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BULLETIN

No. 1

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY



General Information
Requirements for Admission

CAMBRIDGE, MASSACHUSETTS
JANUARY, 1924

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AIRPLANE VIEW OF MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Vol. 59

No. 1

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

GENERAL INFORMATION
REQUIREMENTS FOR ADMISSION



IN EFFECT JANUARY, 1924
(SUBJECT TO REVISION WITHOUT NOTICE)

CAMBRIDGE, MASSACHUSETTS
1924

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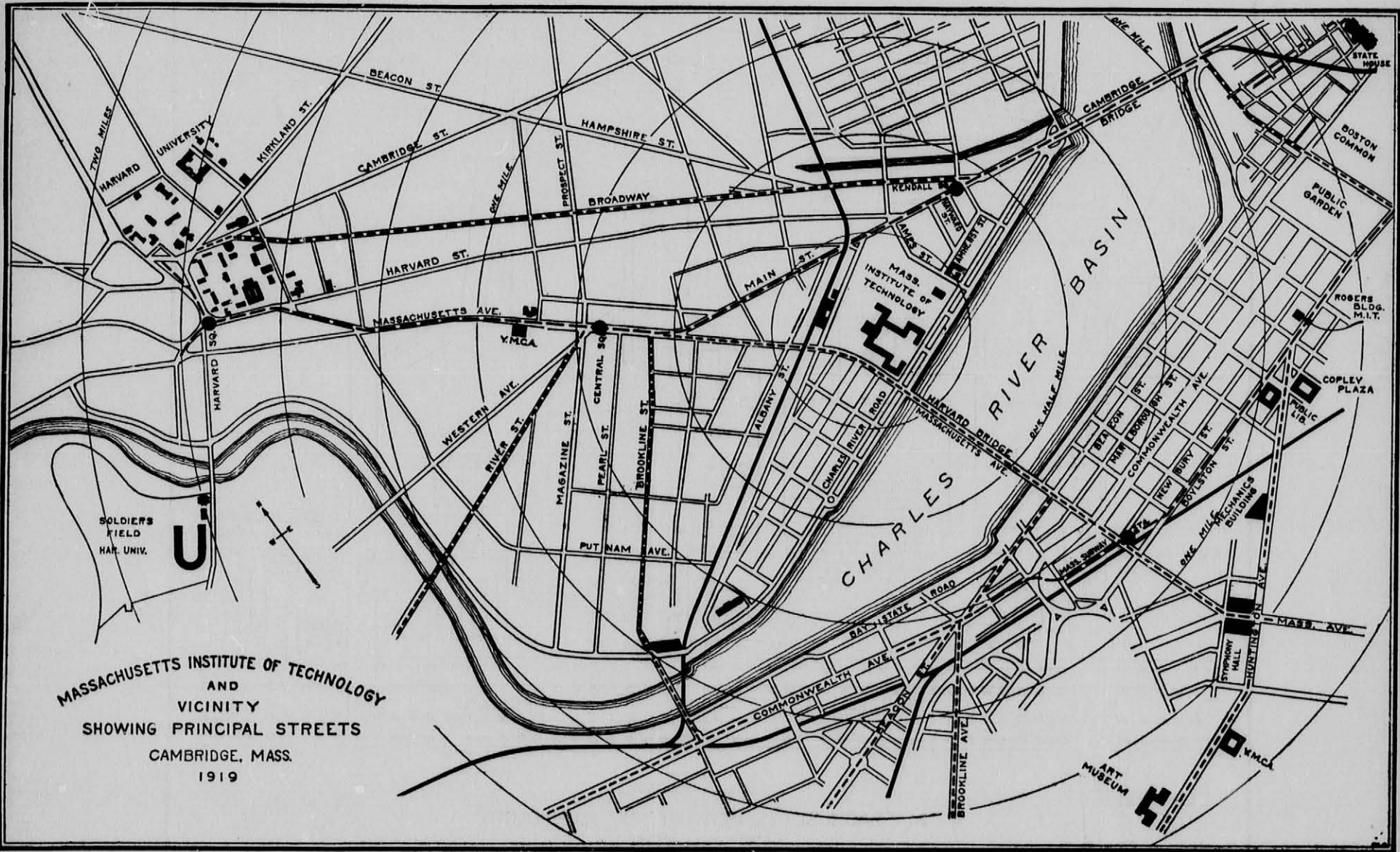
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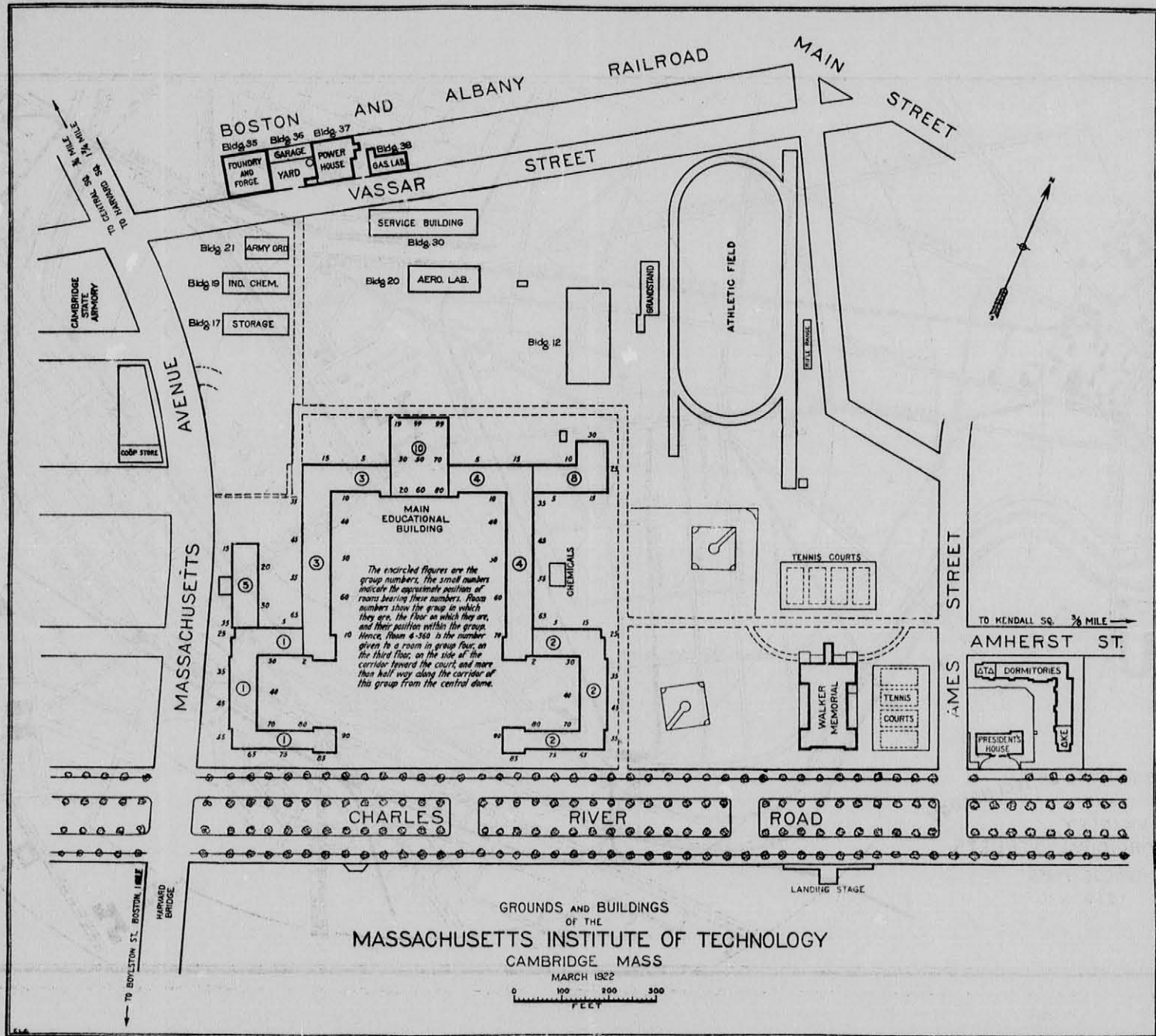
CALENDAR

For Academic Year	1923-24	1924-25
Entrance Examinations at Technology Begin.....	Sept. 19	Sept. 24
College Year Begins.....	Oct. 1	Oct. 6
December Examinations.....	Dec. 15-21	Dec. 17-23
Christmas Vacation.....	Dec. 22- Jan. 1	Dec. 24- Jan. 4
Second Term Begins.....	1924 Jan. 2	1925 Jan. 5
Final and Condition Examinations.....	Mar. 10-15	Mar. 16-21
Third Term Begins.....	Mar. 19	Mar. 25
Spring Recess.....	April 21-23	April 20-22
Last Exercise, Third Term.....	May 29	June 5
Final and Condition Examinations.....	May 31- June 10	June 6-16
Last Examination, Fourth Year.....	June 3	June 9
Commencement Day.....	June 10	June 16
Examinations, College Entrance Examination Board.....	June 16-21	June 15-20
Summer Camp Begins.....	Aug. 5	Aug. 4

Exercises are omitted on the legal holidays of Massachusetts.



MASSACHUSETTS INSTITUTE OF TECHNOLOGY
 AND
 VICINITY
 SHOWING PRINCIPAL STREETS
 CAMBRIDGE, MASS.
 1919



THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

GENERAL INFORMATION

The Purpose of the Massachusetts Institute of Technology. — Its primary purpose is to afford to students such a combination of general, scientific and professional training as will fit them to take leading positions as engineers, scientific experts, and teachers and investigators of science. It is also one of its important functions to contribute to the existing store of scientific knowledge and to the promotion of industrial development through the prosecution in its laboratories of original researches in pure and applied science.

The school consists of the Professional Departments of Civil and Sanitary Engineering; Mechanical Engineering; Mining, Metallurgy and Geology; Architecture, including Architectural Engineering; Chemistry; Chemical Engineering; Electrical Engineering; Biology and Public Health; Physics, including Electrochemical Engineering and Aeronautical Engineering; Naval Architecture; also the Departments of English and History; Economics and Statistics, including Engineering Administration; Mathematics; Military Science; Modern Languages and Hygiene.

The Institute also maintains Research Laboratories of Physical Chemistry, Applied Chemistry, Electrical Engineering and Aerodynamics.

The Institute offers to its students both undergraduate and graduate courses of study. The former lead to the degree of Bachelor of Science; the latter, to the degrees of Master in Architecture, Master of Science, Doctor of Philosophy, Doctor of Science or Doctor of Public Health. It also affords to advanced students and to more experienced investigators excellent opportunities for the pursuit of original scientific investigations in its departmental special research laboratories.

Historical Sketch. — The foundation of the Massachusetts Institute of Technology was laid in a "Memorial" prepared in 1859 by Prof. William Barton Rogers, and presented, by a Committee, to the Legislature of the Commonwealth of Massachusetts of 1860. In this Memorial "reference is made to the expected early establishment of a comprehensive Polytechnic College, furnishing a complete system of industrial education supplementary to the general training of other institutions and fitted to equip its students with every scientific and technical principle applicable to the industrial pursuits of the age."

On April 10, 1861, an Act was passed by the General Court of Massachusetts to incorporate The Massachusetts Institute of Technology "for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science, and aiding generally by suitable means the advancement, development and practical application of science in connection with arts, agriculture, manufactures and commerce."

The first meeting of the Institute for organization was held April 8, 1862, but the Civil War led to the postponement of the opening of the School of Industrial Science. A preliminary session of the school was opened on February 20, 1865, fifteen students attending. The regular courses of instruction began October 2, 1865.

For fifty years the Institute developed on the original site granted by the State. During this time the number increased from fifteen students to nineteen hundred, the staff of instruction from ten to three hundred, and the number of courses of study leading to the degree of Bachelor of Science from six to fifteen.

Location. — After occupying for fifty years its original location in Boston the Institute moved to a new site on the Charles River Basin. This site comprises a tract of fifty acres extending along the esplanade on the Cambridge side of the river and affording an extensive panoramic view of the city of Boston. Here are located the Educational Buildings, the Walker Memorial, a social center, the Dormitories, the Athletic Field and the Power House. Many street car and subway lines afford easy access from all parts of Boston, Cambridge, the suburbs, and the railroad stations for trains from the north, south and west. The location of the Institute in proximity to the great collections and libraries

of Boston and Cambridge, and in the neighborhood of a great manufacturing district is of great advantage to technological students.

The Department of Architecture is located in Boston and occupies the Rogers Building on the old site on Boylston Street.

REQUIREMENTS FOR ADMISSION

Admission to the First Year. — To be admitted as a first-year student the applicant must have attained the age of seventeen years and must give satisfactory evidence of preparation in the following subjects. (Numbers in parentheses indicate the ordinary "unit" rating, but require no attention from candidates.)

Subjects in which **examinations** must be passed:

Algebra (2)	Plane Geometry (1)
English (3)	Solid Geometry ($\frac{1}{2}$)
French, German (a or b or c)	History (unless student can present record of certificate grade for course taken four or five hours per week for one year) (1)
(a) Elementary French (2) and Elementary German (2)	Physics (1)
(b) Elementary and Intermediate French (3)	Plane Trigonometry ($\frac{1}{2}$)
(c) Elementary and Intermediate German (3)	

Subjects for which **certificates** may be presented:

Chemistry (1) **History** (see list above) and one unit of the following electives if language (a) is offered or two units if language (b) or (c) is offered:

Biology (1)	Latin (2) (not less than two units may be offered)
English (Additional) (1)	Mechanical Drawing (1)†
French (Intermediate)* (1)	Mechanical Drawing and Mechanic Arts (1)†
German (Intermediate)* (1)	Spanish (1)
History (Additional) (1)	

*If not offered as an examination subject.

†Will be withdrawn from the list in 1926.

Table of Equivalents. — The following table shows for which subjects records of the College Entrance Examination Board are accepted as covering requirements for admission to the Institute.

M. I. T. Subjects

Algebra
 Chemistry
 English
 French (Elementary)
 French (Intermediate)
 Geometry, Plane
 Geometry, Solid
 German (Elementary)
 German (Intermediate)
 History
 Physics
 Plane Trigonometry
 Electives

C. E. E. B. Subjects

Mathematics A, or A1 and A2
 Chemistry
 English Cp or 1 and 2 or 1-2
 French A or Cp 2
 French B
 Mathematics C
 Mathematics D
 German A or Cp 2
 German B
 History A to D inclusive
 Physics
 Mathematics E
 History A to D inclusive; Latin 1 and 2 or
 Cp 2; French B or Cp 3; French BC or
 Cp 4; German B or Cp 3; German BC or
 Cp 4; Spanish; Botany; Zoölogy; Biol-
 ogy, Drawing.

Records of 60 or above will be accepted, except as noted below.

Candidates are expected to take the divided examinations in Geometry. If the single examination in Geometry, CD, is taken, a record of at least 70 is required.

A record of 70 in Trigonometry will be required in 1924 and thereafter in view of the importance of the subject for Institute candidates and the fact that the College Board ratings in this subject are relatively high in comparison with those in Algebra and Geometry.

Candidates are expected to take the divided examinations in both French and German, but if the single examination, Cp 3, is taken, a record of 60 or above will be accepted as covering both elementary and intermediate.

Division of Entrance Examinations.—Candidates are allowed to divide their entrance examinations over a period of two or three years or between June and September of the same year.

A preliminary candidate is one who is taking examinations a year or more in advance of his anticipated admission. He may take examinations either in June or September, but is not in general allowed to repeat in September any examinations in which he has failed in June. The examinations in Physics and Trigonometry should be taken not more than one year before admission, and the study of Mathematics and English should have been continued during the year immediately preceding admission.

Preliminary candidates taking the Institute examinations in September are expected to present statements from their schools or their teachers in regard to their preparation, blank forms for which may be obtained by writing to the Institute. Admission to the examinations will not in any case depend on the presentation

of such a statement, but this information will aid the Admissions Committee when considering the records.

Time and Place of Entrance Examinations.—Examinations for admission to the first-year class are held in June by the College Entrance Examination Board, and in September by the Institute in Cambridge, only. Information in regard to the June examinations may be obtained by addressing the secretary of the College Entrance Examination Board, 431 West 117th Street, New York, N. Y.

Candidates are advised to attend the June entrance examinations in order that any deficiencies may be made up during the summer.

The September examinations are held at the Institute on the Wednesday, Thursday, Friday and Saturday following September 18.

SCHEDULE OF EXAMINATIONS

FOR SEPTEMBER, 1924

(Application in advance for admission to the examinations is not necessary. Candidates will register during the examination period.)

Wednesday, September 24, 1924

9.00 a.m. to 12.00 a.m. Algebra
2.00 p.m. to 4.00 p.m. Physics

Thursday, September 25, 1924

9.00 a.m. to 11.00 a.m. English
11.15 a.m. to 1.00 p.m. Plane Geometry
2.00 p.m. to 4.00 p.m. French (Elementary)

Friday, September 26, 1924

9.00 a.m. to 10.45 a.m. Solid Geometry
11.00 a.m. to 1.00 p.m. German (Elementary)
2.00 p.m. to 4.00 p.m. Trigonometry

Saturday, September 27, 1924

9.00 a.m. to 11.00 a.m. French (Intermediate)
11.00 a.m. to 1.00 p.m. German (Intermediate)
2.00 p.m. to 4.00 p.m. History (U. S. or Ancient)

Entrance Examination Fee (See Page 22.)

Conditions.— A candidate for admission in September of any year must take at that time examinations in any subject not already passed.

Summer Courses in Entrance Subjects.— The Institute offers summer courses corresponding to entrance requirements in Algebra, Solid Geometry, Trigonometry, Physics, Chemistry, English, French and German. An applicant passing any of these subjects will be excused from taking the entrance examination in subjects passed. (Summer Session Bulletin will be sent upon request.)

General Preparation.— The student intending to enter the Institute should bear in mind that the broader his intellectual training and the more extensive his general acquirements, the greater will be the advantages he may expect to gain. Thorough preparation in the subjects set for examination is important, for the character and the amount of instruction given in the Institute leave little opportunity to make up deficiencies. The training given in the best high and preparatory schools will, in general, afford suitable preparation.

The requirements of age and scholarship specified herewith are regarded as a minimum in all ordinary cases, and only exceptional circumstances will justify any relaxation. Application in advance for admission to the Institute is at present unnecessary, and admission depends only upon the satisfactory completion of the entrance requirements.

DEFINITIONS OF ENTRANCE SUBJECTS

In entrance mathematics, importance will be attached to accuracy in the numerical work of the papers in algebra and geometry and to satisfactory drawings in geometry. Familiarity with the metric system is required.

The attention of teachers and applicants is particularly called to the necessity of thorough preparation in mathematics, not merely as to the extent and amount of work done, but as to its quality. Candidates should be thoroughly grounded in fundamental principles, operations, and definitions. A considerable portion of the mathematics should be given during the final years of preparation.

The definitions given herewith are those reported by the committee of the American Mathematical Society, September, 1903.*

DEFINITIONS OF REQUIRED SUBJECTS

Algebra.—The four fundamental operations for rational algebraic expressions; factoring, determination of highest common factor and lowest common multiple by factoring; fractions, including complex fractions; ratio and proportion; linear equations, both numerical and literal, containing one or more unknown quantities; problems depending on linear equations; radicals, including the extraction of the square root of polynomials and numbers; exponents, including the fractional and negative; quadratic equations, both numerical and literal; simple cases of equations with one or more unknown quantities, that can be solved by the methods of linear or quadratic equations; problems depending upon quadratic equations; the binomial theorem for positive integral exponents; the formulas for the n th term and the sum of the terms of arithmetical and geometric progressions, with applications.

It is assumed that pupils will be required throughout the course to solve numerous problems which involve putting questions into equations. Some of these problems should be chosen

**The College Entrance Examination Board has recently adopted new definitions of the mathematical subjects and examinations based on the new definitions will be given in 1924 and thereafter. Detailed information in regard to these definitions may be obtained from the Secretary of the Board. For the present examinations will also be given on the old basis in algebra and trigonometry, and the examinations at the Institute in 1924 will correspond with the existing definitions.*

from mensuration, from physics, and from commercial life. Facility in the analysis and the discussion of an algebraic expression or equation, and the use of graphical methods and illustrations in connection with the solution of equations, is also expected.

A summer course is given in this subject. (See page 10.)

Plane Geometry.—The usual theorems and constructions of good textbooks, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons and the measurement of the circle. The solution of numerous original exercises, including loci problems. Applications to the mensuration of lines and plane surfaces.

Solid Geometry.—The usual theorems and constructions of good textbooks, including the relations of planes and lines in space; the properties and measurement of prisms, pyramids, cylinders and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including loci problems. Applications to the mensuration of surfaces and solids.

A summer course is given in this subject. (See page 10.)

Trigonometry.—Definitions and relations of the six trigonometric functions as ratios; circular measurements of angles. Proofs of principal formulas, in particular for the sine, cosine, and tangent of the sum and the difference of two angles, of the double angle and the half angle, the product expressions for the sum or the difference of two sines or of two cosines, etc.; the transformation of trigonometric expressions by means of these formulas. Solution of trigonometric equations of a simple character. Theory and use of logarithms (without the introduction of work involving infinite series). The solution of right and oblique triangles and practical applications. Accuracy in the use of four-place tables of natural and logarithmic functions is important. (The use of the slide rule will not be permitted at the examination.)

A summer course is given in this subject. (See page 10.)

Chemistry.—Applicants must present evidence of familiarity with the rudiments of chemistry. More importance is

attached to aptitude in manipulation and in critical observation, and to a practical knowledge of the composition, methods of preparation, and reactions of the common chemical substances, than to a knowledge of theoretical conceptions, such as the determination of atomic and molecular weights, molecular structure, valence, etc. A certificate in Chemistry must indicate a passing grade and must show 150 hours of work.

A summer course is given in this subject. (See page 10.)

Physics.— The candidate will be expected to be familiar with the fundamental principles of physics. It is especially desirable that he should have a good knowledge of general mechanics and of the mechanics of solids, liquids, and gases. A knowledge of physical hypotheses is comparatively unimportant. Textbook instruction should be supplemented by classroom experiments. A sufficiently extended treatment of the subject will be found in any of the principal textbooks now in use in secondary schools. Ability to solve simple problems will be expected.

It is furthermore expected that the student will receive training in laboratory work. Deficiency in laboratory work will not necessarily lead to rejection, provided the school from which the student comes is unable to furnish such instruction. In this case, however, a certificate of such inability will be required from the principal of the school.

The laboratory work required for entrance should consist of at least twenty-five well selected experiments, chosen with the view of illustrating and teaching fundamental laws and principles rather than methods of physical measurement. This work should preferably come during the school year immediately preceding the student's entrance. A satisfactory selection may be made from Experiments 1 to 51 of the College Entrance Examination Board.

A summer course is given in this subject. (See page 10.)

English.— The examination in English is intended as a test of the candidate's ability to express himself clearly and simply, and of his capacity for using his past experience and reading in expressing elementary processes of thought.

In preparation for the examination the candidate should have done a considerable amount of reading, chosen from authors of

recognized worth. The books adopted by the National Conference on Uniform Entrance Requirements are taught in most secondary schools, and the candidate may, if necessary, use these in his preparation. In any case it is expected that the aim of preparatory study will be, first, to develop in the pupil a consciousness that words, if understood, convey definite ideas; and, secondly, to form in him the habit of comparing these ideas with his own experience and his own views.

The candidate will be required to write upon subjects familiar to him, or to comment on a literary treatment of some such subject. When questions of a literary sort are asked, they are intended rather as a test of the candidate's power to read intelligently than of his knowledge of specific books.

The composition should be correct in spelling, punctuation, grammar, idiom, and the formation of paragraphs, and should be plain and natural in style. The candidate will be judged by how well he writes rather than by how much he writes.

A summer course is given in this subject. (See page 10.)

French (Elementary).—The requirement for Elementary French is a systematic course of four or five periods a week extending over at least two school years, each year representing not less than 120 full sixty-minute periods or the equivalent. Training in pronunciation and in the understanding of easy spoken French is regarded as an essential part of this requirement.

The examination in Elementary French covers the following:

(a) Ability to read simple prose at sight and to translate it into clear and idiomatic English.

(b) Proficiency in elementary grammar, to be tested by the translation of easy English into French and by questions on the following topics: inflection of nouns and adjectives for gender and number; pronominal adjectives; the forms and positions of pronouns, especially the personals; the partitive construction; the forms and use of numerals; the use of the subjunctive, except unusual cases; the conjugation of the regular and of the more common irregular verbs. Special attention will be given to the verbs.

French (Intermediate).—This course should consist of recitations partly conducted in French. It should comprise a

continuation of the study of grammar, translation into French of connected passages, letter-writing, dictation, reading and translation of some standard modern authors.

At the end of the course the student should be able to understand easy spoken French, express simple ideas in French, read works of ordinary difficulty with considerable ease, and finally, have a real appreciation of the authors read.

Summer courses are given in French. (See page 10.)

German (Elementary).—The requirement for Elementary German is a systematic course of four or five periods a week extending over at least two school years, each year representing not less than 120 full sixty-minute periods or the equivalent.

Training in pronunciation and in the understanding of easy spoken German is regarded as an essential part of this requirement.

The examination in Elementary German covers the following:

(a) Ability to read simple prose at sight and to translate it into clear and idiomatic English.

(b) Proficiency in elementary grammar, to be tested by the translation of easy English into German, and by questions on the following topics: the conjugation and synopsis of the regular and of the more usual irregular verbs; declension of readily classified nouns, of adjectives, articles, pronouns; comparison of adjectives and adverbs; use of the more common prepositions; the simpler uses of the modal auxiliaries; simple cases of indirect discourse, and the rules for the order of words.

German (Intermediate).—This course should include a systematic review of grammar. The reading, scientific as well as literary, should become more difficult, and the syntax, idioms and synonyms of the language should be carefully studied.

By the end of the course the student should be able to read understandingly any ordinary newspaper or magazine article of a literary or popular scientific nature, to understand simple spoken German, and to express simple thoughts in German.

Summer courses are given in German. (See page 10.)

Note.—It is expected that the translations from French and German will be written in correct and expressive English; and these papers may at any time be examined as additional evidence in determining the student's proficiency in composition.

History.— The History requirement may be met by presenting a record of certificate grade or by passing the examination in any of the following subjects: Ancient, European, English or American History. The Institute offers only examinations in Ancient and United States History. In United States History a thorough acquaintance with the history of the Thirteen Colonies and of the United States to the present time is required, together with an elementary knowledge of the government of the United States. In Ancient History the requirement covers the history of Greece and Rome to the fall of the Roman Empire in the West.

Each of the above subjects is intended to represent one year of historical work, wherein the study is given five times per week, or two years of historical work, wherein the study is given three times per week.

The examination in History will be so framed as to require comparison and the exercise of judgment on the pupil's part, rather than of mere memorizing. The examinations will presuppose the use of good textbooks, collateral reading and practice in written work. Geographical knowledge may also be tested.

Candidates expecting to take the Course in Architecture are advised to prepare in Ancient History.

DEFINITIONS OF ELECTIVE SUBJECTS

The object of the elective requirements is to secure and to recognize greater breadth of preparatory training. The time allotment for each unit of elective should be equivalent to four or five periods per week for a school year of approximately forty weeks. The grade attained should be 60 per cent or better.

These requirements are to be met by the presentation of certificates made out on forms supplied by the Institute. Certificates are not required of candidates passing College Entrance Board Examinations in the elective subjects.

Excuse from the elective requirement, or the acceptance of an equivalent, may be allowed in the case of applicants considerably above the usual age, or those coming from foreign countries. Applications for the acceptance of elective subjects other than those included in the list may be addressed to the Registrar. In general it is desired that electives should not be

chosen with reference to anticipation of subjects in the Institute curriculum. Applicants desiring advance credit for such work will be expected to pass the usual examinations for advanced standing.

Elective Biological Subjects.— Applicants may offer either (a) an extended course in botany, zoölogy or in physiology; or (b) briefer courses in any two of the same subjects. In the latter case evidence should be given of thorough elementary knowledge of general principles and of some laboratory and field work.

Elective English.— The work of secondary schools varies so much in this subject that no definite requirement is formulated at present. Any applicant who has carried work in English materially beyond the entrance requirements may present for approval as his elective a statement of the amount and kind of work done.

Elective Latin.— Satisfactory evidence should be presented that the applicant has acquired the elements of Latin Grammar, that he has had an elementary course in Latin Composition and has read four books of Caesar or the equivalent. As a smaller amount of Latin would be of no practical advantage, this is the minimum amount that can be accepted.

The study of Latin is recommended to persons who purpose to enter the Institute and who can give the subject adequate attention while preparing for the regular requirements for admission.

Elective Mechanical Drawing.— The applicant should have had at least 160 hours of drawing, and have attained good results in penciling and inking. He should be familiar with the projection of solids, and the finding of sections and developments. Experience in reading projection drawings is regarded as important, and it is also desirable that the applicant shall have had some instruction in sketching from machine details, and in free-hand lettering and dimensioning. Applicants are advised in general not to offer mechanical drawing or descriptive geometry with a view to omitting these courses at the Institute.

Elective Mechanical Drawing and Mechanic Arts.— These subjects may be offered in combination. The drawing should rep-

resent at least 60 hours' work, as described in the preceding section or such as is ordinarily given in connection with mechanic arts courses.

In mechanic arts, the applicant should be thoroughly familiar with the different tools and materials and know when and how to use them. He should be able to adjust and to sharpen all edge tools and capable of executing work from working drawings. The main object of preparatory exercises should be systematic instruction in the correct use of various tools and in the fundamental operations, rather than construction.

Carpentry: The exercises should include systematic instruction in sawing; planing; chiseling, including chamfering, grooving, and plain molding work; framing, including tenoning, mortising and fitting in braces; use of the ordinary molding-planes and the making of simple moldings; the making and use of the miter-box in fitting moldings; nailing; dovetailing; gluing; and the proper use of sandpaper.

At least seventy-five hours should be allowed, exclusive of any time that may be used in making working drawings.

Wood-turning: The Applicant should have had systematic instruction and experience in the use of the wood-lathe; should understand the adjustment of speeds for the work in hand, and how to use properly the turning tools, such as gouges, turning chisels, nosing tools, right and left side tools, parting tool, calipers and dividers. The exercises should also include systematic instruction in center and duck turning, with particular attention to the production of smooth work by the cutting action of the tools, and not by the excessive use of sandpaper.

At least forty-five hours should be allowed, exclusive of any time that may be used in making drawings.

Elective Spanish (Elementary).—Elementary grammar, including the common irregular verbs; reading, translation from Spanish into English and from English into Spanish.

ADMISSION TO ADVANCED STANDING

The Institute offers to both graduates and undergraduates of other colleges opportunities for transfer on as favorable a basis as is compatible with the requirements of its professional courses and standards. As most of these requirements are, however, prescribed,

it is important that the applicant's previous work should have been planned due with reference to them.

In general, an applicant from another college who has attended one full year or more, obtained satisfactory grades (the lowest passing grade is not a satisfactory grade on which to base credit) and received honorable dismissal, may expect excuse from entrance examinations and provisional credit for entrance subjects and those given at the Institute in so far as he has covered these subjects. Students who present but a single year of college work and offer chemistry are not credited with first-year Chemistry except on the basis of an examination taken in that subject at the Institute in September. Students presenting but one year's work in English without History must take English and History 12 and 13, unless they pass an examination in September. Students who intend to take any of these examinations should notify the Institute and send for an examination schedule. In case a student has not been credited with entrance subjects he will, in general, be expected to make them up by taking entrance examinations.

A candidate for admission with advanced standing should send to the Institute early in June, and in any case not later than July 15, his application, accompanied by an official record from the college or university which he has attended, showing the subjects credited at entrance and those which he has taken in college, with his grades; also a statement of honorable dismissal (or its equivalent) or a certificate of graduation. He should send sheets detached from his college catalogue describing the subjects which he has pursued. On these selected sheets he should write his name and (in the margin) check, the subjects that he has taken. By preparing a tabulation of his subjects and credits on the application form for admission with advanced standing and underlining the Course Schedule to show the subjects in which he expects to receive credit, he may be able to estimate the terms of his admission and his probable deficiencies. This tabulation will also be helpful to the Committee on Admissions in determining his rating. As soon as his rating is determined, a report will be sent him in the form of a certified Course Schedule which will show with what Institute subjects he is credited.

A student who plans to enter the third or fourth year at the Institute should, if possible, send his credentials earlier than the

dates mentioned above, including a certificate of the subjects completed, together with a statement of those which he expects to complete before entrance. The candidate can forward in June a record of the additional subjects completed at that time. Candidates having deficiencies are urged to make them up by attending the Summer Session at the Institute.

Questions about credits in professional subjects given in the *third* or *fourth* year will be adjusted in personal interview when they are not settled by correspondence. In such cases the student is required to consult the Department concerned a few days before the opening of the term so that he may complete his registration in season.

Candidates should send for application blanks, circulars of information and bulletin on Courses of Study. They should if possible name the course that they desire to take.

For information concerning opportunities for graduate work and research applicants are referred to the Bulletin "Graduate Study and Research."

Students applying for admission with advanced standing to Course IV, Option 1, will be graded in design in accordance with their performance in their first problem.

Admission of Special Students.— An applicant above the usual age, pursuing special work, may be classed as a Special student. He should present a plan for study approved by the Department with which his work will be taken. He may be excused from the usual entrance examinations in case he has presented to the Department evidence of such professional or other experience as will justify the expectation that he can profitably undertake the work desired. In all other cases, special students will be expected to take those examinations on which the work they desire depends, or to present college records in corresponding subjects.

Admission of Special Students in Architecture.— Applicants desiring admission as special students in architecture must be college graduates; or must be twenty-one years of age, with not less than two years' experience in an architect's office, or have had some equivalent and satisfactory preparation. They must give evidence of this preparation through personal conference, letters from former employers, and by the presentation of draw-

ings covering their experience. They must take in their first year of residence freshman courses in descriptive geometry, and English unless these subjects have been passed at the September examinations for advanced standing, or excuse has been obtained on the basis of equivalent work accomplished elsewhere. Entrance to these courses must be approved by the Division of Drawing and the Department of English and satisfactory records must be obtained in order to continue architectural subjects. All special students must also register for freehand drawing. The first week of this course will be considered a test period to determine the standing of the student. Special students in option 1 will be required to take, in addition to the subjects already mentioned, courses in design, shades and shadows, perspective, modelling, theory of architecture and architectural history, the arrangement of subjects for each student to be approved by the Department. To become eligible for the Traveling Fellowship in Architecture a special student must, in addition to the courses already named, obtain satisfactory records in the courses in European civilization and art and philosophy of architecture and a satisfactory record in graduate design. Special students who desire to take work in option 2, Architectural Engineering, must pass or offer equivalents for the entrance examinations in mathematics and physics, and courses in mathematics, physics, and applied mechanics required in this option.

FEES, DEPOSITS, PAYMENTS, ETC.

Tuition Fees.—The tuition fee for all students pursuing regular courses is \$300 per year and must be paid *in advance* as follows:

\$100 before the opening of each term, the date and hour to be specified in the Registration Instructions issued to students prior to the opening of each term.

The tuition fees for students taking Course VI-A after the second year or X-A are \$75 per term (4 terms).

Tuition is now charged for all required summer courses. For fees and payments see Summer Session Bulletin.

The above rules are not applicable to the fees of students pursuing the courses in Naval Construction and Aeronautical Engineering which are subject to special arrangements and to change according to arrangement with the United States Navy Department.

Entrance Examination Fee.—The charge for entrance examinations is \$9, except that when a candidate takes only one examination the fee is \$5. A candidate will be required to pay the fee each period in which he takes examinations. Fees may be paid to the Bursar during the examination period or may be remitted in advance.

Other Fees.—A charge of \$5 is made for each condition examination taken, and \$5 for the removal of each deficiency.

Late Registration Fine.—A fine of \$5 is imposed for late registration or late payment of tuition. Students should note that registration is not complete until tuition fees are paid.

Deposits to Cover Laboratory Fees, Breakage, etc.—To cover laboratory fees, etc., all students (except men taking Course IV, Option 1, and officers detailed by United States Army or Navy Department) will be required to make a deposit, from which the fees covering laboratory courses, chemical and mining breakage, etc., are to be deducted.

Unused balance of deposits will be returned at the end of the year, or held for credit the following year.

No refund of deposits will be made during the school year except in the case of students leaving the Institute.

These deposits are due and payable with the first term's tuition.

1. <i>All first-year men</i> (Except Course IV, Option 1).....	\$25.00
2. <i>All upper classmen</i>	50.00
With exceptions as follows:	
Civil Engineering, Course I.....	25.00
Architecture, Course IV, Option 1.....	none
Architecture, Course IV, Option 2.....	15.00
Engineering Administration, Course XV, Option 1.....	15.00
Engineering Administration, Course XV, Option 2.....	25.00
3. <i>All special and unclassified students</i>	50.00

Students will not be permitted to enter upon their work in the various laboratories without making the above deposits.

A detailed list of laboratory fees is printed in "Courses of Study" (April, 1923), pages 192-196.

For students taking **Military Drill**, a deposit of \$25 is required. Amounts are returned for each unit of the equipment

which the student returns to the Military Department, in condition commensurate with its use, at the end of the school year or upon his withdrawal.

Graduate and Undergraduate Dues.— Dues of \$9 per year are levied on all male undergraduate students who pay, or have paid on their behalf, more than half the regular tuition fees for the year and the corresponding tax for students who pay one-half the regular tuition fee or less is \$4.50 per year.

In the case of female students the dues are \$4.50 per year.

These dues are payable in three equal parts upon the same dates as the tuition fee and are levied on all students, including special students and unclassified students.

Graduate dues are \$7.50 per year, payable \$3 each term for the first and second terms and \$1.50 for the third term.

Dues will be remitted and the corresponding amount supplied from funds applicable to such purposes in the case of all students who are granted scholarships on the basis of financial need and of others who may be exempted from the payment of dues by a committee appointed to deal with such matters.

The proceeds of the dues will be devoted to the promotion of student life at the Institute with special reference to the physical and social welfare of the students. No part shall be spent for any class function, athletic event or social entertainment that is not open without charge to every qualified member of the student body in good standing.

These dues will be expended under the general direction of the Institute Committee subject to the approval of an Advisory Committee appointed by the Corporation.

Subject to modification dues will be apportioned as follows:

Institute Committee.....	\$0.36
Class Dues.....	.74
Athletics.....	5.30
Walker Memorial.....	1.00
Department of Hygiene.....	1.00
Reserve and Contingent Fund.....	.60

Payments.— *No bills are sent.* All payments should be made to Horace S. Ford, Bursar, Massachusetts Institute of Technology, Cambridge, Mass. *Students are strongly advised to make payments by mail, as they will find it greatly to their convenience to do so.*

Special students pay, in general, the full fee; but when a few subjects only are pursued, application for reduction may be made to the Bursar.

Payment is required also for apparatus injured or destroyed in the laboratories, and for the cost of repair of damage by students to any other property of the Institute.

Student Employment.— To assist students in securing employment, either during the school year or the summer, an Undergraduate Employment Office is maintained by the Technology Christian Association. Application may be made at this office by students desiring to help themselves in meeting their expenses. Prospective students should, however, realize that the demands of the Institute curriculum are such as to make it impracticable to devote a large amount of time to outside employment during the school year.

Residence.— As the exercises of the school begin at nine o'clock in the morning, and end by five o'clock in the afternoon, students may conveniently live in any of the nearer cities or towns on the lines of the various railroads, if they prefer to do so.

Expenses.— An estimate of expenses for the school year, a period of 38 weeks, is given below:

FOR A PERIOD OF 38 WEEKS

Tuition.....	\$300	
First year deposits.....	50	}
Undergraduate Dues.....	9	
		\$359.00
Board.....		380.00
Room.....		228.00
Books and materials.....		90.00
		\$1,057.00

WALKER MEMORIAL

The Walker Memorial, built in memory of the late president, General Francis A. Walker, is the center of the social activities of the Institute. The building was finished in 1917 at a cost exceeding \$500,000 contributed in part by Alumni. The income of a considerable bequest by the late Frank H. Cilley of the Class of '89 is available for purposes connected with the Memorial.

On the top floor of the building is a large gymnasium with lockers and dressing rooms. There are offices for the various student activities, squash courts and rooms for hand ball. There are club rooms, lounges and reading rooms and on the main floor a large dining hall with cafeteria service at cost prices. At the north end of the hall has recently been hung one of the largest single mural paintings in America. It is entitled "Alma Mater," and is the work of an internationally known artist, Mr. Edwin Howland Blashfield, M.I.T. '69. It covers nearly one hundred square yards of canvas, and is a splendid example of Mr. Blashfield's artistry. In the grill room a table d'hôte lunch is served and other dining rooms provide for class dinners and dinners of any Technology organization. In the basement are found bowling alleys and a billiard room. A matron is in attendance and excellent opportunities are afforded for the entertainment of guests.

DORMITORIES

1. Buildings and Location.— The dormitory building is located at the east end of the Institute property on the line of the Charles River Esplanade, near the Walker Memorial. It is built along the north and east sides of the lot that contains the President's house.

The dormitory consists of four halls, each hall with a separate entrance, and four stories high, except in the case of Runkle, which has rooms on six floors. A reception room is located on the first floor of this hall.

The halls are named Atkinson, Runkle, Holman and Nichols, in honor of professors at the Institute in its earlier years.

2. Rooms.— The rooms on the first floor in each hall are single rooms. A few of the rooms on the fifth and sixth floors of Runkle Hall are also for single occupancy. All other suites are arranged for two or three men. They consist of a study, a dressing-room, and either a double or two single sleeping rooms. There are fifty-four double suites and seven triple suites. One hundred and seventy men may be accommodated in the four halls.

Sixty per cent of the rooms are provided with lavatories. Toilets and shower baths are located on every floor in each hall.

3. Equipment.— The Institute equips the rooms as follows: *Single Rooms:* Iron bed, mattress and cover, pillow, all bedding, chiffonier, desk and chair, rocking chair, bookcase, electric lamps (Mazda), sash curtains and wastebasket.

Suites: As above for each man, also wardrobes (single rooms have closets) and study tables.

4. Application for Rooms.— Application for rooms in the dormitories should be filed before March 1 on forms provided for the purpose at the Bursar's office, but the Dormitory Board reserves the right to close the application list at its discretion prior to that date. Applications for double or triple suites must bear the signatures of the two or three men who desire to occupy them.

5. Rentals and Payments.— The rentals of the single rooms and suites vary according to space, floor, exposure and on account of lavatory installation.

In addition to the rental of the space, students should observe that prices include: Furnishings, heat, light, water, janitor and chamber service, soap and towel supply and laundry service for all bedding.

Rentals will be made by lease, bearing signatures of applicants, also of parents or guardians, and payments will be regularly due *without notice* — one-third on or before the opening day of each term. *No bills will be sent.*

Leases will not be accepted unless accompanied by a deposit of \$5, which amount will be applied toward the first payment. This deposit will be refunded only to students who are unable to attend the Institute, and only upon notice filed with the Dormitory Board, Room 10-180 before September 1.

6. Occupancy.— Rooms may be occupied from the Monday before the opening of the fall term until the Saturday after Commencement. Tenancy beyond these dates will be charged for at the summer rate.

A student will not be permitted to sublet or transfer his room or his share in a room without the consent of the Dormitory Board.

7. Allotment of Rooms.—As far as possible, the assignment of rooms by the Dormitory Board will be in order of application but the Board reserves the right to reject any application for sufficient reason.

Notices will be sent as soon after March 1 as possible to successful applicants, and signed leases must be in the hands of the Dormitory Board, Cashier's Office, Room 10-180, before May 1, otherwise the rooms will be reassigned.

8. Government.—While the government of the Dormitories is carried on under the superintendence of the President of the Institute, through the Dormitory Board, it is the desire to place the whole question of discipline, maintenance of good order and right living, in the hands of the student occupants themselves. The Dormitory Board is responsible for the sanitation and janitor service and general regulations as to the allotment of rooms and will make an inspection of the rooms from time to time in these interests. The board also acts in an advisory capacity.

During the week prior to May 1, the retiring seniors of each hall will be required to Nominate three resident Juniors for Chairman of the Hall. Following the Nominations an election by members of each Hall, resident Seniors excepted, will elect one of the nominees who shall represent the Hall on the Dormitory Committee. This committee is composed of the representatives from all the Halls and the Chairman, elected by the residents of the Dormitories, is the representative of the Dormitories on the Institute Committee, the student governing body of all the Institute activities.

Only in event of a failure of such student government to maintain order and right living will it become necessary for the Dormitory Board to exercise its authority.

House rules framed by the Dormitory Committee will be posted in each hall and each occupant of a room will be provided with a copy of the same.

9. General Information.—*Withdrawals:* In the event of a student withdrawing from the Institute, the Dormitory Board will endeavor to reassign the room vacated, provided proper notice is given.

Keys: Key cards, obtainable at the Bursar's office, may be exchanged at the office of the Superintendent of the Dormitory for individual room keys. A deposit of one dollar is required.

Mail and Express: Packages and mail matter should be addressed to the students, Massachusetts Institute of Technology Dormitory, Ames Street and Charles River Road, Cambridge, Mass. Individual lock boxes are provided at Superintendent's office.

Telephone Service: A telephone pay-station is located on the the first floor of Runkle. Persons calling the dormitory from outside should give the number — University 7077. An intercommunicating telephone service, reaching each corridor, enables the Superintendent's office to call any occupant. Private telephone service may be arranged for by communicating directly with the Commercial Department of the New England Telephone and Telegraph Company at Cambridge.

Storage: Ample facilities for the storage of trunks, etc., are provided in basement of dormitory without charge.

Additional Lights: Students who desire to purchase desk fixtures or other additional lighting should see that the connecting plugs will fit the wall sockets which are generally provided throughout the dormitory.

Building Service: The building is of concrete construction with brick and stone facing, and is as near fireproof as possible. Power and light are furnished directly from the Institute's own power plant and the building is cleaned by the use of vacuum cleaners. The service is directly in charge of a Superintendent and is maintained by experienced colored porters. The Superintendent's office is always open, and a representative of the Institute is on the premises day and night.

For further information, floor plans, prices, etc., address the Dormitory Board, Cashier's Office, Room 10-180.

UNDERGRADUATE ACTIVITIES

The Technology Christian Association.— The Technology Christian Association aims to be of practical service to every student at the Institute, and to help Technology realize its highest ideals. Its purpose is "To foster among the members of the Institute the best ideals of Christian living and to enlist them in active Christian service."

All students and members of the Institute who are in sympathy with the objects of the Association and wish to co-operate in promoting them are eligible to membership.

There are no membership dues, but the Association depends for support upon the voluntary contributions of the students. The salary and expenses of the general secretary who is a college graduate, and who gives full time to the direction of the work, are paid by the alumni and outside friends of the Institute under the direction of an advisory board.

Athletics.— The purpose of athletics at Technology is not to develop highly trained athletes, but rather to encourage all students to participate in some form of physical recreation. The control of athletics is vested in the M. I. T. A. A., an undergraduate student organization. It is composed of all captains and managers of Varsity teams as working members and assistant managers and the officials of class teams as associate members. Funds are secured by undergraduate dues elsewhere referred to, the dues being collected by the Technology authorities, but disbursed by the students. An Advisory Council of Alumni works with the students and exercises the functions which its name implies.

No attempt is made to concentrate on the few men composing a single varsity team but coaching and instruction is given to all men reporting for a given sport. As a corollary to this, the success of a given athletic activity is gauged by the number of men it attracts. Varsity and class teams are maintained in a wide variety of athletic exercise. Among the activities may be named: track and field sports, cross-country, rowing, basket ball, boxing, fencing, golf, gymnastics, hockey, swimming, tennis, wrestling, while class teams only are developed in football and baseball. Squads range from the twenty to thirty men who report for fenc-

ing to the two hundred to three hundred men who are interested in track or in rowing. A coaching system is being gradually developed for most of these activities.

Through the generosity of the Corporation the physical equipment for the conduct of these various sports is being steadily improved.

Massachusetts Institute of Technology Undergraduate Association.— The student government of the undergraduates at Technology is in the hands of the Institute Committee, a body representing every important student activity.

Undergraduate Publications.— *The Tech*, the newspaper of Technology, established in 1881, is published three times a week throughout the academic year.

Technique is the year book of the Institute and forms a permanent record of all the notable undergraduate activities. It also contains a photograph of each member of the Senior Class.

Voo Doo is Technology's monthly humorous publication.

The Tech Engineering News is the professional journal of the undergraduates, and is published monthly throughout the school year. Its purpose is to disseminate news of scientific and industrial interest by publishing articles written by prominent alumni and engineers, the results of original investigations conducted in the Institute laboratories, news of scientific interest, and articles on topics of timely importance.

Tech Show.— The Tech Show, which is produced each year during Junior Week, is a musical comedy written, staged, acted, and orchestrated entirely by undergraduates.

Combined Musical Clubs.— The Combined Musical Clubs of the Institute consist of the Glee, Mandolin, Banjo Clubs, and also the Band. The Musical Clubs are one of the oldest activities in school, the Glee Club having been founded in the fall of 1880.

GENERAL REGULATIONS

School Year.— This is shown on the calendar on page 4. The exercises of the Institute are omitted on Massachusetts legal holidays, which are January 1, February 22, April 19, May 30, July 4, Labor Day, October 12, Thanksgiving Day and December 25.

Registration.— Before the opening of each term the student is required to fill out and present registration forms to the Registrar.

Attendance.— After approval of his registration the student must attend all exercises including the final examination in the subjects for which he is registered. Irregular attendance, habitual tardiness or inattentiveness may lead to probation. With the exception of an interval of one hour in the middle of the day, students are in general expected to devote themselves to the work of the school between the hours of 9 A.M. and 5 P.M. There are no exercises on Saturday after 1 P.M., and the rooms are closed.

Status of Students.— The ability of students to continue their courses is determined in part by means of examinations but regularity of attendance and faithfulness to daily duties are considered equally essential.

Provisional Admission.— All students admitted to any subjects without having fulfilled the usual preparation requirements are classified as provisional students in such subjects. Students admitted without examination, students whose work is generally low and students readmitted to the Institute after dismissal or after withdrawal incident to low standing are classified as provisional in all subjects. Provisional admission to any subject may be cancelled at any time that the work of the student is unsatisfactory.

Physical Training.— The Department of Hygiene is organized to protect and improve the health of students and to take care of those who become sick or injured. A Clinic is held by a Doctor every morning and afternoon for the care of the sick and injured, and gymnastic facilities are available for all students. Students in the first year are required to take physical exercise,

and have their option of taking routine gymnastic work in the gym or substituting one of the competitive sports for it.

Every student who enters the Institute is given a physical examination, and if any defects are found an effort is made to correct them. With a view to correcting certain defects a course in gymnastics is given by an Instructor especially trained in this work. Students, who are found to be markedly underweight may, if they desire, enter a special class which has been organized to ascertain and remove the cause of this condition. Accurate measurements are taken at the first of the year of all the men entering physical training.

At the end of each year bronze medals, the gift of the late Samuel Cabot, '70, are given to the five students who make the greatest improvement in strength, measurements, and general gymnastic efficiency, as indicated by the physical examinations and as shown in regular class work. Five more students are given Honorable Mention.

Military Science.— All male students, except aliens, who are under twenty-eight years of age and who are rated as first or second-year students, are required to attend exercises in military science and drill. The military exercises include not only military drill but, also, lectures upon military subjects.

Physically defective students who would be injured by drill will be furnished by the Medical Director written excuse from drill only.

Several units of the Reserve Officers' Training Corps, such as Artillery, Engineer Corps, Ordnance, Signal Corps and Air Service are arranged, whereby students may prepare themselves to become reserve officers in these various branches of the Army. Members of this R. O. T. C. continue their military work through the third and fourth year in conjunction with their professional courses and receive pay for taking this additional military training.

Conduct.— It is assumed that students come to the Institute for a serious purpose, and that they will cheerfully conform to such regulations as may be from time to time made by the Faculty. In case of injury to any building, or to any of the furniture, apparatus, or other property of the Institute, the damage will be

charged to the student or students known to be immediately concerned; but if the persons who caused the damage are unknown, the cost of repairing the same may be assessed equally upon all the students of the school.

Students are expected to behave with decorum, to obey the regulations of the Institute, and to pay due respect to its officers. Conduct inconsistent with general good order, or persistent neglect of work, may be followed by dismissal. In case the offense be a less serious one, the student may be placed upon probation.

It is the aim of the Faculty so to administer the discipline of the school as to maintain a high standard of integrity and a scrupulous regard for truth. The attempt of any student to present as his own the work of another, or any work which he has not honestly performed, or to pass any examination by improper means, is regarded by the Faculty as a most serious offense, and renders the offender liable to immediate expulsion. The aiding and abetting of a student in any dishonesty is also held to be a grave breach of discipline.

Petitions.— The Committee on Petitions is the Faculty body through which the student may make appeal for special consideration of his individual case. All petitions must be submitted on printed blanks furnished for the purpose, which may be obtained at the Information Office.

Advisers.— The Dean is the general consulting officer for students, and co-operates with the President in matters touching discipline and other student relations. In co-operation with the Technology Christian Association a number of upper class men are selected to act as advisers to incoming students. These men are assigned to students who have taken entrance examinations, and they will help new men in matters of registration, in the selection of rooms, etc.

On request to the Dean, advisers from the instructing staff will also be assigned to new students.

It is not intended that the advisers shall become, in any sense, guardians of the students assigned to them; nor does the Faculty by this action assume any responsibility for the conduct of students outside the halls of the Institute.

UNDERGRADUATE COURSES OF STUDY

The Institute gives instruction in English, History and Political Science, and in other general studies, which are essential to a liberal education. It also gives a thorough training in the fundamental sciences of chemistry, physics and mathematics, and in the important application of the principles of these sciences to the various branches of engineering and applied science. It lays far more stress on the development of the power to deal effectively with new engineering or scientific problems than on the acquirement of an extensive knowledge of details. In order to attain these results, much of its classroom instruction is given to small sections of students, and in its laboratories and drawing-rooms students receive a large amount of personal attention. The independent solution of assigned problems forms a large part of nearly all its courses. A large proportion of liberal studies of a literary and general scientific character are insisted upon and courses upon technological methods and other highly specialized subjects are largely excluded; for, while the latter are sometimes important in special industries, they are not essential to a broadly trained engineer, who can readily acquire later the necessary technical knowledge. The system of instruction differs from the university plan of education in that cultural studies are closely correlated and interwoven with the professional work, while under the latter plan the two groups of studies are ordinarily pursued successively, in separate undergraduate and graduate schools. The Institute lays, moreover, especial emphasis on training in science and scientific methods, not only as an essential to professional success, but as an important element in culture and in life. Its courses differ, from those of many colleges, in that electives are introduced to a much less extent, in the belief that better results are obtained by prescribing, after the student has selected the profession for which he desires to prepare himself, the principal studies which he is to pursue. He is given, however, the choice among groups of elective studies relating to different branches of his profession and between a variety of electives in the group of general studies.

The sum of the time assigned to exercises and of that estimated as being normally necessary for the outside preparation for them in all courses is from forty-eight to fifty hours each week.

Following the first, second or third year, certain of the professional courses require attendance at summer classes.

In addition to the prescribed subjects, all students in most regular courses, are required to devote a specified amount of time to elective work in General Studies.

Courses of study leading to the degree of Bachelor of Science are offered in the fifteen branches of science and engineering named below.

Special attention is, however, called to the fact that admission to the Institute does not guarantee subsequent admission to any particular professional course nor to certain special courses, which may be open only to the extent of professional equipment and may be restricted to citizens of the United States or to minors whose parents are citizens of the United States.

ARCHITECTURE, Course IV, with options in Architecture and Architectural Engineering.

BIOLOGY AND PUBLIC HEALTH, Course VII, with options in Public Health and Fisheries and Food Technology.

CHEMICAL ENGINEERING, Course X, with School of Chemical Engineering Practice, X-B.

CHEMISTRY, Course V.

CIVIL ENGINEERING, Course I, with options in Hydraulic, Transportation and Hydro-electric Engineering.

ELECTRICAL ENGINEERING, Course VI, with electives in professional subjects in the fourth year and Coöperative Course in Electrical Engineering, VI-A.

ELECTROCHEMICAL ENGINEERING, Course XIV.

ENGINEERING ADMINISTRATION, Course XV, with options in Civil, Mechanical and Electrical, and Chemical Engineering.

GENERAL SCIENCE, Course IX-A, GENERAL ENGINEERING, Course IX-B and MATHEMATICS, Course IX-C.

GEOLOGY AND GEOLOGICAL ENGINEERING, Course XII.

MECHANICAL ENGINEERING, Course II, with electives in professional subjects in the fourth year.

MINING ENGINEERING AND METALLURGY, Course III, with options in Mining and Metallurgy.

NAVAL ARCHITECTURE AND MARINE ENGINEERING, Course XIII.

PHYSICS, Course VIII, with options in Industrial and Theoretical Physics. In this department work in Aeronautical Engineering is given.

SANITARY ENGINEERING, Course XI.

In most of these courses distinct options or electives in professional subjects, as shown above, are offered in the later years which enable the student to concentrate more of his attention upon some one side of his profession. In no case, however, is the specialization carried so far as to preclude a thorough training in all the fundamental branches of the subject.

It will be observed that in addition to the courses in the various branches of engineering, the Institute offers courses in the other important branches of applied science. Thus the courses in industrial chemistry, metallurgy, public health and industrial biology serve to prepare students as scientific experts and for professional positions in manufacturing establishments and government laboratories. Thorough courses in pure science, namely, in chemistry, physics, biology, geology, and general science, are also offered. These give the training required for teaching positions in technological institutions, colleges, and preparatory schools, and for research positions in the departments of the Government, the industries, and in private laboratories. The course in Biology and Public Health furnishes, too, an exceptional training for the subsequent study of medicine in medical schools of the graduate type. Special opportunities leading to the Certificate in Public Health and in Public Health Education are also offered.

The course in Architecture, with its two options in Architecture and Architectural Engineering, is a course of an artistic as well as a scientific character, involving a large amount of instruction and training in the fine arts.

The course in Engineering Administration provides a training for men who expect to enter upon administrative work in enterprises which demand a knowledge of scientific and engineering principles.

Choice of Professional Course.— All these courses except Option 1 of Architecture are practically identical, in the first year. The student therefore may change his course of study at any time before the beginning of the second year. In making the

choice of course, the primary consideration should be the student's tastes and aptitudes, as shown by the results of his previous work at the Institute and in his preparatory school, rather than any supposed pecuniary or other advantages attaching to special professions.

Options in General Studies.— The object of these options is to promote breadth of intellectual interest. Most of the student's time beyond the second year is devoted directly, or indirectly, to increasing his future professional efficiency and even in the earlier years this has been the underlying purpose of most of the work.

Without attempting any discrimination between general and professional, or liberal and technical studies, the Faculty has aimed to include in the list of general studies subjects so far removed from the professional field that the student shall acquire in some measure new points of view and a wider mental horizon. Even subjects which have an implied relationship to the professional fields are presented with such emphasis on their broader general aspects as to serve the purpose indicated.

Summer Session.— Subjects are offered which correspond to most of those given during the regular school year. The object and arrangement of these are described in a special circular. Professional summer schools in Civil Engineering, Mining, Engineering, Metallurgy, Chemistry, and Geology and Mineralogy are carried on either regularly or at intervals. Some of this work is supplementary to and different in character from that given during the regular terms. Certain entrance subjects are also given at the Institute in the summer. The passing of any one of these subjects will excuse an applicant from taking the regular entrance examination in that subject.

EXAMINATIONS

Final Examinations.— General final examinations are held in December covering the work of the first term, in March on the work of the second term, and in May or June upon the work of the third term.

No member of the Instructing Staff is empowered to grant excuses in advance from a final examination except, on authority from the Faculty. Absence from any final examination is equivalent to a complete failure except as, on presentation in writing to the Dean of adequate evidence of sickness or other valid reason for the absence, the Faculty may permit a student whose term work has been satisfactory to take the next ensuing condition examination in the subject.

Any student taking a dependent subject without a clear record in any subject on which it depends may be required to drop that subject at any time if his work is unsatisfactory.

Conditions received in May or June must be made up in the following September; those received in December must be made up in March; and those received in March must be made up in June. A student not taking an examination at times stated forfeits the right to such examination.

EXPLANATION OF RECORDS

H, passed with honor.

C, passed with credit.

P, passed.

L, low standing. To be used as an informal record only. Without improvement record will be Fail at end of term.

J, the student has attended the exercises of a subject for which no formal record is returned for the term, but the record of this term will be covered by the record of a subsequent term.

D, deficient. A portion of the work required has not been accomplished. Except in drawing or laboratory subjects, all marks of D must be removed not later than the end of the fifth week of the succeeding term of the regular academic year. Marks of D or F in drawing or in laboratory work must be removed within one year from the date incurred except that such marks incurred in the Electrical Engineering laboratories shall be removed not later than the end of the term succeeding the one in which they were received.

F, failed to pass. The student must take a condition examination, except in drawing or laboratory subjects, at the next examination period, or forfeit the right to such examination. Failure in drawing or laboratory work is to be made up as specified above.

FF, failed completely. The student is not entitled to a condition examination but must repeat the subject, and will not be admitted to dependent subjects.

R, repeat. The subject must be repeated and the student will not be admitted to dependent subjects. A student classed as a first or second-year student who fails in more than fifty per cent of the work taken during any term must repeat those subjects in which he has failed (including subjects in which condition examinations have been failed) except as admission to the condition examinations in particular subjects taken during the term is granted at the time when term records are presented to the Faculty. Records of F in subjects which are to be repeated are changed to R.

Abs, Absence from final examination or from a subject for which a student is registered, if not satisfactorily explained, is equivalent to a record of FF.

For each condition examination a fee of \$5 is charged and for the removal of each deficiency a fee of \$5 is charged.

Reports.—Reports for all classes are sent at the close of each term. These reports are sent to students, and to the parents or guardians of those not of age at the beginning of the term, but reports will be sent to a parent or guardian in any other case on application to the Registrar, and notification will be made to parents or guardians in all cases of students advised or required to withdraw, or placed on probation.

REQUIREMENTS FOR GRADUATION

To receive the degree of Bachelor of Science the student must have attended the Institute not less than one academic year, which must in general be that next preceding his graduation. He must have completed the prescribed subjects of his professional course or equivalent work.

The student must, moreover, prepare a thesis on some subject included in his course of study; or an account of some research made by him; or an original report upon some machine, work of engineering, industrial works, mine, or mineral survey, or an original design accompanied by an explanatory memoir.

All theses and records of work done in preparation of theses are the permanent property of the Institute, and cannot be published, either wholly or in part, except by authorization of the heads of the respective departments. This rule applies also to the theses prepared by candidates for advanced degrees.

No degree can be conferred until all dues to the Institute are paid.

THE PROFESSIONAL COURSES

The descriptions of the fifteen professional courses are arranged here alphabetically.

ARCHITECTURE, COURSE IV

Architecture is essentially a fine art which for its inspiration must continually refer to the achievements of the past, and for its fulfillment must borrow much from the sciences and from engineering. The education of the architect, therefore, which is

based primarily upon the canons of art, must at the same time include historical study of civilization, painting, sculpture, and architecture, as well as some instruction in science and its engineering applications. As a profession it requires many years of earnest effort and self-sacrificing study. The architectural school can undertake to furnish only the fundamental training necessary to start the young man in his career. He must be given the proper attitude toward this profession; he must be made familiar with the underlying principles of art and science which are to become the foundation of his professional knowledge and development; he must be taught the logic of all true architecture; his taste, his power of discrimination between the good and beautiful and the commonplace and vulgar must be developed. He must be given facility in the processes which he is to use in the expression of his imagination and thought, and made acquainted with the sciences and their applications by which his creations may be transformed into reality. Such is the ideal toward which the course in Architecture aims.

The curriculum and methods of instruction employed have been selected not merely to prepare the student for the future practice of his profession, but to supply a training which shall be educational in the broadest sense.

Two options are offered by the department, one in Architecture and one in Architectural Engineering. The option in Architecture lays most stress upon design and art with a minimum of structural design, while that in Architectural Engineering lays greatest emphasis upon structural design and engineering, with enough of the history of architecture to give the student an education of corresponding breadth.

The teaching of these two options has steadily developed under the conviction that the ever widening field of professional opportunity offered ample scope for each. It consequently has seemed fundamentally unsound to graduate students in either option with the impression that they were qualified to assume the obligations of the other. Certain subjects are obviously and properly taught in common, such as English and history, economics, mathematics, mechanics, descriptive geometry; and also certain professional and semi-professional subjects, as history of architecture, office practice, professional relations and building con-

struction. The more highly specialized subjects pertaining to the distinctive characteristics of the two options are necessarily taught separately.

A recent revision in the schedules of both options has advanced into the first year subjects which may be considered essentially preparatory, but which afford the student in each case immediate contact with the distinctive nature of the profession that he has chosen to study. This has a double purpose: first, that those who are not in earnest or who have made an honest error may learn of it at once; and second that the student may profit to the utmost from these early years in order that time toward the end of his course may be free to devote to the application of those principles thus learned at the outset.

The degree of Bachelor of Science in Architecture conferred by the Institute admits the holder to candidacy for membership in the American Institute of Architects without the examination ordinarily required.

A fifth or graduate year is offered leading to the Master's degree. That every student would profit by taking this additional year is demonstrated by the more rapid advancement characterizing the careers of those who have followed this procedure. That this is generally recognized in the student-body is further shown by the steady increase in the numbers following this course that has marked the years since the war.

The department will accept under certain conditions special students in Architecture who must conform to the requirements stated on page 20. Except for these requirements there is no definite course of study for the special student. He may select, with the approval of the department, such subjects as he desires and for which he has the necessary preparation.

All drawings and designs made during the course become the property of the department to be retained, published, exhibited or returned at the discretion of the department.

BIOLOGY AND PUBLIC HEALTH — COURSE VII

The applications of modern biological sciences have opened up new fields of usefulness for those with broad and properly coordinated training, in public health, research and industry.

To provide the equipment necessary for these positions two

groups of related studies covering four years have been arranged. The first deals primarily with public health, the second with the industrial or technical applications of biology.

In the public health field useful and inviting careers in the service of the government, states and cities, or with public service or private corporations, health organizations or individuals are now open to ambitious students well trained in general and sanitary biology, bacteriology, industrial hygiene, municipal sanitation and public health administration and the diagnostic procedures used in identification and control of infectious diseases.

For persons proficient in these subjects the demand has of late years generally exceeded the supply, and graduates have readily obtained positions as bacteriologists, health officers, sanitary inspectors or in connection with welfare work in industrial plants, or as assistants with manufacturers of biologic products, or in research.

These studies also afford an excellent preparation for entrance to those medical schools of high grade which require for entrance special training in physics, chemistry and biological subjects.

Graduates of this department are immediately eligible as candidates for, and after one additional year of study may expect to obtain, the Certificate of Public Health (C. P. H.).

The option in Industrial Biology is arranged primarily for those intending to follow the commercial or industrial applications of biologic processes as in fisheries or food conservation and manufacture, industrial fermentations and the control of biochemical processes. One course here described is in Fisheries Technology, since fisheries industries have especially requested training of this type in order to be able to secure men properly equipped in biological, engineering and administrative subjects to become superintendents of plants, managers, and administrators. This basic industry, comparable in significance to Forestry or Animal Husbandry, has had but slight attention from the standpoint of technical training, so that a course in Fisheries Technology should lead to positions of industrial importance and great technical interest. Another course presented has been so developed that it trains especially for the other great food conservation industries and is therefore essentially one in Food Engineering or Technology.

Either of the two subdivisions of the course in Biology and Public Health thus furnishes certain essential elements for well-rounded education with professional training for special occupations.

CHEMICAL ENGINEERING — COURSE X

The efficiency of any industrial chemical process depends not only upon a knowledge of the chemical reactions forming the basis of the process, but also upon a knowledge of the mechanical principles on which depend the design, construction and maintenance of plant for carrying on these reactions. To prepare students capable of filling the demand for men competent to build and operate manufacturing industries based upon chemical principles is the purpose of this course in Chemical Engineering.

The professional work of the course falls naturally into three groups: First, courses which provide a thorough knowledge of the fundamental principles of chemistry. Second, those courses which furnish a sound knowledge of mechanical engineering subjects, both in theory and in practice. Third, courses which deal with chemical engineering as a separate entity.

The course therefore includes a training in inorganic, analytical, organic, and industrial chemistry, which is the same as that given to students in the course in Chemistry except in the case of some of the laboratory courses. The training in mechanism, mechanical engineering drawing, heat engineering, applied mechanics, and other important mechanical engineering subjects is given in the Department of Mechanical Engineering, with special reference to the particular needs of this course. This is true also of the work of the course which is given in the Electrical Engineering Department. The instruction in Chemical Engineering and Industrial Chemistry is of a distinctly professional nature.

A graduate year of the course is provided in which opportunity for the development and correlation of these fundamental subjects in the field of chemical engineering is presented.

CHEMICAL ENGINEERING — COURSE X-A

(With School of Chemical Engineering Practice)

At three industrial centers, field stations of the School of Chemical Engineering Practice have been established, each station having access to two or more industrial chemical plants.

Here the student begins the practice of his profession and carries out quantitative tests on the processes and equipment to determine their efficiency and how they may be improved. The class is distributed among the stations in groups of equal size, and each group remains at each station for a period of eight weeks. There are never more than twelve men at a time at one station. These men are under supervision of a member of the Institute Faculty and his assistant who devote their entire time to the educational work of the station.

After graduating from the four-year course of the Institute or any other school of recognized standing, and being well grounded in the principles of general inorganic, organic, analytical and physical chemistry, and in chemical engineering, the student spends six months in the School of Chemical Engineering Practice where the work is confined to teaching him how to apply his knowledge in the plant. By means of experimental work on full scale equipment and the application or comparison of theory and practice there are fixed more firmly in the student's mind the fundamental factors of chemical engineering. Although the plants which co-operate with the Institute cover a wide field of industrial chemical processes, namely, the manufacture of sulfite and soda pulp, writing paper, caustic soda, chlorine, heavy chemicals and acids, rubber, sugar, iron, steel, gas, coke, benzene, soap, etc., the majority of the time in the Practice School is not spent on the study of industrial chemistry but on the study of chemical engineering which the manufacture of these materials illustrates.

The work of the last two terms of the year is advanced in character, broad in scope and wholly elective.

Admission will be restricted to those students chosen by the department on the basis of scholarship and general professional promise.

CHEMICAL ENGINEERING, COURSE X-B

The privileges of the School of Chemical Engineering Practice are available for a selected group of Institute undergraduates the last two terms of the senior year. Students desiring this course should apply the second term of the third year and those accepted will be given special courses in Summer School and in the first

term of the fourth year to prepare them for the work of the Practice School.

CHEMISTRY — COURSE V

The course in Chemistry provides fundamental training in inorganic, analytical, organic, theoretical and industrial chemistry, in both classroom and laboratory. It aims to prepare its graduates to take a responsible part in the establishment or development of industries which involve an application of chemical principles, to act as consulting chemists, to deal with problems of public welfare, to engage in research, or to become teachers. The course includes also a considerable range of instruction in mathematics, physics, and German, all of which are essential to an intelligent grasp of modern chemical science and its rapid advances in scientific and technical fields.

The growing appreciation of the importance of chemical science, especially in its technical applications, has created an active demand in widely different fields for graduates with a thorough chemical training. It is believed, however, that this demand can best be met by making this training fundamental and common to all students for the first three years of the course with opportunity for a selection of subjects during the last year, which will allow the individual student to pursue that branch of the science (or related sciences) which most appeals to him.

In any scientific career, the highest success is attained by those who possess an ability to surmount difficulties as they appear, to attack untried problems systematically, and to use knowledge already acquired to advance the boundaries of the science. This is particularly true of chemical science. It is the purpose of the course in Chemistry to foster this spirit, and the subjects designated as "Research Problems" in the third and fourth years, as well as the thesis required of all students, are designed to develop these powers. In these subjects each student is assigned a small piece of investigation work, which he is expected to study, plan, and execute, under reasonable guidance from an instructor, and to present his results in the form of a carefully prepared report. The extensive equipment of the various laboratories is fully utilized for this work. For those students who show special aptitude for such work, opportunity for advanced research is offered in the Research Laboratories

of Physical Chemistry, and that of Applied Chemistry. The instruction in Theoretical Chemistry is also especially designed to develop power on the part of the student.

The optional subjects afford an opportunity to acquire specialized practice in such subjects as water supplies, foods, oils, gases, sugars and starches, and the methods of proximate technical analysis.

CIVIL ENGINEERING — COURSE I

The course in Civil Engineering is designed to give the student sound training, both theoretical and practical, in the sciences upon which professional practice is based. Particular care is taken to enforce the application of the principles taught, and the student is made familiar with the use of engineering instruments and with the usual problems of practice.

Civil engineering is the broadest in scope of the engineering professions, being the parent stem from which have diverged all the other branches; but, even though these have become recognized as distinct professions, the field of civil engineering still remains so large that no one can become expert in its whole extent. It covers topographical engineering, including the making of geodetic and geological surveys, and surveys for engineering construction; transportation engineering, consisting of the building of railroads, highways, canals, docks, harbors, and other works serving the purpose of commerce and transportation; municipal engineering, including the construction of sewers, waterworks, roads, and streets; structural engineering, consisting of the construction of bridges, buildings, walls, foundations and all fixed structures; hydraulic engineering, including the development of water power and public water supplies, the improvement of rivers and the reclamation of land by irrigation. All of these branches of engineering rest upon a relatively compact body of principles, and in these principles the students are trained by practice in the classroom, the drafting-room, the field and the testing laboratory.

In the comparatively advanced work of the upper years, the student is offered a choice of three options or lines of study, namely: a general option in civil engineering, including the study of hydraulic and sanitary engineering in considerable detail,

an option in transportation engineering in which more than usual attention is paid to railway and highway engineering, and an option in hydro-electric engineering in which special consideration is given to the subject of water power development. The special work of the hydro-electric option begins in the third year, and that of the other options in the fourth year.

ELECTRICAL ENGINEERING — COURSE VI

Great importance is attached in Electrical Engineering to the study of mathematics, chemistry, physics and applied mechanics in the earlier years, and of the theory of electricity and magnetism beginning in the second year and continuing throughout the remainder of the course. Along with these are associated the essential principles of steam engineering, hydraulic power engineering, the designing of structures and machines and of political economy. The electrical engineering lectures of the junior and senior years take on a distinctly professional character and offer a variety of alternative specialized courses involving the applications of electricity to the various problems in railroad work, power station design, power transmission, lighting, telephony, etc.

The theoretical work runs parallel with an extended course in the laboratories, which begins with the work in chemistry and physics and extends through all of the scientific branches studied. The electrical testing laboratories and the laboratories devoted to electrical machinery are component parts of the equipment. These laboratories are extensively equipped with apparatus adapted to the needs of undergraduate and advanced study. The laboratory work is carried on with the purpose of developing in the student habits of accurate observation, and of bringing to his consideration not only the methods and tests of fundamental importance, but questions of economy of time and precision of results and culminates in a thesis requiring originality and application of acquired technique.

The importance of work of the nature of scientific research is emphasized. Research laboratories are provided and meetings are held monthly at which the progress of research work being carried on is reported and discussed. The historical development of the electrical sciences and arts is discussed in monthly meet-

ings of an electrical engineering seminar. These meetings are open to all students.

Under present regulations no students will be admitted to Course VI in the second year with incomplete records in any entrance subject or an incomplete record in any first year subject. On account of the number of applications it is probable that no admissions to the third year will be made without clear records in both first and second-year subjects and entrance requirements.

ELECTRICAL ENGINEERING — COURSE VI-A

Option 1, Manufacturing Engineering. In co-operation with the General Electric Company.

Option 2, Public Utilities.

- (a) **Light and Power. In co-operation with the Edison Electric Illuminating Company of Boston.**
- (b) **Transportation. In co-operation with the Boston Elevated Railway.**
- (c) **Power Systems — Construction and Operation. In co-operation with Stone and Webster, Inc.**

The Institute offers two distinct co-operative courses in Electrical Engineering. Option 1 affords training for the technical and executive responsibilities of electrical manufacturing industries. All of the manufacturing practice is taken at the General Electric Company's plants in Lynn, Schenectady, Pittsfield and Erie. Option 2 offers a training of like nature for the technical and executive responsibilities in the operation of public utilities. For those who wish to go into the distribution of light and power, practical experience may be obtained with the Edison Company. Where similar experience is desired on the planning and construction of power systems, it may be obtained with Stone and Webster. For those desiring to go into electric railway work, experience with the Boston Elevated Railway is available.

Each course covers a period of five years, the first two being similar to Course VI, the last three being equally divided between instruction at the Institute and practical training in the shops of the General Electric Company or in the plants of the Boston Edison Company, Boston Elevated Railway or Stone and Webster.

The instruction of the first four years is similar in method and content to Course VI with minor omissions. The work of the final year is definitely of an advanced nature. For Option 1 the emphasis during this year is on problems of administration of large manufacturing enterprises, the design and development of engineering projects and creative research. For Option 2 the emphasis during the fifth year is on problems of administration of public utilities together with research on technical, scientific and administrative problems incident to the conduct of affairs of such enterprises. The training at the plants is laid out and conducted with a view to the maximum educational value and is intimately correlated with the professional instruction at the Institute. In the final year of this course considerable latitude may be exercised in the assignment of men to posts in the engineering and research bureaus of the respective companies with a view to utilizing and developing individual aptitudes.

The successful completion of the courses leads to the degree of Master of Science, together with the Bachelor's degree as of the preceding year. The number of men who may be admitted to the co-operative training each year is at present limited to sixty men. Candidates for admission are subject to the approval of both the Institute and the co-operating companies. On account of the limitations of number and the unitary nature of training, men who are admitted to a course with the approval of both parties are expected to carry it through to completion unless prevented by exceptional circumstances. Well qualified students who have completed at other institutions the substantial equivalent of the work of the first two years may be admitted to advanced standing at the beginning of the co-operative training. Students in training at the plants are subject to the usual regulations of the company. They receive regular compensation for their work, the total of which, considerably exceeds the tuition charges for the three years of co-operation. The work in the shops, testing departments and engineering divisions is supplemented by conferences with department heads in which technical and administrative problems arising in the work are intimately discussed. Three hours a week are devoted to classroom work in electrical theory and general studies, for which six hours' preparation per week is required. At the conclusion of the course, graduates are free to

accept employment wherever offered without further obligation to the co-operating company.

Under present regulations no students will be admitted to Course VI-A in the second year with incomplete records in any entrance subject or an incomplete record in any first-year subject. On account of the number of applications it is probable that no admissions to the third year will be made without clear records in both first and second-year subjects and entrance requirements.

ELECTRICAL ENGINEERING — COURSE VI-C

Students, who wish to follow particularly the theory and practice underlying Electrical Communication, may, upon the approval of the Head of the Department, register for the Electrical Communication Option at the beginning of the junior year. For admission to this option, a student must have completed the first two years of the undergraduate Course VI at the Institute, or their equivalent.

The option embraces work covering wire telephony, carrier telephony and radio telephony, also wire telegraphy, carrier telegraphy and radio telegraphy. The properties and engineering applications of electron tubes are also included.

ELECTROCHEMICAL ENGINEERING — COURSE XIV

The course in Electrochemical Engineering aims primarily to prepare students to enter the various electrothermic and electro-metallurgical industries. The instruction given in this course is, however, of so broad a character that students completing it should be well prepared to undertake various lines of purely electrical and chemical work as well as electrochemical, if they so desire.

Its main features are a very thorough training in electrical engineering and chemical subjects, which extend throughout the whole course, and the distinctly professional work in electro-chemistry, which runs through the third and fourth years. The electrical studies are similar to those taken by students in electrical engineering, and include courses in the theory of direct and alternating currents, courses in direct and alternating current generators and motors and power transmission, with practice in the laboratories of electrical engineering and electrical testing.

The instruction in chemistry is devoted chiefly to courses in analytical, organic and industrial chemistry. In addition to these subjects are included courses in mechanism, applied mechanics, heat engineering, testing materials and metallography.

In the third year the underlying principles of electrochemical and chemical phenomena are discussed both from the kinetic and thermodynamic points of view. This course is completed in the first term of the fourth year, when it is accompanied by extended laboratory practice in electrochemical measurements. In the second term the instruction is continued by a course on applied electrochemistry, including electro-deposition, accumulators, electric furnaces and their products, electrolytic processes, and electrometallurgy, and by work in the laboratory of applied electrochemistry. Current periodical literature is reviewed in a weekly colloquium. The third term is devoted principally to a thesis on some electrochemical topic.

A wide range of elective studies is allowed in the fourth year to meet the needs of students who desire to specialize along certain lines of work.

Admission to the laboratory courses in electrochemistry is necessarily restricted to the capacity of the special laboratories equipped for this work.

ENGINEERING ADMINISTRATION — COURSE XV

The course in Engineering Administration provides a training for men who expect to enter positions concerned with the management or administration of manufacturing, construction, and transportation enterprises which demand a knowledge of scientific and engineering principles. Studies in the methods, economics, and law of business are combined with instruction in general engineering. The course includes (1) the instruction common to all courses, in literature, language and history, and in chemistry, physics and mathematics; (2) a choice of engineering studies, classified under three options: Civil Engineering, Mechanical and Electrical Engineering, Chemical Engineering; and (3) a selected group of subjects in business and economics. While the amount of time assigned to engineering subjects is less than that prescribed in the other courses of the Institute, the fundamental subjects have been retained which will enable graduates to fill many of the positions open to engineers.

Approximately one-fourth of the total time is given to business subjects which are primarily chosen to train students to analyze commercial and industrial problems. In this group special emphasis is placed upon accounting, business law, the industrial organization of society, and business management. The course in Accounting is designed to be of service to administrative officers in the analysis of accounts and financial reports, rather than to make bookkeepers, auditors, or accountants in a technical sense. Business Law treats of contracts, agency, negotiable instruments, sales, and patents. The two extended subjects of Industrial Organization and Business Management deal with the financial operations of corporations and the conduct of business from the standpoint of the individual employer. Among other subjects included in the group of business studies are banking, statistics, report writing, industrial relations, and securities and investments.

Civil Engineering Option. The Civil Engineering Option is intended to meet the needs of students expecting to enter upon administrative positions in organizations engaged in transportation or the construction of works pertaining thereto, or in the development and distribution of hydraulic power. The course differs from the regular Civil Engineering Course by the substitution of business subjects for some of the specialized optional subjects of the fourth year and for the following subjects of earlier years: astronomy, geodesy, geology, railway drafting, and topographical drawing. The graduates of this option are, however, trained in the fundamental principles and professional subjects upon which the practice of civil engineering depends.

Mechanical and Electrical Engineering Option. The Option in Mechanical and Electrical Engineering is planned to give a training in a sufficient number of the fundamental engineering subjects to make its graduates competent to deal with engineering affairs other than the direct design and construction of plants. It includes many of the important subjects given in the regular course in Mechanical Engineering, omitting, however, certain of the more specialized subjects. The option differs from the course in Electrical Engineering in that less attention is given to design and to the more theoretical parts of electrical engineering, the aim being to give the students a general knowledge, which, together

with the laboratory practice, should make them capable of employment in the operating or in directing the operating of electrical plants.

Chemical Engineering Option. The Chemical Engineering Option affords instruction in the more important branches of chemistry and in the fundamental principles of mechanical engineering. The time devoted in this option to organic chemistry is much less, and that devoted to the other branches of chemistry is somewhat less than in the Chemical Engineering Course. The training is, however, adequate to fit capable students to take business positions in establishments concerned with industrial chemistry. The instruction in mechanical and electrical engineering is also less extended than that in the Chemical Engineering Course. The primary purpose of the option is to give the information and training necessary to prepare men to deal with the economic administration rather than with the scientific development and control of the processes involved in the industries devoted to the manufacture of materials, such as textiles, paper, leather, rubber, fertilizers, iron and steel, foods, and chemicals.

Owing to the rapid increase of numbers of students in Course XV to a point where the registration in the course is about one-sixth of the total registration of the Institute, and to protect the real interest of the course and of the Institute from the pressure of students inadequately prepared to take up the work it has been decided for the present that:

The total number admitted to the Third Year of Course XV inclusive of the three options shall be limited, until the number of applicants for this course with perfectly clear records in the work of the first two years shall exceed one hundred and fifty.

Preference will be given to students who have completed the second-year work at the Institute with clear records in all first and second-year studies, including entrance records, and to students who have graduated from other colleges with uniformly good standing and satisfactory equivalents for first and second-year schedules of Course XV.

Students of the second year with deficiencies and students transferring from other colleges will be ranked and selected according to their records.

**GENERAL SCIENCE, GENERAL ENGINEERING, MATHEMATICS
COURSE IX-A, IX-B, IX-C**

General Science IX-A.— This course, largely elective in the senior year, is planned to offer first, a substantial education along scientific lines, and to provide subsequently, through its electives, for a more intensive training in some one branch of science, or in closely inter-related sciences. There is, also, an opportunity to elect a considerable amount of such humanistic studies as English, modern language, history, economics and social science.

Such a course possesses many advantages in view of the ever increasing inter-relations of the various sciences, and should prove particularly valuable to those who have not fully decided upon any particular line of specialization, or to those who intend to specialize in graduate work later.

The choice of electives in the third and fourth years must in all cases be approved by the professor in charge of Course IX.

General Engineering IX-B.— This course is designed to meet the needs of those who desire training in fundamental engineering subjects, and who either do not wish to specialize in any particular branch of engineering to the extent demanded by one of the regular engineering courses, or who may wish to follow out some line or lines of work not provided for by the schedule of any particular engineering course.

A schedule, except for that portion listed as elective, has been prepared and is offered as one suitable for a broad training in engineering. There is also opportunity for the election of economic and business subjects, or of courses in literature and modern languages.

In all cases the choice of electives must be approved by the professor in charge of Course IX.

Aeronautical Engineering.— Undergraduates, intending to specialize later in Aeronautical Engineering, may register in IX-B, and will choose their electives from courses having a special bearing on aeronautical work. The choice of these electives should be made in consultation with the Faculty in Aeronautics.

Mathematics IX-C.— The Institute offers exceptional opportunities for the study of mathematics particularly as applied to scientific and engineering work.

The schedule outlines a course of study leading to the Bachelor's degree for men who desire to specialize in Applied Mathematics. It is a course well adapted to serve as a preparation for later specialization in pure mathematics, in mathematical physics, or along lines of experimental physics or engineering requiring a high degree of proficiency in mathematics.

Considerable latitude in the choice of subjects is provided for in the electives of the junior and senior years in order that the student shall be able to take, in addition to his purely mathematical courses, a considerable amount of work in general studies, or in scientific and engineering subjects in which mathematics plays an important part. For example, he may elect courses in thermodynamics, mechanics, electricity or in physical chemistry.

While a definite schedule for the second year is offered, any student who has completed satisfactorily the work of the first two years in any of the professional courses of the Institute or their equivalent, provided always that a creditable record has been obtained in mathematics and physics, may be admitted to the third year in this option.

GEOLOGY AND GEOLOGICAL ENGINEERING — COURSE XII

The geologist and the geological engineer have lately won for themselves a place in many technical enterprises related to mining, civil engineering and water supply. Course XII is planned with this fact in view, though it is also adapted for those who desire to follow geology in its more theoretical aspects.

The course prescribes during the first two years the usual subjects taken by all the engineering and science courses. It also requires summer work in surveying and, throughout the upper years, a carefully arranged list of geologic subjects fundamental to one specializing in geology. A considerable amount of time is left for electives which may be chosen from either engineering subjects closely related to geology, such as mining engineering, or from more advanced geological subjects. The course is thus given considerable flexibility and can be adapted to the needs of students desiring to specialize in one of the larger divisions of geologic science; the same flexibility makes it possible to adapt the course to the needs of students from other colleges who may have in part anticipated the prescribed studies of the course.

MECHANICAL ENGINEERING — COURSE II

As Civil Engineering, which embraces outdoor engineering of all sorts, is the oldest and earliest developed branch of the profession, so Mechanical Engineering ranks next in point of time and development as the foundation of all industrial progress. It is essentially the engineering of design and production in industry.

The course in Mechanical Engineering prepares the student to enter any one of a number of branches of that profession. Besides machine design, with its specialties, engine design, power plant design, locomotive construction, steam turbine engineering and mill engineering, subjects are offered in the upper years preparing for heat and ventilation engineering, refrigeration and hydraulic engineering, factory construction, and industrial management. There is also some work in Electrical Engineering, sufficient for the handling of ordinary problems.

The work of the first two years is made up of the fundamentals for all these professions. It aims first to give the student a thorough training in such subjects as physics, mathematics and applied mechanics; then to familiarize him by means of lectures, laboratory work and drawing-room work, with the various problems that a mechanical engineer has to deal with. He is also given a training in the mechanic arts sufficient to make him familiar with the use of shop tools, foundry practice, forging and pattern work, such knowledge being essential for the successful designer of machinery. Mechanism, mechanical drawing, precision of measurements, are, of course, essentials in this preparatory work. All subjects offer, parallel with the classroom work, a sufficient amount of laboratory work to assist the student in thoroughly grasping the subject.

Instruction in drawing extends through the third year, the work finishing with the complete design and calculation of a boiler. The course in machine design, extending through all terms of the senior year and the course in power plant design, afford the student an opportunity of applying many of the facts learned in preceding years. In the fourth year the student is offered the choice of several professional electives; also the choice of one of four options, *i.e.*, Automotive Engineering, Engine Design, Textile Engineering, Ordnance Engineering.

MINING ENGINEERING AND METALLURGY — COURSE III

The demands made upon the mining and metallurgical engineer call for training in a great variety of lines. The policy of the school, accordingly, is to give him the underlying principles of mathematics, physics, chemistry, mineralogy, geology, mining engineering, and metallurgy, as well as some practical knowledge of mechanical, civil, and electrical engineering. Thus equipped, he can take up specialized work after graduation with the expectation of carrying it on successfully. The broad foundations laid in scientific and engineering subjects also give a student the general training he needs if he intends to follow technical enterprises other than mining and metallurgy.

Two optional lines of study are open to the student.

Option 1, general in character, covers the field of mining engineering, but includes also a sufficient number of metallurgical subjects, so that the students may defer the choice between mining and metallurgy to a later date.

Option 2 is for those interested chiefly in metallurgy. Prominence is given to the metallurgical processes; the production, properties, and treatment of metals and alloys; and to metallography. Opportunity is given to specialize in iron and steel, copper and non-ferrous metallurgy, or in gold and silver. Trips followed by conferences and reports are made to mills, foundries and shops in the vicinity. The principles of mechanical and electrical engineering, ore dressing, mining and accounting are covered in the course.

Valuable opportunities are offered for observation and field work in the ample laboratories of the Institute and in the Summer School of Surveying, of Mining and of Metallurgy.

Graduate courses of one year, which may lead to the degree of Master of Science, have been arranged for students able to devote an additional year to professional study.

**NAVAL ARCHITECTURE AND MARINE ENGINEERING
COURSE XIII**

The course in Naval Architecture and Marine Engineering provides instruction in the theory and methods of designing and building ships, together with a study of the properties requisite for safety and steadiness at sea. It aims to furnish a well rounded training for those who expect to be ship-builders, ship-designers, ship-managers, or marine engine builders, or who desire to enter allied industries.

In addition to the literary, mathematical, and scientific studies requisite for a general training and for preparation for the special work of the course, instruction is given in mechanism, thermodynamics, applied mechanics, hydraulics, heat engineering, steam turbines, and marine engineering. It is believed that a proper co-ordination of the design of a steamship and its propelling machinery can be attained only by a naval constructor who is familiar with both branches of his profession.

Lectures are given on theoretical naval architecture and marine engineering: treating of displacement and stability launching, theory of waves, rolling of ships, strength of ships, propulsion of ships, steering and manoeuvring, and also of power, proportion and strength of marine engines, and the application of steam turbines to marine propulsion.

After preliminary instruction in ship-drawing, each student carries through the design of a ship and its machinery for a given service in a systematic manner as in good practice, giving attention both to the logical development of the design and to the requirements for registration, for insurance and governmental inspection. Drawings and all customary computations are made of the structure and arrangements of hull, engines and propellers. The student makes a model, lays out plating and draws up specifications. To explain and unify the work of design, lectures are given on the materials and methods of construction of ships of wood and of steel, and on their equipment.

Lectures are also given on the Organization and Management of Shipyards, including buildings, plant personelle, wages, trades unions, etc.

A course of lectures is given to the United States Naval Constructors on "The Design and Construction of Merchant Ships."

While the fundamental principles of design are the same for all kinds of ships, the relative importance of the various factors is very different. Such items as economy of cost both during construction to reduce capital charges and when in commission so as to minimize working expenses, the influence of marine insurance, and the rules of the Registration Societies, the commercial limit of economical speed in relation to length of voyage, the stability at beginning and end of voyage and its effect on the behavior of the ship at sea, the freeboard and tonnage laws, types of propelling machinery, and the general sequence of work in the shipbuilding yard are described, and their effects on the problems of design are discussed.

PHYSICS — COURSE VIII

The position of Physics in science and engineering is so fundamental that it is imperative to offer a course in Physics, both theoretical and industrial, wherein the instruction shall be so organized as to carry the study of the basic sciences, mathematics, physics, and chemistry through the junior and into the senior year. The student thus equipped is fitted to apply his knowledge in a broad way to existing industries or to conduct scientific investigations for the industry of the future and for science itself. A considerable part of the senior year's work is left elective so that the student may be free to follow his own bent.

Option 1. Industrial Physics. The demand for the industrial physicist is great and increasing. Large corporations have already come, and smaller ones are rapidly coming, to realize that they must have in their employ men capable of dealing with old and new problems of which the solution involves a thorough knowledge of physical instruments, of physical properties of matter, and of methods of scientific procedure. To enable the student to fit readily into the industry, a large amount of engineering work is offered in the senior year, in part at the expense of continued work in science.

Option 2. Theoretical Physics. Our higher institutions of learning, great business concerns like the United States Government, and the General Electric Company, maintain large research laboratories where the pure scientist shall carry on investiga-

tions. To fit students for these activities the option in theoretical physics continues the work in pure physics to the end of the senior year.

The department reserves the right to limit admission to Course VIII above the Sophomore year to that number of students (at present about twelve or fifteen in each class) who may be properly trained with the professional equipment available. The limitation if necessary will be effected by the selection of the applicants of highest grade.

In this department graduate work in Aeronautical Engineering is given. The subjects treated are dynamics of rigid bodies, fluid dynamics, theoretical and experimental, aeronautical engines and meteorology; also the theory and practice of airplane design, airship design and propeller design. Practice is also given in the aerodynamical laboratory. Some of the courses in Aeronautics are open to properly qualified undergraduates as professional options or in Course IX-B as major electives.

SANITARY ENGINEERING — COURSE XI

The course in Sanitary Engineering is designed for students who wish to pay particular attention to those engineering branches which are concerned with problems of the public health, and who, therefore, desire to gain a better knowledge of the subjects of chemistry, biology and public health, and of their relations to engineering problems, than can be obtained in the course in Civil Engineering.

The line of study offered differs from the regular course in Civil Engineering, in the following particulars:

There is a reduction in the time devoted to railroads and bridges, and an entire omission of the courses in dynamo electric machinery, roads and pavements, astronomy and geodesy, and foundations.

The time thus gained is devoted principally to courses in chemistry, biology and public health. In these it is designed to give the students such training as shall fit them to interpret properly the results of researches in sanitary chemistry and sanitary biology, and to cooperate with chemists and biologists in professional work. Practice is given in the chemical and biological laboratories, and the student is instructed in the methods of water analysis,

and is taught to observe and identify the various animal and vegetable organisms present in natural waters and sewage. The course devotes particular attention to the sanitary side of questions of water supply and drainage, and discusses, among other things, the principles of filtration and the methods of purifying water and sewage, the relation between drinking waters and disease, the methods of disposing of sewage, and other questions relating to public health.

GRADUATE COURSES OF STUDY AND RESEARCH

In addition to the courses leading to the Bachelor's degree, the Institute offers to its graduates and to graduates of other Scientific Schools, Universities, and Colleges of good standing who have the requisite preparation the opportunity for advanced study and research leading to the degrees of Master in Architecture, Master of Science, Doctor of Philosophy, Doctor of Science, and Doctor of Public Health. The value of graduate study cannot be overestimated. At the best it is difficult for the student to acquire an adequate professional education from an undergraduate course of four years, especially since much of this time needs to be given to preparatory and general educational studies. It is therefore highly desirable that at least one additional year be devoted to graduate work leading to the Master's degree. The character of such work and the conditions under which it is carried on differ so much from those in the undergraduate courses that the fifth year is almost sure to give not merely much additional professional knowledge, but a new and valuable kind of training. The closer individual contact with the instructors, the general use of original articles and scientific monographs rather than textbooks, and especially the larger proportion of time devoted to research, develop originality and independent power, and inculcate the principles and spirit of investigation, which are necessary to success not less in technological than in scientific pursuits.

The degrees of Doctor of Philosophy or Doctor of Science are awarded for advanced study and research, courses of two or three years' duration. Such courses serve not merely to give a more thorough knowledge of the branch of science or engineering pursued as a major subject and of the allied branches pursued as

minor subjects, but also to train the student thoroughly as a scientific investigator, by far the larger proportion of the time being devoted to an extensive research of a scientific or technical character. Such courses give the thorough training needed by teachers in the higher institutions of learning, by scientific experts employed in government or industrial research laboratories, or by engineers who are to do creative work of the highest order in their professions.

Opportunities for such research work are offered in connection with all the departments of the Institute and in specially equipped laboratories — the Research Laboratories of Physical Chemistry, Applied Chemistry, Industrial Physics, Electrical Engineering, and Aerodynamics.

For more detailed information see the *Bulletin on Graduate Study and Research*.

EDUCATIONAL BUILDINGS

The plans for the development of the Institute on its new site provide for the utilization of the entire fifty acres and are the result of years of the most careful expert study and investigation. As a result the Institute now possesses an entirely new plant that is unrivaled in its facilities and adaptation to the purposes of technological instruction. The most important part of the buildings now completed consists of the Educational Group, comprising distinct but connected units which occupy and enclose an area of about thirteen acres with a floor space of about fifteen acres. As the need arises new building units will be added until ultimately this group will enclose an area of about thirty acres with a floor area of about thirty-five acres. Within this group of buildings is carried on all the educational work of the Institute except that in the Department of Architecture, which is given in the Rogers Building on the old site on Boylston Street in Boston.

Libraries.—The Library of the Institute contains about one hundred and fifty-five thousand volumes and fifty-seven thousand pamphlets and maps, and receives regularly nine hundred and fifty-seven periodicals. It includes the Central Library and a number of Departmental Libraries and Reading Rooms.

The main collection of books is situated in the stack surrounding the Central Reading Room (10-550). This room affords a

convenient place for reading and study. It is open on week days during term time from 9 a.m. to 10 p.m. except Saturdays when it is closed at 4 o'clock.

Laboratories.— The most marked characteristic of the Institute from the material point of view consists of its numerous large and well equipped laboratories.

Recognition of the value of laboratory instruction as a fundamental element in general education and of the proper function of such instruction is of comparatively recent origin, dating only from the latter half of the last century. Such instruction has formed a very important part of the work from the beginning, the Institute having taken the initiative in the establishment of laboratory work.

The principal laboratories are listed below:

The Mechanical Engineering Laboratories, including the Laboratory of Steam and Compressed Air, the Hydraulic Laboratory, the Refrigeration Laboratory, the Testing Materials Laboratories, the Gas Engine Laboratory, the Power Measurement Laboratory, and the Laboratories of Mechanic Arts.

The Laboratories of Mining Engineering and Metallurgy.

The Laboratories of Chemistry.

The Laboratories of Chemical Engineering.

The Research Laboratories of Physical Chemistry.

The Research Laboratory of Applied Chemistry.

The Laboratories of Electrical Engineering.

The Research Laboratories of Electrical Engineering.

The Laboratories of Biology and Public Health.

The Laboratories of Physics, including Laboratories of General Physics and the special laboratories of Heat, Optics, Electricity, Electrochemistry and Industrial Physics (Research).

The Mineralogical and Geological Laboratories.

The Aerodynamic Laboratory.

The Institute laboratory work is effectively supplemented by visits to engineering and industrial establishments, and by excursions directed by members of the Faculty.

SCHOLARSHIPS, FELLOWSHIPS AND PRIZES

UNDERGRADUATE SCHOLARSHIPS

The Massachusetts Institute of Technology holds funds bequeathed or given to it from which scholarships and fellowships are annually awarded. For the past several years an average of about \$40,000 has been expended from these funds for undergraduate scholarships. An additional amount has been awarded each year for fellowships and graduate scholarships.

It is the policy of the Faculty to apply the available funds to the assistance of as many well qualified needy students as possible by assigning, in general, amounts less than the full tuition. Awards are made to students pursuing regular courses who have completed at least a year of thoroughly satisfactory work at the Institute. The facts considered in making assignments are the needs of the student and his promise, as indicated by his previous Institute record. Scholarships are awarded only to those students who produce satisfactory evidence that they are greatly in need and whose records are entirely clear. A student who is not in need of aid can not honorably apply for a scholarship. Awards will be made in the summer for each term of the school year. The recommendations of the awards of the Faculty Committee on Undergraduate Scholarships are mailed to the applicants, and the Committee informs the Bursar of the recommendations. Credit toward the tuition fee to the extent of the award is given by the Bursar.

Awards, however, are made for each term of the year and are subject to cancellation whenever the student's record for a term fails to be clear and of the standing required of scholarship applicants. In case of forfeiture, the student and the Bursar are both notified.

Applications for scholarships should be made not later than May 1, on blanks supplied by the Registrar. Applications for the Cambridge scholarships are filed during May and June. The scholarships described below are arranged in the alphabetical order of their names.

Architectural Society Scholarship Fund.— This fund has been donated by the Architectural Society of the Institute and the income will be awarded to such student or students of the Department of Architecture as may be designated by the Trustees.

Elisha Atkins Scholarship.— This scholarship was founded by Mrs. Mary E. Atkins of Boston, with a gift of five thousand dollars.

Austin Fund.— From the estate of Edward Austin the Institute has received a bequest to assist meritorious students and teachers in the pursuit of their studies. A part of the income from this fund is available for undergraduate scholarships.

Billings Student Fund.— By the will of Robert C. Billings the Institute has received fifty thousand dollars. Any student receiving a benefit from this fund is expected to abstain from the use of alcohol and tobacco.

Jonathan Bourne Scholarship Fund.— By the request of Hannah B. Abbe the income from a fund of ten thousand dollars is available for scholarship purposes.

Harriet L. Brown Scholarship Fund.— This scholarship was founded in 1922 by a bequest from Harriet L. Brown, to aid deserving young women.

Cambridge Scholarships.— A limited number of scholarships are granted to students about to enter the first-year class at the Institute who are graduates of schools in Cambridge and children of legal residents of that city. These scholarships are awarded by competition on the results of the regular entrance examinations. They are confined to students who furnish evidence of need, obtain clear records, and reach the standard required by the Faculty for scholarship aid. Those to whom scholarships are awarded in the first year receive scholarships in their second, third and fourth years provided that they maintain a clear and scholarship record in the previous year and continue to furnish evidence of need. These amounts are for full tuition. Forms of application for these scholarships, including the com-

plete regulations concerning them, may be obtained from the Registrar. Applications must be filed with that officer during the months of May and June of the year in which the applicant intends to enter the Institute.

Lucius Clapp Scholarship Fund.— The income from this fund of five thousand dollars is available to aid students who otherwise might be unable to complete their studies at the Institute.

Class of '96 Scholarship Fund.— This fund was received in 1923 from the Class of '96 to found a scholarship, allotment of which by the Scholarship Committee shall be subject to the approval of the Class Secretaries. Preference in awarding scholarship will be given to the descendants of members of the Class of '96, and shall be available for such men at any time in their course, including men who may be starting in their freshman year. The scholarships are to be considered as loans to the students to be repaid by the recipients when and if able.

Lucretia Crocker Scholarship Fund.— The income from the bequest of Matilda Crocker is to be used to provide pecuniary assistance for one or more young women students.

Isaac Warren Danforth Scholarship Fund.— Founded by bequest of James H. Danforth as a memorial to his brother, Isaac Warren Danforth. The amount of this fund is five thousand dollars.

Dickinson Fund.— By the will of Mrs. Ann White Dickinson the Institute has received about forty thousand dollars, the income of which is applied to the assistance of young men of American origin.

Farnsworth Scholarship.— To establish this scholarship the Institute received a gift of five thousand dollars from Mrs. Mary E. Atkins, of Boston.

Charles L. Flint Scholarship.— Founded by Charles L. Flint of Boston. This scholarship is to be awarded, by preference, to a graduate of the Boston English High School.

Sarah S. Forbes Scholarship Fund.— Originally a fund of twenty-eight hundred dollars given in trust in 1868 by Sarah S. Forbes to William Barton Rogers and Henry S. Russell, Trustees, and afterwards transferred to the Institute, the income to be available for the maintenance and education of a student at the Institute.

George Hollingsworth Scholarship Fund.— This scholarship was founded by George Hollingsworth, and originally amounted to five thousand dollars.

T. Sterry Hunt Scholarship.— Founded by bequest of T. Sterry Hunt, for seven years Professor of Geology at the Institute. This scholarship is restricted to students of Chemistry and preference will be given those in the higher years.

William F. Huntington Scholarship.— Founded in memory of William F. Huntington, who graduated in Civil Engineering in the Class of '75. Preference will be given to a student in that course.

Joy Scholarship.— The money by which these scholarships are sustained was given by Miss Nabby Joy. They were created pursuant to a decree of the Supreme Judicial Court of Massachusetts, for the benefit of one or more women studying natural science in the Institute.

William Litchfield Scholarship.— By the will of William Litchfield the Institute has received five thousand dollars to be known as the William Litchfield Scholarship, the income to be awarded annually and paid to such student in said Institute as may upon a competitive examination be determined by the President of said Institute to be entitled thereto for excellence in scholarship and conduct.

Lloyd Scholarship Fund.— Founded by the Lloyd Registry of American and Foreign Shipping. The amount of this fund is \$500 per annum, and it is tenable for three years. The scholarship is awarded on the results of the freshmen year's work. The successful candidate is required to complete the course in either Naval Architecture or Marine Engineering.

Elisha T. Loring Scholarship.—Founded by Elisha Thacher Loring of Boston, by a bequest of five thousand dollars.

Lowell Institute School Scholarship Fund.—This fund was received in 1923 as a gift from the Alumni of the Lowell Institute School to found a scholarship for graduates of that school.

George Henry May Scholarship Fund.—Founded by George Henry May of the Class of '92 to provide a scholarship for graduates of the high schools of Newton, Mass. The beneficiary to issue a note in which he will agree to repay to the fund, face of note, without interest, when he can. The scholarship is awarded by a committee consisting of the superintendent of schools, chairman of the school committee and the headmasters of the Newton high schools.

Milton High School Scholarship.—Founded by the Institute in recognition of contributions of residents of Milton. This scholarship will be conferred upon such former pupil of the Milton High School in good standing at the Institute as the master of that school and the school committee of the town may select.

James Henry Mirrlees Scholarship.—Founded by James B. Mirrlees, of Glasgow, Scotland, in memory of his son, who died in May, 1886, while attending the Institute. This scholarship will be awarded to a third or fourth-year student in Mechanical Engineering.

Charles C. Nichols Scholarship Fund.—By the will of Charles C. Nichols the Institute has received five thousand dollars, the income of which is to be used for scholarships.

Nichols Scholarship.—Founded by bequest of Mrs. Betsey F. M. Nichols in memory of her son, William Ripley Nichols, of the Class of '69, for sixteen years Professor of General Chemistry at the Institute. Preference will be given to students in the course in Chemistry.

John Felt Osgood Scholarship.—By the will of Elizabeth B. Osgood, and as a memorial to her husband, John Felt Osgood,

the Institute has received five thousand dollars for the establishment of a scholarship in Electrical Engineering.

George L. Parmelee Scholarship Fund.— This scholarship was founded in 1921 by a bequest from George L. Parmelee.

Perkins Fund.— By a bequest of Richard Perkins, of Boston, the income of fifty thousand dollars is available for aiding students in such amounts as shall be recommended by the Faculty.

William Barton Rogers Scholarship Fund.— The income from this fund, which was raised and is held by the Alumni Association of the Institute as a memorial to President Rogers, is applied to aiding students requiring financial assistance. Grants from this fund carry with them the obligation of ultimate repayment, and all amounts returned become immediately available as income. In general, awards are restricted to students who have become members of the senior class.

William Barton Rogers Scholarship.— In commemoration of the connection of President Rogers with William and Mary College of Virginia, the Executive Committee has established a scholarship of the value of three hundred dollars a year to be known as the William Barton Rogers Scholarship. This scholarship will be granted to a student nominated by the Faculty of William and Mary College.

Richard Lee Russel Fund.— See Graduate list.

Henry Saltonstall Scholarship Fund.— See Graduate list.

John P. Schenkl Scholarship Fund.— Founded in 1922 by the bequest of Johanna Pauline Schenkl in memory of her father to establish scholarships in the department of Mechanical Engineering.

Sherwin Scholarship.— Founded by the English High School Association in memory of Thomas Sherwin. The student to receive the privilege of this scholarship is to be a graduate of the English High School of Boston and must be pursuing a regular course at the Institute.

Susan Upham Fund.— By gift of Susan Upham the income of one thousand dollars is available for students who may be in need of financial assistance.

Vose Fund.— By the will of Mrs. Ann White Vose, the Institute has received about sixty thousand dollars, the income of which is used for scholarships in aid of young men of American origin.

Louis Weissbein Scholarship.—By the will of Louis Weissbein the Institute received four thousand dollars for founding a scholarship, preference to be given to a Jewish boy in making the award.

Frances Erving Weston Scholarship Fund.— Founded by bequest of Frances Erving Weston in memory of her husband, the income to be used to aid a native-born American Protestant girl of Massachusetts.

Samuel Martin Weston Scholarship Fund.— Founded by bequest of Frances Erving Weston in memory of her husband, the income to be used to aid a native-born American Protestant boy, preference to be given to one from Roxbury.

Jonathan Whitney Fund.— See Graduate list.

GRADUATE SCHOLARSHIPS AND RESEARCH FUNDS

Besides the funds from which undergraduate scholarships are awarded, the Institute holds other funds from which graduate scholarships and fellowships are given. In some instances bequests provide for both graduate and undergraduate students. Information and regulations concerning Graduate Scholarships and Research Funds are set forth below.

Applications should be filed not later than the first of March. This rule applies both to original applications and to renewals of previous grants. If funds are available, applications will be considered up to the first of October.

An application for scholarship aid must be accompanied by an application for a course of advanced study and an official transcript of the applicant's college record, if these papers have not been filed previously. Both applications must be made on forms which may be obtained from the Registrar of the Institute.

In the award of graduate scholarships the committee will consider first, the ability of the candidate to pursue advanced study and research; second, his pecuniary need.

The awards made to students proceeding towards the Master's degree will in general be in sums sufficient to cover the tuition, that is, \$300, distributed over the school year. The same is true of awards made to students, proceeding towards the doctorate, who have not previously been in residence at the Institute.

The maximum award made to a student, proceeding toward the doctorate, who has been in residence at least one year, either as an advanced or an undergraduate student, will in general be \$600, but the total award made to any candidate during his whole period of graduate study will not exceed \$1,500, except in the case of applicants with exceptional qualifications.

Foreign traveling scholarships of \$500 may be awarded to applicants with exceptional qualifications who are Institute graduates or who have served on the instructing staff of the Institute.

The recipient of graduate scholarship aid is expected to complete the period of study for which he has received the grant. In case he discontinues his work before the end of such period he is expected to refund such part of the grant as he has received.

The Institute now possesses the following funds, the income of which is available, wholly or in part, to aid students in pursuing advanced study and research.

Austin Fund.—Founded by a bequest of Edward Austin, to assist meritorious students and teachers in the pursuit of their studies. From this fund a number of awards of three hundred dollars each, equivalent to free tuition, are made each year to students working for the degree of Master of Science. A limited number of awards, not exceeding five hundred dollars each, are available for candidates for the degree of Doctor of Science and Doctor of Philosophy.

Two Austin Research Fellowships carrying an award of five hundred dollars each, in addition to remission of tuition fees, have been established. Candidates for the degree of Doctor of Science or Doctor of Philosophy who have shown exceptional ability may be appointed to these Fellowships.

Malcolm Cotton Brown Fund.— Established by Charles A. Brown and Caroline C. Brown in memory of their son, Lieutenant Malcolm Cotton Brown, '19, for the purpose of stimulating advanced study and research in Physics. The income is available annually to a senior in high standing in the course in Physics. Only in exceptional cases where the recipient has greatly distinguished himself is the award made for a second year to the same student.

Collamore Fund.— The income from the bequest of Helen Collamore to be applied primarily to the aid of women students in graduate courses.

Dalton Fund.— Founded by Charles H. Dalton, the income to be used for the payment of fees of American male students, graduates of the Institute, who may wish to pursue advanced chemical study and research, especially applicable to textile industries.

du Pont Fellowship.— Donated by the du Pont de Nemours Company, annually available for graduate students in Chemistry.

Moore Scholarship Fund.— The income from a fund, the gift of Mrs. F. Jewett Moore, is available to assist some Institute graduate who wishes to continue studies in Europe, especially in organic chemistry. Preference will be shown to one who has distinguished himself in this subject while an undergraduate.

Williard B. Perkins Fund.— Founded by a bequest of Willard B. Perkins, of the Class of '72. The income, amounting to one thousand dollars, will be available every fourth year for a traveling scholarship in Architecture.

Ellen H. Richards Research Fund.— The income of this fund will be devoted to the promotion of research in sanitary chemistry, the branch of science to whose development Mrs. Richards so greatly contributed. The income will be utilized by the Institute for the award of fellowships to advanced students competent to pursue this line of research, for the employment of research assistants, and in such other ways as will best promote investigations in the field in question.

Henry Bromfield Rogers Fund.— The income from this fund is used for fellowships or scholarships for women graduates of the Institute or other colleges whose graduate work is carried on at the Institute.

Richard Lee Russel Fund.— Founded by Theodore E. Russel in memory of his brother, Richard Lee Russel. The income to be devoted to assisting some worthy student of high standing in the department of Civil Engineering to continue his studies at the Institute as a post-graduate or undergraduate.

Henry Saltonstall Scholarship Fund.— Founded by the bequest of Henry Saltonstall. The income to be used to aid students, whether undergraduate or graduates, pursuing advanced courses.

James Savage Fund.— Founded by the late James Savage, the income to be awarded to a graduate student of the Institute, or of some similar institution of equal standing, who wishes to engage in the advanced study of some branch or branches of knowledge taught in the Institute.

Susan H. Swett Fund.— The income to be awarded to a graduate student of the Institute, or of some similar institution of equal standing who, by his character, capacity, training, and attainments, shall give evidence of special fitness to pursue advanced study in some branch or branches of knowledge taught in the Institute.

Technology Plan Research.— In connection with the Division of industrial Coöperation and Research, a fund of several thousand dollars is available for the study of problems in pure science. With the aid of this fund, problems in Physics and Chemistry are now being studied.

Traveling Fellowship in Architecture.— One thousand, two hundred and fifty dollars to be devoted to travel and study abroad under the direction of the Department of Architecture. The competition for this fellowship is open to regular and special students who have passed at least two consecutive years in the school within the last three years, one of which must have been in the graduate class.

Jonathan Whitney Fund.— The income from this fund, established by Francis B. Greene, is available for the purpose of aiding students who need financial assistance in obtaining an education at the Institute.

PRIZES

The following annual prizes are offered to the students of the Department of Architecture, and are awarded through competitions in Design:

Architectural Society Fund.— Founded by former students of the Department of Architecture to be used for the relief of deserving students.

The Boston Society of Architects' Prize.— The gift of the Society. A prize of one hundred and fifty dollars to the best design submitted by a present or former student of Harvard, Technology or the Boston Architectural Club on one of the regular conjunctive programs.

The Chamberlin Prize.— The gift of Mr. W. E. Chamberlin of the Class of 1877. Twenty-five dollars awarded to a student in the graduate class.

The F. W. Chandler Prizes.— The gift of the alumni of the Department and of Professor Chandler's friends. Five prizes of ten dollars each awarded for sketch problems in the third, fourth and graduate years.

The "Class of 1904" Prizes.— The gift of the Class of 1904. Two prizes of ten dollars awarded to a regular and a special student in the junior class.

Rotch Prizes.— The gift of Mr. Arthur Rotch. Two prizes of two hundred dollars awarded at the end of the senior year to the regular and the special student having the best general records. The special student must have spent at least two years in residence to be eligible.

Student Medal of the American Institute of Architects.
— This medal is awarded on the recommendation of the Department to the member of the graduating class whose record for the course is the best.

Department of Architecture Medals.— At the end of each academic year the bronze medal of the Department is given to the winner of each prize.

Further information may be obtained by addressing the Registrar, Massachusetts Institute of Technology, Cambridge, Mass.