four years to the degree of Bachelor of Science in Humanities and Engineering or in Humanities and Science.

This unusual program gives a student an excellent liberal education and a start on many careers: he can go on to graduate study in the humanities, or in business, law, public administration, education, theology (or medicine if he has chosen his scientific courses appropriately); he can take a fifth year to complete

the work for a Bachelor's degree in his professional subject and build a career in science or engineering; or he can start directly on a career in one of many occupations where the first call is for men and women of broad understanding.

### **Industrial Management**

Students who combine an aptitude for science and engineering with an interest in managerial careers will find M.I.T.'s undergraduate Course in Industrial Management well designed for their needs.

Successful management of enterprises in the future will demand the ability to deal with technological issues of increasing complexity, a broad comprehension of business problems, and an understanding of human behavior. Fundamental training in science and engineering has proved to be an excellent base for the study of management, and the Institute is uniquely qualified to provide a curriculum which combines science and technology with administration and the humanities.

The undergraduate program in industrial management rests upon such disciplines as economics, psychology, and applied mathematics which underlie the management functions. Building on these foundations, the program seeks to give each student a broad understanding of the areas with which industrial manag-

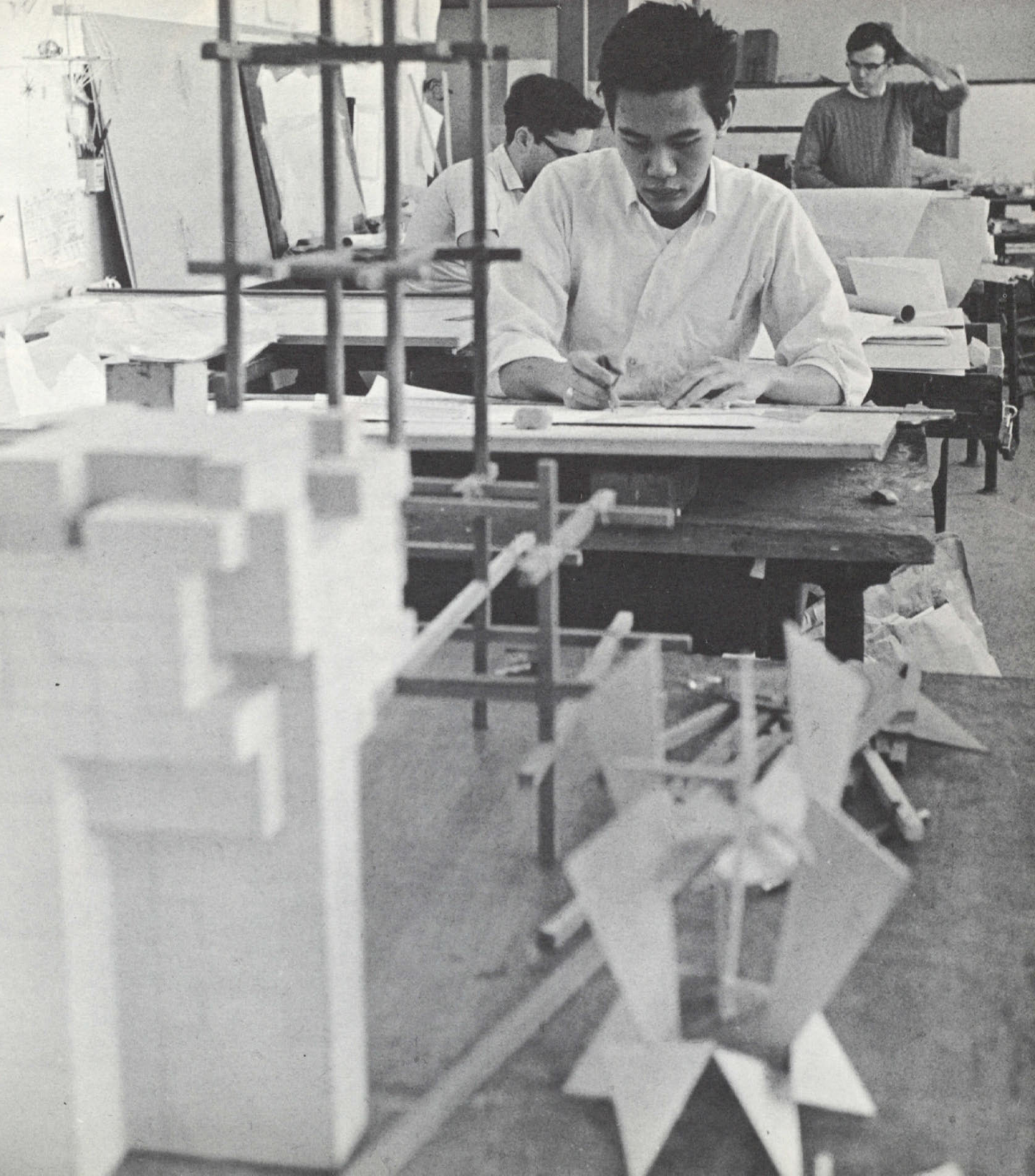
ers are chiefly concerned, including production, marketing, finance, and organization. Much of the work in management is quantitative, and several of the required subjects offer immediate introduction to the many rapidly developing mathematical and statistical techniques for solving industrial problems.

The goal of the program is to provide a core curriculum of the underlying disciplines and major applied fields of study and yet to permit sufficient flexibility so that students may pursue special interests or broaden their base of general knowledge. Thus, the program gives each student a range of professional management and management-related subjects and substantial freedom to express other interests.

Students majoring in other fields at the Institute may take a Management Minor consisting of four core subjects in the Sloan School of Management.

### **Linguistics**

Many undergraduates study modern languages at M.I.T., some to improve language skills begun in high school and some to become acquainted with great literature of France, Germany, and Russia in the original tongue. Special first-year humanities classes are conducted in foreign languages when there is sufficient demand. In addition to these







undergraduate subjects, the Institute's Department of Modern Languages offers a doctoral program providing comprehensive coverage of all areas of modern linguistics. The Department encourages interdisciplinary programs in relevant areas of psychology, communication sciences, mathematics, philosophy, and other fields.

### **Mathematics**

Mathematics has always had a natural place at M.I.T., but it has become a subject of central importance as the need for mathematical analysis has grown in a wide range of fields, from the explanation of the properties of liquid helium in physics to the analysis of the nation's economy or the operations of a business. No longer is it true (if it was once) that the only careers open to a mathematician are in statistics or teaching.

M.I.T.'s Department of Mathematics is a large one, and it embraces both pure and applied mathematics. Each field gains strength from the other. The Department offers a four-year program leading to the degree of Bachelor of Science in Mathematics which allows each student great freedom in the choice of study. Whatever his ultimate objective—preparation for teaching, for participation in the research programs of an industrial or government-

sponsored organization, or for a position in a business or in a modern high-speed computer center—the immediate aims of the program are to provide an understanding of a substantial part of the existing body of mathematical knowledge and an ability to impart this knowledge to others. More important, the Department hopes to inspire in each student an interest in the discovery or invention of new mathematics or in the application of mathematics to new fields.

### **Mechanical Engineering**

Mechanical engineering is a broadly based engineering discipline concerned with devices for harnessing the forces of nature to the service of man. As with other engineering disciplines its progress depends on research, and the Department of Mechanical Engineering at M.I.T. has made outstanding contributions in research in many fields, including the properties of materials, the mechanics of elastic and plastic solids and of electrically charged and electrically neutral fluids, the Newtonian dynamics of moving and rotating systems, the use of computers as aids in design, and the dynamics of systems involving men and machines. Some of these fields are also of interest to mathematicians and scientists, but the starting point is a concern with devices for human use, which is the business of engineering.

The Department of Mechanical Engineering aims in its undergraduate programs to provide a firm base in mechanics, dynamics, fluid mechanics, thermodynamics, engineering materials, and electrical theory and at the same time to introduce students to the art of engineering—the exploitation of scientific knowledge in the design of useful and efficient devices. An Engineering Projects Laboratory gives each undergraduate the opportunity to work as an intern with faculty and graduate students doing research on advanced engineering projects.

The Department offers five programs leading to the degree of Bachelor of Science in Mechanical Engineering: a four-year engineering program; a four-year engineering science program; an “advanced undergraduate program” which allows selected students to follow special curricula planned on an individual basis, with many graduate subjects included; a five-year “honors course” for selected students, leading to the award of the Master's with the Bachelor's degree; and a four-year cooperative program (for selected students) which includes six months of work in industry.

### **Metallurgy and Materials Science**

An important technology since the beginning of civilization, metallurgy has become central to advances re-

quiring new properties in metals and other materials. Examples are the alloys for jet engine blades, the ceramics for rocket nose cones, and the extremely pure single crystals of germanium or silicon used in transistors. In many fields of engineering today, it is the industry or the country that develops the right material at the right time that makes the breakthrough. M.I.T. has always been a center for research and teaching on the structure and properties of metals and ceramics, and new developments are now extending this work to a wide variety of materials. Recognizing the crucial importance of materials, M.I.T. has built a new Center for Materials Science and Engineering which provides an important interdepartmental focus for research and teaching in this area.

The Department of Metallurgy offers two four-year programs leading to the degree of Bachelor of Science—one in metallurgy and the other in materials science.

The program in metallurgy focuses on the relations between structure and properties in metals and the basic thermodynamics, unit processes, and mechanical operations which underlie their production. A large amount of elective time allows each student to develop his interest in a particular area.

The program in materials science, while including many of the same

basic subjects in metallurgy, emphasizes the application of physics and chemistry to phenomena of the solid state, thus providing a foundation for scientific understanding of the structure and properties of materials in general. There are also specific studies of metals, ceramics, semiconductors, glasses, and plastics.

### **Meteorology**

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The atmosphere poses complex and fascinating problems that are best approached through the quantitative application of basic physical principles. Observations obtained from such devices as artificial satellites, rockets, and radar are providing a more adequate description of the atmosphere. The high-speed digital computer has opened the way to major advances, and mathematical models of the atmosphere are now being developed that show promise of reproducing most of the major features of the real atmosphere. Facilities of the M.I.T. Department of Meteorology include several radar systems, a hydrodynamics laboratory, an instrumentation laboratory, teletypewriter and facsimile receivers for weather data, a small digital computer, and direct access to large computers. Only graduate degrees are offered, but there are a number of subjects in meteorology that may be elected by interested undergraduates. Students planning to take grad-

uate work in meteorology should acquire a strong background in the physical sciences and mathematics. The undergraduate program of the Department of Geology and Geophysics provides excellent preparation, but entirely suitable programs may be taken in other departments, notably physics and mathematics.

### **Naval Architecture and Marine Engineering**

M.I.T. is one of four institutions in the United States offering degrees in naval architecture. Its faculty and alumni have helped design a significant portion of ships flying the American flag, from America's Cup defenders to nuclear submarines; since 1901, most of the naval officers responsible for the design and construction of the ships of the U.S. Navy have held degrees from M.I.T. The Institute's Department of Naval Architecture and Marine Engineering regards the whole realm of the ocean as its province, and the Department is interested in devices of all sorts which exploit this "inner space," from machines to harvest the resources of the ocean floor to submarines and high-speed hydrofoil craft. The Department's research facilities, which are used by undergraduates in their thesis and laboratory work and in freshman seminars, include a ship model towing tank for studies of the hydrodynam-

ics of ships' hulls, a propeller tunnel for controlled underwater tests of model ships' propellers under simulated conditions, and a ship structures laboratory for research in structural arrangements for ships.

The Department offers two programs for undergraduates—a four-year program in naval architecture and marine engineering which leads to the Bachelor's degree and a five-year program in shipping and shipbuilding management which leads to both Master's and Bachelor's degrees. Both programs stress fundamentals and allow considerable elective time. The first is customarily followed by those interested in the technical aspects of the marine industry—naval architects, marine engineers, and those with more specialized interests. The second, which builds on a core of technical subjects, is intended for students primarily interested in the business and management phases of the industry.

### **Nuclear Engineering**

M.I.T.'s Department of Nuclear Engineering offers a limited number of undergraduate-level subjects and a broad program of graduate instruction and research in fission reactor technology and nuclear applications of plasma physics. The Department's facilities include a nuclear reactor designed for 5,000 kw. fueled with U-235 and cooled and moderated by

heavy water, a well-equipped nuclear instrumentation laboratory, a pulsed neutron source, and two subcritical natural-uranium reactors. Excellent preparation for graduate study in the Department may be obtained in undergraduate programs in physics, chemistry, or any of the engineering departments.

### **Nutrition and Food Science**

Besides offering introductory elective work at the undergraduate level, M.I.T.'s Department of Nutrition and Food Science offers a wide choice of graduate study and research with opportunities for specialization in basic nutrition (physiological chemistry), biochemical and food engineering, food microbiology, food processing, food and flavor chemistry, food toxicology, animal pathology, oral science, and clinical nutrition. The undergraduate programs in biology, chemistry, and chemical engineering offer good preparation for graduate study in the Department.

### **Oceanography**

The oceans, the atmosphere, and the solid earth are so intimately related that they must often be studied together as parts of a single system, and advanced work in oceanography is therefore a natural part of the work of the Departments of Geology and Geophysics and of Meteorology. This

includes studies of the chemistry, physics, and circulation of the oceans as well as of their influence on our environment. M.I.T.'s work in oceanography is conducted in cooperation with the Woods Hole Oceanographic Institution, whose research laboratories and vessels are frequently made available to graduate students. The undergraduate program in geology and geophysics is the usual preparation for advanced work in oceanography, but a major in one of the many other fields of science through which oceanographers study the oceans and life in them is entirely appropriate.

### **Philosophy**

Graduate study in philosophy has grown naturally in the Department of Humanities at M.I.T. from two sources—the undergraduate teaching in philosophy which is part of the humanities program for all M.I.T. undergraduates and the natural interest throughout the Institute community in the philosophical bases of the sciences. Thus the program of graduate study leading to the doctor's degree emphasizes the philosophy of science and contemporary philosophical analysis without bypassing the central areas of philosophy (epistemology, moral philosophy, philosophy of language, and logic) or fundamental historical developments. An ideal undergraduate prep-

aration would combine work in science (mathematics, physics, linguistics, and psychology tend to be the most relevant) with standard undergraduate subjects in logic, theory of knowledge, analytical value-theory, and the history of modern philosophy.

### **Physics**

The extraordinary progress of physics in the twentieth century and its basic importance in so many related fields make it a vital subject at M.I.T. The noted physicist Karl T. Compton, who came to M.I.T. as President in 1930, devoted special attention to the Institute's teaching and research in physics, and the Physics Department today is among the foremost in the country. Its facilities for high-energy and nuclear research include a cyclotron, a linear accelerator, several Van de Graaff accelerators, and the 6-Bev Cambridge Electron Accelerator (operated jointly by M.I.T. and Harvard). In addition to research in progress using these machines, the Department is active in research on cosmic rays, astrophysics, plasmas, and the properties of matter at very low temperatures and in the solid state. Much of this work is carried out in such interdepartmental laboratories as the Center for Materials Science and Engineering, the Laboratory for Nuclear Science, and the Research Laboratory of

Electronics. Students in the Department also make effective use of the National Magnet Laboratory and of the nuclear reactor and neutron physics laboratory of the Department of Nuclear Engineering.

The Department offers a four-year program leading to the degree of Bachelor of Science in Physics. The program is a flexible one, affording each student an opportunity to acquire competence in the fundamentals of both experimental and theoretical physics. The work is of such breadth and depth that each graduate is well equipped either to build a career in the field of applied physics in industry or to enter graduate study in preparation for more advanced professional work.

### **Political Science**

In the environment of a technological institution, political scientists at M.I.T. are concerned especially with the new political conditions born out of explosive technological advance and population increase and with new techniques for compiling and analyzing unprecedented quantities of information. These developments give new pace and perspective to the classic problems of human conflict, power, and authority.

Students in the four-year undergraduate program leading to the degree of Bachelor of Science in Political Science explore the nature of

political behavior and the political process; the government's role in science and technology, both in America and abroad; the role of technology in international relations; military strategy and political factors in national security; and techniques of policy formulation and decision-making on issues of public policy. There is no rigid curriculum; each student plans his own sequence of subjects in consultation with his faculty adviser, usually taking three or four subjects in one field or two in each of several other fields. In his senior year, each student normally participates in two graduate seminars to study a single subject more deeply and to gain experience in research. Graduates have a unique combination of understanding in the physical, engineering, and social sciences which qualifies them for work or further study in science or engineering, in politics, or in areas in which scientific and political affairs come together.

### **Psychology**

The Psychology Department offers a doctoral program in addition to elective undergraduate work. The graduate work provides concentration in any one of three areas: physiological psychology, general experimental psychology, and social-developmental psychology. A student may prepare for the program by taking un-

dergraduate work in any of the basic natural sciences, mathematics, or the social sciences.

### **Interdisciplinary Programs**

Any description of M.I.T.'s educational programs tends to be misleading because it concentrates on organization, not content. It is important to realize that M.I.T. has a single campus and a single faculty. Teachers and their students tend to group themselves according to their interest, attaching themselves to departments primarily for administrative convenience. For example, members of the Physics, Biology, and Electrical Engineering Departments work together in the Research Laboratory of Electronics; there are similar groups in operations research, automatic control, computation, molecular engineering, history of science, and others; and new interdisciplinary centers are now planned for the earth sciences, life sciences, space science and technology, communications science, and materials science and engineering. In a very real sense, students at M.I.T. share a dialogue with their fellows which knows no artificial walls.

### **Pre-Legal Studies**

A number of M.I.T. graduates go on to law school each year, and the Institute welcomes students interested in science who wish to prepare for

legal careers. M.I.T.'s academic programs, based on fundamentals and including in every case serious study of the humanities, provide the kind of undergraduate preparation recommended by the leading law schools. There is no specific pre-legal program; each student chooses one of the regular majors which suits his particular interest. Professor Stanley M. Jacks of the Sloan School of Management is adviser to pre-law students.

### **Pre-Medical Studies**

The Institute also welcomes students who come to prepare for medical schools. The entrance requirements of all medical schools may be met in most of the Institute's departments. Modern science and scientific techniques have contributed extensively to recent medical progress, and an education strong in fundamental science and mathematics is now particularly appropriate for medical preparation. It is also significant that many faculty at M.I.T. have become active collaborators in medical research with Boston medical schools and hospitals, thus strengthening the Institute's ties with medical practice. Dr. Harriet L. Hardy of the Institute's Medical Department acts as adviser to premedical students.

### **Overseas Study**

M.I.T. has no formal "junior year abroad" program, but there are many

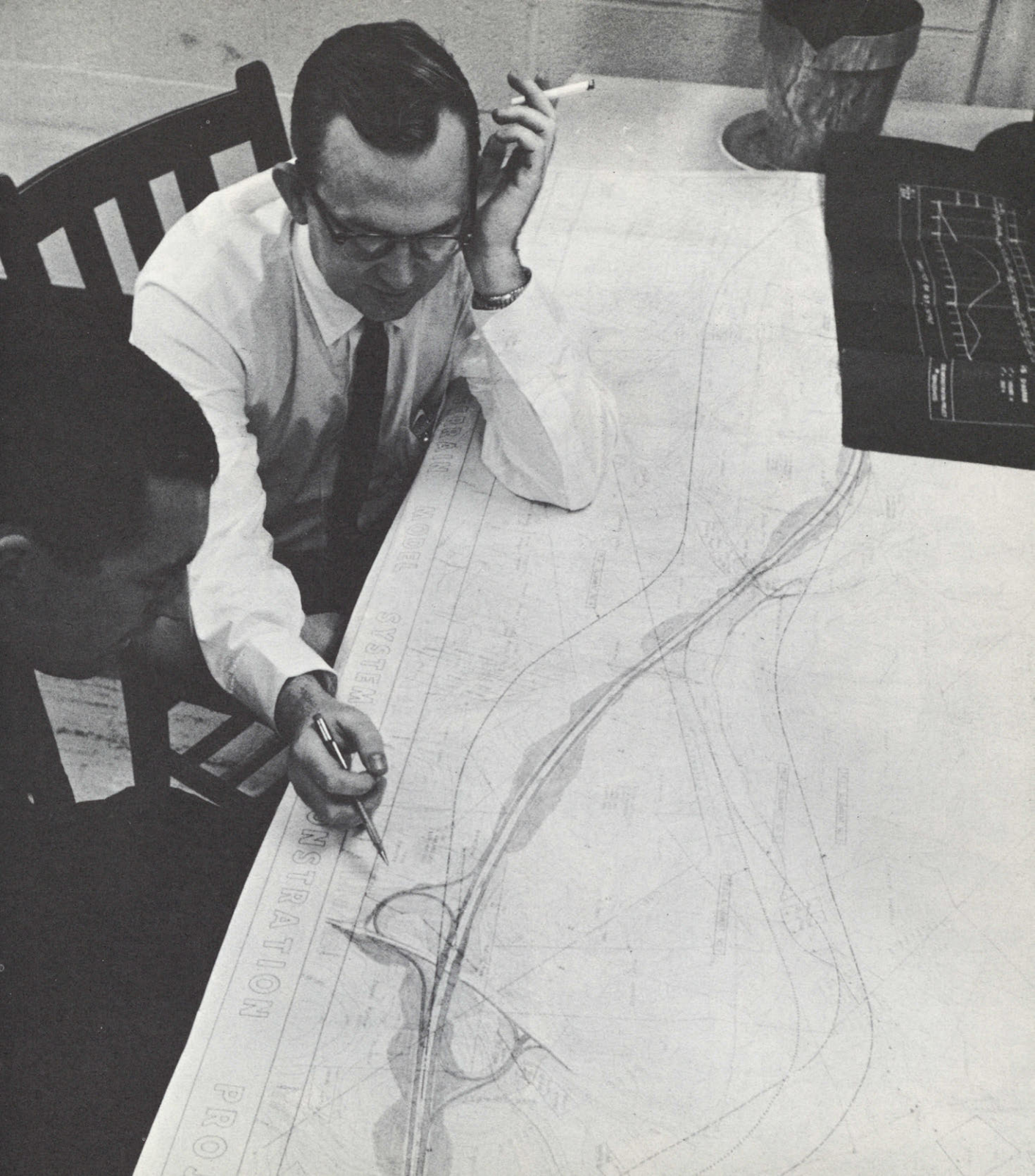
opportunities for undergraduates to gain the experience of overseas study. Some M.I.T. students participate in established overseas study programs sponsored by others, taking subjects in mathematics, the humanities and social sciences, and the natural sciences at levels comparable to the third year of M.I.T. Other students are able to arrange individual programs at overseas universities, and M.I.T. is cooperating with a number of international student agencies on travel, housing, and social arrangements for such students.

Because of the important differences in academic practices and programs in U.S. and overseas universities, there are no specific rules for applying academic credit earned overseas toward M.I.T. degree requirements. Students should realize that a year spent abroad is not literally a substitute for a year at M.I.T. But the Institute recognizes that overseas study is an important and meaningful experience for many students, and departments and faculty advisers are prepared to help in planning useful programs for which academic credit can be given. Further information is available from Professor John T. Norton, Adviser on Overseas Study.









TRAIN MODEL SYSTEM

CONSTRUCTION PROJECT





# The Freshman Year

All the undergraduate programs at The Institute depend on a basic knowledge of mathematics and science. In particular, all undergraduate programs require a knowledge of calculus and of the fundamentals of physics and chemistry. Every student, therefore, takes essential work in these subjects and an introductory program in the humanities during his first two years at M.I.T. The only major with different requirements is architecture, which does not require chemistry.

## **First-Year Classes**

Specific schedules during the first year vary according to students' backgrounds and interests. Programs are arranged during consultation between each student and his Freshman Adviser. One typical schedule might be:

### *First term:*

Chemical Principles I

Physics I

Calculus

Humanities: The Greek Tradition

Undergraduate seminar: Systems Design Problems of Space Vehicles

### *Second term:*

Physics I

Calculus

Humanities: The European Tradition  
Introduction to Engineering Systems  
(elective)

Some students may find that it is appropriate for them to postpone one of the major subjects until the second term and use the time thus made available to pursue independent study and for additional elective subjects. A typical schedule might include:

### *First term:*

Chemical Principles I

Calculus

Humanities: The Greek Tradition  
(in French)

Beginning Russian (elective)

### *Second term:*

Physics I

Calculus

Humanities: The European Tradition  
(in French)

Introduction to Automatic Computation  
(elective)

Introductory Psychology (elective)

Many other first-year schedules are also possible. Students with advanced placement credit in one or more of the usual first-year subjects may substitute more advanced subjects in the same areas or may use the time for elective subjects, other basic subjects, or, if the degree credit is appropriate, subjects in a professional field which would normally be taken in the second or third year.

## **Physics**

The introductory sequence in physics assumes one year of high school physics, and the two-term calculus sequence assumes that each student has taken mathematics through trigonometry and is ready to proceed without reviewing this material. The two programs get off to a fast start, and calculus is used freely in the physics program after the first half of the first term.

## **Mathematics**

The program in calculus includes topics in probability, statistics, and linear algebra and concludes with differential equations. Many students will continue work in physics through

their sophomore year, and some will go on through the first term of their junior year. In the first term the subject is mechanics—the principles of conservation of momentum; the properties of matter including elementary thermodynamics; and the kinetic theory of gases, solids, and liquids. In the second term the subjects are relativity, resonant systems, oscillations, and wave dynamics. Sophomores and juniors in physics study electromagnetism and the electro-magnetic theory of light and introduction to quantum physics. Prospective physics majors and students intending to major in a number of other science-based fields are likely to study physics at least through their sophomore year. These are intensive studies; many freshmen who have taken college-level courses in high school receive credit in chemistry or calculus, but it is relatively rare for a freshman to be given advanced credit in physics.

### **Chemistry**

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The one-term introductory program in chemistry covers the basis of atomic theory; an introduction to the structure of atoms and molecules; gases, kinetic theory; solids, crystal structure; liquids and solutions; chemical equilibrium; electro-chemistry; an introduction to chemical thermodynamics; and the application of these concepts and principles to real chemical systems. The

depth of the treatment of these topics is based on the assumption that all students entering M.I.T. have completed one year of high school chemistry.

### **Humanities**

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The introductory program in the humanities continues through the sophomore year. In the freshman year it is based upon an intensive reading of selected writings in history, literature and philosophy from classical, medieval, and early modern times. Some background reading is required but most of the reading is of original works. Examples are the tragedies of Aeschylus, Thucydides' *History of the Peloponnesian War*, the political writings of Plato and Aristotle, the *Confessions* of St. Augustine, Shakespeare's *King Lear*, and Pascal's *Pensées*. These are works which have shaped the thinking of Western man on many of the questions that most concern him—the meaning of life, the nature of one's obligations to society, the limits of reason—and they serve as an excellent introduction to the different areas of the humanities the student may elect to study during his upperclass years.

In the sophomore year there are two different kinds of options in the humanities. One is a choice between "The Nature of Literary Art" and "Philosophical Classics," and the sec-

ond is between a history subject on the twentieth century and a social science subject entitled "The Modern World." Each set of options is intended to introduce the student to the particular perspectives and languages of two disciplines outside the fields of science and engineering and to help him choose an area for further study in the School of Humanities and Social Sciences.

While the emphasis in the humanities program is on ideas, there are frequent writing assignments and students are encouraged to develop their writing abilities. English composition is offered as an elective.

For students who have had sufficient preparation in French (usually three years), the first- and second-year humanities classes are also offered in French; Plato, for example, is read in French, and the class discussion is in French. There is a similar program in German.

### **Electives**

Besides the core in chemistry, calculus, physics, and the humanities, every student chooses two or more electives in the freshman year. Typically, more than eighty subjects are chosen by one or more freshmen for this purpose. Some are offered specifically as freshman electives, as, for example, "Introduction to Contemporary Philosophy," "Astronomy," "Introduction to Meteorology," "Struc-

ture of Materials," and "Perspectives in Life Science." Others are the regular classes offered by the Department of Modern Languages in French, German, and Russian. Still others are classes given primarily for upperclassmen, chiefly in the humanities, for which the instructor in charge thinks the freshman is qualified, such as "Introductory Psychology," "Economic Principles," and "The Writing of Fiction."

### **Seminars**

The faculty has also instituted elective seminars in which small groups of freshmen (usually four to eight students) work with a professor on an unresolved topic in his professional field. The faculty in these seminars strive for an unusually close association with their students, and the seminars provide an opportunity for serious study with a high degree of student responsibility and freedom. About 40 seminars are given each term, and they cover a very wide range of fields and subjects. Here are descriptions of three seminars held last year:

*Experimental High-Energy Physics:* This seminar is an informal discussion of the basic facts and research techniques of particle physics, based upon current operations of the Cambridge Electron Accelerator, the world's largest electron accelerator. Important experiments are in progress at the accelerator to increase our knowledge of the

strange world of particle physics. The aim of this seminar is to give the students some insight into the purpose and method of experiments currently on the experimental floor of the accelerator—for example, the properties of mesons or the operation of the 300-ton bubble chamber. Students are encouraged to look deeper into some aspect of one of the experiments, perhaps participating in an actual "run".

*Experimental Studies:* A program of studies are arranged to acquaint students with a wide spectrum of research activities in such fields as the earth sciences, computer technology, fluid dynamics, materials, and biophysics. Groups of several students carry out four projects during the semester. Each one of these experiments takes the students to a different research laboratory, permitting them to get acquainted with the staff and their areas of scientific and engineering interest. This program is conducted as an interdepartmental effort by the Departments of Aeronautics and Astronautics, Chemical Engineering, Civil Engineering, Geology and Geophysics, Management, Mechanical Engineering, Naval Architecture and Marine Engineering, and Physics.

*Contemporary Art and Architecture:* Boston offers interested students multiple opportunities for seeing contemporary works of painting, sculpture, and architecture. This seminar consists principally of visits to museums, galleries, and new buildings in and around Boston. Attention is focused on recent development such as "pop" art, environmental sculpture, and exposed concrete structures. There are short assignments and a few short essays about specific topics discussed in the seminar. The instructors have differing opinions about contemporary art and architecture which are aired in the sessions, and students

are encouraged to develop their own critical abilities through an exchange of views with the instructors.

### **How Are the Freshman Subjects Taught?**

The freshman classes in calculus, chemistry, and physics, like introductory classes at many colleges, are taught partly by lectures and partly by classroom recitations. The 900 members of the freshman class are divided into groups of about 25 each in each freshman subject, and these groups meet separately for recitations. Here an instructor takes the small group through problems which illustrate the principles taught in the lectures, and the students have a chance to ask questions about points they do not understand. In calculus there are two lectures each week and one recitation; in chemistry and physics there are two lectures and two recitations. In chemistry there is also laboratory work, which amounts to three hours in two weeks out of three.

In the humanities, on the other hand, all the work is done in seminar-type sections which meet three times a week.

There is no set pattern of teaching in the various electives.

The typical student is likely to spend more time in studying and preparation than he spends in class or in the laboratory. The faculty believes that a student should receive due credit for the outside work done

in preparation for his classes, and each subject at M.I.T. is rated for the amount of study and preparation required as well as for the number of hours to be spent in class and in the laboratory. In this reckoning, a typical freshman's program shows a total of about twenty hours in the classroom and laboratory and about twenty-five hours of study and preparation each week. (Experience suggests that the amount of time allocated for outside preparation is somewhat conservative; the *average* student may require more time than is indicated.)

A study load of 45 units, counted in this way, is considered a regular academic program for a semester. Eight semesters of study at this rate, or about 360 units, are required for the Bachelor's degree.

A student's progress in the freshman classes is measured by periodic quizzes and by a three-hour examination at the end of each semester.

All ranks of the faculty help to teach the freshman classes, and a freshman's teachers will include a number of the senior faculty at M.I.T. In calculus, chemistry, and physics the faculty are assisted by graduate students, many of whom will later become members of the faculty themselves. A number of prizes are awarded annually to graduate students for particularly effective teaching.

## Advanced Placement and Advanced Standing

Most freshmen enter M.I.T. without degree credit and take the subjects which have been described. However, an increasing number (about one third of the class) now come with credit towards the M.I.T. degree. They acquire it by taking the College Board's Advanced Placement Examinations, by taking M.I.T.'s Advanced Standing Examinations before registration, or by direct certification if they took college courses as part-time students while attending school. A student who comes with credit for a subject may take the next subject in sequence or substitute another.

Such advanced credit is most commonly given in calculus, but many freshmen get credit in chemistry. The faculty require that all freshmen take the introductory subject in the humanities, which is rather different from most courses in secondary school, but many students are given credit for the freshman electives for Advanced Placement work they have done in history or English. Elective credit, usually without reference to class level, is also given for creditable Advanced Placement work in physics, biology, German, or French.

Credit given at entrance is not necessarily limited to the freshman year. A few freshmen each year get credit for classes usually taken by sophomores.

Many students get further credit after entrance by taking the Advanced Standing Examinations which the Institute offers throughout the undergraduate years. Like the Advanced Standing Examinations which may be taken before entrance, they are the equivalent of regular final examinations. They allow students of outstanding ability to obtain credit for work which they have done on their own, out of class. Candidates for the examinations must have the permission of the faculty and they must not have registered for the subject or attended classes in it at M.I.T.

Students may also depart from the regular schedule by registering for more than the normal load in a given term. By this means, again, they can accelerate, or take courses which they could not take otherwise. The fee for tuition is the same whether a student takes four, five, or more subjects a term.

Considering the rigor of the normal five-subject program, it is noteworthy that many students find the time to study for the Advanced Standing Examinations or to take an extra subject. In a recent freshman class 105 were registered for more than five subjects and a similar number started the sophomore year with credit for upperclass subjects which they had obtained by Advanced Standing Examinations.

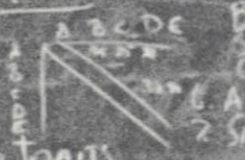
Detailed information about advanced placement at M.I.T. is given in a leaflet, "Advanced Placement and Degree Credit at Entrance," available from the Director of Advanced Placement at M.I.T.





# TRAIT & the FA Approach

1. Unit of Pers
2. Correlation → TRAITS
3. Cluster analysis
4. Performance v Expressive traits
5. ANALYSIS



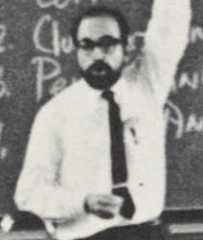
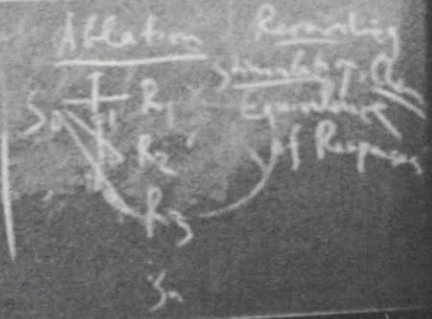
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## The 'Bobs'

1. STABILITY
2. SUBSTITUTABILITY
3. ARBITRARINESS
4. ADDITIVITY
5. EXPLANATION
6. BLANK & 0 FACTORS





# Residence

More than three-quarters of M.I.T. undergraduates live in student residences on the campus and in nearby fraternities; the remainder live at home or in apartments near the campus. All women undergraduates, except married students or those living at home, live on the campus in McCormick Hall. There are no sororities.

The students in the undergraduate residences and those in the fraternities are each staunch defenders of their ways of life, and both groups invite the incoming freshmen to join them. They are vigorous competitors in academic matters, in athletics, and in other campus activities.

## Undergraduate Houses

There are six undergraduate residences on campus. They are Burton House, Baker House, the combined Alumni Houses known as "East Campus," Senior House, and Bexley Hall, for men; and McCormick Hall, for women. All have their own student government. Student committees take full responsibility for planning social activities, fielding teams in the intramural competitions, and

making recommendations to the faculty and administration on house maintenance, room assignments, parking spaces, and the like. The houses have their own newspapers, their own musical groups, their own social committees, and their own program committees responsible for planning meetings with distinguished visitors on topics of general interest.

Notwithstanding the name of the Senior House, all the houses are open to members of all classes. The houses welcome freshmen as full members of the community; no distinction is made between freshmen and upperclassmen, and there is no hazing. Each house has its own character, and a freshman may indicate which he would prefer.

Burton House, Baker House, and McCormick Hall each has its own dining hall. Residents of East Campus and Senior House share a dining hall in the Walker Memorial. Students in Bexley Hall, which is smaller than the other houses, use the dining hall in the Graduate House—if they wish.

All the undergraduate houses (and a number of the fraternities) have

resident faculty or instructors who do not participate in the house government but reside in the houses as counselors and friends. In Burton House, Baker House, Senior House, and McCormick Hall the ranking faculty member is a married professor with the title of "Master." He is assisted by an unmarried member of the faculty called the "Senior Tutor" and a number of instructors and selected graduate students called "Tutors." As their titles indicate, these teachers are ready and willing to give academic help, but their main function is simply to participate in the life of the house, sharing their experience and knowledge. They serve as an important bridge between the students and the faculty at large.

## Fraternities

There are 28 fraternity chapters at M.I.T., each with its own house in Cambridge or nearby Boston. The Institute's fraternities are distinguished by their acceptance of responsibility in setting their own standards and in managing their own affairs. Within the individual houses

the members have complete control of finances and management; committees work on planning social functions, preparing menus, house maintenance, alumni relations, and finances. The system is arranged so that many people can share in the experience of planning and executing programs fairly and expeditiously in the interests of the group.

The Interfraternity Conference, coordinating body for the group of fraternities, is also unique in its acceptance of community responsibility and, hence, in its freedom from Institute control. The group has recently won national recognition for the excellence of its program. Subcommittees of the I.F.C. handle such matters as organizing Rush Week, planning the annual I.F.C. social weekend, carrying out a yearly blood drive, and scheduling open house parties; one subcommittee, the Purchasing Manager's Council, handles cooperative buying of house supplies—about \$500 thousand worth of goods each year.

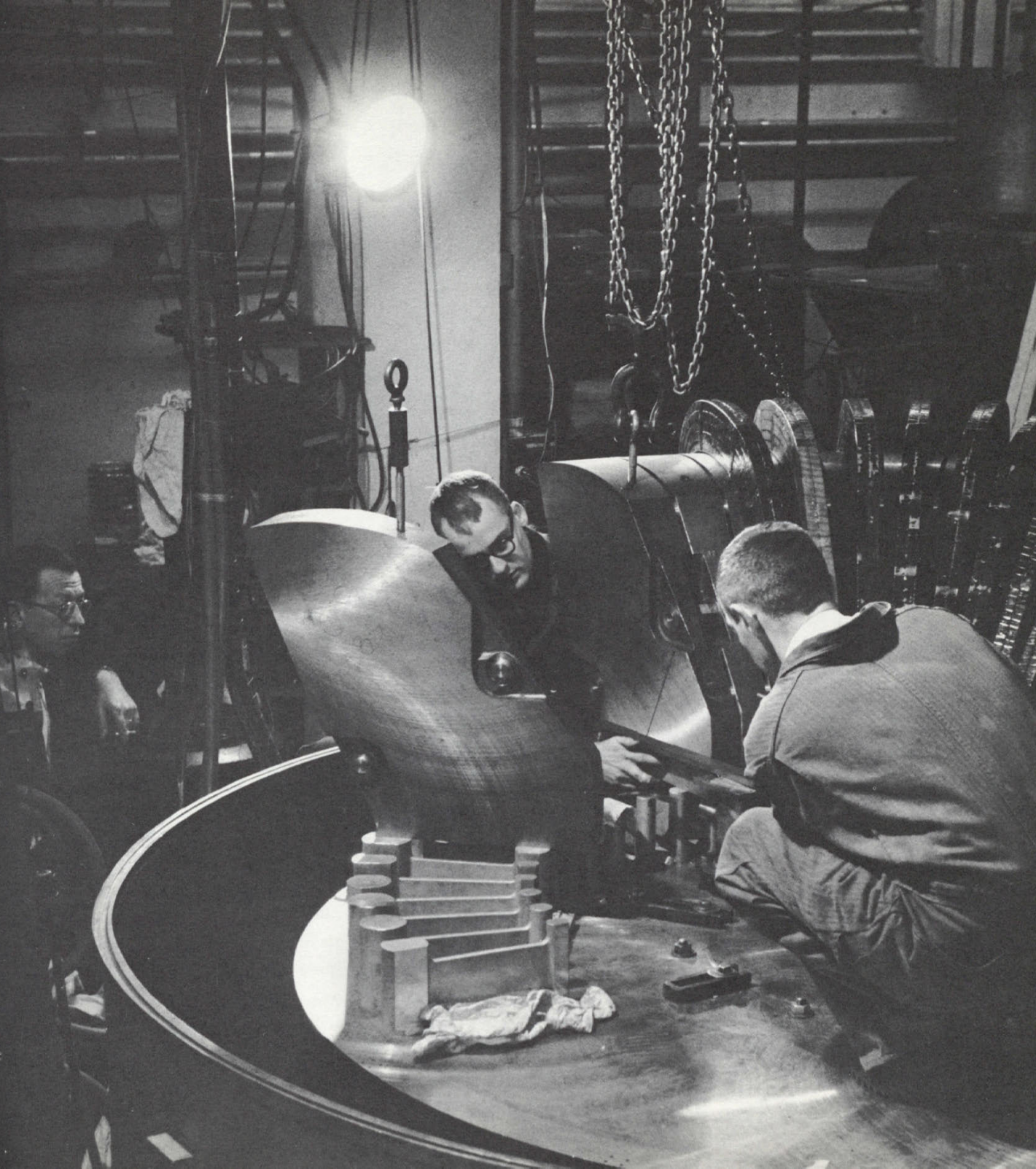
Freshmen interested in the fraternities are invited to come a few days before the beginning of the fall term for Rush Week. During this time the fraternities hold open house to allow the freshmen and the houses to get to know each other. Students who decide to "pledge" move into the houses immediately. "Pledge training" follows at the beginning of the

second term; the emphasis is on programs which will develop the freshman's sense of membership in his house and in the Institute. Several houses have adopted the idea of a "help week" during which the pledges take part in a community service project, such as refurbishing a settlement house or collecting for the March of Dimes.

The fraternities watch their budgets and are careful to keep their costs low. They are also watchful of the academic records of their members, and they are famous for the help which upperclassmen give to freshmen during tutoring sessions.

### **The Student House**

Besides the living groups already mentioned, there is also the M.I.T. Student House, an independent, cooperative living group which offers its members excellent and low cost accommodations. With the assistance of a group of active alumni the members manage and maintain the House themselves (except for cooking and major repairs), reducing the usual cost of room and board by almost \$400 a year. Membership in the House is based primarily on the financial need of the applicant; inquiries should be sent directly to the President of the House at 111 Bay State Road, Boston, Massachusetts, 02115.





# Activities

Extracurricular activities are many and varied at M.I.T., and they play a central role in the Institute's community life.

The management of these activities is the principal responsibility of student government, an elaborate organization of student committees reporting to the Institute Committee, the Chairman of which is the President of the student body. Through councils and committees reporting to Institute Committee, student government runs its own affairs, administers an annual student activities budget of over \$50,000, handles disciplinary cases involving students and student activities, certifies various student groups for activity on the campus, provides its own publicity services, represents the students in discussions of educational policy with the faculty, and programs events and supervises management of the Student Center.

The Chairman of the Institute Committee is elected each year in an all-school election in which campaigning is often vigorous, for the Chairman's position is an important and busy one. The Institute provides

his dormitory room on the campus, and he receives a grant of \$500 towards his expenses from a fund given by Dr. Vannevar Bush, Honorary Chairman of the M.I.T. Corporation.

## Student Center

M.I.T.'s \$4.6 million Student Center, open in the fall of 1965, is the focus for student government and for many other community activities. It provides student activity offices; meeting rooms; restaurants; stores, bank, and post office; pool tables and bowling lanes; art and photography areas; browsing room; music rooms; and a large general-purpose room which can be converted from lounge to ballroom. This Student Center, together with the adjacent Kresge Auditorium and Chapel, give M.I.T. a focus for its community, cultural, and recreational activities which is being widely praised for its beauty and effectiveness.

## Music

Music is a prominent activity at M.I.T. The classes in music offered as part of the humanities program

are a contributing factor. So is the Kresge Auditorium, with its remarkable acoustics and its fine Holtkamp organ. Another stimulus comes from the M.I.T. Music Library, with its large collection of printed and recorded music, its high fidelity listening rooms, and its daily record concerts.

Kresge Auditorium is the scene of numerous concerts during the year, some given by visitors like the Julliard Quartet, others by musical groups on campus. Among these campus groups are the Choral Society, Glee Club, Symphony Orchestra, Concert Band, Brass Choir, and Woodwind Ensemble.

Assisted by professional soloists, the Choral Society—composed of men and women, students and staff—sings oratorios and other major works. Recent performances have included Bach's *B Minor Mass* and the first performance in the United States of Buchtger's *Christmas Oratorio*. The group has made a number of concert trips to Europe; during the last one, in 1962, an English newspaper said, "They perform a repertoire which does not stop short at

standard works of immediate public appeal but ranges across the centuries, with no inhibitions either about attempting difficult contemporary compositions."

The Glee Club, the second oldest in the nation, is open only to male student singers. Its repertoire includes some of the most important major choral works as well as a variety of *a cappella* selections from Gregorian chants and madrigals to contemporary compositions. The Glee Club holds concerts with choral groups from leading women's colleges in the East, such as Vassar and Smith; recent performances have included the American premiere of Haydn's opera *Orfeo ed Euridice*, and the oratorio *The Creation* with members of the Boston Symphony Orchestra. The Glee Club was honored to participate in the dedication of Boston's new War Memorial Auditorium with the leading choruses of New England in the spring of 1965.

The M.I.T. Symphony repertoire consists of the standard concert literature as well as seldom-heard old and new compositions. In recent years, it has performed such traditional works as Brahms' First Symphony and such contemporary works as William Walton's ballet suite *The Quest*, which was given its Boston premiere by the Orchestra. On occasion, the Orchestra combines with

musical groups of other New England colleges such as Mt. Holyoke, and Smith.

The Concert Band has won a reputation for its performances of original compositions for "symphonic" band. In less than twenty years of existence, the Band has amassed a fine collection of serious music including works by such composers as Hindemith, Prokofiev, and Berlioz. It has played several times in Boston and makes annual concert tours to such centers as Quebec, Washington, and New York City. After a recent concert in New York City's Town Hall, the *New York Herald-Tribune* commented that the band "succeeded brilliantly" in its interpretation of the compositions on its program, "an impressive example of its aims and capabilities."

The Brass Choir is an ensemble of about seventeen instruments which makes a specialty of 16th, 17th, and 20th century music. It shares joint concerts with other groups and often plays at ceremonial occasions.

Other active musical groups are the Techtonians, a concert jazz band, and the Logarhythms, a close-harmony octet which specializes in "barber shop." The musical groups in the houses compete at an annual "All-Tech Sing," at which there are various prizes, including the surprise "Egbert" for the most original presentation. This—and a number of



other musical events, including concerts by outstanding professional artists—is under sponsorship of Baton Society, an honorary dedicated to broadening the scope of musical events at M.I.T.

### Dramatics

The center of student theatrical interest at the Institute is the Dramashop, which is a student organization supervised by a professional staff consisting of director, designer, and technical assistant. The Dramashop's program provides a monthly event for the M.I.T. community throughout the academic year. It includes four evenings of one-act plays entirely produced by students, with an on-stage critique with the entire company following the performances; and twice-yearly major productions staged by M.I.T.'s Director of Drama. The one-act evenings are usually devoted to recent plays by contemporary American and European authors, and the major productions are chosen from the classical repertoire. The programs have recently included Bertolt Brecht's *Galileo*, Congreve's *Way of the World*, Ibsen's *The Wild Duck* and one-act plays by Beckett, Ionesco, Genet, Pinter, and Albee.

An independent undertaking is the annual musical, Tech Show. Written and composed entirely by students, it is always a big event.

### Lecture Series Committee

The outstanding events made possible by the student-operated Lecture Series Committee have given it an important role in the M.I.T. community. These include public lectures, musical events, and contemporary and classic movies. Recent lecturers under the Committee's auspices have included Henry Cabot Lodge, discussing American foreign policy; Jacques Yves Cousteau, with movies of his oceanographic expeditions; Vance Packard, author and critic; Barry Goldwater; Ayn Rand, author; and Ogden Nash, poet-humorist.

### Publications

A lively observer and critic of everything that goes on at M.I.T. is the weekly newspaper, *The Tech*. Running to sixteen pages and published entirely by students, it reports and editorializes on campus news, reviews current entertainments at M.I.T. and in Boston, and covers the Institute's athletic teams.

Engaged in constant journalistic battle with *The Tech* is *Voo Doo*, a humor magazine which is "published monthly (if we're lucky)," to quote the editors. In contrasting vein is the *Tech Engineering News*, which publishes serious articles by undergraduates on scientific and other topics. *Tangent*, a literary magazine, publishes poems, short stories, and draw-

ings. *The Social Beaver* is a guide to life at M.I.T. for incoming freshmen, and *Technique*, the yearbook, sums up the Institute year.

### Other Activities

Altogether there are over 80 student activities on campus, representatives of most of the hobby and professional interests of the student body. Some of these are the Debate Society, Gilbert and Sullivan Society, Hobby Shop (carpentry, printing, and photographic facilities), Pershing Rifles, Outing Club, Rocket Research Society, Society for Social Responsibility in Science, Sports Car Club, Model Railroad Club, WTBS (an AM and FM radio station), WIMX (a "ham" station), the Young Democrat Club, and the Young Republican Club.

Technology Student Enterprises, Inc., is a new corporation which provides management facilities under which M.I.T. students may develop individual and group entrepreneurial efforts.

Students who are members of such organizations as the Technology Community Association, Alpha Phi Omega, and the Social Action Committee join to take part in social service work in many areas of Greater Boston.

Professional societies such as student chapters of the American Institute of Physics, Institute of Electrical

and Electronic Engineers, and the American Institute of Chemical Engineers enable students to discuss problems and projects in their fields.

Some activities reflect the international character of the Institute. M.I.T. students have taken part in "Operation Crossroads Africa," spending the summer vacation living and working in several African villages. The foreign students at M.I.T. (over 800) have formed a number of clubs and each year stage an International Week, with talks, films, and social events. The social club of the Latin American students, the Club Latino, is famous throughout the Institute for its "fiestas."

### **Social Life**

The M.I.T. campus is a busy place for social as well as professional activity.

There are informal dances or parties almost every weekend in the various dormitories and fraternities, and there are occasionally more elaborate formal affairs. Among the latter are the Junior Prom and Spring Weekends, consisting of a formal dance on Friday and informal events on Saturday. Recent Saturday performers have included Peter, Paul, and Mary, Pete Seeger, the New Christie Minstrels, and Fats Domino.

M.I.T.'s Boston environment offers many cultural, social, and recreational opportunities. *The Social*

*Beaver*, the handbook published by students through the Technology Community Association, thoughtfully includes a descriptive guide to the many women's colleges in the Boston area. Legitimate theaters in Boston offer many plays, some in advance of their New York openings. The Boston Symphony Orchestra, the Boston Pops, and several concert series provide programs throughout the year. Students quickly learn to find the many excellent restaurants and coffee houses. The five professional athletic teams in Boston and the nearby recreational areas, including both beaches and mountains, give every student an opportunity to watch or participate in many sports.









# Athletics

Athletics are a prominent part of student life at M.I.T. The athletic requirement assures that all men are introduced to athletic activities, with an emphasis on those sports which may be continued throughout life. Intercollegiate athletics attract in excess of eight hundred students each year, and a very large intramural program organized about the living groups annually provides recreation for some 2,000 participants. A sizable number of students prefer a casual workout at the swimming pool, the squash courts, or the ice skating rink. Regardless of their choice, all students at the Institute enjoy recreational or competitive sports.

The athletic facilities, all on the campus near the dormitories, include the Alumni Pool, with adjoining squash courts; the du Pont Athletic Center for squash, wrestling, fencing, judo, and gymnastics; the Rockwell Cage for indoor track and basketball; the Armory for indoor tennis, basketball, and pistol; a small rifle range; and the Briggs Field House, with lockers and showers to serve the Institute's playing fields.

There is also an outdoor ice rink maintained for ice skating and hockey from November to March, and there are extensive athletic fields for all outdoor sports. M.I.T.'s Sailing Pavilion, with a fleet of sixty sailboats on the Charles River Basin, provides unique recreational opportunities, and the Boat House is the center of activity for 200 students who participate in crew.

## **Intramural Athletics**

M.I.T.'s intramural program is outstanding. The emphasis is on participation, and the 2,000 students who take part play on 500 teams and compete in 1,250 contests each year. Eighteen sports are represented, including badminton, basketball, bowling, football, hockey, rifle, softball, squash, tennis, and volleyball. There is keen, year-long competition among living groups for the All-Sports Trophy, presented at the end of the year to the dormitory floor or fraternity group with the best overall record.

## **Intercollegiate Athletics**

M.I.T. fields intercollegiate teams—both varsity and freshman—in base-

ball, basketball, crew, cross country, fencing, golf, hockey, lacrosse, pistol, rifle, sailing, skiing, soccer, squash, swimming, tennis, track, and wrestling. Supported by fine coaching, the teams have done well in past years. M.I.T. has sent crews to England for the Henley Regatta, and two former M.I.T. oarsmen represented the United States in the 1964 Tokyo Olympics. The sailing team has won almost all of the important trophies in the Northeast. The varsity basketball team ended its 1964-65 season with a 14-7 record, including a win over the Icelandic National Team. Here are the highlights of 1963-64:

An undefeated sailing team swept through their New England competition in a fitting farewell to Sailing Master Walter C. "Jack" Wood, retiring after twenty-eight years.

The cross-country and track teams (indoor and outdoor)—combined records—won 19, lost 9, compiling the greatest of sixty-eight years of competition in these sports at the Institute. Seven new M.I.T. indoor and outdoor records and an all-time M.I.T. cross-country record over the Franklin Park course were set.

The basketball team won sixteen games while losing eight for the sec-

ond-best effort by an engineer quintet. M.I.T. soccer was an exciting sport. Highlights included a 3-2 victory over Harvard, Ivy League Champion, a 3-1 win over a strong Amherst team, and a 1-0 shut-out of Bridgeport, New England Champion.

M.I.T.'s lightweight crew won three of four regattas, losing only to Cornell while defeating lightweight crews from Harvard, Yale, Penn, Columbia, Dartmouth, and Rutgers. Heavyweight crew placed fifth at the Intercollegiate Rowing Association Regatta.

Four new M.I.T. swimming records were set by the varsity mermen. The fencing team won their second straight New England small college fencing championship. The ski team placed second in the intermediate division of the Eastern Intercollegiate Ski Championships. The M.I.T. tennis team won eight of sixteen matches and placed fourth in the New England Championships. The rifle team won the Greater Boston Collegiate Rifle League Tournament.

### **Minor Sports**

A group of athletic clubs sponsor competition in a number of minor sports at M.I.T., including cricket, fencing, rugby, water polo, and weightlifting.

### **Athletic Management**

Students have an important part in the management of this large athletic program. Basic control is vested in an Athletic Board, made up of both students and faculty. The student-run M.I.T. Athletic Association, an integral part of the student govern-

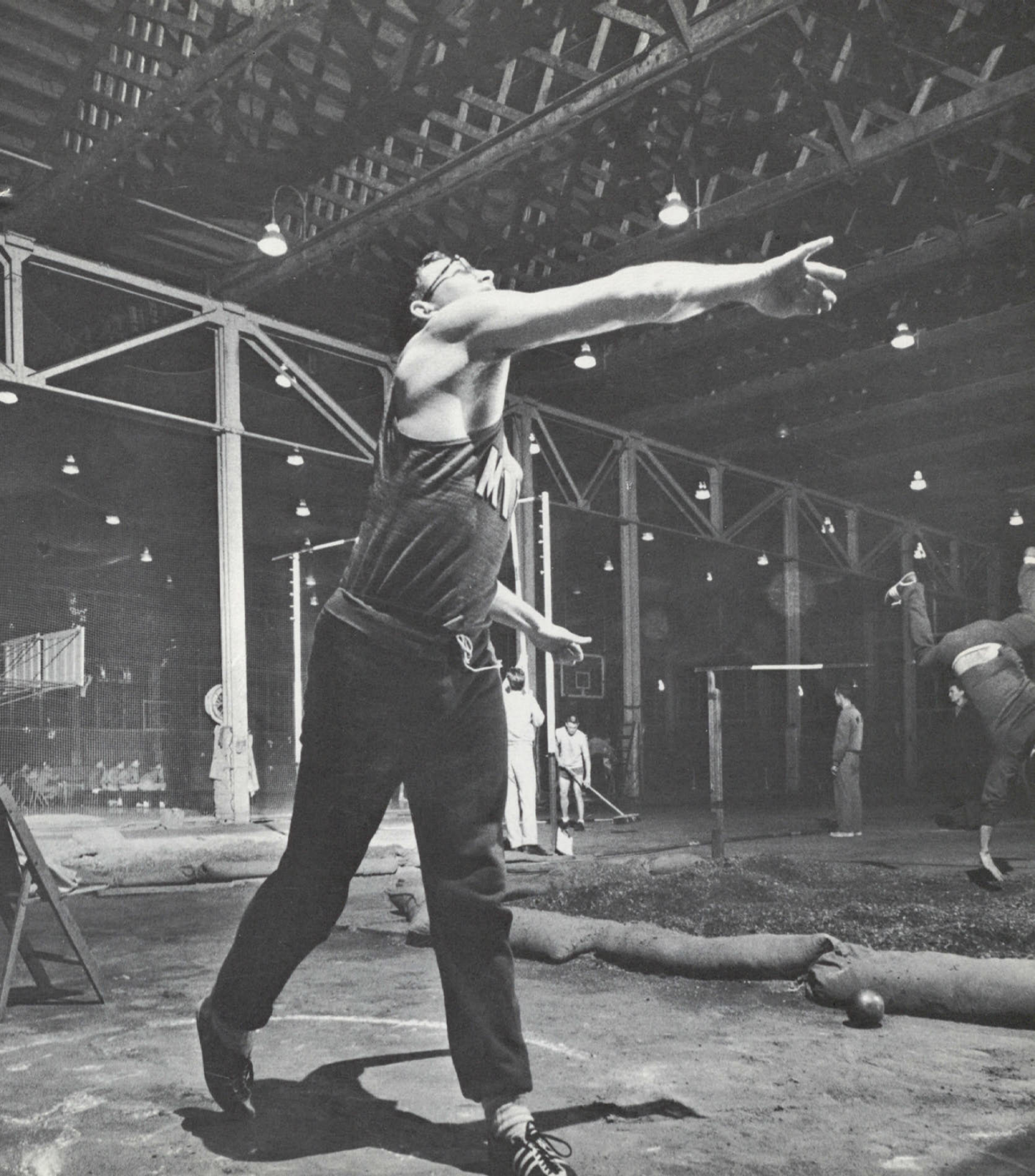
ment, shares with the Director of Athletics responsibility for the intercollegiate program; and the Association has major responsibility for the intramural events, including scheduling, coaching, and refereeing.

### **Athletics for Women**

Participation in athletics is becoming increasingly popular among women students, though there is no physical education requirement for women and no intramural competition.

Many register for physical education classes—the most popular being tennis, sailing, swimming, volleyball, fencing, and judo. The women's sailing team competes in fall and spring regattas as a member of the New England Women's Intercollegiate Sailing Association. In 1964-65 the fencing team competed in one dual meet with Brandeis and in a quadrangular meet with Radcliffe, Brandeis, and Wheaton. M.I.T. women join Radcliffe and Boston University students for riding instruction at a suburban Boston riding school. Mixed volleyball is developing into a popular activity among Greater Boston universities.







# Expenses and Financial Aid

As a private institution, M.I.T. depends for support on its students, alumni, and friends. Through the generosity of many benefactors, the Institute has an endowment which enables it to charge a tuition fee substantially less than the real cost of an M.I.T. education.

The tuition fee for 1966-67 is \$1,700 per academic year. The total basic expenses of a student for a year are estimated roughly as follows:

Tuition	\$1,700
Room and board	1,130
Books and materials	150
Student Health Program	74
	—
Total	\$3,054

In addition to these basic expenses, an allowance must be made for clothes, meals during vacations, social activities, and the extra outlay a student incurs in going away from home; the cost of travel naturally varies, but a reasonable estimate of the minimum of the other expenses is about \$400, depending on individual circumstances.

M.I.T. recognizes that this total expense is considerable. As a matter of principle, M.I.T. expects students and their families to pay as much of their educational costs as they can. These expectations are based on the premise that an M.I.T. education is a product of high value, an investment with many kinds of returns. At the same time, M.I.T. has long been concerned with developing ways of creating opportunities for young men and women of high academic and personal promise to meet their educational costs. We are determined that such applicants shall not be denied an M.I.T. education for financial reasons.

In fulfilling this pledge, M.I.T. offers four types of financial aid: scholarships, low-interest loans, part-time campus work, and two deferred payment plans. Scholarships and low-interest loans are made available only to students with financial need, while part-time work and the deferred payment plans are available to all students (with the exceptions noted below). All four types of financial aid should be viewed together in considering ways of meeting the cost of attendance at M.I.T.

Last year M.I.T. undergraduates received more than \$3,000,000 in scholarships, loans, and campus employment, and, according to a recent survey, undergraduates at only one other institution benefited from more financial support per student enrolled.

*An application for admission is not prejudiced or jeopardized by an application for aid, and no student who has the ambition to attend M.I.T. should be deterred from applying concurrently for admission and aid.*

The Institute judges the extent to which a qualified candidate needs scholarship and loan help by requiring the submission of a Parents' Confidential Statement through the College Scholarship Service of the College Entrance Examination Board.

In general, scholarships and loans are not available to students from foreign countries in their first year at the Institute. In later years, depending on their record, they may be granted aid. However, it is likely to cover only a part of their expenses.

## **Scholarships**

Scholarships are at once the best known and least understood of un-

dergraduate financial aids. Too often they are thought of as academic prizes only. More accurately, they are gifts of money to promising *and* needy students. This is not to say that scholarships do not recognize academic achievement, but it does underline the key criterion of *need*. Scholarships are not given to those who do not need them.

Since scholarship funds are limited, these awards are themselves competitive. Thus while most scholarship recipients stand above the median of their classes, not every student so ranked can expect to share in our scholarship resources. Moreover, personal qualifications are considered as well as academic achievement. When scholarships are awarded to those who are qualified, their specific values are determined insofar as possible by economic need alone.

Most of M.I.T.'s freshman scholarships are awarded on an annual basis. For most students, scholarships are continued from year to year, with the yearly stipend varying according to the need of each student at that particular time. Grants are seldom renewed for students who do not make strong academic records. Conversely, students who enter M.I.T. without scholarship aid may apply in their upperclass years and their applications will be considered on an equal basis with the applications of those who already hold grants.

Many students come to M.I.T. with scholarships from outside sources, and a candidate for an Institute scholarship should also investigate other scholarships for which he may be eligible. Correspondingly, a student who has applied to outside sources should not fail to apply simultaneously for help from M.I.T.

In all, more than half the members of every freshman class now enter M.I.T. with scholarship help, about 35 per cent with scholarship funds derived from Institute sources. These grants range from \$100 to \$2,400, depending on need; the current average is about \$1,200.

#### **Low-Interest Loans**

Loan funds represent a means of paying part of the cost of education on long-term credit under very favorable financial terms. They serve to broaden the base of assistance beyond the restricted capital available in scholarship funds. However, the loan fund capital is limited, and loan requests are granted only on the basis of financial need as established by the Parent's Confidential Statement.

Loan assistance is available to M.I.T. students from the Institute's own Technology Loan Fund and from funds available under the terms of the National Defense Student Loan Program.

M.I.T.'s was the first college loan fund in the country, and since its

founding in 1931 students at the Institute have benefited from more than \$8,000,000 in loans from the Technology Loan Fund. The following regulations now govern its operation: The amount loaned to any student in any one year is limited to the full amount of tuition, and the total loaned to an undergraduate cannot exceed \$6,000 for the undergraduate period. The repayment rate is \$150 every six months after graduation. Students who continue studies in graduate school may apply for deferment of repayment until they have completed their graduate program. Loans carry 1 per cent per annum interest during enrollment and 2 per cent per annum after graduation or termination of enrollment.

The National Defense Student Loan Program, makes available loans to students on terms quite similar to those of the Technology Loan Fund. The maximum available to an undergraduate for any one academic year is \$1,000; no undergraduate may borrow more than a total of \$5,000. Repayment commences one year after the completion of studies and is spread over a ten-year period. A student may apply for deferment of repayment if he enters graduate school, military service, or the Peace Corps. (A maximum of three years' deferment is allowed in the latter two cases.) Up to one-half of the loan may be forgiven if the borrower

chooses a career in elementary or secondary public school teaching. Loans carry no interest while the student is enrolled, and 3 per cent is charged on the unpaid balance during the repayment period.

The amount which may be loaned to an undergraduate in any one academic year from both the Technology Loan Fund and the National Defense Student Loan Program is limited to the amount of his tuition.

Approximately 40 per cent of the members of a typical M.I.T. freshman class hold loans from either or both of the sources described; the current average per student is \$625.

Loans from either source may be used to defray any legitimate educational expense. Often, for example, they are used to supplement a scholarship award so as to leave a student with no cash outlay for tuition.

Students are encouraged to consider this avenue of aid if their financial need warrants it. It is M.I.T.'s experience that students borrowing for educational purposes have incurred no millstone of debt; they have merely transferred payments for their education from a time when their earning capacity was low to a time when it was much higher.

#### **Deferred Payment**

M.I.T. allows students and their parents to defer payment of tuition in two ways.

They may, by arrangement with the Bursar, pay any or all annual fees in installments during the year, without interest or carrying charges.

Under the Installment Credit Plan, another means of spreading educational costs over a period of time, any tuition cost in excess of \$1,000 may be met by applying to the Director of Student Aid for credit in amounts up to \$350 per term. Thus, a student may use the Installment Credit Plan to obtain a maximum four-year credit of \$2,800 without collateral. This credit is available to all students who are U.S. citizens and who *do not have any other form of loan* from the Institute for the period in question. Initial payments begin six months after the first credit is received, and installment payments are continued at six-month intervals. The typical student has six years after his graduation with the bachelor's degree to complete these payments. The interest charge is 6 per cent on the unpaid balance, and the balance of the principal may be paid in full at any date. No financial statements need be submitted, but students who are minors are required to have a parent or guardian co-sign their applications.

#### **Campus Employment**

Student earnings are another important way to meet educational costs, and many students find that term-time work is an opportunity for edu-



cational development. M.I.T. provides many opportunities for jobs, including part-time work in the dining halls, dormitories, laboratories, libraries, and elsewhere on-campus. Upperclassmen often find interesting and stimulating part-time work in M.I.T. laboratories and departments allied with their academic interests.

In general, students holding on-campus jobs are restricted to between ten and twelve hours of work a week. Some competent students, however, are given permission to work longer, and most students find that they are able to take on increasing amounts of work in successive academic years.

The standard starting rate of pay for freshmen in term-time jobs is \$1.25; dining hall jobs pay \$1.50. Thus on the basis of an average ten-to-twelve-hour week, a first-year student can earn between \$200 and \$250 a term—or up to \$500 a year. Upperclassmen are paid higher hourly rates; the average annual earnings of all undergraduates is about \$525. These figures show that only a few students with unusually high earning power may expect a major part of their primary living expenses by term-time work, and no student should anticipate earning all of his living expenses in this way.

### **Scholarship and Loan Applications**

All candidates for admission will receive an Application for Financial

Aid with their Final Application material. Candidates who wish to be considered for scholarship and loan aid should complete this application and return it to the Admissions Office with their Final Application for Admission, before January 15. Applications for scholarship and loan aid filed after that date cannot be considered, except under unusual circumstances. The application for Financial Aid is an application for assistance in whatever form—scholarship, loan, or both—may be available.

The applications for admission and for financial aid are separate forms and are considered separately by different committees, even though both applications are sent from and returned to the Admissions Office.

Every student who submits an application for financial aid is required to file a Parents' Confidential Statement with the College Scholarship Service, Box 176, Princeton, New Jersey, 08540, (or Box 1025, Berkeley, California, 94701) by March 1. This form may be obtained in most secondary schools through the guidance office, or it may be obtained directly from the College Scholarship Service or from the Director of Student Aid at M.I.T.

The Student Aid Committee announces its decisions in mid-April, after the decisions of the Admissions Committee but well before May 1, the Candidates' Reply Date.

### **Applications for Other Financial Assistance**

Any student who has been admitted to M.I.T. and who is interested in employment during the school year, whether or not he or she has applied for other forms of financial assistance, should write directly to the Director of Student Personnel, Room E19-238. Although job openings are customarily available throughout the year, applicants who write shortly after they have accepted the offer of admission normally have a greater choice of positions available to them.

Admitted students who are not receiving financial aid in the form of loans and who are interested in the Installment Credit Plan should write to the Director of Student Aid, Room 5-115, for details and an application form.

All M.I.T. students, including freshmen, receive forms for the Budget Payment Plan with their registration material shortly before each academic term. No special application is required.









# Admission

M.I.T. welcomes students who by their ability, character, and interests give promise of making a contribution to the world. There is no standard M.I.T. candidate, just as there is no standard M.I.T. alumnus. Some candidates have exceptional scholarly interests, some have shown noteworthy leadership in their school or community, some have shown unusual creativity or initiative.

M.I.T. is interested not only in a student's academic record but also in what he has accomplished out of class, be it in athletics, music, publications, service enterprises, scientific or mechanical projects, or plain self-help. It regards the quality of his achievement in these areas as a significant part of his record.

A candidate's application is not affected by the number of other students applying from his school or by the area in which he lives. In accordance with Massachusetts law, M.I.T. does not consider a candidate's race, color, creed or national origin.

## **Subject Requirements**

Most secondary schools, public and private, offer the necessary subjects

for admission to M.I.T. If a student takes his work seriously and makes the most of what is available, even a small school can provide very adequate preparation. M.I.T. is careful to judge a candidate on his own merits, not on the merits of his school. The freshman class generally represents more than 600 schools, of which 80 per cent or so are public.

The subjects which M.I.T. specifically requires for entrance are English, mathematics through trigonometry, physics, and chemistry. Four years of English are required. The mathematics should include the standard topics in elementary and intermediate algebra, plane geometry, and trigonometry, but the precise form of the mathematics curriculum is not important so long as it will prepare a student to go on directly to calculus. A good score in one of the mathematics achievement tests of the College Entrance Examination Board is an indication of satisfactory preparation. If a student has covered the standard topics before his senior year he should preferably continue further, taking perhaps calculus or such topics as solid

geometry, statistics, probability, and logic.

The physics and chemistry may be covered in one-year courses or in an integrated two-year sequence in physical science. Either way, it is important that the equivalent of a full school year be devoted to each subject.

In choosing the rest of his program a student should normally make room for a foreign language and for social studies. These are important subjects, and every student should include them if he can. Any language studied should be continued long enough to gain some mastery in it.

A course in graphics can be helpful for a student going into engineering. Graphics, like language and mathematics, is a tool for the manipulation and communication of ideas, and an engineer should be able to turn to it, when this is appropriate, as readily as he does to mathematics and language in tackling a problem. It can usefully be studied at the high school level, leaving time in college for other subjects. A prospective engineering student can also profit from technical courses at

school, provided they do not displace other more important work. However, neither graphics nor shop courses are required for M.I.T. admission.

Leaflets on language study and preparation in mathematics are obtainable from the Admissions Office.

### **Entrance Tests**

M.I.T. requires every candidate to take the Scholastic Aptitude Test of the College Board (testing verbal and mathematical aptitude) and the achievement tests in (1) Level I *or* Level II Mathematics, (2) Physics *or* Chemistry, and (3) English Composition *or* American History and Social Studies *or* European History and World Cultures.

Foreign candidates should take the Scholastic Aptitude Test and the achievement tests in Level I or Level II Mathematics, Physics, and Chemistry.

The tests may be taken at any time and any number of times but should be completed not later than January of the senior year. The tests will be offered at centers throughout the world on the following dates during the coming year: July 14 and December 4, 1965; and January 8, March 5, and May 7, 1966. The March and May testing dates are for candidates for admission in 1967. A student who completes the tests after the January test date may be considered—as

a “late applicant”—for admission the following September. A few places are reserved for such “late applicants,” but most can be admitted only as vacancies may occur in the admitted class.

Each candidate should take the individual tests at the best time for him, when he will be most likely to do himself justice. If a student takes any test more than once, M.I.T. takes note only of the higher score in evaluating the results. Thus a student completing physics or chemistry in his junior year at school is strongly advised to take the achievement test in that subject in May or July, when the subject is still fresh in his mind. A student starting chemistry in September of his senior year will find it awkward to take the test in that subject in December or January when he is only halfway through the course. If a student misses taking the test in his junior-year science in May or July, it is probably to his advantage to take this test, rather than the test in his senior-year science, in December or January. However, when a test in the senior-year science is taken in December or January, M.I.T. will make allowance in interpreting the score.

A student who has studied in mathematics the standard topics in elementary and intermediate algebra, plane geometry, and trigonometry would probably take the Level I

Mathematics examination. A student who has gone beyond these and has covered topics selected from statistics, probability, analytic geometry, or calculus would probably take the Level II examination in mathematics. The admission decision will not be prejudiced by the test taken, but any student who plans to apply for advanced placement in calculus should take the Level II examination.

Each student should plan these tests in consultation with his director of studies or guidance counselor and should apply to take the tests by writing directly to the College Entrance Examination Board, Box 592, Princeton, New Jersey, 08540. (Students in the Mountain and Western States, in Western Canada, and in countries in the Far East should write to the College Entrance Examination Board, Box 1025, Berkeley, California, 94701.) Application to take the tests should be made not later than four weeks before the test date; there is an extra fee for applications received later than this. A student who applies later than two weeks before the test date may not be admitted to the tests.

### **Application Procedure for Admission**

A student may file a Preliminary Application for Admission at any time, and every applicant is encouraged to do so before or during his junior

year in high school. Filing a Preliminary Application assures each applicant that he will receive current information, including publications, interview instructions, and Final Application materials.

Students who have filed a Preliminary Application are sent final application material for both admission and financial aid in September, at the start of their last year in school. This material includes a Final Application form, which the candidate completes and returns himself, two Teacher's Personal Evaluation forms to be given to two teachers to complete and return, an Activity Adviser's Evaluation form to be given to the adviser of a student activity in which the candidate has been active, and a School Report form to be given to the school principal or guidance counselor. The material should be returned promptly, no later than January 15. Applications filed after this date can be considered only under unusual circumstances. The School Report form need not be held for mid-year grades; the Institute will send for these later. There is a \$10 final application fee (not required of foreign candidates who are overseas).

A personal interview is part of the final application process. Candidates who live close to Cambridge are asked to come for this interview at the Admissions Office. Other candidates are referred to representa-

tives of the Institute in their area. These representatives are members of the M.I.T. Educational Council, a group of alumni who are chosen for their interest in counseling students about education in the fields of science and engineering and about the broad career fields thereby opened to them. These alumni are familiar with current developments at the Institute and with the basic procedures of admission. In addition to the customary interviews, M.I.T. Educational Counselors welcome the opportunity to chat informally with prospective students to give a more personal view of the educational experience which awaits them. (Foreign candidates are not required to have an interview unless specifically requested to do so.)

The appropriate time for this required interview is between May 1 of the junior year and January 15 of the senior year. However, a student with questions he would like to discuss is encouraged to have an interview before then. If a student has had an interview before May 1, he is asked to arrange another nearer the time for filing the final application.

Members of the Admissions Office are always pleased to talk with interested students who want to see the Institute and discuss college plans. The Office is open from 9 to 5 every weekday, Monday through Friday, except on holidays, and stu-



dent-conducted tours of the campus start from the Office each day at 10 and 2. Appointments are not necessary for an interview or the tour.

Overnight accommodations in student living groups can be arranged for prospective students during the fall and spring terms; students should write in advance to the Admissions Office, indicating the day and time when they expect to arrive.

The Admissions Committee completes the selection of the freshman class after the January College Board scores are received. Most candidates are informed of the decision on their applications before the end of March. A small number, however, are held on a waiting list of qualified alternates for a decision at the end of April. No candidate who is offered admission is required to reply to the offer before May 2, the Candidates' Reply Date established by the College Board. Students who accept a place in the freshman class are sent housing information during the summer.

### **Early Action**

The Admissions Committee prefers to consider all the candidates in a given year together, after the last College Board scores are available; it feels that this allows for the fairest selection. However, if a student has completed all of the required tests before his senior year,

the Committee will, if he so requests, review his application early in his senior year. If his test scores, school grades, and other qualifications are so excellent that he is clearly acceptable, it will offer him admission then. If his qualifications are not so outstanding, the Committee will hold his application for consideration with the rest at the usual time. A qualified student who seeks early consideration under this scheme is free to file applications at other colleges, and he is not required to reply to any offer of admission he may receive from the Institute until May 2.

### **Admission from the Junior Year**

Each year some students apply for admission directly from their junior year in secondary school. The Admissions Office does not encourage this practice; but such applications are accepted and carefully reviewed at the same time, and under the same conditions, as other applications. To be accepted for admission to M.I.T. after his junior year, a student must be found to be well qualified academically, socially mature, and unable to work out a meaningful and challenging curriculum for a senior year in his secondary school.

### **For Further Information**

Special brochures describing the programs and career opportunities in some departments are available. For

these, and for answers to special questions about admission and curricula, write Professor Roland B. Greeley, Director of Admissions, Room 3-108, Massachusetts Institute of Technology, Cambridge, Massachusetts, 02139. For information about advanced placement and advanced standing, write to the Director of Advanced Placement, Room 3-108, Massachusetts Institute of Technology, Cambridge, Massachusetts, 02139.

Send questions about financial aid to Jack H. Frailey, Director, Student Aid Center, Room 5-115, Massachusetts Institute of Technology, Cambridge, Massachusetts, 02139.

### **A Note About Visiting M.I.T.**

The Institute welcomes visits from prospective students.

Institute offices are open from 9 to 5 on weekdays; they are closed on Saturdays, Sundays, and holidays. (Note that, in addition to the usual holidays, M.I.T. is closed on Washington's Birthday, Patriots' Day (April 19), Memorial Day, Columbus Day, and Veterans' Day.)

Prospective students should go to the Admissions Office, entering the Institute at 77 Massachusetts Avenue, Cambridge. Advance appointments are not necessary. Student-led tours of the Institute leave the Admissions Office each weekday (except holidays) at 10 and 2.

## The Photographs

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2-3: Aerial view of the central campus (*Laurence Lowry*).

6: The Great Court (*David A. Cahlander '59*).

8: Visual design studio.

9: Freshman chemistry laboratory (*Sam Falk, The New York Times*).

10: Life science laboratory.

16: The gallery in Hayden Library.

17: Dormitory discussion (*J. Ph. Charbonnier, Réalités*).

18: TX-O Computer.

25: Architecture drafting room.

26: Freshman seminar in materials.

33: Hayden Library reading room (*Major Morris*).

34: Undergraduate seminar in electrical engineering.

35: Civil Engineering Systems Laboratory.

36: Student government election (*Elliott A. Green '66*).

42-43: First-year elective in psychology (*Major Morris*).

44: Senior House courtyard.

47: Van de Graaff accelerator.

48: Field Day action (*Curtiss D. Wiler '63*).

53: The Brass Choir.

54: Briggs Field (*Conrad E. Grundlehner '64*).

55: Tech Show (*Curtiss D. Wiler '63*).

56: The crew at Henley, 1962  
(©*Geo. Bushell & Son*).

59: Rockwell Athletic Cage (*Gjon Mili '27*).

60: Dinghies on the Charles River (*Conrad E. Grundlehner '64*).

64: Physics question (*Owen D. Franken '68*).

66: After-class comment (*Owen D. Franken '68*).

67: Humanities elective in American folklore (*Gjon Mili '27*).

68: Registration Day (*Gjon Mili '27*).

cover: M.I.T. from the West Campus.













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